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Engineering Construction on Infrastructure

Review of Trends to 30 June 2017

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Engineering Construction on Infrastructure; Review of Trends to 30 June 2017
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Executive Summary

This report updates trends in engineering construction on infrastructure through to 30 June 2017. Although the emphasis in the discussion is on infrastructure, the final Chapter of the report looks at engineering construction in sectors that fall outside the definition of infrastructure. The statistics used throughout are Australian Bureau of Statistics (ABS) statistics on engineering construction. These statistics measure engineering construction commencements, work completed and work outstanding on projects underway. This construction adds to the stock of infrastructure and is a reliable surrogate measure of infrastructure. Recourse to a surrogate is necessary because governments consistently refuse to make available statistics on the stock of Australia's infrastructure, its condition, its capacity and its remaining economic life.

The approach used in the report is to differentiate between public and private sector construction. Sectors are defined by ownership of the asset under construction; thus, private sector construction relates to assets that when completed are owned and operated by the private sector and public sector construction relates to assets that when completed are owned and operated by public sector agencies irrespective of whether construction was undertaken by public sector agencies or by private entities under contract to the public sector. It is important to note that all three levels of government are included in the public sector and it is not appropriate to attribute activity to any one sector.

Practically all public sector engineering construction is the construction of infrastructure, mainly in cities and other major population centres and the transport links between them. The public sector is now emerging from a period of below average growth in engineering construction on infrastructure. Last year public sector infrastructure construction increased by 6.3% and in the year ending 30 June 2017 construction grew by 10.7%.

Three quarters of public sector engineering construction completed in 2016-17 was on roads (43.2%), telecommunications facilities (16.9%) and on railways (13.2%) and there were substantial increases in construction completed in each of these asset classes. There were, however, several areas where public sector construction contracted in 2016-17, notably harbours, sewerage and electricity. The large scale of growth sectors ensured the overall outcome.

Last year public sector commencements on infrastructure fell but remained consistent with the scale of commencements achieved over the past decade. There was a large amount of unfinished construction outstanding on projects already underway sufficient for about 4.2 years of work at the current rate of public sector completions. These trends suggest that the current scale of completions is likely to continue for several more years. It is important to keep these positive changes in perspective. In constant price terms, public sector infrastructure completed in 2016-17 was $28,779.6 million. This is higher than completions in the previous three years, but less than the 2009-10 outcome of $30,184.2 million.

Private sector construction is less clear-cut than the public sector because it is divided between construction providing the infrastructure necessary to support

resources projects and construction on infrastructure that is complementary to public sector infrastructure. Long term average annual growth in private sector infrastructure was high (9.0% per year) and was strongly influenced by resources factors. The resources construction boom is now over and average annual growth over the past five years was in fact contraction of 7.9% per year. During this period only the construction of bridges, electricity facilities and telecommunications facilities showed positive outcomes. Last year private sector construction on infrastructure contracted by 2.7% to $18,920.8 million in constant prices with strong results in roads and telecommunications. The negative impact of the end of the resources boom on private sector infrastructure has now been offset by growth in public sector infrastructure completions.

Much of the discussion about the end of the resources boom gives the impression that engineering construction in this sector has pretty much disappeared. Certainly it is true to say that just as there was an extraordinarily rapid increase in construction as the boom gathered pace, there has been a rapid fall in construction in recent years. But the key point to remember is that there continues to be a substantial amount of engineering construction taking place in the resources sector and it is likely to continue for a few years yet. Indeed, engineering construction completed in the resources sector last year was larger than public sector construction on infrastructure and will have spill over effects in private sector construction on associated infrastructure.

All forms of engineering construction contribute to Australia's GDP. However, infrastructure facilities in Australia's cities and population centres, by virtue of wider accessibility to large numbers of businesses and consumers, are likely to have higher economic multipliers and higher productivity potential.

Congestion in Australia's cities has not been resolved and public transport remains inadequate and there is a long list of unresolved issues in other infrastructure areas. The increases in public sector infrastructure recorded in this report are consistent with political pronouncements that action is underway to correct these problems. But, our view is that compared to the nation's response to the resources boom, our response to the infrastructure deficiency in cities and other population centres is tardy. From an economic perspective, the increase in public sector infrastructure has not come close to offsetting the reduction in construction in the resources sector resulting in a net depressive effect on economic activity. The case for a substantial surge in public sector infrastructure remains strong.

The increases in public sector infrastructure recorded in this report are consistent with political pronouncements that action is underway to correct these problems. But, comparing the relative scales of engineering construction components suggests that these efforts are more modest than put forward and this needs to change.

1. Measuring Trends in Infrastructure Work Completed

1.1 Report Objectives

Since the last Engineers Australia Infrastructure Report Card was released in 2010, we have assessed progress on infrastructure development by reviewing trends in ABS engineering construction statistics. Engineering construction completed add to the stock of infrastructure in the economy and are a surrogate for the stock of infrastructure. New engineering construction started on infrastructure assets is a reliable indicator of what lies ahead as do the trends in unfinished engineering construction on projects already underway. This report aims to update the review process to the end of the 2016-17 financial year.

We use ABS statistics on engineering construction[1] because announcements and documentation about infrastructure developments by all levels of government are replete with double counting due to multiple announcements, often confuse new capital works with recurrent costs of operation, often contain inflated cost items and though announced some projects are never completed. Engineers Australia has repeatedly called for better statistics on infrastructure development, but the status quo persists.

ABS engineering construction statistics apply consistent protocols and have been collected for several decades allowing current conditions to be compared to past circumstances. It is important to note that the protocols used mean that engineering construction statistics cannot be reconciled to government budget figures. Never-the-less, consistent application of the protocols produce reliable indicators of trends and trend changes.

The report uses Infrastructure Australia's definition of economic infrastructure as set out in its establishing legislation. This definition focuses on infrastructure that will materially improve national productivity and includes roads, bridges, railways, harbours, water and sewerage, electricity, gas and telecommunications.

For many years engineering construction statistics were dominated by construction to support the resources sector. The popular media has often confused construction of economic infrastructure to support and enhance economic development in cities and other major population centres and construction to support the resources sector which is typically located in remote areas of Australia.

Geographic disaggregation of the ABS statistics is limited to state and territory level which means that it is not feasible to accurately untangle the two types of construction. However, important insights can be obtained by differentiating between public and private sector engineering construction on infrastructure. Public sector engineering construction is almost all construction of infrastructure assets. While the private sector is increasingly engaged in infrastructure development in cities and population centres to complement public sector activity, the private sector also constructs the infrastructure assets needed to support the mining, oil and gas industries in the remote areas where these facilities are located.

Engineering construction generally adds to national gross domestic product. In other words, both types of infrastructure identified in the previous paragraph are important. However, the particular advantage of public infrastructure, and private sector infrastructure that

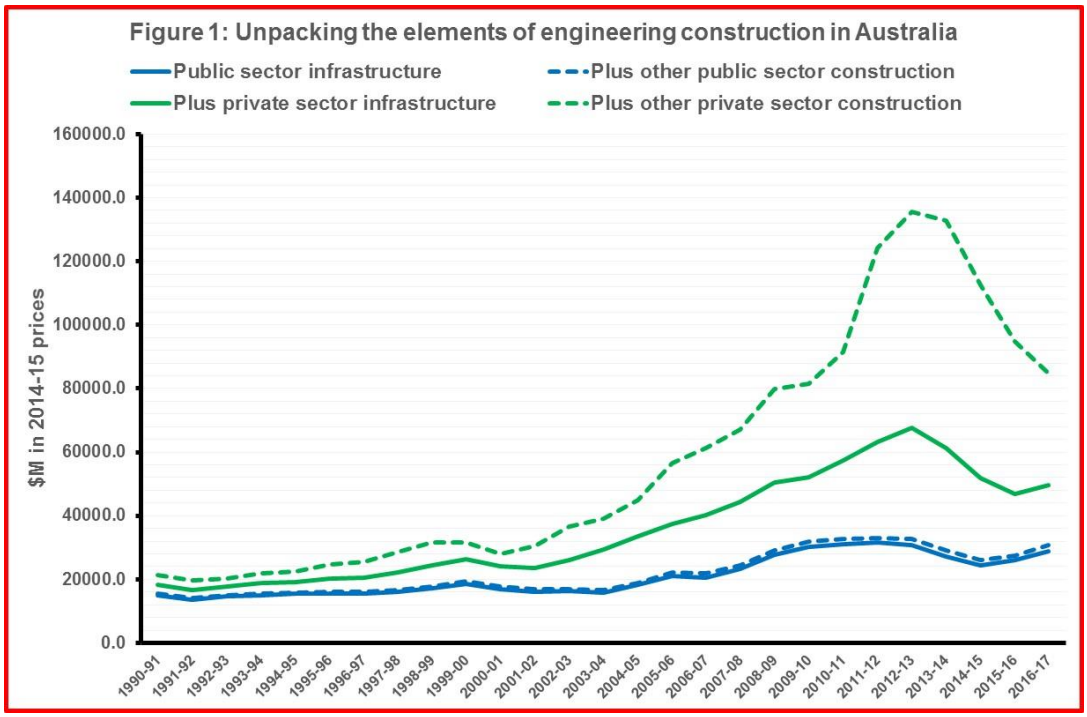
[1] ABS, Engineering Construction, Australia, Cat No 8762.0, electronic releases, www.abs.gov.au

complements it, is that it gives rise to larger economic multiplier effects by virtue of its accessibility to large numbers of users. In contrast, infrastructure in remote areas, while critically important to the functioning of mines and gas and oil facilities, has limited accessibility, usually for the operators of these facilities and sometimes for operators of nearby similar facilities through third party access agreements.

One of the quirks of the ABS statistics is that that the base year for the chain volume technique used to produce constant prices statistics is updated annually. In the last update the base year was 2013-14. This year the base year is 2014-15. As a result, the statistics in this report should not be compared to those in last year's update. To facilitate historical comparisons, we reproduce trends from 1990-91 onwards using the 2014-15 base.

1.2 Unpacking Engineering Construction

This section looks more closely at the composition of engineering construction statistics to demonstrate the difference between public and private sector construction. In figure 1, the blue lines are public sector trends; the solid line is the trend in infrastructure construction since 1990-91 and the dashed line shows the additional public sector engineering construction that falls outside the definition of infrastructure we are using. The green lines are the corresponding private sector trends. Thus, the dashed green line shows the trend in overall engineering construction in Australia from 1990-91 to 2016-17.



The dominant feature of Figure 1 is the influence of the resources boom on private sector engineering construction. The upsurge in the solid green line shows the effect of constructing the infrastructure facilities needed to support new resource sector facilities. The point made in the previous section is that also contained in this trend is private sector construction on infrastructure that is complementary to public sector

infrastructure development. The upsurge in the dashed line shows the effect of constructing the mines and gas and oil facilities themselves.

Each of the four trends in Figure 1 can be further disaggregated into their constituent components. The ABS releases its statistics on a quarterly basis, but for convenience these have been annualised and expressed in 2014-15 prices in the following Tables. Tables 1 and 2 show the components of public and private infrastructure and Tables 3 and 4 the components of public and private construction additional to infrastructure.

In the following Chapters we consider the trends in the components of these trends and how they have contributed to Figure 1.

Table 1: Engineering construction on economic infrastructure, public sector, Australia ($m in 2014-15 prices)

Year	Roads	Bridges	Railways	Harbours	Water	Sewerage	Electricity	Pipelines	Telecomm's	Infrastructure
1990-91	4349.5	419.6	742.9	181.2	1212.1	1064.8	2669.9	191.3	4178.0	15009.3
1991-92	4007.0	436.2	787.9	100.7	1237.3	963.8	2663.9	93.7	3204.7	13495.2
1992-93	5126.4	390.5	912.1	202.5	1096.9	1022.0	2545.2	97.3	3165.9	14558.8
1993-94	5478.3	580.0	1224.6	232.2	1056.3	938.9	2368.4	212.4	2879.0	14970.1
1994-95	5210.1	469.0	1648.1	140.8	797.9	932.9	2221.7	223.9	3817.5	15461.9
1995-96	5457.8	326.3	1684.2	138.9	629.8	816.8	1563.2	547.3	4451.9	15616.2
1996-97	5143.9	339.0	2082.8	291.3	521.0	688.7	1831.0	169.4	4398.9	15465.9
1997-98	6026.7	415.7	1609.3	186.8	531.9	877.1	1680.6	112.2	4549.5	15989.6
1998-99	6701.1	465.5	1428.0	233.5	671.8	954.2	1691.6	175.6	4768.5	17089.8
1999-00	6636.9	571.3	984.9	140.0	877.6	1468.0	2135.5	80.3	5651.2	18545.7
2000-01	6157.0	491.2	799.2	169.0	681.5	1216.7	2392.3	79.6	5025.1	17011.7
2001-02	5513.3	445.1	905.9	329.6	684.9	870.7	2687.6	72.4	4708.8	16218.2
2002-03	5705.8	351.1	1125.7	238.3	692.9	1024.0	2918.2	46.4	4142.6	16244.9
2003-04	5280.4	307.9	1768.6	241.9	885.2	1207.2	2999.0	42.2	3184.5	15916.8
2004-05	5955.6	402.8	2374.8	226.3	1189.0	1131.5	3390.7	20.5	3499.5	18190.8
2005-06	6586.4	616.4	2261.5	181.7	1174.5	1116.3	4638.5	146.8	4479.8	21201.8
2006-07	7446.0	994.3	1935.9	184.2	1440.8	1378.3	5129.6	237.7	1693.5	20440.3
2007-08	8206.9	1219.2	1607.0	534.9	4327.3	1930.7	5415.3	43.9	34.0	23319.4
2008-09	10628.9	1210.4	2286.5	734.6	4175.5	1988.1	6565.5	11.2	58.5	27659.2
2009-10	10173.6	1302.4	3565.5	763.5	4425.3	2495.7	7248.8	15.8	193.7	30184.2
2010-11	11664.3	1223.5	4258.1	760.5	3099.2	2960.9	6809.9	34.6	286.5	31097.5
2011-12	13509.2	831.8	3685.6	363.8	2882.7	2485.5	7282.8	36.7	544.9	31622.9
2012-13	13409.8	731.9	3293.3	271.0	2565.6	2293.3	6977.8	43.7	1219.1	30805.6
2013-14	11092.1	645.1	2873.3	490.4	1871.9	2149.9	5929.6	14.2	2080.2	27146.7
2014-15	9985.7	524.1	2391.2	645.3	1407.2	1594.1	5200.5	9.9	2716.5	24474.4
2015-16	10669.3	790.8	2938.9	473.4	1417.5	1827.1	4095.9	12.7	3783.0	26008.5
2016-17	12422.4	844.1	3808.2	328.8	1774.5	1651.9	3079.5	16.7	4853.7	28779.6

Source: ABS, Engineering Construction Australia, Cat No 8762.0

Table 2: Engineering construction on economic infrastructure, private sector, Australia ($m in 2014-15 prices)

Year	Roads	Bridges	Railways	Harbours	Water	Sewerage	Electricity	Pipelines	Telecomm's	Infrastructure
1990-91	1873.3	20.1	32.2	89.7	183.4	171.4	173.1	124.8	16.1	2684.2
1991-92	1847.1	21.3	59.4	53.4	106.5	100.8	177.8	176.6	12.2	2555.0
1992-93	1734.2	5.3	22.3	58.0	145.3	131.8	140.2	332.5	122.7	2692.5
1993-94	2022.1	18.4	68.2	121.7	255.1	193.3	268.1	247.1	146.2	3340.2
1994-95	1927.3	11.0	49.4	44.2	462.9	125.9	283.3	296.4	126.0	3326.3
1995-96	1870.6	63.0	103.3	41.4	430.0	250.5	751.3	459.2	329.1	4298.4
1996-97	2465.9	57.6	133.8	133.8	203.1	126.5	690.8	399.3	279.2	4490.0
1997-98	3065.8	38.8	282.3	339.2	230.3	169.2	998.2	491.9	111.2	5727.0
1998-99	3544.4	104.0	257.7	314.9	233.4	128.2	1223.9	655.9	181.2	6643.7
1999-00	2718.4	164.8	244.7	126.5	272.9	237.7	2151.7	656.2	556.1	7129.2
2000-01	1962.0	19.6	139.8	136.7	283.4	293.9	2239.2	363.3	964.5	6402.4
2001-02	2342.3	49.6	408.2	156.2	214.2	235.7	2047.6	755.9	549.3	6758.8
2002-03	3624.1	109.3	774.0	203.5	240.8	412.9	1943.8	1339.1	522.5	9170.0
2003-04	5642.1	61.5	387.9	406.5	419.0	686.8	2105.8	1985.5	1100.1	12795.2
2004-05	6906.4	117.3	660.0	1032.8	480.1	401.2	2888.2	938.0	1258.0	14682.0
2005-06	7171.2	21.5	621.4	1121.8	577.1	410.9	2553.8	1156.2	1559.3	15193.2
2006-07	6337.8	79.9	1172.5	1191.3	563.0	429.6	3556.7	1067.9	4040.3	18439.2
2007-08	5600.7	103.3	1731.1	1132.9	824.5	982.4	4082.7	690.5	4833.9	19982.0
2008-09	6464.8	91.8	1278.6	1303.3	629.2	1075.0	5472.4	930.6	4138.4	21384.1
2009-10	5215.1	49.6	1431.6	1553.9	1860.1	553.9	4565.6	1082.0	3918.4	20230.1
2010-11	5483.8	116.3	2239.4	3037.5	3113.4	689.0	4449.2	1845.1	3832.9	24806.7
2011-12	5591.0	151.7	4213.6	5548.8	2099.4	700.9	4765.6	2601.0	4514.0	30186.0
2012-13	5287.2	69.1	4425.1	7263.6	1444.3	649.4	7019.0	4182.6	4583.0	34923.2
2013-14	4317.7	124.0	3830.8	5333.8	1193.7	599.9	6410.5	5346.0	4859.3	32015.8
2014-15	4569.8	150.0	2846.7	2363.3	917.9	418.4	3820.4	6177.2	4681.3	25945.0
2015-16	4442.2	62.6	845.7	787.6	598.8	554.8	3579.4	3621.7	4957.5	19450.2
2016-17	4886.3	134.5	541.5	808.2	660.4	485.8	4384.4	1017.0	6002.7	18920.8

Source: ABS, Engineering Construction Australia, Cat No 8762.0, electronic statistics

Table 3: Engineering construction additional to infrastructure, public sector, Australia ($M in 2014-15 prices)

Year	Recreation	Resources	Heavy industry	Other	Total
1990-91	289.8	184.8	40.0	55.4	569.9
1991-92	276.6	266.1	12.7	43.4	598.8
1992-93	260.3	129.1	56.0	41.4	486.7
1993-94	273.0	131.4	56.0	25.3	485.9
1994-95	240.3	46.7	60.2	16.0	363.3
1995-96	301.2	59.1	54.7	20.7	435.7
1996-97	328.6	190.5	23.8	20.2	563.2
1997-98	367.0	159.1	14.2	26.9	567.1
1998-99	418.6	181.2	14.8	32.9	647.4
1999-00	601.2	73.5	29.8	51.4	755.9
2000-01	458.3	80.5	56.8	65.0	660.6
2001-02	548.5	51.4	1.2	63.4	664.5
2002-03	551.4	36.8	8.1	48.7	644.9
2003-04	538.1	15.4	36.3	40.0	629.7
2004-05	496.9	31.4	3.4	72.5	604.2
2005-06	544.9	329.7	6.9	120.5	1002.0
2006-07	662.8	579.7	10.6	88.4	1341.5
2007-08	717.5	180.3	14.5	68.2	980.5
2008-09	953.2	250.1	3.4	271.4	1478.1
2009-10	1166.7	178.1	9.6	256.6	1611.0
2010-11	1349.5	59.8	8.2	116.6	1534.1
2011-12	1119.2	34.5	3.2	110.3	1267.2
2012-13	1498.8	181.8	48.7	211.5	1940.9
2013-14	1721.2	148.7	53.8	114.4	2038.2
2014-15	1241.1	139.1	24.2	101.7	1506.0
2015-16	1202.0	186.7	28.1	67.3	1484.0
2016-17	1356.0	221.1	29.7	272.9	1879.7

Source: ABS, Engineering Construction Australia, Cat No 8762.0

Table 4: Engineering construction additional to infrastructure, private sector, Australia ($M in 2014-15 prices)

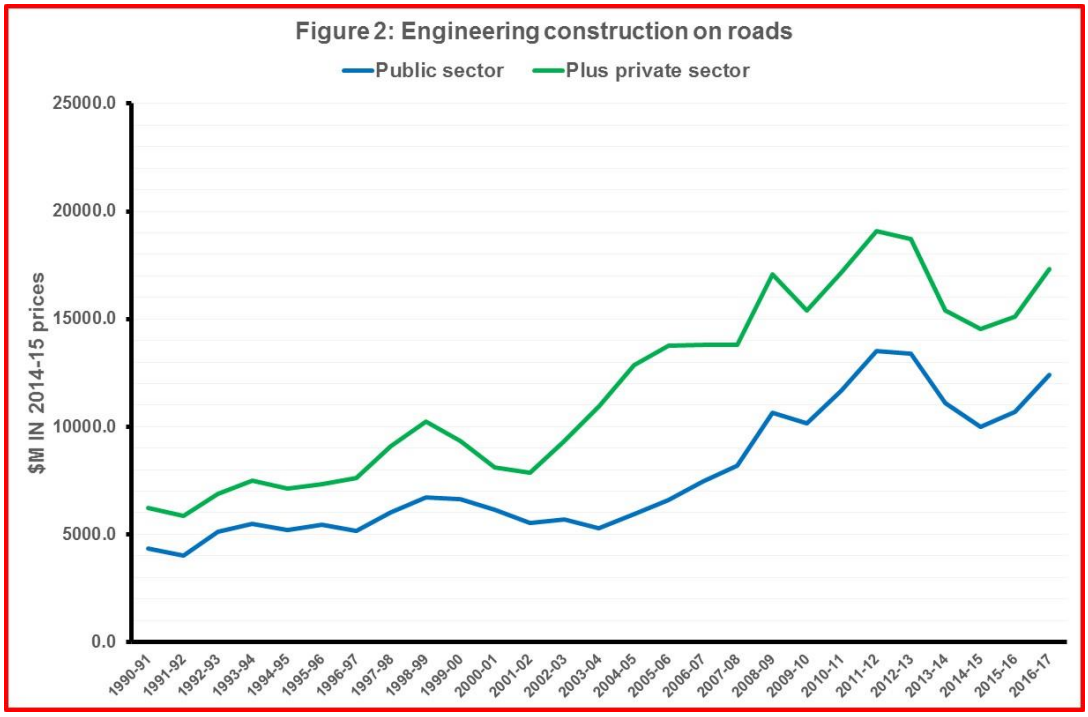
Year	Recreation	Resources	Heavy industry	Other	Total
1990-91	587.9	1677.8	761.6	48.3	3075.7
1991-92	326.4	2048.1	652.5	55.9	3082.8
1992-93	389.4	1638.4	536.3	30.5	2594.7
1993-94	393.5	2162.4	669.8	12.8	3238.4
1994-95	566.5	2140.1	697.8	21.3	3425.8
1995-96	659.2	2889.4	764.2	63.2	4376.1
1996-97	977.7	2985.2	957.6	58.1	4978.6
1997-98	1066.2	4509.5	731.9	77.2	6384.8
1998-99	967.0	5157.3	1018.3	108.6	7251.3
1999-00	1107.0	3434.1	533.2	214.8	5289.2
2000-01	1100.3	2176.1	439.7	190.3	3906.4
2001-02	1182.3	4707.4	553.8	289.1	6732.6
2002-03	1487.5	8278.4	331.8	334.7	10432.3
2003-04	1469.5	7699.9	384.1	331.7	9885.2
2004-05	1759.0	8728.7	705.7	294.4	11487.8
2005-06	1661.5	15783.1	1049.9	651.2	19145.7
2006-07	1416.8	17610.4	1375.0	535.3	20937.6
2007-08	1238.6	20033.4	1019.6	534.9	22826.6
2008-09	1288.5	25569.6	1214.8	1316.5	29389.4
2009-10	1626.3	25946.4	529.3	1370.0	29472.0
2010-11	1682.6	30576.2	905.0	828.6	33992.5
2011-12	1955.8	56895.6	929.9	1436.0	61217.2
2012-13	2438.2	61448.9	1408.3	2569.8	67865.2
2013-14	2569.9	66142.0	1226.5	1698.7	71637.1
2014-15	2431.9	56033.9	860.9	1162.7	60489.4
2015-16	2729.4	43651.5	585.6	782.8	47749.4
2016-17	2330.3	31540.8	635.1	836.7	35342.9

Source: ABS, Engineering Construction Australia, Cat No 8762.0

2. Construction of Roads

2.1 Engineering Construction Completed

Figure 2 shows the trends for public and private sector engineering construction on roads.



In 2016-17, the public sector completed $12,422.5 million in road construction, up 16.4% on the $10,669.3 million completed the previous year. Construction has now increased in each of the past two years. The increase in construction was $1,753.1 million which compares to an overall increase in infrastructure completed of $2,771.1 million. Public sector road construction last year was 43.2% of public sector infrastructure completed. Although a positive development, 2016-17 completions should be gauged against peak construction of $13,509.2 which was achieved in 2011-12.

Private sector road construction completed was $4,886.3 million, up 10.0% from the previous year. Construction has ratcheted up and down in each of the past four years. In 2016-17, road construction was 25.8% of private infrastructure completed. The increase in private sector road construction compares to a reduction in overall infrastructure completed of $529.4 million.

Overall in 2016-17, the two sectors combined completed road construction of $17,308.6 million, an increase of 14.5% over the previous year. The increase in construction completed was $2,197.2 million which compares to an overall increase

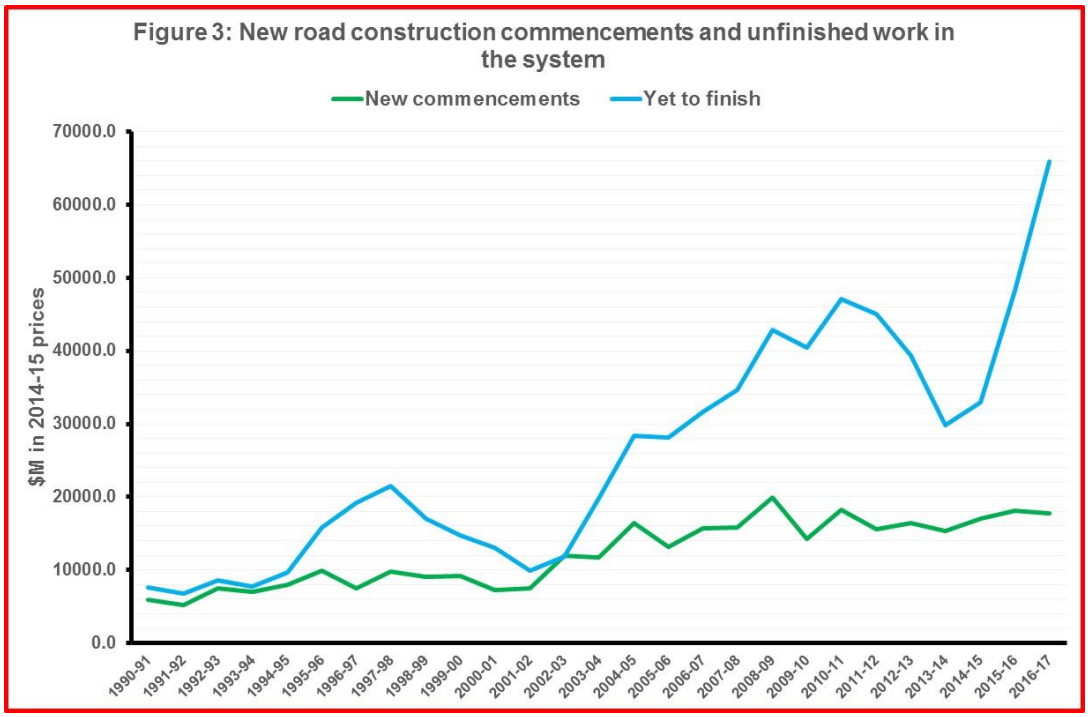
of $2,241.7 million in infrastructure completed. The peak in road construction was $19,100.2 million in 2011-12.

2.2 Outstanding Work

New road construction commenced and unfinished work on projects already underway are illustrated in Figure 3. The public sector commenced new construction valued at $13,955.0 million which was 5.9% down on the record commencements achieved in 2015-16. At the present rate of public sector completions, this represents 1.12 years of work.

Private sector road commencements were up 13.6% on the previous year at $3,734.8 million, well down on the peak of $8,979.4 million in 2008-09. These commencements represented 0.76 years of work at the present rate of private sector completions.

Overall new road construction valued at $17,689.8 million was commenced in 2016-17, slightly down (2.4%) on the previous year and well down on the peak of $19,943.2 million in 2008-09. These commencements represent 1.02 years of work at the present overall rate of completions.



The public sector had unfinished road construction valued at $51,990.6 million outstanding at the end of 2016-17, 61.8% higher than the previous year. This was 58.3% of unfinished public sector infrastructure in the system. At the present rate of public sector completions, the unfinished work represents 4.19 years of work.

Unfinished work in the private sector was valued at $13,877.2 million, down 13.9% on the previous year and well down on the peak which occurred in 2008-09. At the present rate of private sector completions this represents 2.84 years of work.

Overall there was unfinished road construction valued at $65,867.8 million outstanding at the end of 2016-17. This was the highest amount of outstanding work on roads ever recorded and represents 3.81 years of work at the present overall rate of road completions. These results suggest buoyant conditions in road construction with construction completions continuing at present levels and possibly increasing as unfinished work is finalised.

3. Construction of Bridges

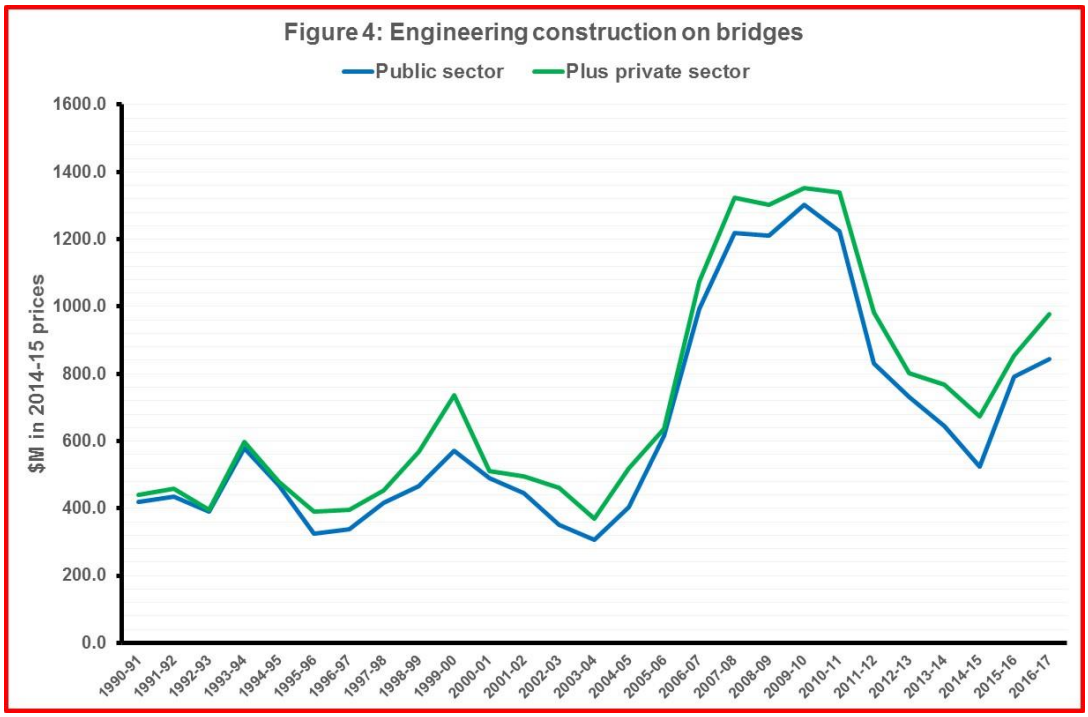
3.1 Engineering Construction Completed

Bridges includes road bridges, railway bridges, causeways and elevated highways. This is a small component of infrastructure accounting for just two per cent of the total in 2016-17. Trends for work completed are illustrated in Figure 4 which cumulates the work completed in the two sectors.

Private sector construction has been highly variable year on year. In 2016-17 there was just $134.5 million in construction and this was over double the previous year's outcome.

Public sector construction was not quite as variable as in the private sector. Construction valued at $844.1 million was completed in 2016-17, up 6.7% on the previous year.

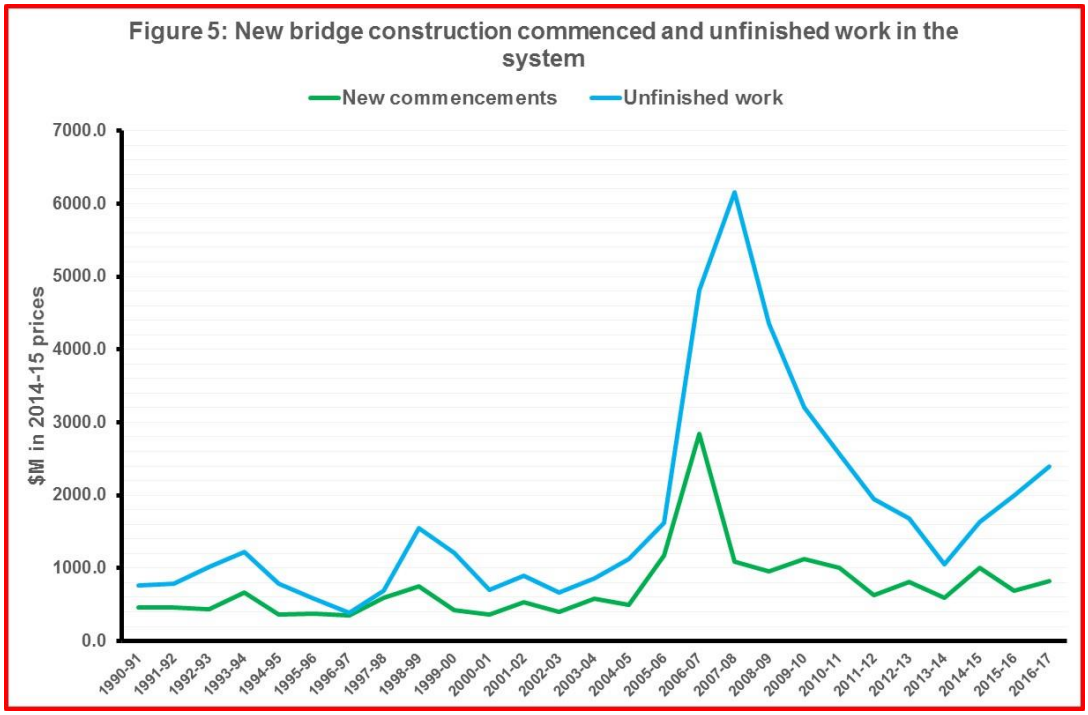
Overall, the two sectors combined completed $978.6 million in bridge construction. Although 6.7% higher than the previous year, peak construction was substantially higher at $1,353.0 million in 2009-10.



3.2 Outstanding Work

Figure 5 illustrates the trends in new bridge construction commencements and unfinished work on projects already in the system.

New commencements were valued at $822.8 million at the end of last year, representing about 0.84 years of work at the current rate of completions for the two sectors combined. About 14% of commencements were in the private sector and the balance was in the public sector.



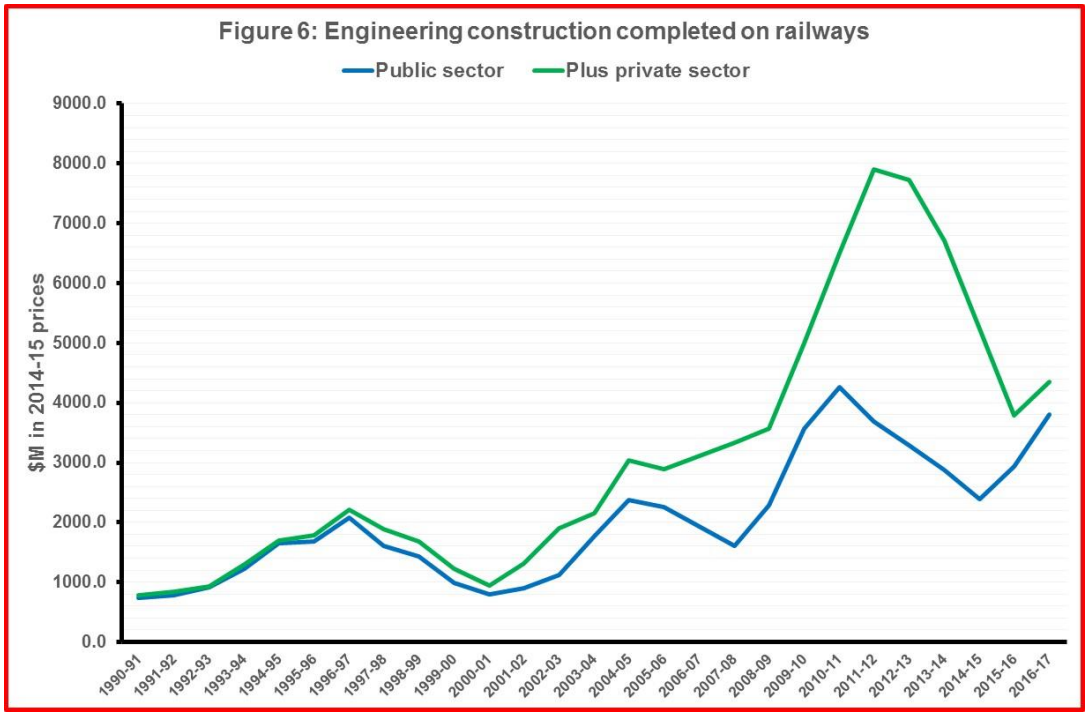
There was unfinished bridge construction valued at $2,394.9 million at the end of 2016-17 representing 2.4 years of work at the current rate of completions for the two sectors combined. The split between the sectors was the same as for new commencements: 14% of unfinished work was in the private sector and 86% in the public sector.

These results suggest that construction completions are likely to continue more-or-less at present levels.

4. Construction of Railways

4.1 Engineering Construction Completed

Railways includes all facets of railways such as tracklaying, overhead power lines and signals, platforms, tramways, tunnels and fuel facilities. Figure 6 shows the trends in the value of railway construction completed cumulating work from the two sectors.



Over the last decade there has been a surge in railway construction. In the private sector the emphasis has been support for the resources sector. In the years 2010-11 to 2014-15 inclusive, the private sector completed railway construction valued at $14,708.9 million, even more if we extend the starting year back to 2006-07. As Figure 6 shows this intense period of construction is now over.

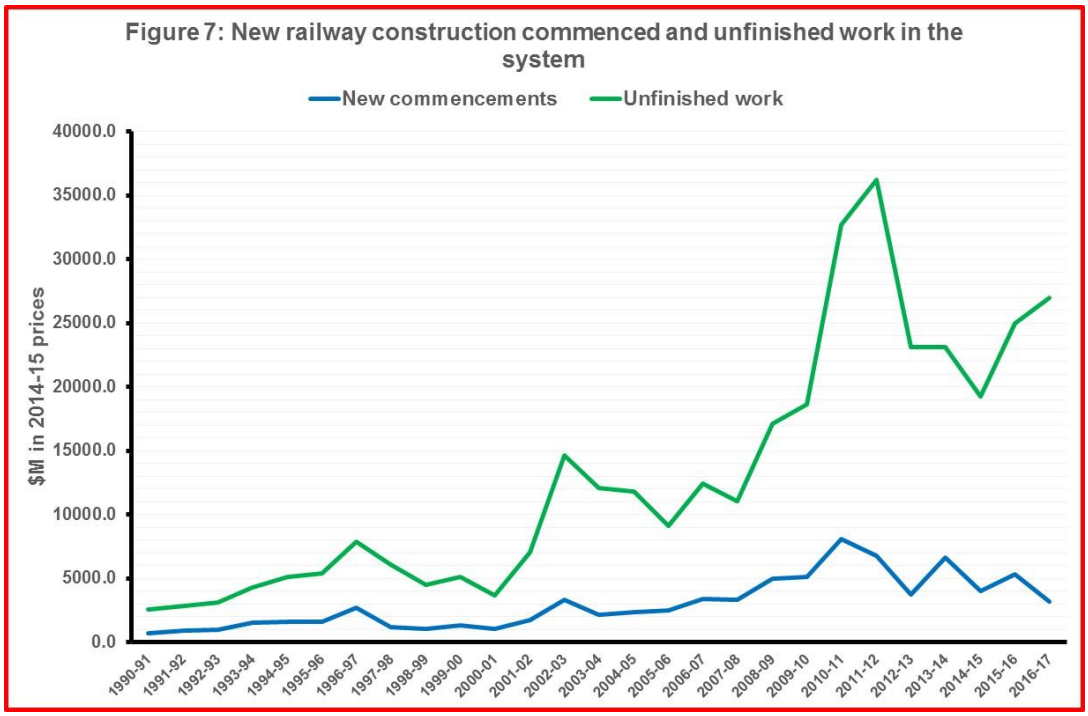
In 2016-17, the private sector completed railway construction valued at $541.5 million down 36% on the previous year and a far cry from the figures in the previous paragraph. This was just 2.9% of private sector infrastructure completions compared to 12.6% when construction was at its peak in 2012-13.

Public sector construction on railways ramped up in the period 2002-03 to 2008-09 and has remained high ever since. In 2016-17, the public sector completed $3,808.2 million in railway construction, up 29.6% on the previous year. Last year railway construction accounted for 13.2% of public sector infrastructure completions.

Overall last year the two sectors combined completed railway construction valued at $4,349.7 million, up 14.9% on the previous year and accounting for 9.1% of all infrastructure completed.

4.2 Outstanding Work

Figure 7 illustrates the trends in new railway construction and unfinished work on projects already underway.



By the end of 2016-17 new railway construction commencements were valued at $3,207.8 million, down 39% on the previous year and representing three-quarters of a year's work at the present rate of completions for the two sectors combined. Commencements by the private sector were valued at $764.9 million and accounted for 23.8% of new starts. Commencements by the public sector were valued at $2,443.0 million accounting for the balance.

The high proportion of public sector representation in commencements is reflected in the value of work outstanding on projects underway. For the two sectors combined unfinished work at the end of 2016-17 was valued at $23,794.5 million which was 21.3% higher than at the end of 2015-16. Only 7% of this was attributable to the private sector and 93% was public sector work. At the present rate of completions for the combined sectors unfinished work represents another 5.5 years of work.

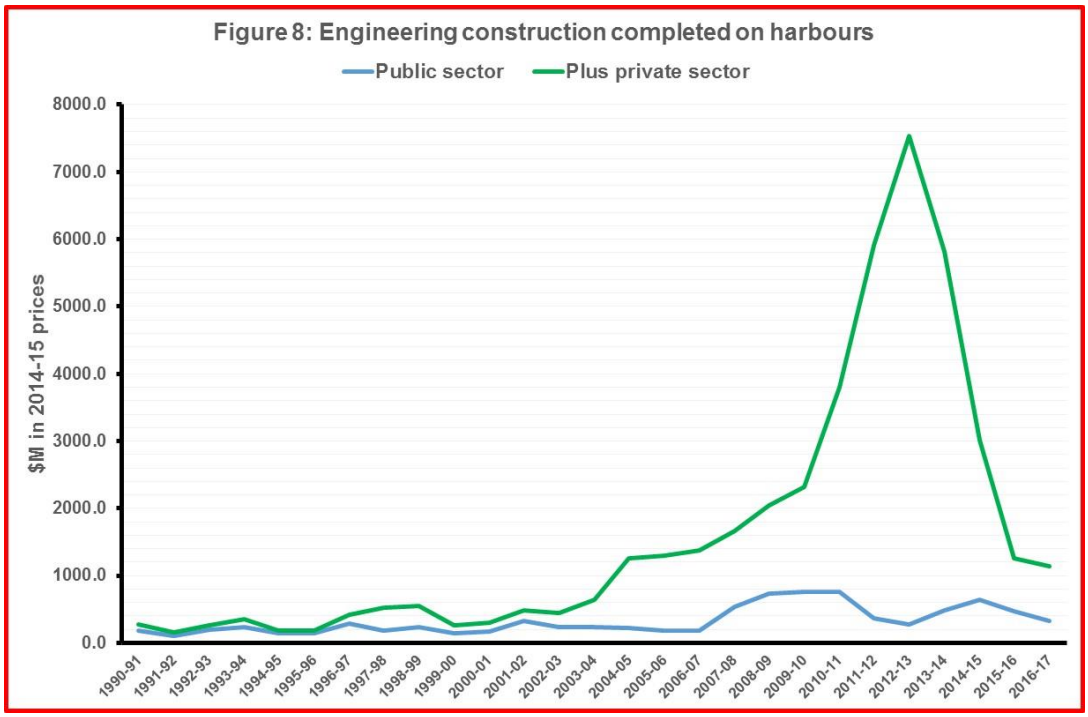
Railway construction has changed dramatically since the start of this century. The emphasis in the private sector was on support for the resources sector but the resulting surge in work has been over two years now. On-going construction by the

private sector is at a much lower level. However, the public sector has responded to demands for improved public transport and has substantially upgraded the level of railway construction. New commencements and the amount of outstanding work in the sector suggests this momentum is continuing and the outlook for the sector is strong.

5. Construction of Harbours

5.1 Engineering Construction Completed

The ABS definition of harbours is quite broad and includes boat and yacht basins, breakwaters, retaining walls, docks and piers, terminals, wharves, dredging work and marinas. Figure 8 cumulates the trends in construction completed by the public and private sectors.



The pattern exhibited in Figure 8 clearly shows the influence of harbour construction in support of the resources boom. Between 2010-11 and 2014-14, the private sector completed harbour construction work valued at $23,547 million. This extraordinary spurt in activity is now over and in 2016-17, the private sector completed a more modest $808.2 million in harbour construction.

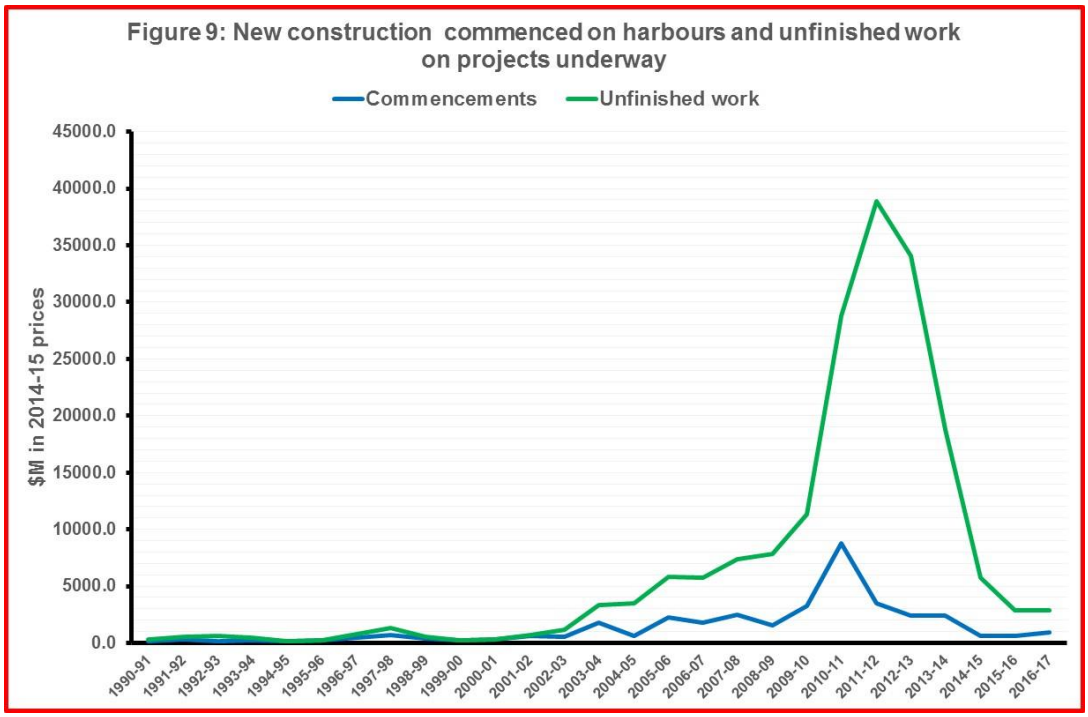
As Figure 8 shows, the public sector maintained comparatively low levels of harbour construction throughout the years illustrated. In 2016-17, the sector completed $328.8 million in harbour construction, down 30.5% on the previous year.

The two sectors combined completed $1,137.0 million in construction which was just 2.3% of infrastructure completions that year.

5.2 Outstanding Work

The pattern illustrated in Figure 8 is repeated in Figure 9 which illustrates the trends in new construction commencements and unfinished work on projects already underway. From this diagram we observe that the impact of the resources boom is well and truly behind us and more normal times have returned.

In 2016-17, new construction commencements on harbours were valued at $937.4 million, up 47.2% on the previous year. Three-quarters of this was commencements by the private sector with public sector the lowest in ten years. At the present rate of combined sector completions new commencements represent about 0.8 years work.



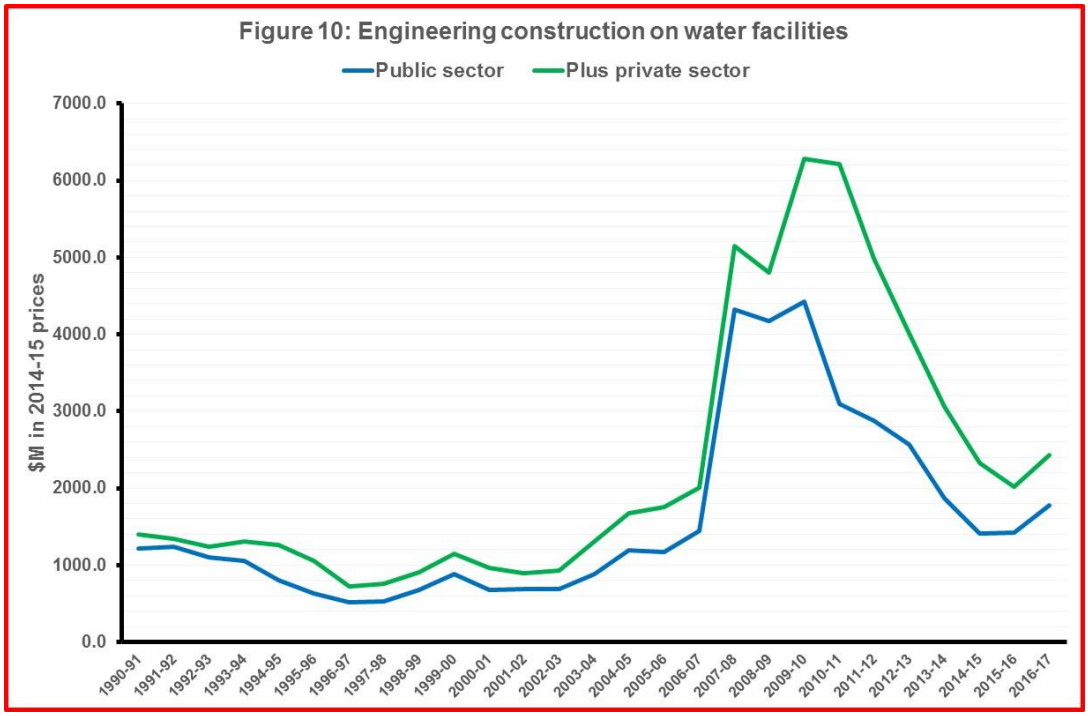
At the end of 2016-17 there was $2,866.7 million of unfinished work on projects already underway with 82% attributable to the private sector. At the present rate of combined sector completions this represents about 2.5 years of work.

The boom in harbour construction is over and construction has returned to more usual levels. Given the level of new commencements and the amount of unfinished work outstanding, this sector will press on and few pressures are likely.

6. Construction of Water Facilities

6.1 Engineering Construction Completed

This sector includes all facets of water storage and supply such as dams, weirs, reservoirs, embankments for water diversion, water pipelines, mains and treatment plants, flood prevention and erosion, aqueducts, water conduits and systems conveying water to residential, commercial and industrial premises. The trends in engineering construction completed on these facilities are shown in Figure 10 which cumulates public and private construction completed.



Until about 2005-06 most construction on water facilities was undertaken by the public sector with a small quantum undertaken by the private sector mainly the development of green fields estate although there was some public-private partnership activity. The spike in activity after 2005-06 was the belated response to the millennium drought.

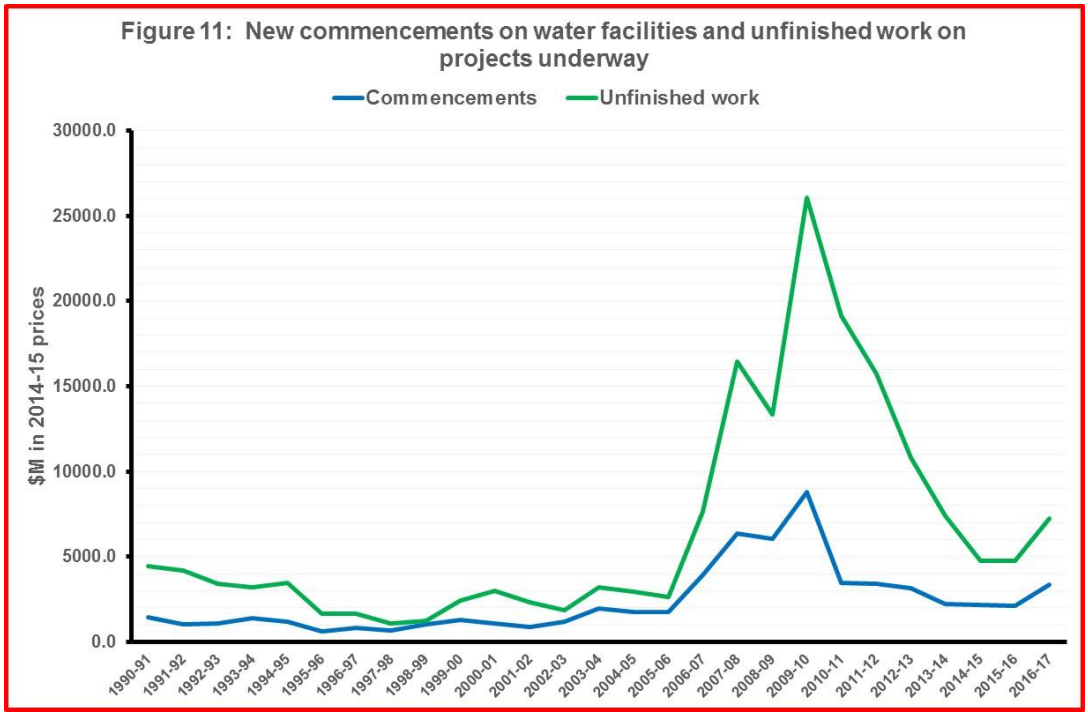
Public sector construction completed ramped up sharply and the period 2007-08 to 2013-14 was one of intense activity with annual construction levels several factors higher than during the earlier period. Since 2013-14, public sector construction on water facilities has eased off and plateaued at a level about twice typical annual construction prior to 2003-04. In 2016-17, the public sector completed construction on water facilities valued at $1,774.5 million, up 25% on the previous year, but well below peak activity recorded in 2009-10.

In 2016-17, the private sector completed construction on water facilities valued at $660.4 million, up 10.3% on the previous year. This level of activity was about one-fifth of the value constructed in the peak year 2010-11. The spike in private sector construction between 2006-07 and 2014-15 was primarily the construction of water desalination plants in several coastal capital cities. During the millennium drought water supplies fell to alarming levels and governments did not respond early enough to augment supplies through conventional means. Comparatively rushed decisions were taken to proceed with water desalination through public private partnership arrangements. These decisions are now widely regarded as unnecessary. During the last three years, private sector construction has fallen back to what might be characterised as normal levels.

Overall, the two sectors combined constructed water facilities valued at $2,435.0 million in 2016-17, about 5.1% of overall infrastructure completed.

6.2 Outstanding Work

Figure 11 shows the trends in new construction commenced and unfinished work on water facility projects already underway. We observe in this diagram the same periods of intense activity as observed in the completions diagram.



At the end of 2016-17, new construction commencements were valued at $3,357.4 million, representing about 1.38 years of work at the current combined sector rate of completions. Over three-quarters of the commencements were by the public sector but both sectors recorded higher levels of commencements than a year before.

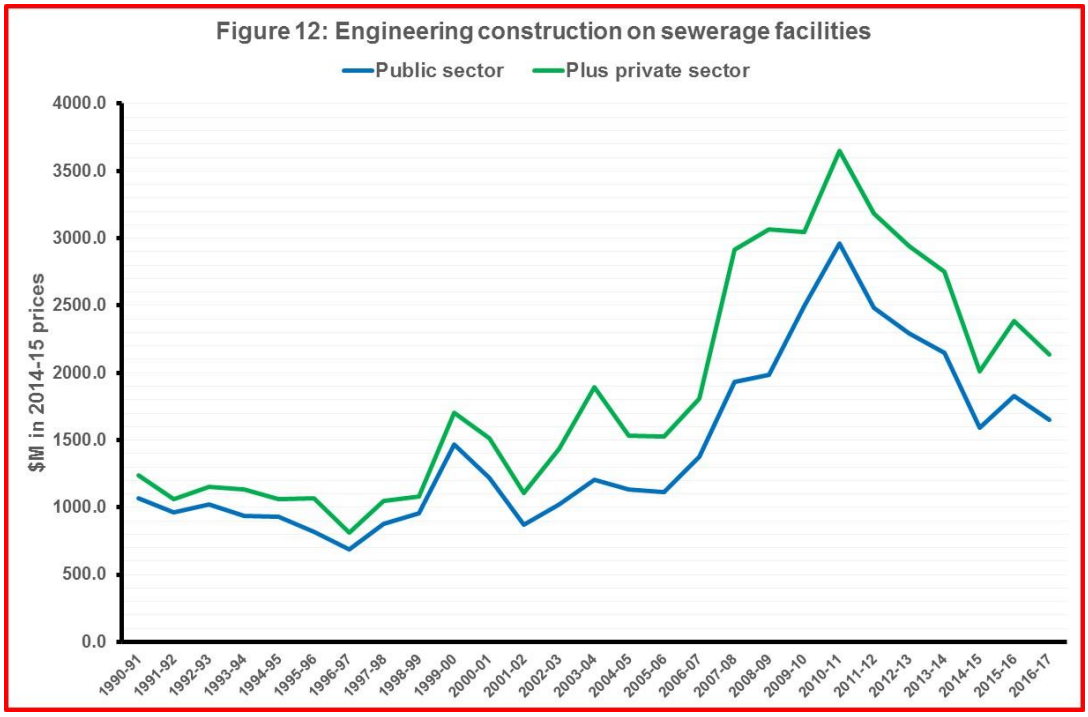
There was a considerable amount of construction work outstanding at the end of 2016-17. The amount involved, $7,261.5 million, represented about 3 years of work at the present combined sector rate of completions. The distribution of outstanding work was the same as for new commencements; over three-quarters for the public sector and the balance in the private sector.

The extraordinary peak which was the residue from the millennium drought is behind us. After two years of plateaued construction, activity is now on the increase. Commencement and unfinished values are solid and suggest present activity levels are likely to continue for a year or two.

7. Construction of Sewerage Facilities

7.1 Engineering Construction Completed

This sector includes sanitary and storm sewers, sewerage treatment plants, stormwater drains and drainage systems. Trends in engineering construction completed on these facilities are illustrated in Figure 12 which cumulates public and private sector construction.



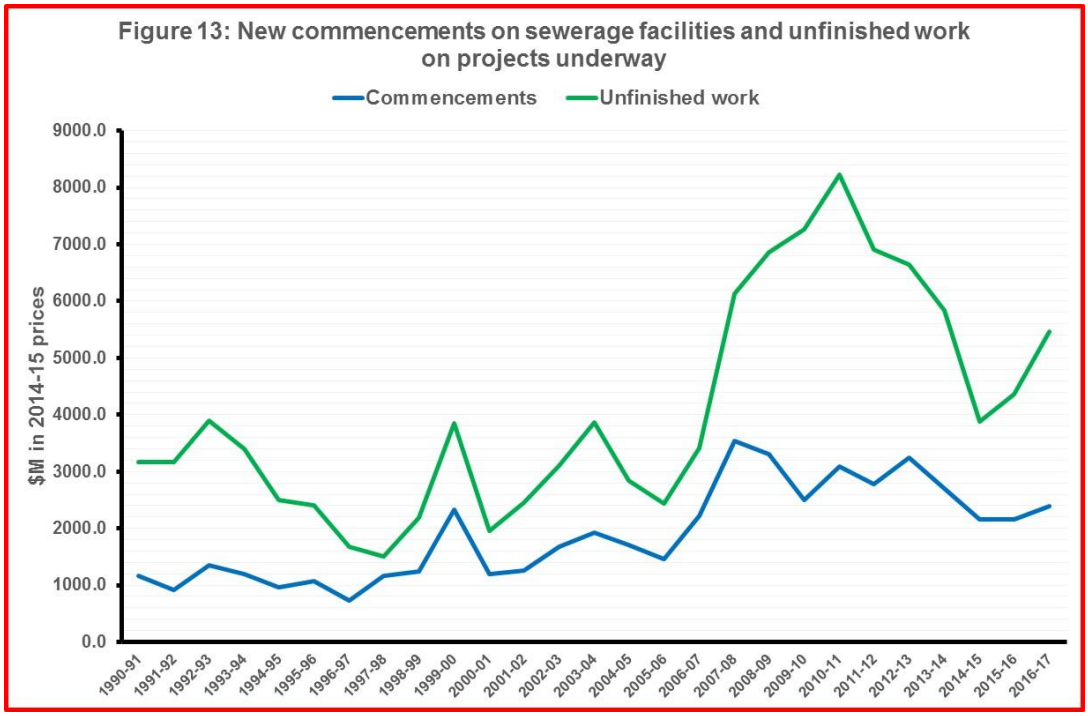
In 2016-17, public sector engineering construction on sewerage facilities was valued at $1,651.9 million, down 9.6% from the previous year and well down on the peak in construction activity achieved in 2010-11.

Private sector construction completed was down even more, by 12.4% to $485.8 million, again substantially lower than the peak recorded in 2008-09.

The pattern shown in Figure 12 has many similarities to Figure 10 with a period of intense activity towards the end of the millennium drought which has now passed. In 2016-17, construction valued at $2,137.7 million for the two sectors combined was completed, 4.5% of total infrastructure completed. The past three years have seesawed and it remains to be seen if annual construction plateaus out at a level higher than the pre-millennium levels.

7.2 Outstanding Work

Figure 13 shows the trends in new construction commencements and unfinished work on projects already underway.



At the end of 2016-17, new construction work valued at $2,398.1 million had commenced representing 1.12 years of work at the present combined sector rate of completions. Almost 80% was new work from the public sector.

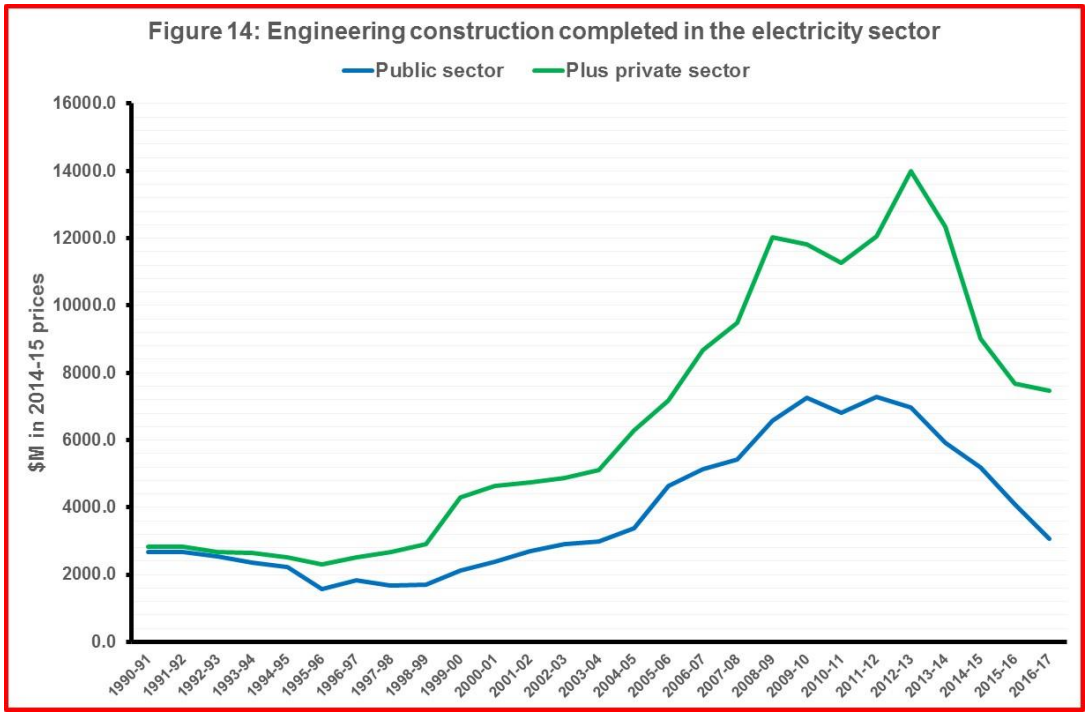
Construction yet to finish was valued at $5,462.4 million, representing 2.5 years of work at the present combined sectors rate of completions. Over 87% of unfinished work was in the public sector.

After a period of intense activity between 2006-07 and 2013-14 associated with responses to the millennium drought, construction of sewerage facilities has settled to a new “normal”. Given the level of commencements and unfinished work, there is every chance that construction completed will continue on at current levels for two years or so.

8. Construction in the Electricity Sector

8.1 Engineering Construction Completed

This sector includes electricity generation (both fossil fuels and renewables), transmission and distribution lines, substations and all associated work such as towers and chimneys. Trends in engineering construction completed are shown in Figure 14 which cumulates public and private sector construction.



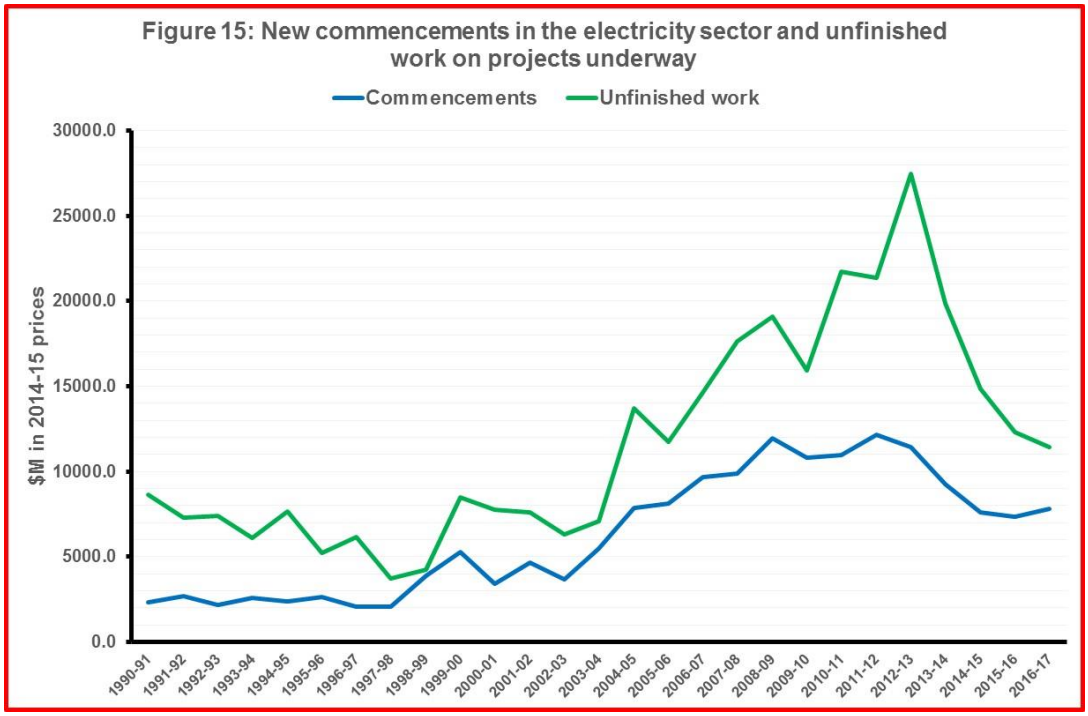
In 2016-17, the public sector completed engineering construction valued at $3,079.5 million in the electricity sector. This outcome was 25% lower than in the previous year and continues a downwards trend from a peak of $7,282.8 million in completions in 2011-12. From 2004-05 annual public sector completions steadily increased to this peak mainly due to reinvestment in the distribution network that services the National Electricity Market.

Annual private sector completions followed a similar pattern to the public sector with activity ramping up from 2004-05 and peaking at $7,019.0 million in 2012-13. Like the public sector annual completions have been falling from that peak but increased by 22.5% in 2016-17 to $4,384.4 million.

Combined sector completions in the electricity sector were valued at $7,463.9 million and accounted for 15.6% of infrastructure construction completed.

8.2 Outstanding Work

Figure 15 illustrates the trends in new construction commencements and unfinished work on projects already underway.



At the end of 2016-17 there was $7,829.6 million of new construction commenced in the electricity sector representing a little over one year's work at the present combined sector rate of completions. Although a large sum, it must be compared to the peak level of commencements of $12,170.0 million in 2011-12.

Public sector commencements were $2,885.7 million which represented 36.9% of the total, but were 28% lower than the previous year. Private sector commencements were valued at $4,943.8 million and were 47.6% higher than the previous year.

There was $11,447.8 million in unfinished work on projects already underway at the end of 2016-17. The public sector accounted for $2,031.2 million, or 17.7% and the private sector for $9,416.7 million or 82.3%. At the current rate of combined sector completions this unfinished work could take 1.5 years to complete.

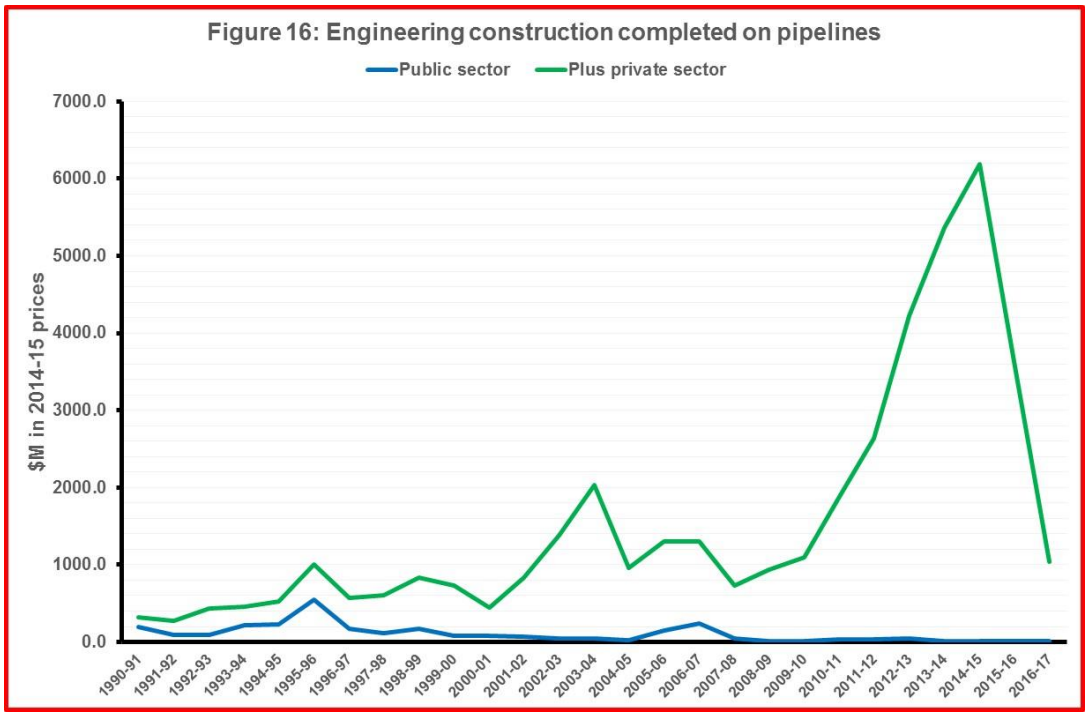
Although the patterns in Figures 14 and 15 resemble those in other sectors, the reason for the pronounced spike in activity from 2005-06 to 2013-14 is completely different. This was when electricity authorities renewed and augmented significant portions of the electricity distribution grid, including some interconnectors for the National Electricity Market. The end of this period of intense activity simply indicates the conclusion of this large project. Public sector electricity assets are more oriented to fossil fuel generation and there has been little activity in this area due to policy

uncertainty. Investment in the renewables sector has mainly occurred in the private sector and this is reflected in increases in each of the three measures discussed. Work outstanding and new commencements are relatively modest but should see completions continue at current levels for at least a year.

9. Construction of Pipelines

9.1 Engineering Construction Completed

The ABS defines pipelines to include oil and gas pipelines, urban supply mains for gas and pipelines for refined petroleum products, chemicals and foodstuffs. In recent years the main influence has been the gas industry. Figure 16 illustrates the trends in engineering construction completed cumulating public and private sector activity.



The trends in Figure 16 show that this sector experienced substantial activity from 2011-12 onwards but has now come off the boil. In 2016-17, there was $1,033.6 million in construction completed with almost all (98.5%) undertaken by the private sector.

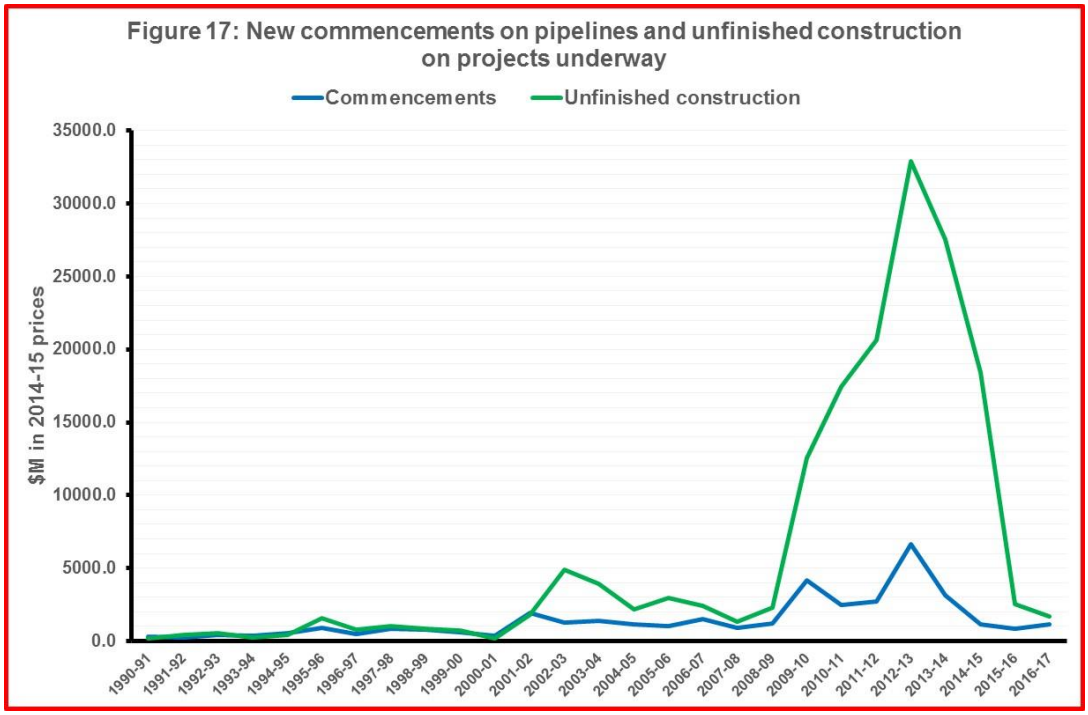
9.2 Outstanding Work

Figure 17 shows the trends in new engineering construction commencements and construction outstanding on projects already underway. The shape of the commencements trend reflects the scale of work completed. Even though scale has changed, new commencements have continued. In 2016-17, these were valued at $1,157.3 million, again principally in the private sector.

At the height of the surge in construction in 2012-13, there was $32,878.1 million in unfinished work underway. The completion of this work is shown by the fall in the green trend line in Figure 17. In 2016-17 there was $1,711.7 million in unfinished

construction still underway. Although small compared to the peak, this is a substantial amount of work.

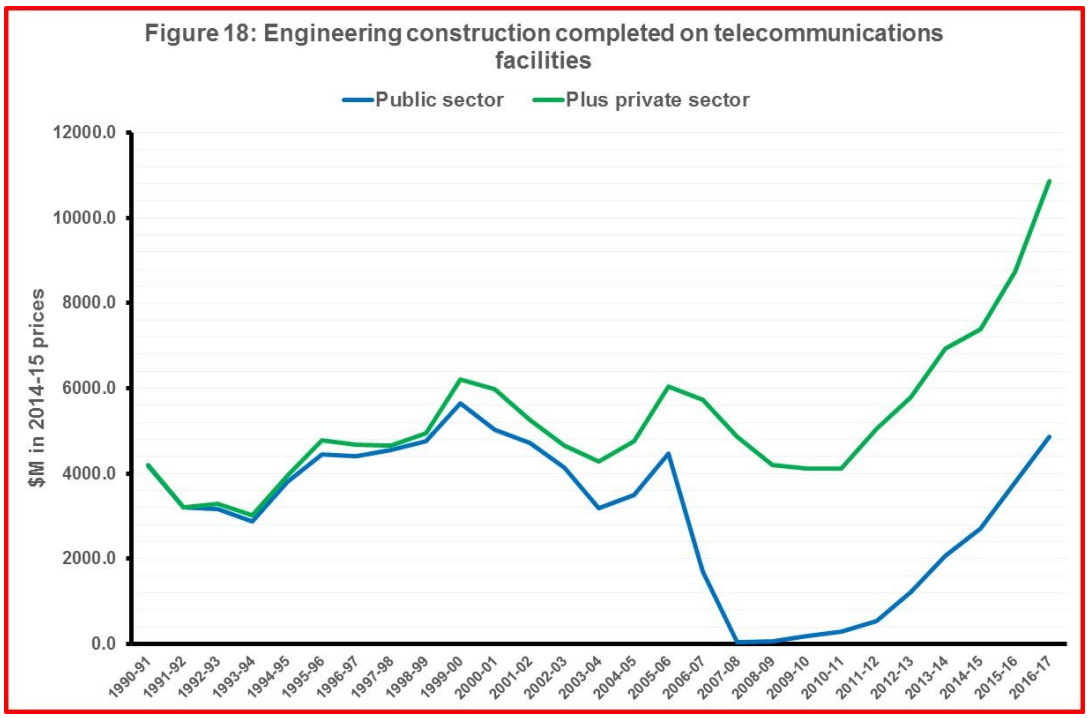
The influence of the resources boom is readily observed in this sector. Its influence has now passed and the sector is transitioning to a substantially lower level of construction activity.



10. Construction of Telecommunications Facilities

10.1 Engineering Construction Completed

Telecommunications includes mobile phones, radio, television, microwave and radar transmission towers, telephone lines and underground cables and coaxial cables. The two dominant developments in recent years have been the continuing development of the mobile phone network and the national broadband network. Figure 18 illustrates trends in engineering construction completed by the public and private sectors, once again cumulating the two.



Engineering construction on telecommunications facilities was the second largest category of construction completed last year behind road construction and accounted for 22.8% of infrastructure completed. Both sectors were strong contributors and each recorded substantial increases in construction compared to last year.

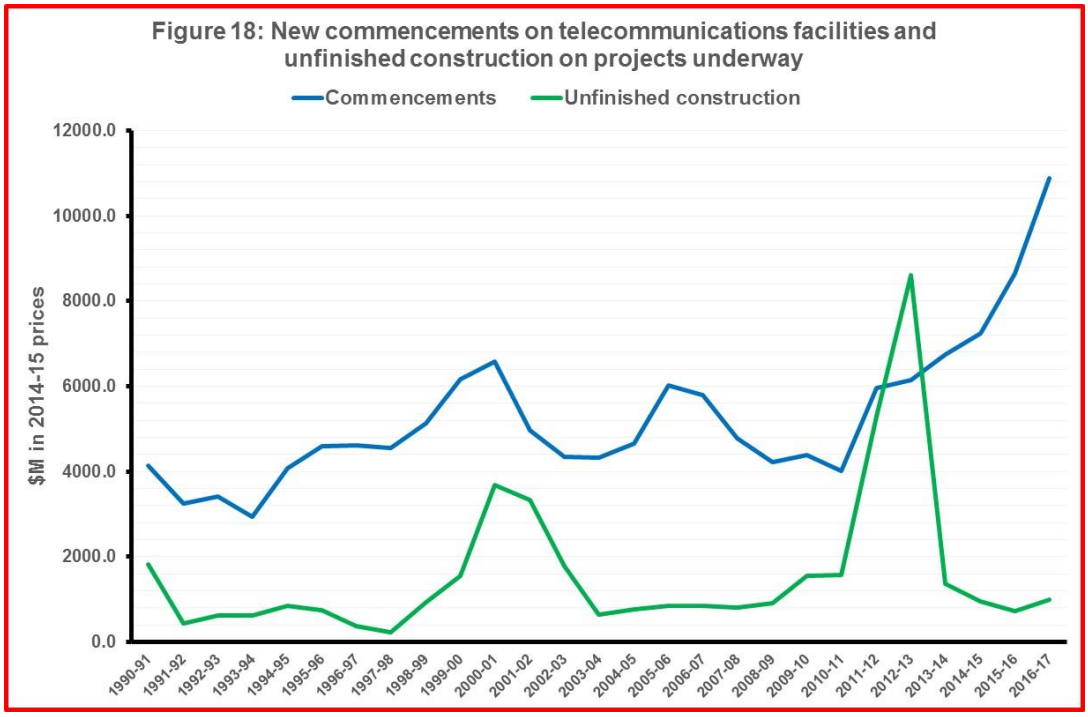
In 2016-17, telecommunication construction completed by the public sector was $4,853.7 million, an increase of 28.3% on the previous year. Public sector construction accounted for 44.7% of the total.

Private sector engineering construction completed was valued at $6,002.7 million, an increase of 21.1% on the previous year. The private sector accounted for 55.3% of the total.

Overall, in 2016-17, engineering construction valued at $10,856.3 million was completed. It is important to note that although there were numerous annual fluctuations, the trend in total engineering construction completed was essentially flat through to 2011-12. The rapidly rising trend since then is mainly due to the ramping up of construction on the national broadband network.

10.2 Outstanding Work

Figure 18 shows the trends in new construction commencements and unfinished construction on projects already underway. Overall, new commencements valued at $10,880.8 million started in 2016-17, a figure comparable to that year's completions and an increase of 25.9% on the previous year's commencements. The division between sectors reflected last year's completions with $6,055.2 million or 55.7% commenced by the private sector and $4,825.6 million or 43.3% commenced by the public sector.



One of the characteristics of the telecommunications sector is that the amount of unfinished construction tends to be comparatively small. The exception to this generalisation occurred in 2012-13 when there was $8,601.6 million in unfinished work in the system, most likely associated with the early phase of NBN construction. The earlier pattern has been re-established in the past for years. In 2016-17, unfinished work was $1,003.1 million with 98% of it in the private sector.

The ramp up of telecommunications construction has had a marked influence on engineering construction completions. The trend in commencements suggests that the completion trend could flatten out soon but at the current scale.

11. Overview of Infrastructure Construction

11.1 An Overview of Public Sector Infrastructure Growth

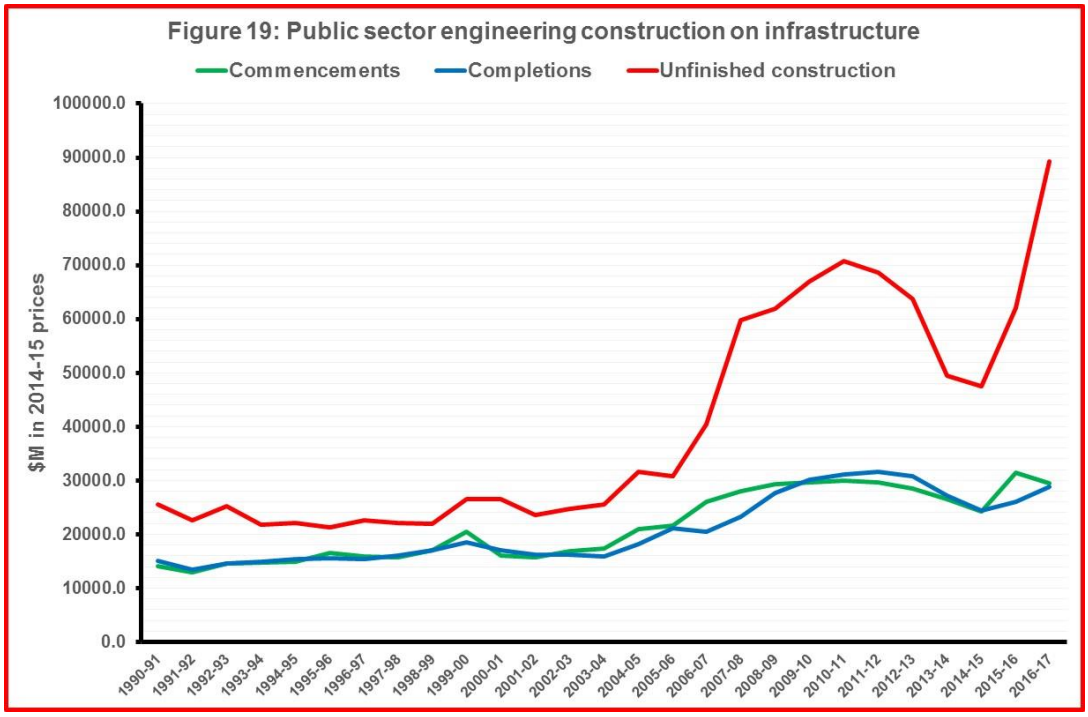
In this Chapter we consider how the changes outlined in the previous Chapter come together as economic infrastructure. We begin by looking at the public sector with consideration of the private sector in the next section.

To assist this review, we summarise long term growth rates (since 1990-91), average growth over the past five years and growth last year in Table 5. We also consolidate the various elements of infrastructure into Figure 19 which shows the trends in public sector infrastructure commencements, completions and construction outstanding.

Table 5: Annual growth rates, infrastructure components, public sector

Sector	Long term	Last 5 years	Last year
Roads	4.8	-0.9	16.4
Bridges	5.7	3.0	6.7
Railways	9.3	2.5	29.6
Harbours	14.0	6.0	-30.5
Water	6.7	-7.4	25.2
Sewerage	3.5	-7.0	-9.6
Electricity	1.7	-15.5	-24.8
Pipelines	26.3	-3.7	31.2
Telecommunications	23.1	58.5	28.3
Infrastructure	2.9	-1.5	10.7

The average growth in engineering construction on infrastructure by the public sector over the past five years does not compare well with long term average. In a later Chapter we will see that this contraction occurred at about the time that engineering construction in the resources sector began serious contraction.



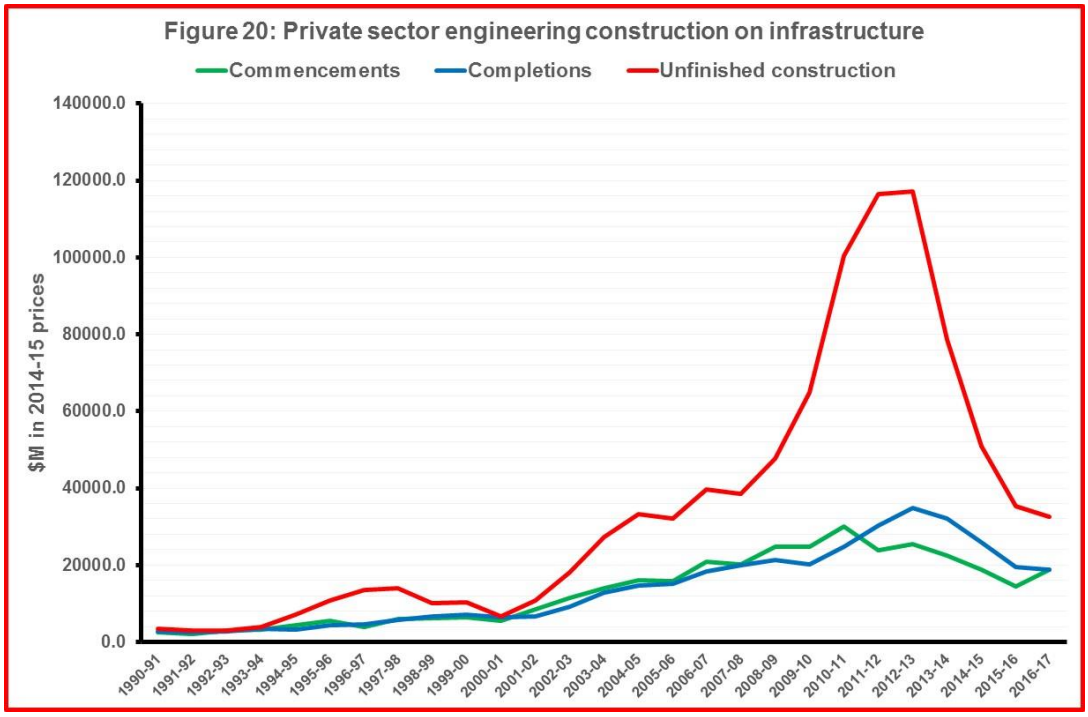
Although there were some areas where public sector construction contracted in 2016-17, notably harbours, sewerage and electricity, the relative sizes of these areas and growth in the remaining sectors, produced a strong outcome of 10.7% growth. This builds on 6.3% growth in 2015-16. However, we need to keep these changes in perspective. In constant price terms, public sector infrastructure completed in 2016-17 was $28,779.6 million. This is higher than completions in the previous three years, but less than the 2009-10 outcome of $30,184.2 million.

11.2 An Overview of Private Sector Infrastructure Growth

The private sector equivalents to Table 5 and Figure 19 are Tables 6 and Figure 20 below.

Table 6: Annual growth rates, infrastructure components, private sector

Sector	Long term	Last 5 years	Last year
Roads	5.7	-2.1	10.0
Bridges	56.1	20.6	115.1
Railways	31.4	-28.1	-36.0
Harbours	28.1	-23.1	2.6
Water	14.6	-19.1	10.3
Sewerage	13.4	-5.0	-12.4
Electricity	19.0	2.9	22.5
Pipelines	18.9	-1.8	-71.9
Telecommunications	62.4	6.2	21.1
Infrastructure	9.0	-7.9	-2.7



In the private sector, long term growth rates are dominated by the influence of the resources boom. Over the 26 years covered by this report, average annual growth in private sector infrastructure construction completed was 9.0% per year. However, average annual growth over the past five years was -7.9% per year with contraction recorded in each of the past four years fully offsetting growth in 2012-13. During these five years only the construction of bridges, electricity facilities and telecommunications facilities showed positive outcomes. This trend slowed during the past year to contraction of 2.7% with the additional sectors of roads, harbours and water showing positive outcomes.

11.3 The Overall Infrastructure Outcome

Table 7 combines Tables 5 and 6 to analyse growth rates for the public and private sector combined. The value of this Table is that it shows the negative impact of the end of the resources boom on private sector infrastructure has now been offset by growth in public sector infrastructure completions.

Table 7: Annual growth rates, engineering construction, both sector

Sector	Long term	Last 5 years	Last year
Roads	4.6	-1.4	14.5
Bridges	5.8	1.3	14.7
Railways	9.2	-10.0	14.9
Harbours	15.5	-22.3	-9.8
Water	6.2	-11.9	20.8
Sewerage	4.4	-6.6	-10.3
Electricity	4.8	-8.0	-2.8
Pipelines	15.1	-2.1	-71.6
Telecommunications	4.8	16.7	24.2
Infrastructure	4.2	-4.7	4.9

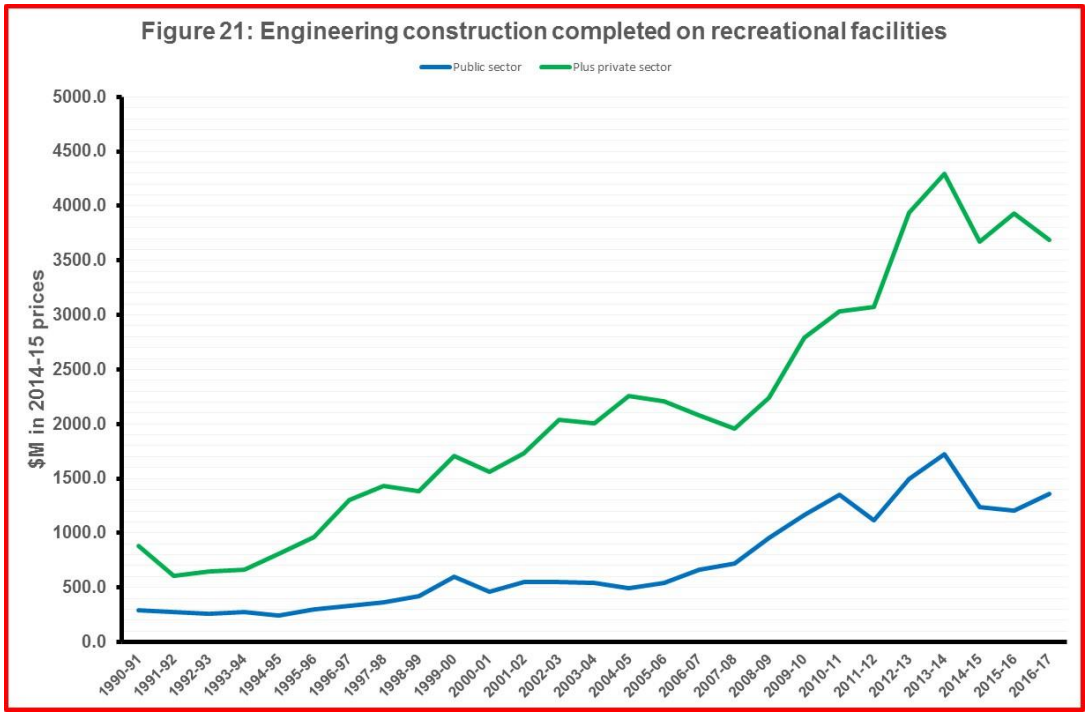
Strong results in road construction, the construction of telecommunications facilities and railways were important factors in this result.

12. Other Elements of Engineering Construction

This Chapter briefly reviews the elements of engineering construction that fall outside the definition of infrastructure. Each in their own right involve amounts of construction that are too large to ignore. Also included is direct engineering construction on mines and other resource sector facilities. The supporting infrastructure for these facilities were included in private sector infrastructure and their completion has been a major factor in the recent fall in private sector infrastructure completions.

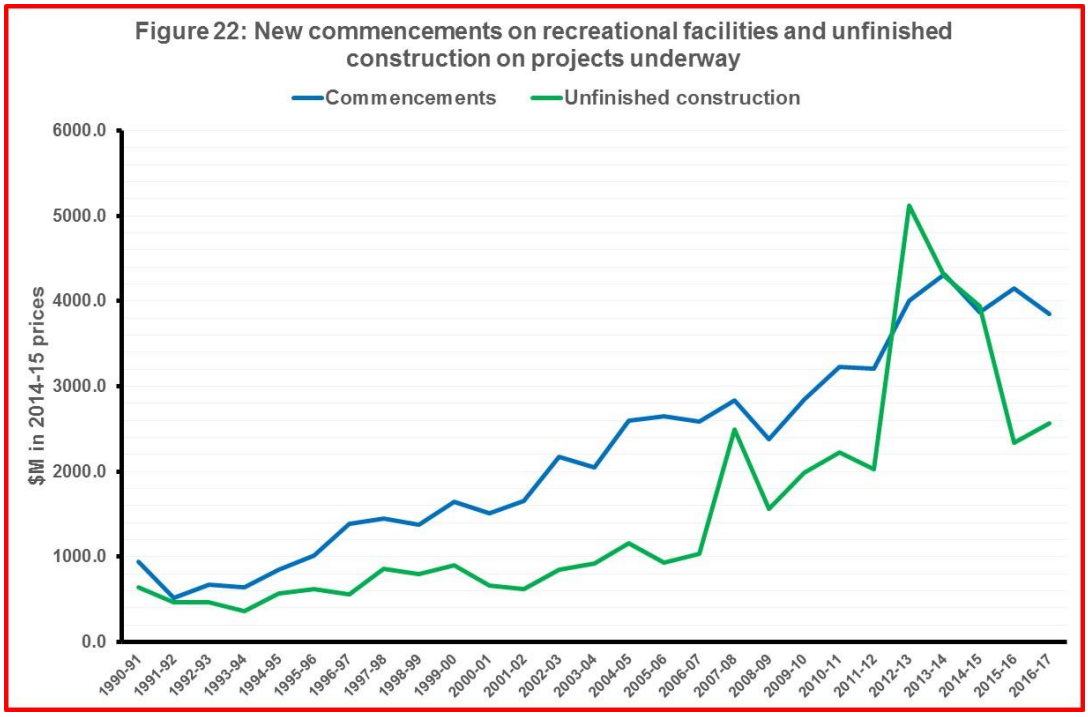
12.1 Recreation Facilities

Figure 21 and 22 extend the analysis we applied to infrastructure components to engineering construction of recreational facilities



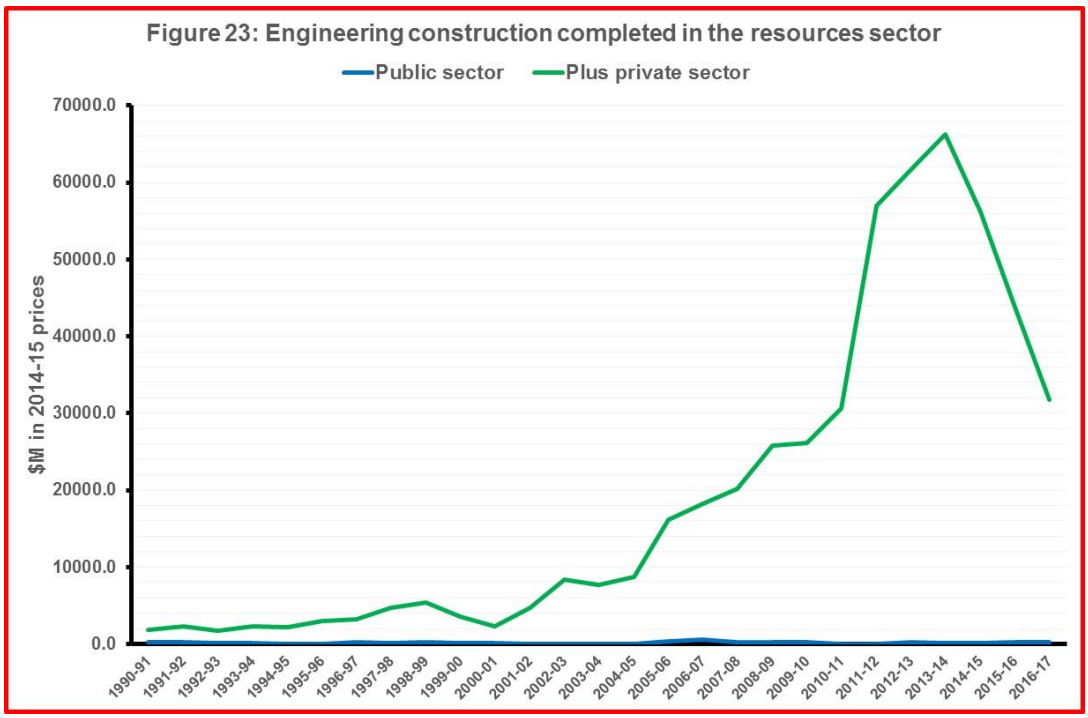
In 2016-17, engineering construction on recreational facilities was $3,686.2 million, comparable to several elements of infrastructure. This result was 6.2% lower than in 2015-16. The private sector completed $2,330.3 million or 63.2%, a fall of 14.6% over last year. The public sector completed $1,356.0 million, an increase of 12.8% over the previous year.

New construction commencements in 2016-17 were $3,844.5 million and there was $2,586.9 million of unfinished work outstanding on projects underway. These figures suggest that the present level of construction completions could continue for another year.



12.2 The Resources Sector

The most significant sector when analysing the course of engineering construction in Australia over the past decade and a half is the resources sector. The ABS defines this sector to include construction of facilities in the oil, gas, bauxite, alumina and other minerals areas. Included are construction of production, storage and distribution facilities, refineries, pumping stations and the construction of mines. Virtually all construction is by the private sector as is evident in Figure 23 which cumulates public and private sector trends in engineering construction completions.



The most important feature of this illustration is the scale of activity. The peak in engineering construction in Figure 23 in 2013-14 was $66,142.0 million. In comparison the peak in public sector infrastructure completions was $31,622.9 million in 2010-11 and the peak in private sector infrastructure completions was $34,923.2 million in 2012-13.

The trajectory of completions is consistent with the popular media view that "the resources construction boom is over". However, it is vital to note that despite the trajectory in completions, in 2016-17, $31,540.8 million in engineering construction was completed in the sector.

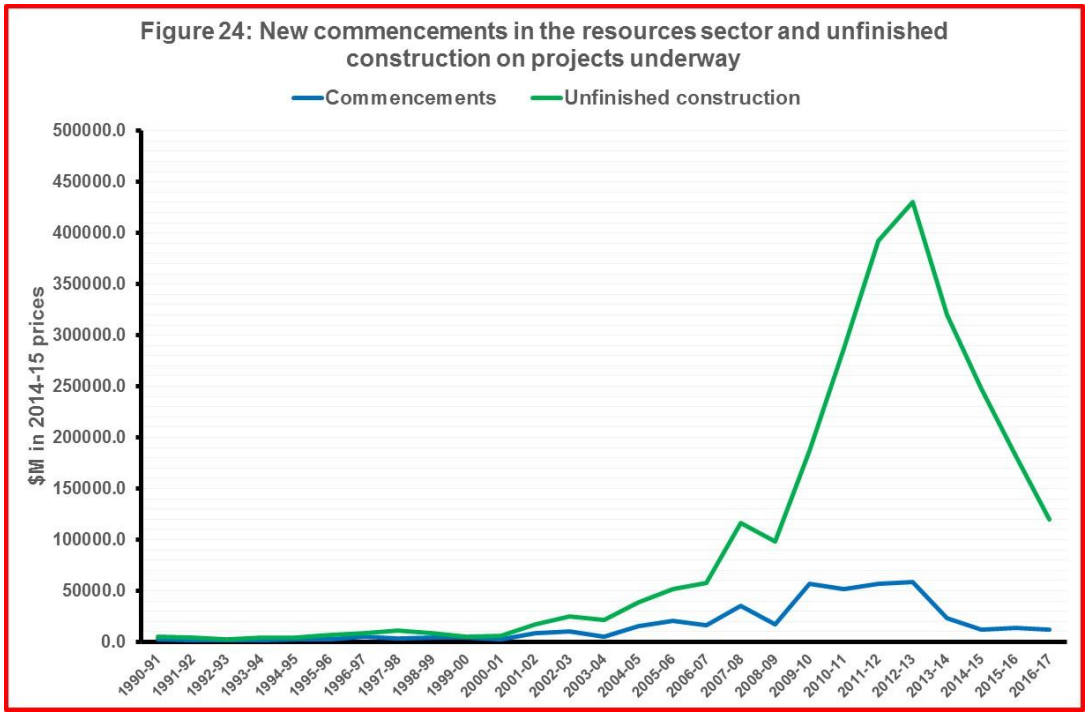


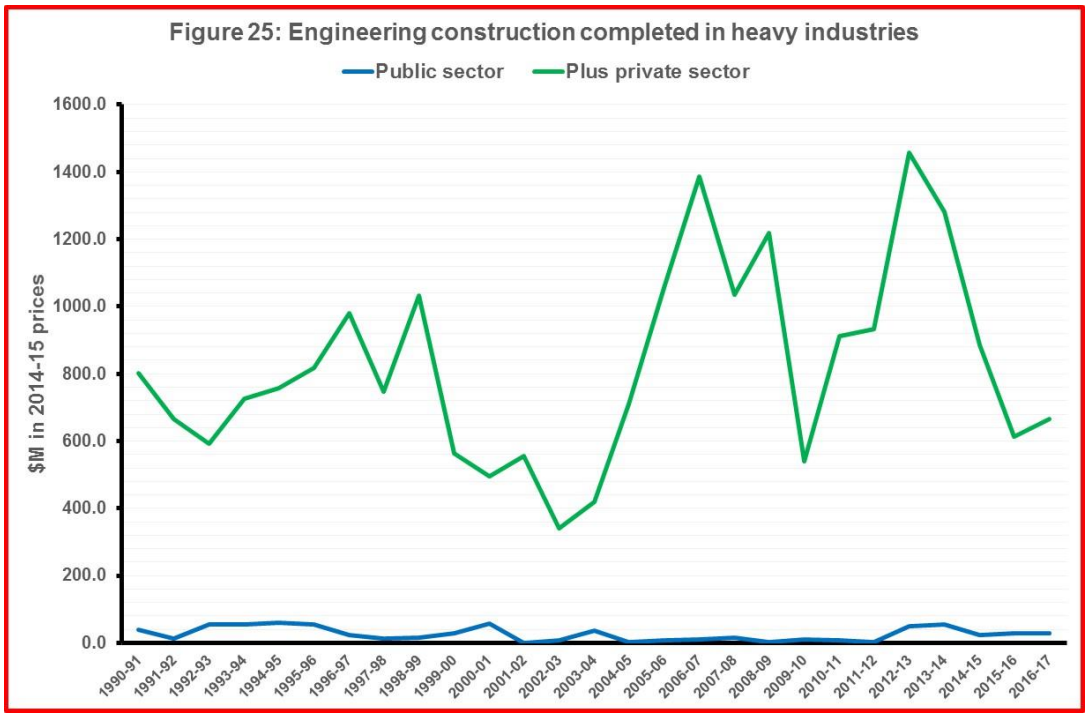
Figure 24 can be used to gauge the likely course of resources sector completions in the coming few years. Commencements have fallen dramatically in recent years, but in 2016-17, there were engineering construction commencements valued at $12,391.7 million. This level of commencements exceeded the 2016-17 completions in all infrastructure elements except roads.

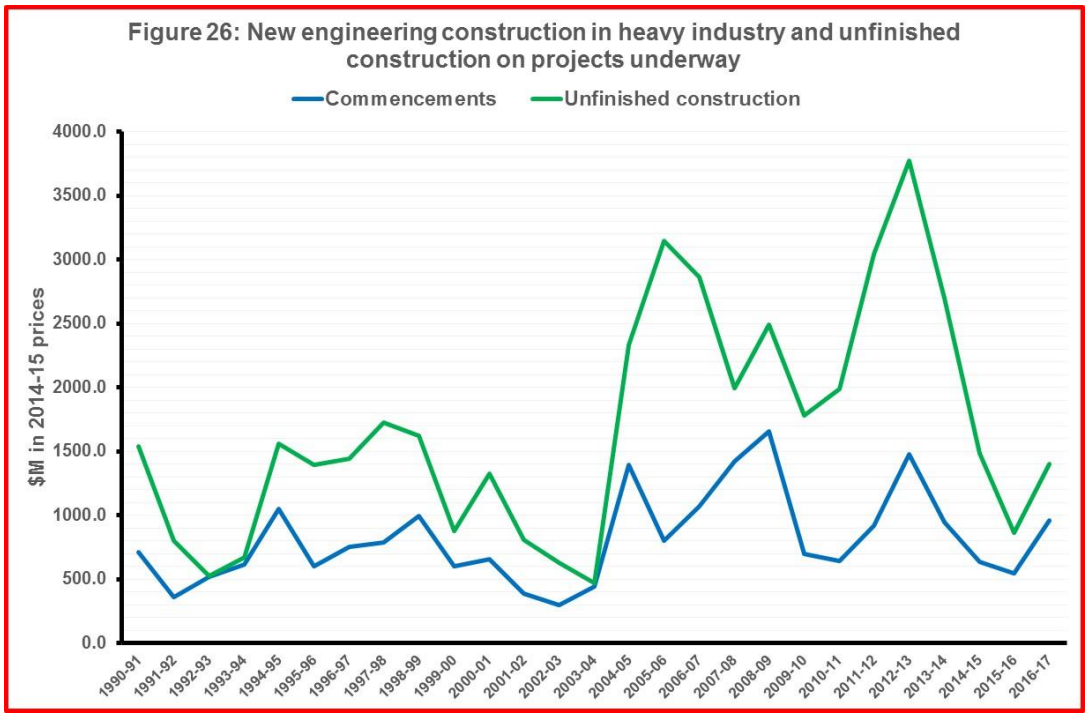
Furthermore, at the end of 2016-17 there was unfinished construction valued at an extraordinary $119,991.9 million on projects already underway. It may be that not all of this work will be completed, but at the present rate of completions in the resources sector, there is some 3.8 years of work here.

From its peak in 2013-14, resources sector engineering construction annual completions have fallen by $34,528.7 million. This is an extraordinary reduction in engineering construction and withdrawal of economic activity from the Australian economy. We comment further on this issue in section 12.5.

12.3 Heavy Industries

Engineering construction also occurs in the heavy industry sector and includes the construction of chemical plants, blast furnaces, steel mills, other industrial processing plants and ovens. This is by far the smallest component of engineering construction with virtually all construction undertaken in the private sector. Trends for engineering construction completed are illustrated in Figure 25 which shows an irregular pattern of activity reflective of the gradual demise of Australian manufacturing.



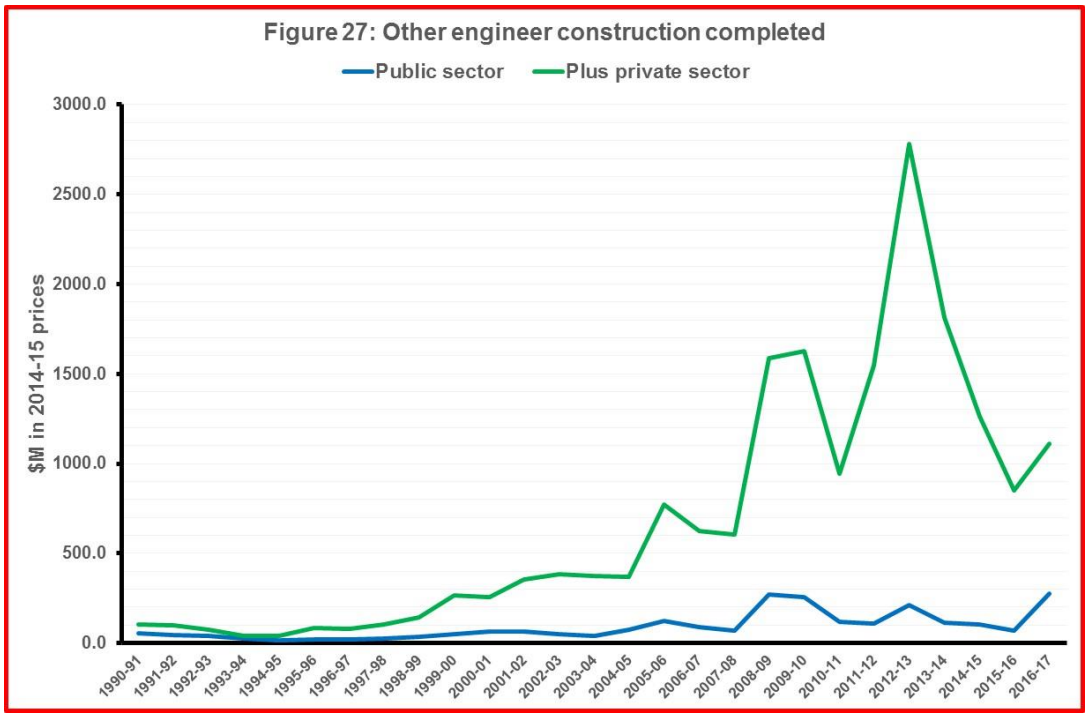


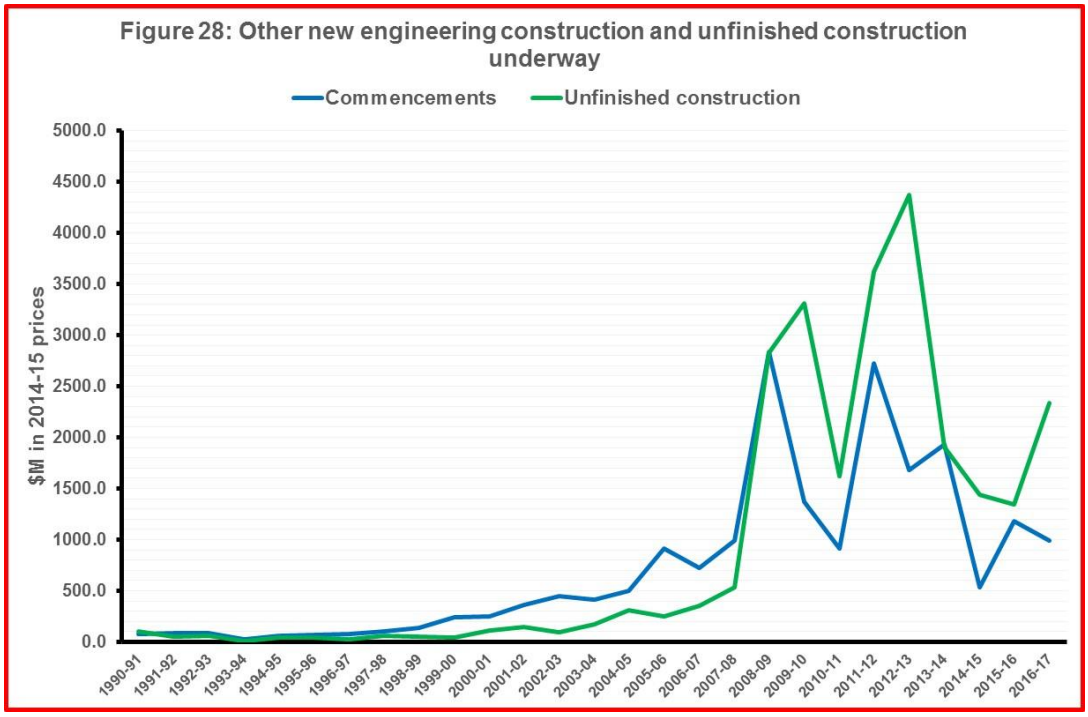
In 2016-17, engineering construction valued at $664.9 million was completed in the heavy industry sector, slightly less than the previous year.

Figure 26 shows the trends in construction commencements and unfinished construction on projects already underway. At the end of 2016-17, new construction commencements were valued at $959.6 million and there was unfinished construction valued at $1,397.7 million outstanding on projects already underway. These figures suggest the present level of completions could continue for another year or so.

12.4 Other Engineering Construction

An increasing amount of engineering construction has occurred that does not readily fit into one of the ABS engineering construction categories. This section covers these "other" elements of engineering construction. Figure 27 illustrates cumulative public and private sector trends in construction completed and Figure 28 shows the trends in commencements and unfinished construction consistent with the rest of the report.





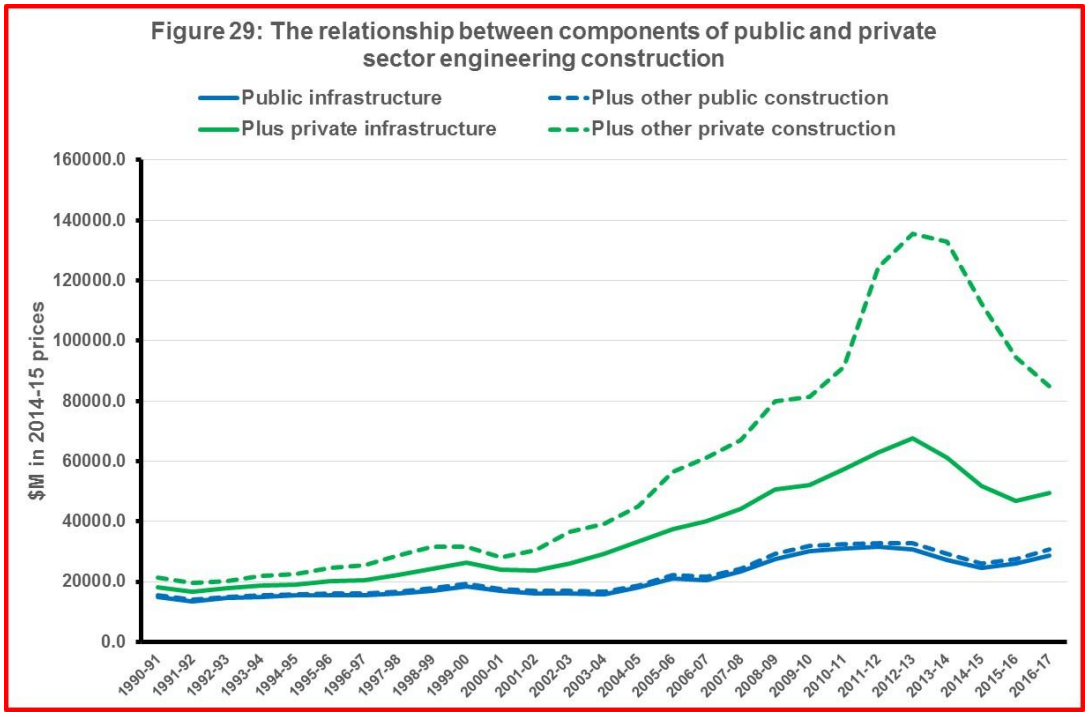
In 2016-17, other engineering construction valued at $1,109.6 million was completed, three-quarters of this in the private sector. New commencements were $959.6 million and unfinished construction valued at $2,332.9 million was outstanding on projects already underway. These figures suggest a continuation of current completion levels over the next year or so.

12.5 The Nexus between Infrastructure Construction and Total Engineering Construction

The main purpose of this section is to reinforce the point made in section 12.2 about the relative scale of engineering construction on infrastructure and engineering construction on elements that fall outside the definition of infrastructure. These relationships are illustrated in the cumulative diagram Figure 29 below.

Almost all public sector engineering construction is on infrastructure. Most occurs in cities and other population centres and the transport links between them. Table 5 showed a modest long term trend growth rate of 2.9%.

The solid green line adds private sector infrastructure completions to the public sector figures. Some of these completions, in the form of private toll roads and other public-private sector partnerships, is complementary to public sector infrastructure completed. However, another part was undertaken in support of the private sector investment in the resources sector, in the form of railways to bring minerals to harbours, the development of the harbours themselves and other necessary supporting infrastructure. The influence of the resources boom is illustrated by the pronounced hump in this trend. Accurately separating the two types of construction is impossible. However, when forming judgments about the extent of infrastructure investment in cities and population centres this distinction should not be overlooked.



The final element of Figure 29 is engineering construction completed in the resources sector. This is the direct outcome of building new mines, gas wells and gas platforms. We have noted that although the “boom” is over there continues to be a substantial amount of engineering construction taking place in the sector and it is likely to continue for a few years yet.

The importance of the distinction we are making is about the impact on the Australian economy. All forms of engineering construction contribute to Australia’s GDP. However, infrastructure facilities in Australia’s cities and population centres by virtue of wider accessibility to large numbers of businesses and consumers are likely to have higher economic multipliers and higher productivity potential. Other reports have noted that our cities remain congested by traffic with inadequate public transport.

The increases in public sector infrastructure recorded in this report are consistent with political pronouncements that action is underway to correct these problems. But, comparing the relative scales of engineering construction components suggests that these efforts are more modest than put forward and this needs to change.

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