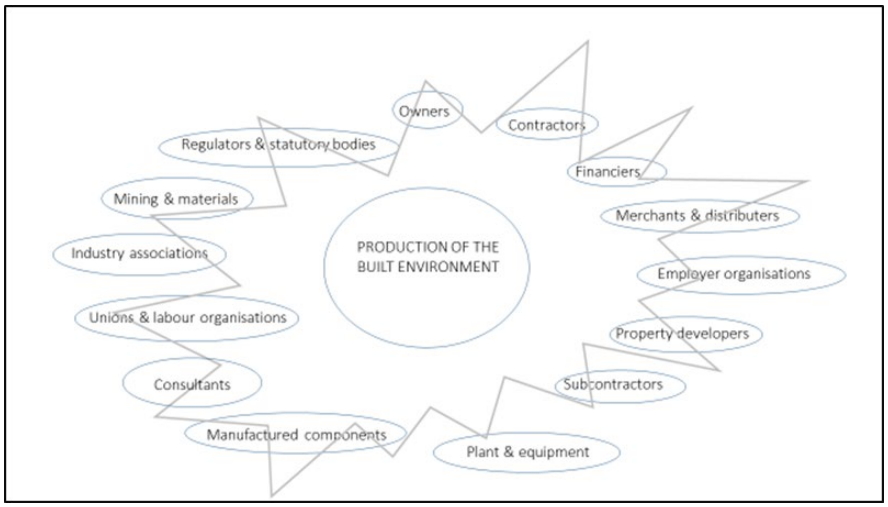
THE AUSTRALIAN BUILT ENVIRONMENT SECTOR

Producing, managing and maintaining the built environment



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Issue 2: 2019

The built environment encompasses the entirety of the human built world. The built environment sector is the collection of industries responsible for producing, managing and maintaining those buildings and structures.

Contents:

A profile of 16 industries based on data from *Australian Industry,* ABS 8155.

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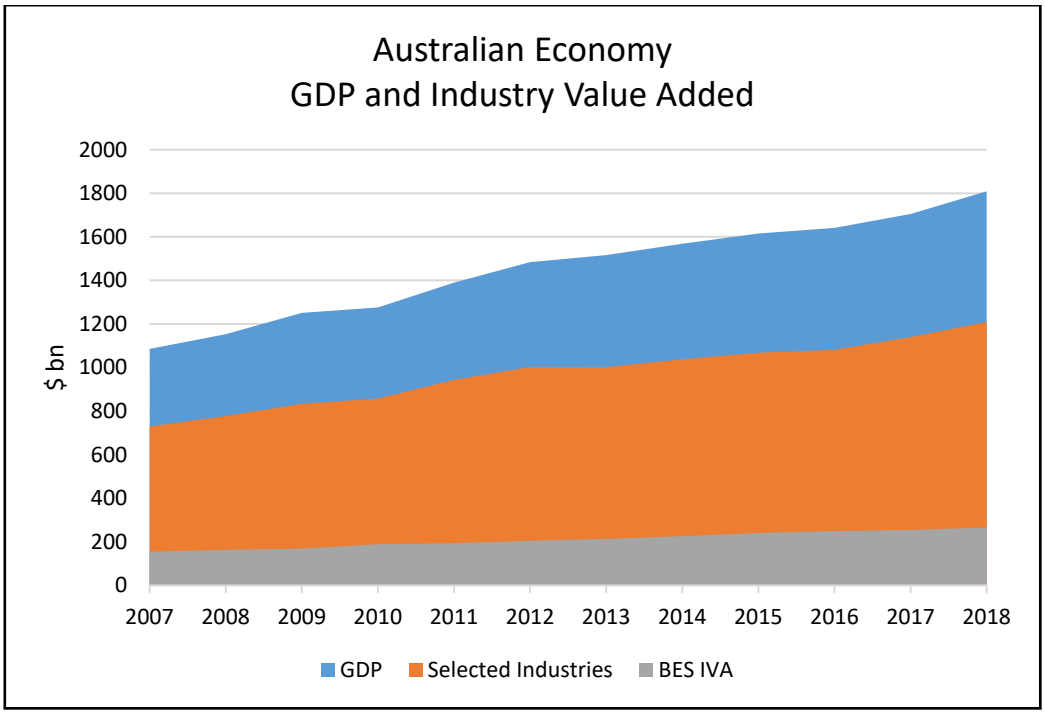


Source: *Australian Industry*, ABS 8155 and *Australian National Accounts: National Income, Expenditure and Product* ABS 5206. In current dollars.

Construction, Management and Maintenance of the Built Environment

The built environment is important. We are surrounded both by it and by its creation, and there is an industry, in fact a collection of industries, responsible not just for its creation, but also for its repair, management and maintenance. The building and construction industry, at around seven or eight percent of gross domestic product (GDP) in industrial economies, is responsible for on-site work, but with that work the construction industry brings together an extensive network of suppliers in the production of the built environment.

On-site work links suppliers of materials, machinery and equipment, products and components, and all other inputs required to deliver the buildings and structures that make up the built environment. Consultants provide design, engineering, cost planning and project management services. There are also inputs from marketing, urban planning, transport, finance and legal services. This can be thought of as the difference between an industry cluster, made up of contractors and sub-contractors supported by plant and equipment suppliers, consultants, manufacturers, distributors and others, and the on-site work that is measured as 'construction activity' in the work done statistics. The latter includes contractors' purchases of materials etc. for use on building sites, but doesn't include consultancy services or construction work by organisations other than contractors.

These two views have been called the broad and narrow construction industry. The narrow industry is defined as on-site work of contractors and subcontractors and the broad industry as the supply chain of materials, products and services. Once produced, buildings and structures then need to be managed and maintained over their life-cycle, work done by another group of related industries. The term that arguably best encompasses the large number and diverse range of participants and industries in the production, operation, management and maintenance of the built environment, is the Built Environment Sector (BES). The Australian BES combines data for sixteen industries in one of the largest and most important industrial clusters in the economy. All else equal, better data leads to better informed policy.

The Australian Built Environment Sector

The method used to measure the size and extent of the Australian BES is to collect the data for output and employment for sixteen relevant industries and sub-industries. These are industries with a direct, physical relationship with the built environment, and the data is provided in the Australian Bureau of Statistics annual publication *Australian Industry* (ABS 8155). *Australian Industry* excludes the finance industry and public sector, but includes non-profits in industries like health and education and government businesses providing water, sewerage and drainage services. These are combined with private sector business to get a total for the selected industries, and these industries account for around two-thirds of GDP.

Industries included in the BES.

Supply industries	Demand industries	Maintenance industries
Non-metallic mining and quarrying	Residential property	Water, sewerage and drainage
Building construction	Non-residential property	Waste collection, and disposal
Heavy and civil engineering	Real estate services	Building and industrial cleaning
Construction services		Building pest control services
Architectural services		Gardening services
Surveying and mapping services		
Engineering design and consulting		
Manufacturing industries		

Industries are groups of firms with common characteristics in products, services, production processes and logistics, subdivided by the ANZSIC version of the Standard Industrial Classification into a four-level structure. The highest level is alphabetically coded divisions such as Agriculture, forestry and fishing (A), Manufacturing (C) and Information and communication (J). The classification is then organized into two-digit subdivisions, three-digit groups, and four-digit classes. ANZSIC codes are therefore two, three and four-digit numbers representing industries, which are defined as firms with shared characteristics.

Industry value added (IVA) is the estimate of an industry's output and its contribution to gross domestic product (GDP), and is broadly the difference between the industry's total income and total expenses. Employment and IVA in current dollars for many, but not all, industries is in *Australian*

Industry. The data is presented for the industries included at varying levels for their subdivisions and classes, with the most recent issue for 2017-18.

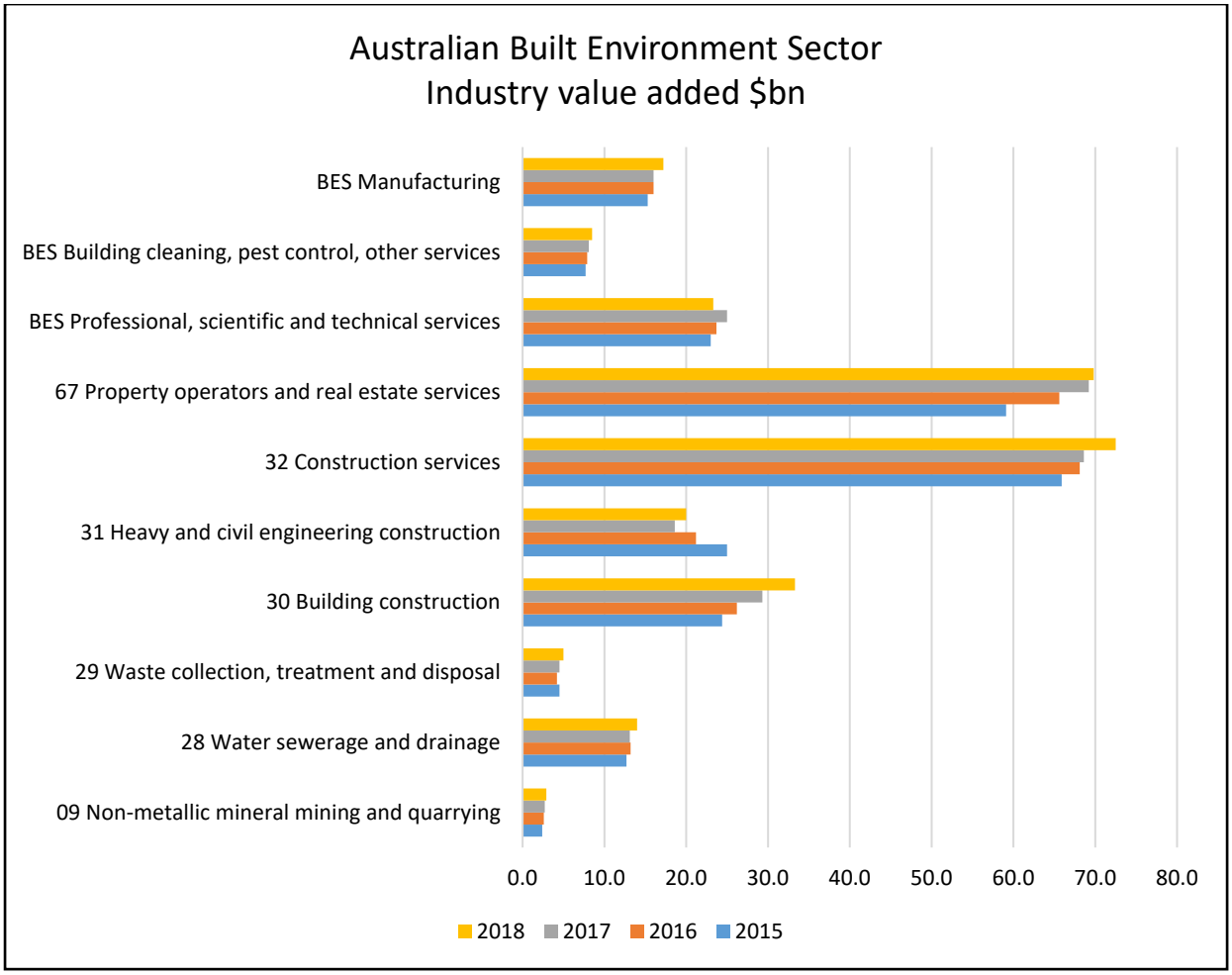
Summary Statistics.

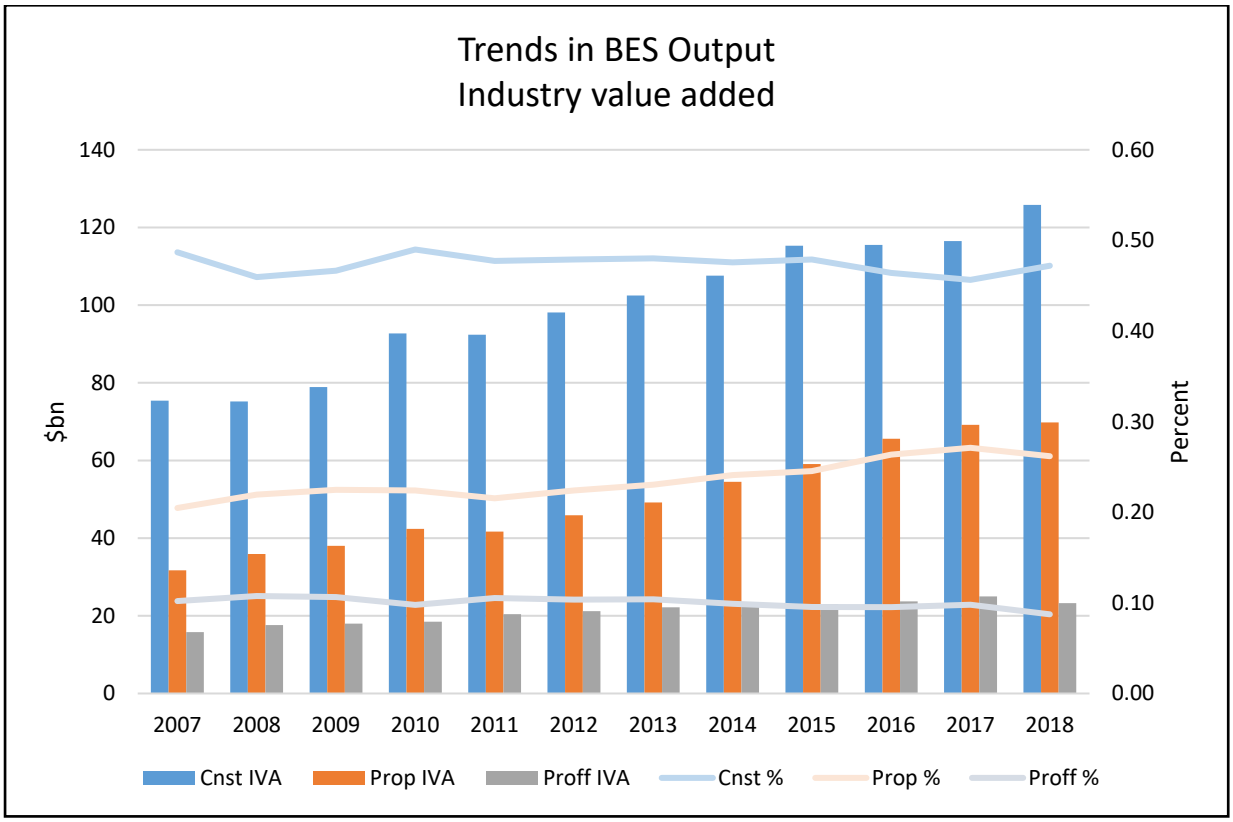
2017-18	Employment	IVA $bn
Total Australian Built Environment Sector	2,101,000	266.5
Total All Selected Industries	11,177,000	1,209
Percent of All Selected Industries	18.8%	22.0%
Total Australia Employment and GDP	12,575,500	1,705
Percent of Australia total	16.7%	14.7%

Note: In 2017-18 the Construction share of BES employment was 53% and of IVA was 47%.
Sources: ABS 8155, ABS 5602, ABS 6202.

Industry Value Added

	Industry value added $bn		
ANZSIC Industry	2015-16	2016-17	2017-18
09 Non-metallic mineral mining and quarrying	2.6	2.7	2.9
28 Water sewerage and drainage	13.2	13.1	14.0
29 Waste collection, treatment and disposal	4.2	4.5	5.0
30 Building construction	26.2	29.3	33.3
31 Heavy and civil engineering construction	21.2	18.6	20.0
32 Construction services	68.1	68.6	72.5
Total construction	115.5	116.6	125.8
6711 Residential property operators		11.1	
6712 Non-residential property operators		42.6	
6720 Real estate services		15.5	
67 Property operators and real estate services	65.6	69.2	69.8
6921 Architectural services	3.9		
6922 Surveying and mapping services	1.9		
6923 Engineering design and consulting services	17.9		
BES Professional, scientific and technical services	23.7	25.0	23.3
7311 Building and cleaning services		6.0	
7312 Building pest control services		0.7	
7313 Gardening services		1.4	
BES Building cleaning, pest control, other services	7.9	8.1	8.5
BES Manufacturing	16.0	16.0	17.2
Total BES IVA	248.8	255.2	266.5





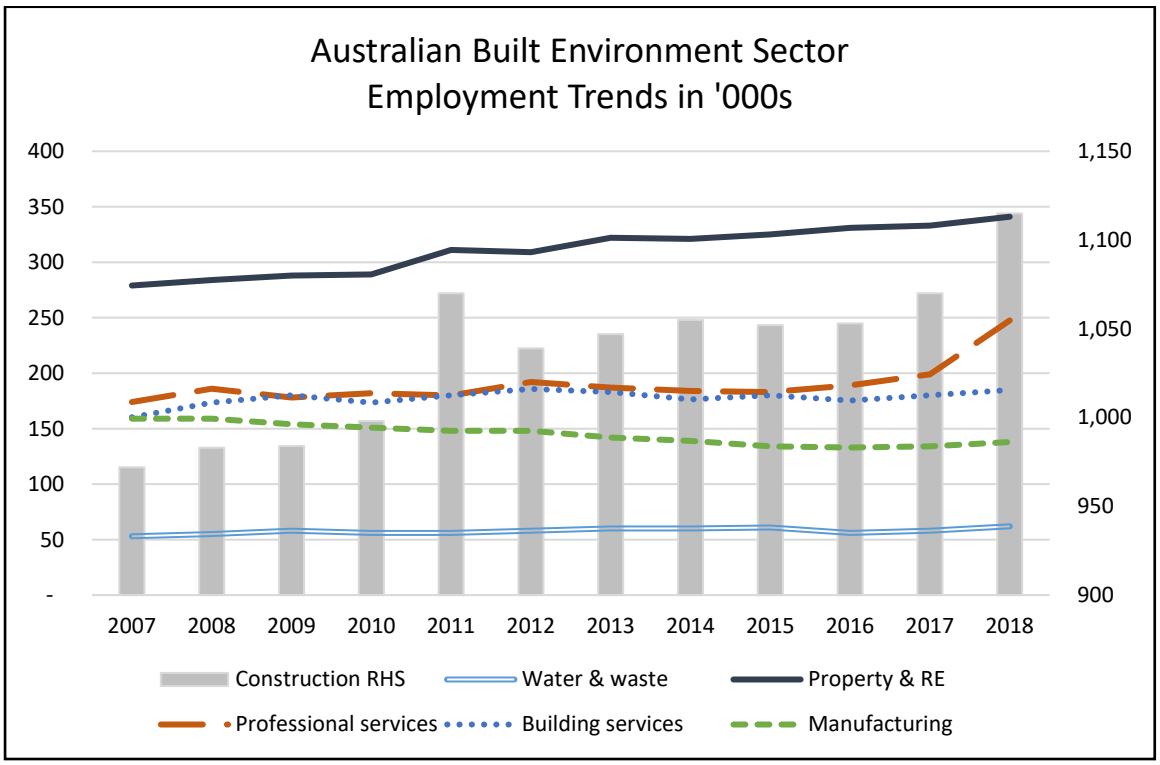
Source: *Australian Industry*, ABS 8155.

Employment

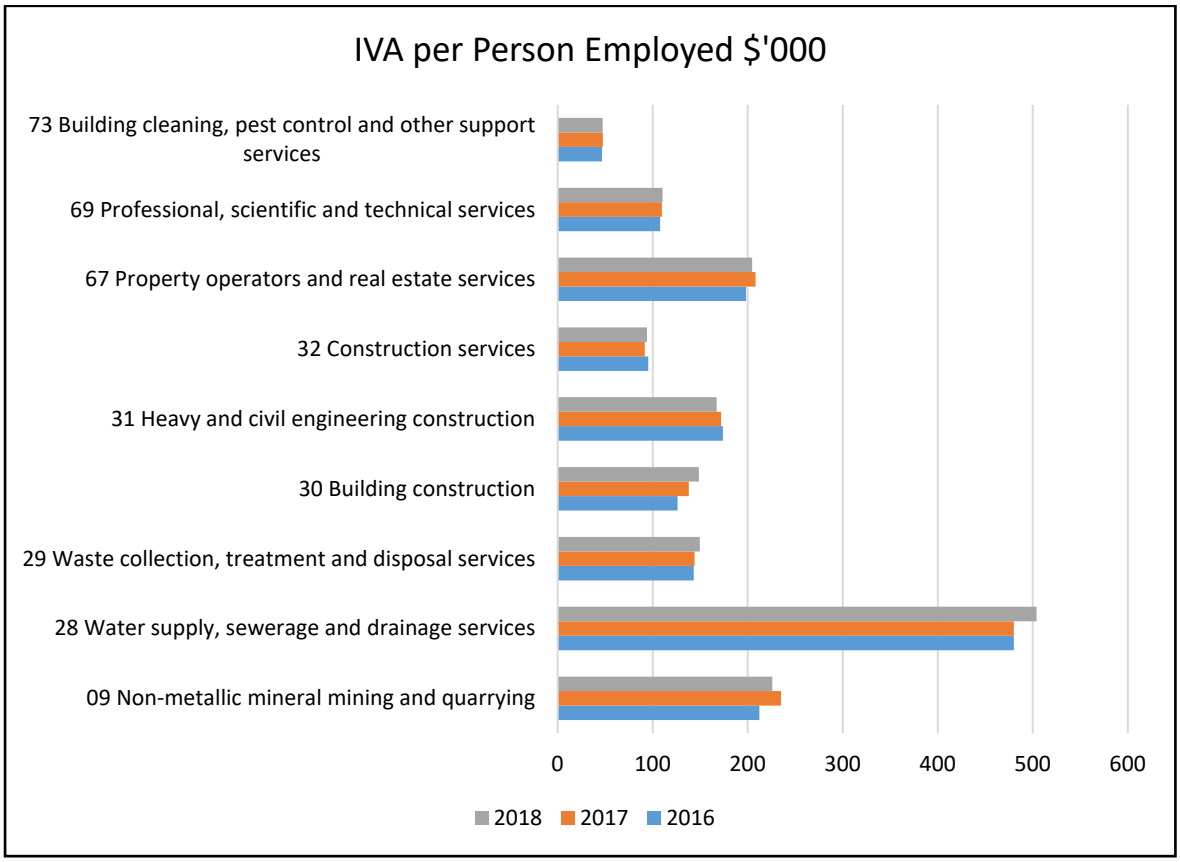
As a sector, the BES accounts for 19 percent of employment in Australia. Total employment in the BES increased steadily but not dramatically for a decade, reaching 2.1 million in 2017-18. Over that time, in the composition of employment across the BES the significant changes have been the rise in Professional, technical and scientific services from 10 to almost 12 percent (however, the current year estimates are usually revised), and the fall in manufacturing BES numbers from 9 to under 7 percent.

The significance of BES employment is not just the scale, nearly one in six employees, but also the distribution. Supply side industries contribute 63 percent of BES output and 71 percent of employment, due to the high labour intensity of Construction. The three Construction industries all have a low value of IVA per employee compared to income per employee, converting relatively low shares of revenue into value added of 19, 30 and 40 percent respectively. On the other hand, the demand side industries of property and real estate contribute 26 percent of BES output but have only 16 percent of employment, and convert 65 percent of income per employee into IVA.

	Employment '000s		
ANZSIC Industry	2015-16	2016-17	2017-18
09 Non-metallic mineral mining and quarrying	12	12	13
28 Water sewerage and drainage	27	27	28
29 Waste collection, treatment and disposal	29	31	34
30 Building construction	208	212	225
31 Heavy and civil engineering construction	122	110	119
32 Construction services	723	748	771
Total construction	1,053	1,070	1,115
6711 Residential property operators		50	
6712 Non-residential property operators		146	
6720 Real estate services		137	
67 Property operators and real estate services	331	333	341
6921 Architectural services	40		
6922 Surveying and mapping services	16		
6923 Engineering design and consulting services	133		
BES Professional, scientific and technical services	189	199	248
7311 Building and cleaning services		150	
7312 Building pest control services		10	
7313 Gardening services		21	
BES Building cleaning, pest control, other services	175	180	185
BES Manufacturing	133	134	138
Total BES Employment	1,949	1,986	2,101



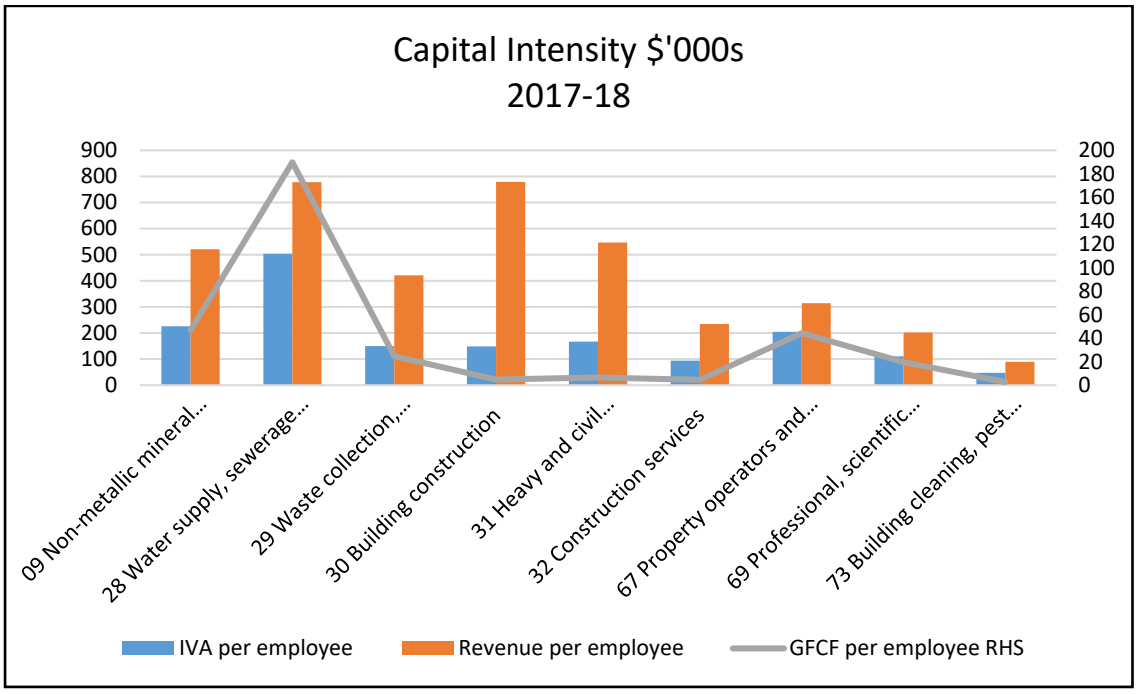
IVA per Person Employed



Source: *Australian Industry*, ABS 8155.

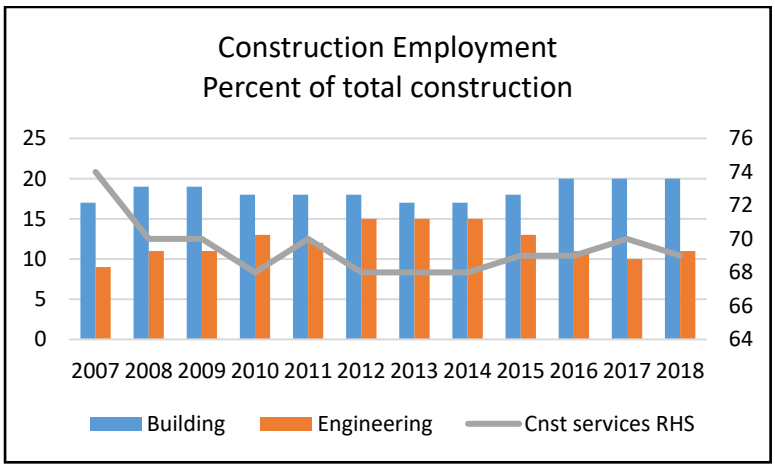
Capital expenditure by firms is their purchases of buildings, structures, software and machinery, the known as gross fixed capital formation (GFCF), “gross” means the expenditure is measured without deducting the consumption of fixed capital (the wear and tear caused by its use in production). GFCF has two types of assets, material and intellectual, the latter includes mineral exploration; computer software and databases; and entertainment, literary and artistic originals. In the long run, investment measured by GFCF determines industry growth rates and their level of labour productivity.

Over time, annual GFCF becomes the capital stock of an industry, the quantity of assets used in production, and industries range from labour intensive to capital intensive. Capital intensity is typically measured as the ratio of fixed capital to labour, or of assets to revenue in a company’s accounts. Industries that are capital intensive like cement, water and sewerage, and real estate require large amounts of capital, and therefore high levels of GFCF. In the absence of capital stock data at this level, GFCF is an alternative measure of capital intensity across the BES. When GFCF per employee is compared to IVA per employee there is a close match, industries with high IVA per employee also have high expenditure on GFCF per employee.

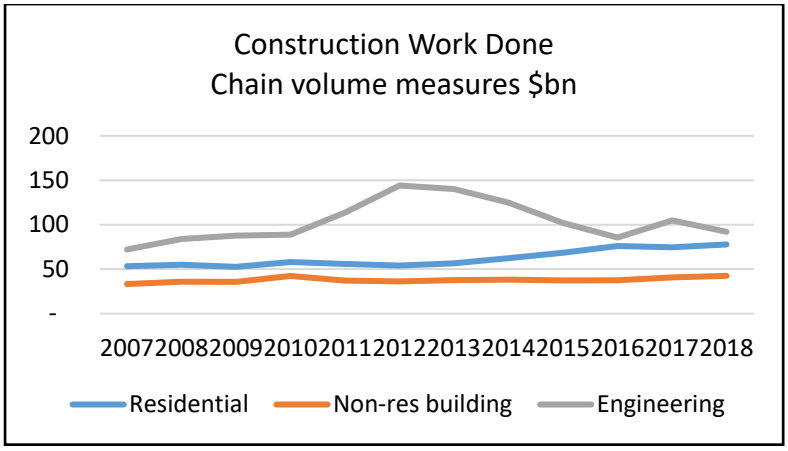


Source: *Australian Industry*, ABS 8155.
GFCF is Gross fixed capital formation, which is investment in software, plant and equipment, and buildings and structures.

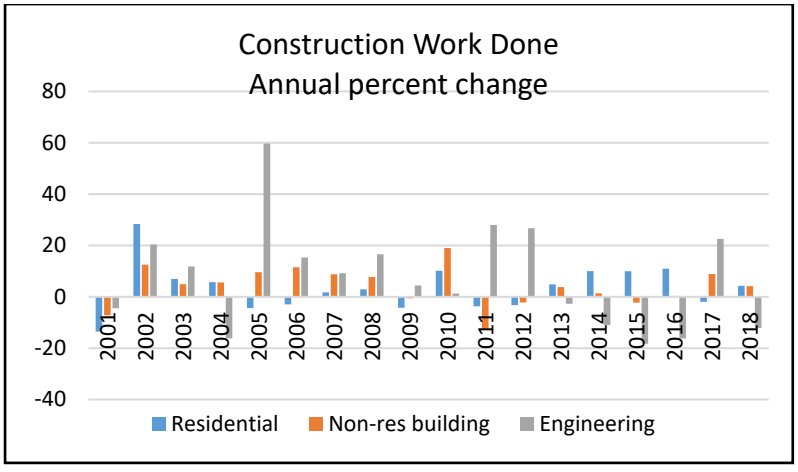
Construction after the Mining Boom



Source: *Australian Industry*, ABS 8155.



Source: *Construction Work Done,* ABS 8782.



Source: *Construction Work Done,* ABS 8782.

The aftermath of the mining boom and its impact on the economy is an ongoing macroeconomic story. However, the focus is typically on the main indicators of GDP, employment and inflation, and there is less discussion about the effects on the building and construction industry. At a structural level, there were significant changes in the composition of construction industry output and employment that have altered the profile of this industry.

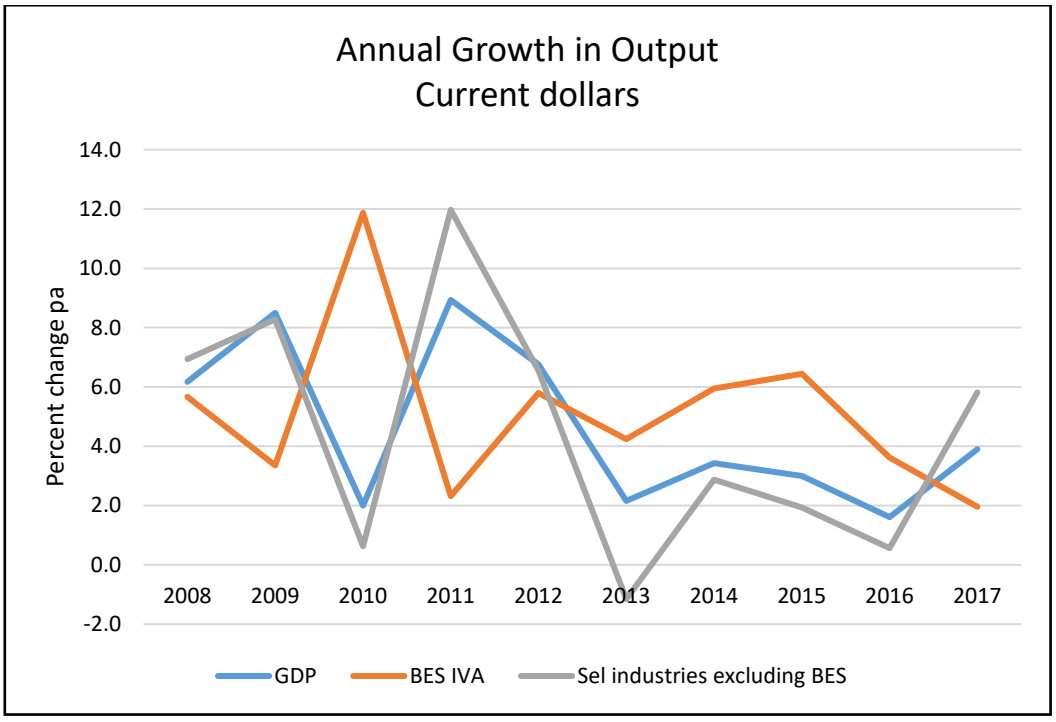
During the mining boom, Engineering construction more than doubled its share of construction IVA, increasing from 12 to 24.4 percent between 2006-07 and 2013-14, when the boom peaked. Over that period the share of Construction services fell from 67 to 55 percent of the total, while Building was around 20 percent. By 2016-17 Engineering had fallen to 16 percent, Building had increased to 24.5 percent of IVA, and Construction services were 59 percent. These trends in IVA match those in employment and the value of work done data from the ABS.

Included in the value of engineering construction are plant, equipment and machinery, such as oil and gas platforms. Much of this is imported. The size of some of these projects makes for some large annual changes in work done. In most years, Non-residential building is more volatile than Residential.

Macroeconomic Role of the Built Environment Sector

Construction projects have many participants and extensive linkages with other sectors, measured through the industry's high multiplier effect of nearly 3. Through those linkages the impact of construction on other parts of the economy is much greater than the direct contribution. This gives the industry an important macroeconomic role, seen clearly in the effects of the Commonwealth Government's fiscal response during the financial crisis in 2009-10.

Separating the BES from the other industries in the ABS data shows how that increase in government spending on schools, buildings and infrastructure flowed through to the wider economy over the following year. Later, in the residential boom from 2013-17, the BES supported output across the economy during the transition at the end of the mining boom, as business investment fell from 18 percent of GDP to 8 percent. The BES also appears to be a potentially useful leading indicator of activity in the wider economy.



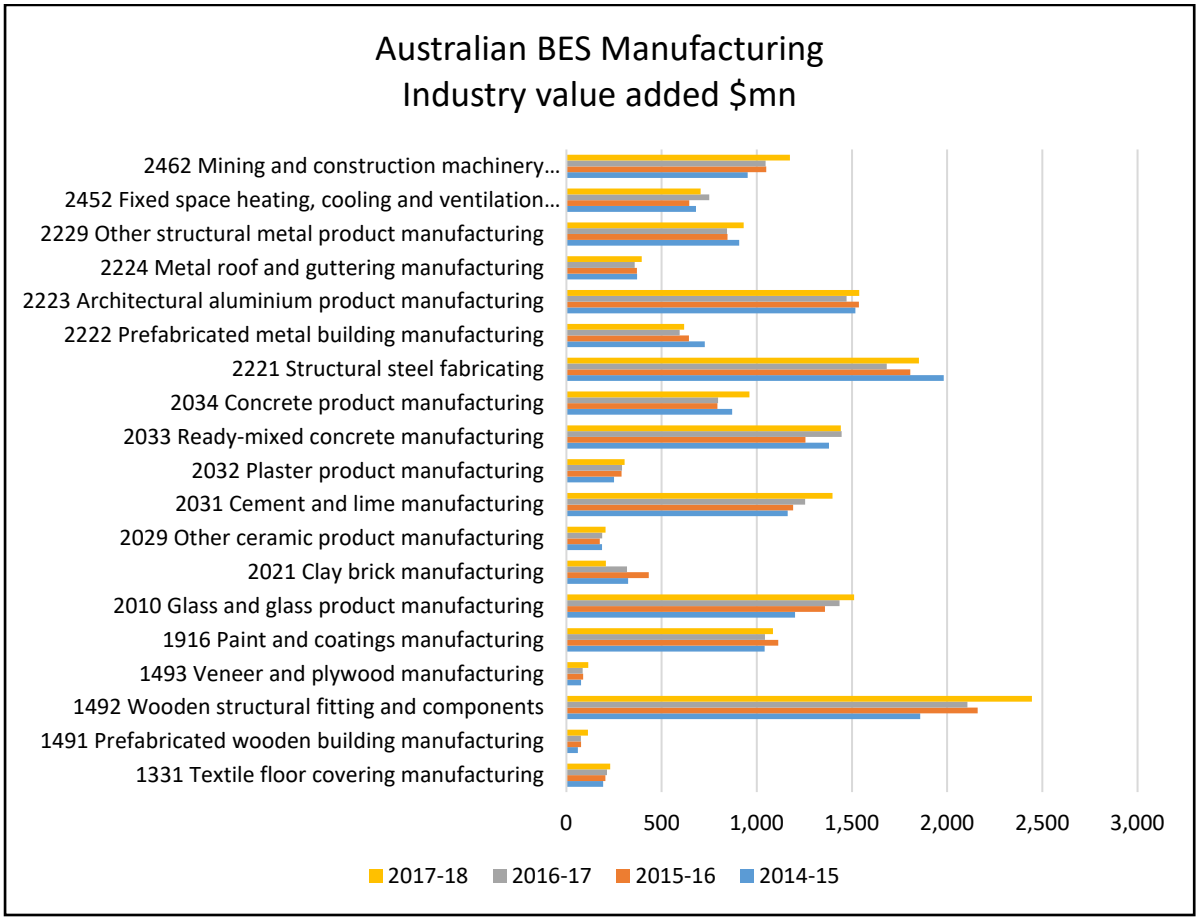
Source: *Australian Industry*, ABS 8155 and *Australian National Accounts: National Income, Expenditure and Product* ABS 5206.

Another factor that regularly emerges is capacity constraints, which strongly affects prices. The quantity of materials like gravel and concrete that can be produced in one year is limited, there are only so many engineers and project managers, and so on. The ABS data shows a significant part of the 2009-10 spend went on increased prices and profits for building and construction projects, and the mining boom significantly increased wages. With twelve years of data, the relationship between BES and the business cycle can be identified, and these output and employment indicators used as a factor in the pipeline of planned infrastructure projects.

Australian Built Environment Sector: Manufacturing

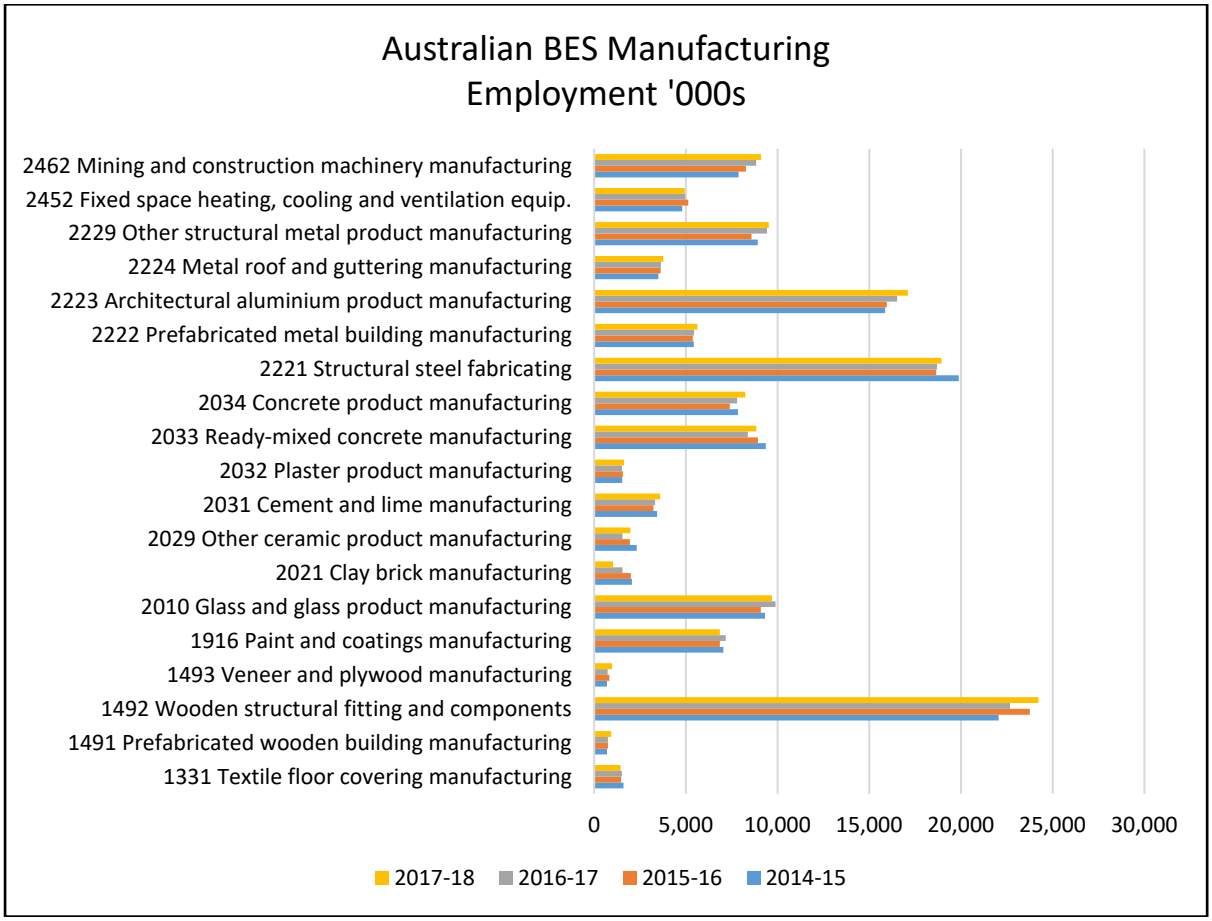
	Industry value added $mn			
ANZSIC Industry	2014-15	2015-16	2016-17	2017-18
1331 Textile floor coverings	193	205	213	230
1491 Prefabricated wooden buildings	60	77	76	113
1492 Wooden fittings and components	1,858	2,160	2,106	2445
1493 Veneer and plywood manufacturing	77	88	85	115
1916 Paint and coatings manufacturing	1,041	1,113	1,043	1085
2010 Glass and glass products	1,201	1,358	1,435	1511
2021 Clay brick manufacturing	324	433	318	207
2029 Other ceramic products	187	175	188	206
2031 Cement and lime manufacturing	1,162	1,191	1,254	1398
2032 Plaster product manufacturing	250	290	292	306
2033 Ready-mixed concrete	1,379	1,256	1,446	1441
2034 Concrete product manufacturing	871	793	797	961
2221 Structural steel fabricating	1,982	1,806	1,683	1852
2222 Prefabricated metal building	727	644	595	618
2223 Architectural aluminium products	1,518	1,536	1,472	1538
2224 Metal roof and guttering	371	370	359	396
2229 Other structural metal products	908	846	844	931
2452 Heating, cooling, ventilation equipment	681	645	750	705
2462 Mining and construction machinery	952	1,050	1,046	1174
Total BES Manufacturing	15,742	16,036	16,002	17,232

Source: *Australian Industry*, ABS 8155.



ANZSIC Industry	Employment 000s 2014-15	2015-16	2016-17	2017-18
1331 Textile floor coverings	1,600	1,470	1,511	1,441
1491 Prefabricated wooden buildings	698	753	753	922
1492 Wooden fittings and components	22,048	23,752	22,673	24,227
1493 Veneer and plywood manufacturing	694	825	732	980
1916 Paint and coatings manufacturing	7,044	6,852	7,177	6,852
2010 Glass and glass products	9,307	9,085	9,891	9,694
2021 Clay brick manufacturing	2,056	1,999	1,542	1,026
2029 Other ceramic products	2,318	1,944	1,542	1,975
2031 Cement and lime manufacturing	3,426	3,229	3,321	3,593
2032 Plaster product manufacturing	1,524	1,559	1,507	1,625
2033 Ready-mixed concrete	9,354	8,923	8,379	8,840
2034 Concrete product manufacturing	7,838	7,388	7,795	8,234
2221 Structural steel fabricating	19,880	18,645	18,692	18,935
2222 Prefabricated metal building	5,426	5,378	5,443	5,631
2223 Architectural aluminium products	15,866	15,951	16,519	17,102
2224 Metal roof and guttering	3,497	3,623	3,636	3,767
2229 Other structural metal products	8,915	8,574	9,423	9,523
2452 Heating, cooling, ventilation equipment	4,801	5,135	4,964	4,935
2462 Mining and construction machinery	7,868	8,276	8,835	9,092
Total BES Manufacturing	134,160	133,361	134,335	138,394

Source: *Australian Industry*, ABS 8155.



Why Measure the Built Environment Sector

In a time of rapid urbanisation and great social and environmental challenges, the built environment and city policies have become central issues in public policy. The quality of the built environment the BES delivers is a major determinant of the quality of life. Further, in a fundamental sense, how cities function depends on how well the BES can deliver the projects required, and cities are at the centre of the economy.

There are many issues affecting the built environment, many of which are wicked problems of great complexity that range widely across industries, institutions and regulatory systems. How measuring the BES helps is by providing an overview of the value chain, from suppliers to end users, and offering a view, or views, of pathways to future policy goals. It does this by allowing possibilities for deeper integration between these participants. For example, contributions to reducing the carbon footprint across supply (particularly concrete), construction (transport) and commercial and industrial use (energy) could be allocated across the BES with targets for each industry. And if sufficient firms were to commit to the target, many of which are already investing in modular building, rooftop solar, improving energy efficiency and so on, this could be done by industry instead of government. Industry level carbon emissions data is available, reducing the BES total becomes the goal, peer pressure does the work.

For government, an important area of application would be evaluating the effects of the City Deals and Smart Cities policies that focus on the built environment. There are now nine City Deals underway in Australia, bringing together federal, state and local governments in a long-term strategic plan, typically focused on transport infrastructure and economic development. The Western Sydney Airport deal is a good example. The BES is the transmission channel for turning that investment into infrastructure, communities and jobs. Similarly, the rollout of smart city technologies will involve

These City Deals and Smart Cities policies come under the Department of Infrastructure. A problem they identify is the lack of current data on the effectiveness of these policies:

> It is important that we are able to measure the success of our Smart Cities Plan, particularly our City Deals which will outline defined development goals. For many of these goals, there is no baseline data readily available to determine and track a city's performance. We will work with the states and territories, councils, communities and the private sector to identify key city metrics and the data required to assess performance. This data will be critical in the design of targeted policies, reforms and capital investments, and to measure the effectiveness of these actions.

The BES metrics of most interest are changes in the composition of output and employment. Over the ten years of a City Deal, jobs in the BES are created first in supply industries like design, materials, manufacturing and construction, then in the demand and maintenance industries like property, real estate and building services. From this data other metrics like industry value added per employee can be found. A significant part of the economic growth after the city deal will be from growth in the region's BES, as commercial and industrial development follows the investment in infrastructure.

In a similar way, the BES also allows a perspective on industrial development. Economies grow by upgrading the products they produce and export, but the technology, capital, institutions, and skills needed to make newer products are more easily adapted from related products with common labour and capital requirements. This network of relatedness between products means that industries move through the product space by developing goods close to those they currently produce. Under these conditions, the set of options available for an industry are strongly influenced by its current position in the BES product space and its ability to adapt to new products. With the wide range of new production technologies currently emerging, such as 3D printing of concrete, automated machinery and buildings made with new materials like engineered wood, the BES is a laboratory for the fourth industrial revolution. Because it is not possible to know now which of these technologies will work at scale, a role of policy as facilitator is to provide opportunities for new methods of production, organisation and management to be tested and trialled on demonstration projects.

Another issue to be addressed is build quality and product safety. The 2017 Shergold-Weir report *Building Confidence* highlighted how difficult policy-making in the built environment is. The report mainly addressed the issue of flammable cladding, and made 24 recommendations, but acknowledged these were the responsibility of state governments in Australia. There is a wide variety of legislation, and different parties are involved during design, construction and certification (professional services, contractors and suppliers, and public and private certifiers respectively). In February 2019 the NSW Government proposed the appointment of a Building Commissioner, following the report's central recommendation, to act as a consolidated building regulator with responsibility for licensing and auditing designers, requiring their building plans to specify a building that will comply with the Building Code of Australia, and for builders, who will have to declare that buildings have been built according to their plans. Banks have risk compliance officers, the BES may need product compliance officers.

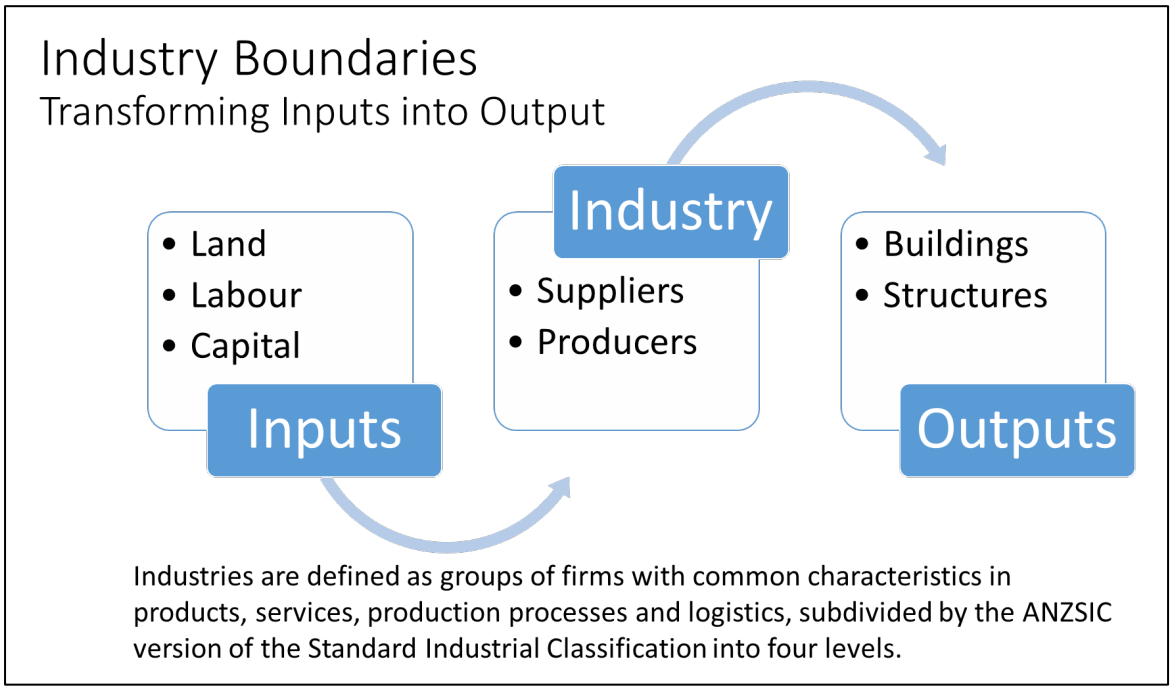
The Commissioner's proposed role cuts across the BES, taking the objective of product safety and built quality and allocating responsibility across the supply chain by having the relevant compliance and certification required for all parties at each stage of design, construction and operation. Consolidating the data on the range of industries and firms involved supports that role, all else equal better data leads to better informed policy.

Finally, taking a broad view of an industrial sector provides perspective on its role and significance in economic and technological development. When economic activities are spread across a wide range of individual industries the contribution of the whole is not obvious. This is why the tourism industry has an annual Tourism Satellite Account produced by the ABS each year. This brings together the contributions of a number of industries like accommodation, tour operators and entertainment to estimate their total output and employment. The contribution of tourism to GDP was 3.1 percent in 2017-18, and the share of employment was 5.2 percent. A satellite account uses the ABS Input-Output Tables (ABS 5209), a much broader data set than in *Australian Industry*.

Industries, Clusters and Sectors

Parts of the economy that involve many different contributors and participants are often called an industrial or economic sector, an example is the non-profit sector with its wide variety of organisations. Although the idea of an industrial sector has no precise meaning, it is often used to describe a loose collection of firms with one or more common characteristics, like 'manufacturing' or 'the business sector', though firms in these sectors come from many different industries.

The starting point is the concept of an industry, which is defined in the Standard Industrial Classification (SIC) used by national statistical agencies as a group of firms with common characteristics in products, services, production processes and logistics. These firms are classified into a four-level structure. The highest level is alphabetically coded divisions such as Agriculture, forestry and fishing (A), Manufacturing (C) and Information and communication (J). The classification is then organised into two-digit subdivisions, three-digit groups, and four-digit classes.



Industries are defined as groups of firms with common characteristics in products, services, production processes and logistics, subdivided by the ANZSIC version of the Standard Industrial Classification into four levels.

The boundaries around an industry are tightly defined by the SIC, to allow identification of individual industries as producers of goods and services and measurement of their contribution to output and employment in the economy. However, to produce something supplies are needed, purchased from other producers, and these relationships between industries are also important. For example, bricks are manufactured products supplied to property developers to provide buildings for their customers. Many industries are structured around such supply chains and production networks, and when enough firms share sufficient characteristics they are often described as an industry cluster.

An industry cluster brings together a group related firms, and was originally applied in the 1990s to specific locations like the wine industry in California's Napa Valley or Bordeaux in France. Over time,

the concept itself broadened as different types of clusters were identified, such as creative industry hubs or knowledge centres. Two types of industry cluster are:

1. Geographical – industries using the same resources in a specific location

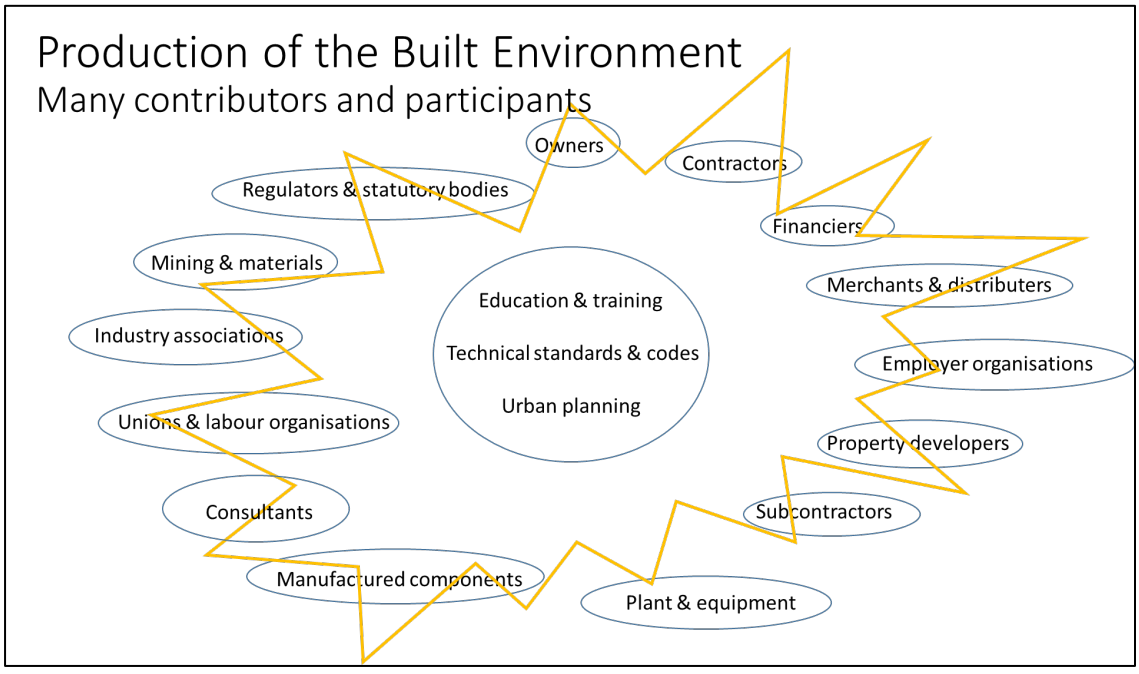
- Movies – Hollywood US, Bollywood India;
- IT – Silicon Valley CA., Silicon Alley NY., Silicon Glen Scotland, Bangalore India;
- Leather goods, spectacles and glasses – Italy;
- Health – Boston US, Oxford England, Chennai India;
- Electronics – Guadalajara Mexico, Cordoba Argentina, Guangdong China;
- Finance – London England, New York US, Geneva Switzerland; and

2. Vertical – a hub and spoke value chain from suppliers to end products

- Automotive – Detroit US, Dusseldorf Germany, Turin Italy, Curitiba Brazil
- Aerospace – Toulouse France (Airbus), Seattle US (Boeing)
- Smart phones – Guangdong China (Apple), Hanoi Vietnam (Samsung)

Some industries do not have central locations like the clusters in IT, wine, finance etc., or major hubs where production is concentrated like automobiles and aerospace. These industries are built around decentralised production, distribution and delivery networks that make their products widely available to clients and customers. Four examples are:

- Pharmaceuticals – a globally distributed industry, with countries combining some form of domestic production and imported supplies;
- Shipbuilding – brings many suppliers together in a few locations;
- Electricity generation – brings many suppliers together in many locations;
- Building and construction – the world's most ubiquitous industry, sharing the most widely used materials of wood, clay, glass, steel and concrete. Is this really a cluster?



Building and construction, in fact, is only one of the many industries involved in the production of the built environment. There is a diverse collection of industries that create, manage and maintain the built environment. On-site work links suppliers of materials, machinery and equipment, products and components, and all other inputs required to deliver the buildings and structures that make up the built environment. Consultants provide design, engineering, cost planning and project management services. Once produced, buildings and structures then need to be managed and maintained over their life-cycle, work done by another group of related industries. The built environment also needs infrastructure and services like water and waste disposal, provided by yet more industries.

A dense network of many different firms and participants such as this is often called an industrial or economic sector, because it is too diverse and distributed to be a cluster. There is no definition of an industrial sector, beyond a broad collection of firms with one or more common characteristics, like 'manufacturing' or 'the business sector', though firms in these sectors come from many different industries. There are also sectors based around a definable market, two examples being:

1. Defence - there is no defence 'industry' because suppliers come from many different industries like IT, aerospace and shipbuilding, but as a sector share resources and clients; and
2. Tourism - which brings together the contributions of industries like accommodation, tour operators and entertainment. This is why the tourism sector has an annual Tourism Satellite Account produced by the ABS each year.

Industries contributing to the built environment

Supply side industries	Demand side industries	
	Property and real estate	Maintenance & management
Mining and materials Plant and equipment Manufactured components Transport and warehousing Professional & technical services Construction contractors Construction subcontractors	Residential property developers Non-residential developers Infrastructure projects Repair and refurbishment	Water and sewerage Waste collection and disposal Building cleaning and pest control
Institutional Framework		
Legislative, regulatory and statutory authorities Technical standards and codes Education and training		

If the built environment encompasses the entirety of the human built world, then the built environment sector (BES) is the collection of industries responsible for producing, managing and maintaining the buildings and structures that humans build. To be included in the BES an Industry needs a direct physical relationship with buildings and structures. Those industries can be divided

into those on the demand side and those on the supply side, like materials or specialised tradesmen, Demand side industries like property developers and facility managers pull output from the supply side, both for new output and for servicing and managing existing assets. Therefore the BES is a sector more like defence than tourism, because it also produces long-lived assets for clients outside the sector (governments and owners respectively) that require repair and maintenance, and that R&M generates significant ongoing revenue for firms across the broad industry sector that produces those assets.

A final requirement is that data on the industries included in the BES needs to be available at a level of detail that separates out BES components of industries like manufacturing and professional services. Generally, this excludes industries such as transport, legal and financial services. These industries clearly play a role in the BES, but that role is hard to identify in Industry statistics because of the level of aggregation in the data. Another complicating issue is that industry-level statistics can vary greatly across different releases by an agency, due to the different data sources and methodology used, and also between countries, whose national agencies typically use their own version of the SIC.

The concept of the BES is broad and extensive, so cannot be precise and exact. While the boundaries of industries and markets are important, in practice the data and SIC definitions are the starting point for the data used. The industries included are selected because they clearly have a relationship with construction, management and maintenance of the built environment. This may not capture every last contribution to the BES, but it does allow the development of a profile of the sector. Measuring the BES provides data on its relationship to the wider economy, and is relevant to a wide range of policies and issues currently facing the built environment.

Note on Data and Method

There is now 12 years of data at the two digit subdivision level for industries within the scope of *Australian Industry*, including industries wholly within the BES like Construction services and Property operators and real estate services. This is not the case for all industries, for example Manufacturing has many subdivisions like textiles, chemicals and petroleum, not directly linked to or part of the BES, so the tables above collect the relevant subdivisions as BES Manufacturing.

However, for the subdivisions Professional, scientific and technical services and Building cleaning, pest control and other services, the data at the subdivision level includes contributions from other classes outside the BES. Therefore, for these industries the two digit subdivision estimates have to be weighted using the four digit class data for the BES component, and this can be done because the ABS over the last two years has collected detailed information for a number of specific industries in the annual Economic Activity Survey, one of the data sources for *Australian Industry*. These are released as supplementary tables and typically provide data at the subdivision and class level. Professional, scientific and technical services were included in 2015-16, and in 2016-17 this data was provided for two divisions: Rental, hiring and real estate services, with subdivisions Rental and hiring services (except real estate), and Property operators and real estate services; and Administrative and

support services, with subdivisions Administrative services and Building cleaning, pest control and other support services.

The data from the survey years for these subdivisions is included in the tables. For the other years, employment and IVA are weighted by applying the BES proportion in the subdivision's survey year to the other year estimates. The tables combine the identifiable relevant industries that contribute to production, maintenance and management of the built environment in Australia, from the ABS data provided for industries and their subdivisions. Note that the current year and previous year estimates are revised with each new release, usually these are minor but some are significant.

The data is not complete because some industries cannot be separated into the relevant classes from *Australian Industry*, for example, rental of heavy machinery and scaffolding (class 6631) is in subdivision 66 but the data is not available. Also, services such as marketing, transport, legal and financial are important but again not identifiable. Government spending on infrastructure and portfolio investment in departments like health and education is included through the BES supply industries, although any maintenance and work done internally will generally not be included. That also applies in industries like retailing where work is done in-house.

There is also leakage around the boundaries of industry statistics: some glass is used in mirrors, some in car windscreens, textiles are used in buildings, architects design furniture, engineers repair machines as well as structures, and so on. Because *Australian Industry* uses tax and business register data, it is the classification of firms to industry classes that fundamentally determines the structure and scope of that data. Needless to say, such classifications are not perfect, particularly in regard to large, diversified multi-unit organisations.

The concept of the BES is broad and extensive, so cannot be precise and exact. While the boundaries of industries and markets are important, in practice the data and SIC definitions are the starting point for the data used. The industries included are selected because they clearly have a direct physical relationship with buildings and structures, with the built environment. The extent of that relationship can be debated, likewise contributions from outside the data available such as financial services.

ABS Exclusions from Australian Industry

These estimates are produced annually using a combination of directly collected data from the annual Economic Activity Survey conducted by the ABS, and Business Activity Statement data provided by businesses to the Australian Taxation Office. The data includes all operating business entities and Government owned or controlled Public Non-Financial Corporations.

Excluded are:

- In most industries, entities classified to General government. This exclusion particularly affected data presented for Public administration and safety, Education and training and Health care and social assistance, in that the estimates related only to private sector businesses. Note, however, General government businesses classified to Water supply,

sewerage and drainage services (ANZSIC Subdivision 28, within Division D) were included - that is, data for relevant local government organisations (for example) were included in the estimates.

- Entities classified to ANZSIC Subdivisions 62 Finance and 63 Insurance and superannuation funds. Note that estimates included in this release for Total selected industries exclude ANZSIC Subdivision 64 Auxiliary finance and insurance services. Estimates for this subdivision are presented as a separate data cube in this issue.
- Entities classified to ANZSIC Subdivisions 75 Public administration, 76 Defence and 96 Private households employing staff and undifferentiated goods- and service-producing activities of households for own use.

https://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/8155.0Explanatory%20Notes12017-18?OpenDocument

APPENDIX: Development of ANZSIC

ASIC 1983	ANZSIC 1994	ANZSIC 2006
Agriculture, forestry, fishing, hunting	Agriculture, forestry and fishing	Agriculture, forestry and fishing
Mining	Mining	Mining
Manufacturing	Manufacturing	Manufacturing
Electricity, gas and water	Electricity, gas and water supply	Electricity, gas and water supply
Construction	Construction	Construction
Wholesale and retail trade	Wholesale trade	Wholesale trade
	Retail trade	Retail trade
Transport and storage	Transport and storage	Transport, postal and warehousing
Communication	Communication services	Information media and telecommunications
Finance, property and business services	Finance and insurance	Financial and insurance services
	Property and business services	Rental, hiring and real estate services
		Professional, scientific and technical services
Public administration and defence	Government administration and defence	Administrative and support services
		Public administration and safety
Community Services	Education	Education and training
	Health and community services	Health care and social assistance
Recreation, personal, other services	Accommodation, cafes and restaurants	Accommodation and food services
	Cultural and recreational services	Arts and recreation services
	Personal and other services	Other services