MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Future demand for construction workers

Projections from the National Construction Occupations Model

July 2016

market economics
environment • spatial

New Zealand Government

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
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ABOUT THIS REPORT

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1 Highlights

- The nationwide increase in construction investment, expected to peak at $37 billion in 2017, will increase demand for construction-related occupations to at least the end of 2021.

- Employment in construction-related occupations (estimated at 490,000 employees for 2015) is greater than employment in the construction industry (estimated at 232,000 for December 2015), because many people with construction-related skills are employed in other industries.

- **Across New Zealand,** demand for construction-related occupations is projected to increase by 10 per cent between 2015 and 2021, by approximately 49,000 employees (including working proprietors) to a total of 539,500. Occupations that are expected to experience the largest growth to 2021 include *electricians* (14 per cent), *plumbers* (13 per cent) and *civil engineering professionals* (11 per cent).

- **Auckland** has the largest construction workforce requirements in New Zealand, requiring just under 185,000 construction-related employees by 2021. Overall construction-related employment levels increase by 21 per cent between 2015 and 2021, i.e. by just over 32,000 employees. Occupations that are expected to experience the largest levels of growth over the period include *project builders* (39 per cent), *plumbers* (38 per cent) and *carpenters & joiners* (34 per cent).

- **Waikato and Bay of Plenty** construction-related employment demand increases by an overall 9 per cent (6,800) to nearly 82,000 employees by 2021. The occupations that are expected to experience the largest levels of growth include *civil engineering professionals* (9 per cent), *electricians* (8 per cent) and *plumbers* (7 per cent).

- **Wellington** construction-related employment demand increases by 10 percent (4,800), to just over 51,000 employees by 2021 in order to sustain the projected levels of construction activity. Occupations that are expected to experience the largest levels of growth include *plumbers* (13 per cent), *project builders* (12 per cent) and *electricians* (12 per cent).

- **Canterbury** initially has large construction-related workforce requirements due to the continuing earthquake rebuild, but from 2016 demand for these occupations is expected to steadily decline by 9 percent (10,400), to a total of 72,500 employees. Occupations that are expected to experience the largest declines include *project builders* (down 37 per cent), *carpenters & joiners* (down 29 per cent), and *plumbers* (down 23 per cent).

- The **National Construction Projections web tool** enables anyone to examine and compare the projections for specific construction-related occupations to 2021, in each of the specified regions. The web tool is located on http://constructionprojections.mbie.govt.nz

2 Introduction

This report presents key projections from the first *National Construction Occupations Model* (NCOM). The objective for the NCOM is to help the construction industry plan for their future workforce needs, by providing information on the occupations which are expected to be in demand to the end of 2021.

MBIE commissioned Market Economics Ltd to develop the NCOM, building on the 2014 Auckland Construction Industry Occupations Model and the Canterbury Earthquake Workforce Model. The NCOM presents occupations forecasts at the national and regional level, to the end of 2021.

The NCOM also expands on the recent *Occupation Outlook 2016* report prepared by the Ministry of Business, Innovation and Employment (MBIE), by projecting across a broader range of career opportunities within the construction sector.

The NCOM uses information from the 2013 Census, and the *National Construction Pipeline Report 2016* (the Pipeline report). The NCOM translates the construction investment projected in the Pipeline report, including residential, non-residential and other construction, into estimates of employment growth in construction-related occupations. Appendix 2 to this report provides further technical details on the structure of the NCOM.

The NCOM produces forecasts for construction-related occupations across all New Zealand industries, and is not limited to the construction industry. This is because many other industries demand construction-related skills (for example, manufacturing employs substantial numbers of machinists, and the transport industry employs many drivers), and occupations which are important for construction are not included in the industry (for example, most architects are classified in the professional services industry).

The focus on construction-related occupations is appropriate because our education and training systems are based on developing skills in professions and trades, and are not tied to particular industries. Similarly, the immigration system is designed to attract skilled workers throughout our economy. Experience has also shown that people with construction-related skills tend to flow in and out of other industries, as market conditions change.

The resulting occupations projections have the potential to benefit the construction industry, education and training providers, local and central government, and individuals. The projections can help inform workforce planning, course provision, policy development, and career decisions.

3 Growth in construction

This section outlines information on the increase in construction activity and employment in the construction industry.

3.1. Increase in building activity

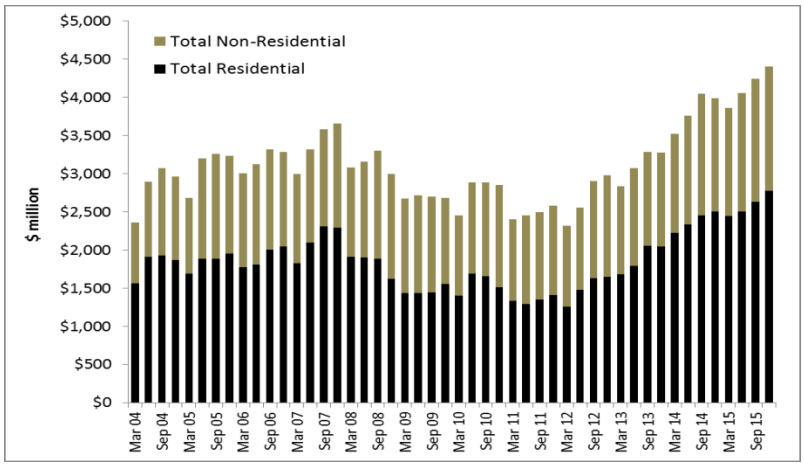
New Zealand's construction industry is experiencing substantial growth. The Canterbury rebuild, Auckland housing investment, leaky home remediation, earthquake strengthening and major infrastructure projects, are examples of the demands on New Zealand's construction and related industries.

For the December 2015 quarter compared with the September 2015 quarter:

- Residential building activity rose 2.8 per cent, to $2.8 billion.
- Non-residential building activity rose 2.3 per cent, to $1.6 billion.

Overall, the value of building work in the December 2015 quarter was at its highest level since the series began in late 1989. During the December 2015 quarter the construction industry contributed 6.0 per cent of New Zealand's Gross Domestic Product. Construction was New Zealand's second-most valuable goods producing industry, after manufacturing.

Figure 1: National trend in value of building work put in place, 2004 to 2015



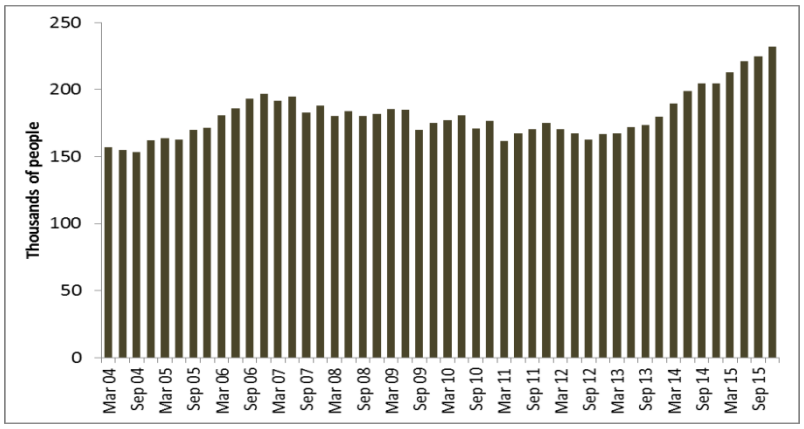
Source: Statistics New Zealand

3.2. Construction leads employment growth

The construction industry was the largest contributor to annual employment growth during 2015, with 27,500 more people employed over the year to December. The estimated total of employment in construction was 232,000 people for the December 2015 quarter.

During the December 2015 quarter the majority of construction employment growth was in Auckland, with 18,900 more people employed during 2015. Canterbury and the Bay of Plenty also contributed to employment growth in the construction industry (up 4,800 and 4,100, respectively). Technicians and trade workers had 20,800 more people employed in this occupation group over the year. More than half of these workers were employed within the construction industry.

Figure 2: National trend in construction sector employment, 2004 to 2015



Source: Statistics New Zealand Household Labour Force Survey

3.3. The construction sector

The construction sector, as it is defined in this report, has three components:

The construction industry, which includes many core construction workers (such as plumbers) but also many occupations, such as accountants, that do not require construction-specific skills. This is measured by the Household Labour Force Survey.

Construction-related occupations, includes the main labour supply sources for the construction sector, but many of whom are not working on construction activities. For example, truck drivers might be working directly for construction firms, working on construction activities but for transport firms, or working outside the construction sector (for example milk tanker drivers).

Construction workers are those workers who are in construction-related occupations and are working directly on construction activities. It includes, for example, architects, who nearly all work on construction activity but are mostly employed in the professional services industry.

Market Economics Ltd has estimated that, of the 490,000 employees and working proprietors working in construction-related occupations during 2015 (see section 5.3 of this report), approximately 188,000 were working in construction activities.

4 Construction investment

The *National Construction Pipeline Report 2016* (the Pipeline) provides a view of national construction investment to the end of December 2021. The information in the Pipeline is prepared by BRANZ and Pacifecon (NZ) Ltd.

The Pipeline data is a compilation of known projects and economic forecasts of building and construction. The nature, value and timing of these projects are estimated using industry knowledge. These estimates form the demand pressures that translate into demand for workers within a range of occupations. The demand pressures are represented by region and the type of construction activity.

The values in the National Construction Pipeline report are expressed as *Gross Fixed Capital Formation*. Gross fixed capital formation is a measure of the net new investment by producers on durable real assets, such as buildings, motor vehicles, plant and machinery, roading, and improvements to land. In measuring the outlays, sales of similar goods are deducted. Land is excluded from gross fixed capital formation.

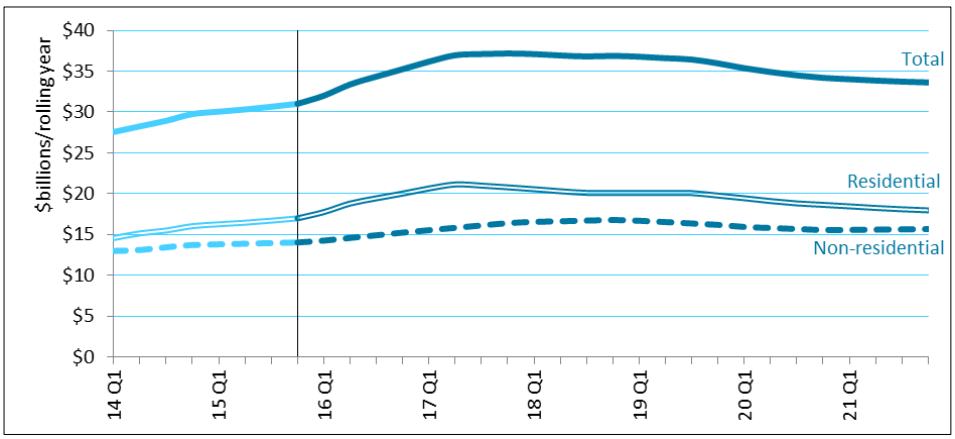
4.1. National outlook

New Zealand continues to construct more by value than ever before, with current levels of recorded activity reaching $31 billion for 2015 and continuing to climb. Total value increased by 4 per cent in 2015, and is expected to grow another 20 per cent to a peak of $37 billion towards the end of 2017. The annual value of all construction nationally is forecast to remain above current elevated levels until 2021.

Residential value increased by 6 per cent in 2015, and is expected to increase 22 per cent more to a peak of $21 billion in 2017. Activity reduces slightly from 2017—2021, but remains higher than 2015's level of activity by value throughout the forecast period.

The value of all non-residential construction is forecast to increase by 20 per cent over 2016-2018 to a peak of $16.8 billion at the end of 2018.

Figure 3: All construction nationally, by value



Source: BRANZ/Pacifecon

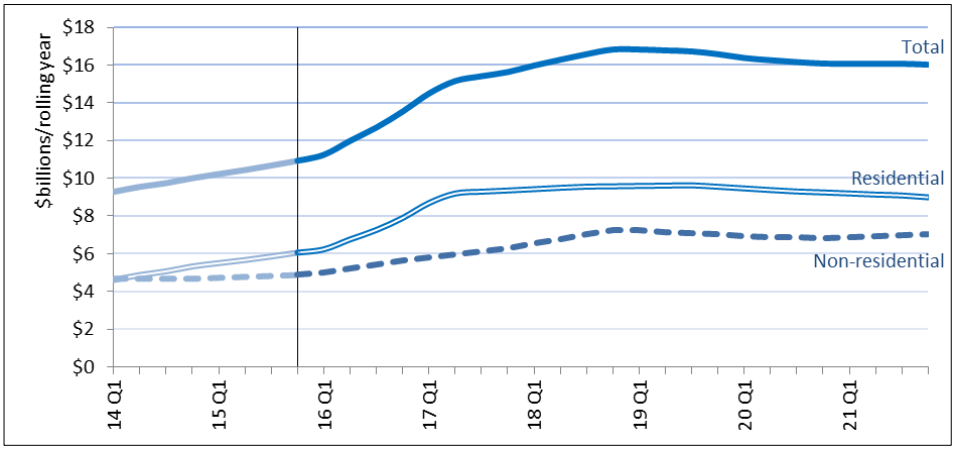
4.2. Auckland

Auckland dominates the national demand for building and construction. The total value of activity in Auckland increased by 9 per cent in 2015. This increase in value is forecast to continue and peak in 2019 at around $17 billion, and to remain at this elevated level for the remainder of the forecast period.

The value of residential construction in 2015 increased by 13 per cent, compared to a 2 per cent increase for all non-residential construction.

Residential building is forecast to increase by 58 per cent to 2018. All non-residential construction is forecast to increase by 49 per cent to 2018.

Figure 4: All construction in Auckland, by value

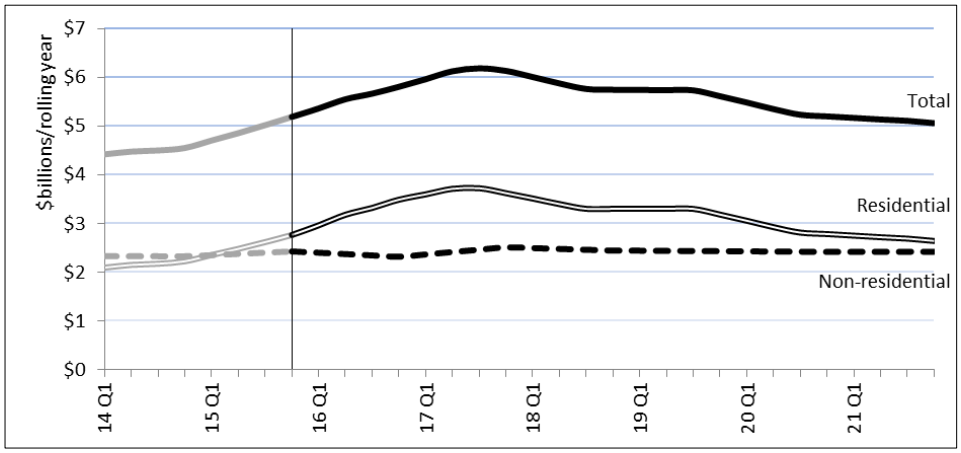


Source: BRANZ/Pacifecon

4.3. Waikato and Bay of Plenty

2015 was a year of significant growth for the Waikato and Bay of Plenty regions, with an increase of 24 per cent in residential building by value. The total value of all building is expected to peak in 2017 ($6.1 billion). Residential activity is forecast to remain elevated above 2015 levels to the end of 2020. Non-residential activity is expected to be relatively stable over the period.

Figure 5: All construction in Waikato and Bay of Plenty, by value

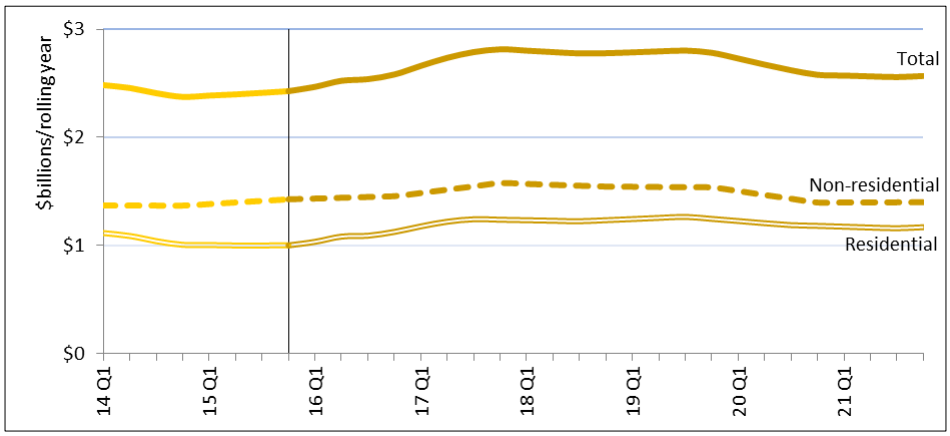


Source: BRANZ/Pacifecon

4.4. Wellington

The value of construction activity in Wellington is expected to increase by 16 per cent to a peak in 2017 ($2.8 billion) and to remain above 2015 levels until the end of 2021. Residential building is expected to increase 20 per cent to a peak in 2017 ($1.2 billion). Non-residential construction is also expected to increase 10 per cent to a peak in 2017 ($1.6 billion).

Figure 6: All construction in Wellington, by value



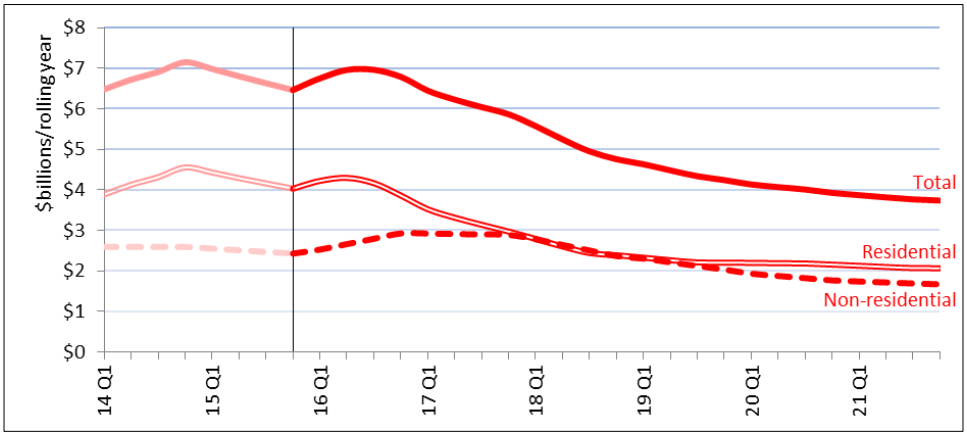
Source: BRANZ/Pacifecon

4.5. Canterbury

Building and construction activity is at peak levels in Canterbury, with total construction activity forecast to remain around $7 billion to the end of 2016. Residential activity reached its peak at $4.5 billion at the end of 2014, and is forecast to remain at elevated levels over 2016. This is a result of residential consent levels dropping off sharply in the first half of 2015 then rising again slightly during the second half of 2015. This has resulted in the bump in residential building value projected for 2016, with a slow decrease expected for the rest of the forecast period.

Non-residential activity has increased over the past few years and is forecast to peak at nearly $3 billion by the end of 2016, before slowly reducing to $1.7 billion by the end of the forecast period.

Figure 7: All construction in Canterbury, by value

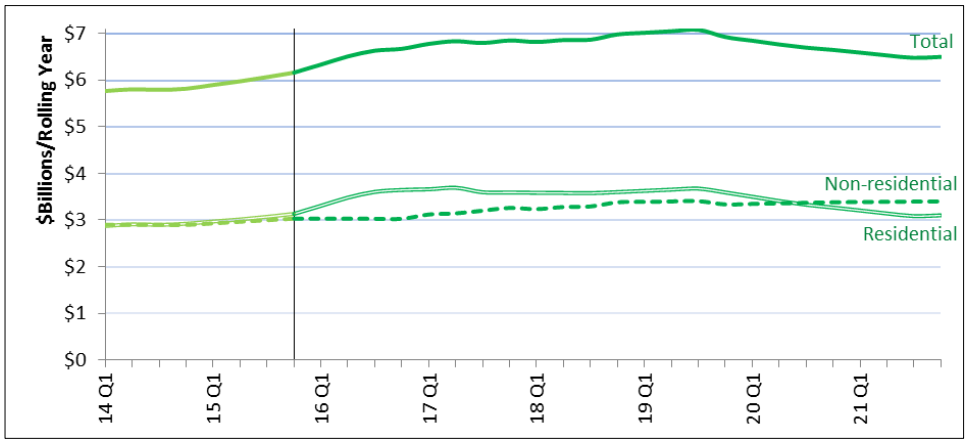


Source: BRANZ/Pacifecon

4.6. Rest of New Zealand

For the rest of New Zealand, the annual value of all building and construction is forecast to rise to a peak around 2019. All non-residential construction activity is forecast to slowly increase throughout the forecast period, with residential building forecast to rise by $1 billion from 2015 levels to a plateau at around $3.6 billion from 2017 to 2019, before falling off slightly.

Figure 8: All construction in the Rest of New Zealand, by value



Source: BRANZ/Pacifecon

4.7. Summary

The *National Construction Pipeline Report 2016* forecasts that construction activity will increase across most of New Zealand, with particular growth in residential building in Auckland. There will be a steady decline to pre-earthquake levels in Canterbury, as the rebuild is completed.

5 The national construction occupations model

5.1. Description

The National Construction Occupations Model (NCOM) has been developed by Market Economics Ltd. The NCOM is an extension of the Pipeline. The NCOM translates the construction investment projected in the Pipeline, both residential, non-residential and other construction, into estimates of employment growth by occupation.

The resulting NCOM projections for construction-related occupations are much broader than employment in just the construction industry, as many other industries employ people with construction skills.

The NCOM adopts *occupation by industry profiles* derived from the 2013 New Zealand Census. This captures industry at the Australia and New Zealand Standard Industrial Classification (ANZSIC) level, and occupations at the Australia and New Zealand Standard Classification of Occupations (ANZSCO) level, for each regional council. The model identifies 62 construction-related occupations from the total of 1,022 ANZSCO occupations.

This list of occupations is the same as that used in the *Greater Christchurch construction-related employment projections,* outlined in Appendix 1. These employment projections are measured in Modified Employee Counts (MECs). MECs include both employees and working proprietors. This measure is used because the construction industry is known to employ large numbers of self-employed people and sole operator businesses.

Combining the National Construction Pipeline Report 2016, along with 2013 Census employment data, provides an outlook of employment and estimated growth within each occupation for the next five years up to the end of 2021.

The NCOM projections can be modified to reflect the different crew mixes for the construction industry in Auckland and Canterbury. Crew mix refers to which occupations make up a labour force (for example, builders, plasterers, and labourers). Specific crew mixes were analysed for Auckland and Christchurch because of the different demands for skills in those regions.

In Auckland, there is an increasing demand for occupations which can deliver medium-density housing and apartment complexes, which require (for example) skills in concrete panel construction, fire safety systems, and internal elevators. In Christchurch, the initial response to the earthquake highlighted demands for repairs (for example, carpentry, painting and road maintenance) primarily for single-level houses and buildings, and demolition skills.

The default crew mix for the occupations projections is based on the 2013 Census. The key concepts and economic tools that underpin the NCOM are explained in greater detail in Appendix 2.

5.2. Web tool

The National Construction Projections web tool enables anyone to search the forecasts for the construction-related occupations, by each of the regions specified in the National Construction Pipeline 2016, to the end of 2021. The web tool is located on http://constructionprojections.mbie.govt.nz

5.3. National-level projections

This section summarises the top ten construction-related occupations for New Zealand, and for each of the regions based on the 2013 Census crew mix.

Auckland has the largest construction workforce demand in New Zealand, requiring just under 185,000 employees and working proprietors by 2021.

Canterbury currently has a large workforce demand due to the earthquake rebuild, but as this is completed demand falls below the levels in Waikato & Bay of Plenty. Wellington requires the smallest construction labour force of the regions, needing just over 51,000 construction employees to sustain the projected levels of construction activity in 2021.

Figure 9: Construction-related occupations employment by region, 2013 - 2021

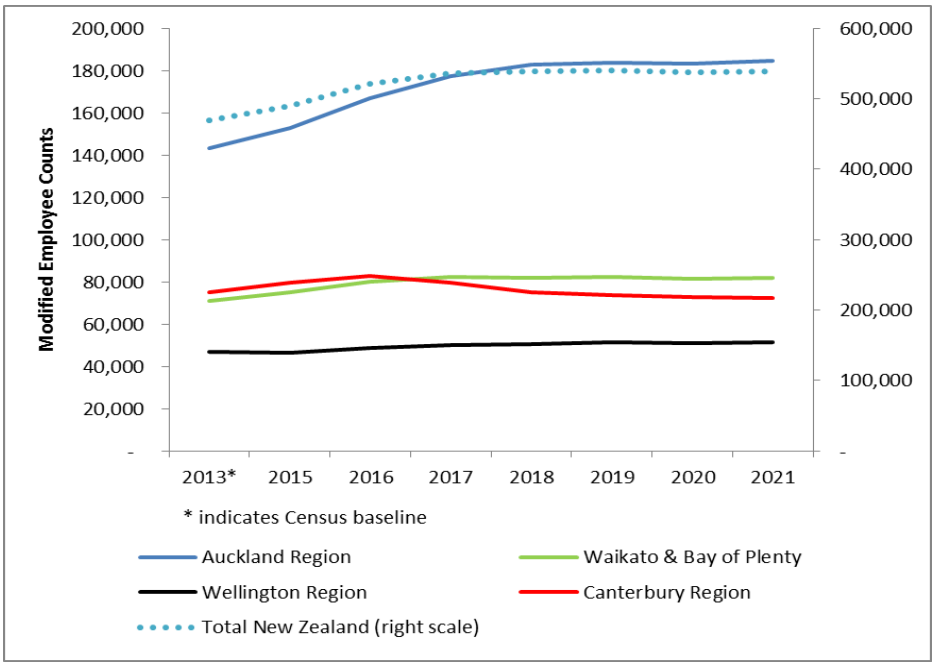


Table 1: Construction-related occupations employment by region, 2013 - 2021

Note: Based on 2013 Census crew mix	2013	2015	2016	2017	2018	2019	2020	2021
Auckland Region	**143,391**	152,671	167,002	177,220	182,981	183,728	183,451	184,776
Waikato & Bay of Plenty	**70,963**	75,109	80,022	82,437	81,976	82,370	81,558	81,917
Wellington	**46,727**	46,559	48,600	50,303	50,744	51,306	50,906	51,369
Canterbury	**75,316**	79,655	82,978	79,738	75,265	73,542	72,693	72,565
*Total New Zealand**	**469,318**	490,114	521,753	535,957	539,021	540,102	536,922	539,503

*This figure is not the sum of the four key regions, as it includes other New Zealand regions which are not specifically projected in the National Construction Occupations Model.

5.4. Total New Zealand

Across New Zealand demand for construction employees is projected to increase on average by 10 per cent between 2015 and 2021. Occupations that experience the largest increases over the period to 2021 include *'Electricians'* (up 14 per cent), '*Plumbers'* (up 13 per cent), and '*Civil Engineering Professionals'* (up 11 per cent). The overall increase in construction-related occupations is approximately 49,000 between 2015 and 2021.

Figure 10: Total New Zealand key construction-related occupations, 2015 - 2021

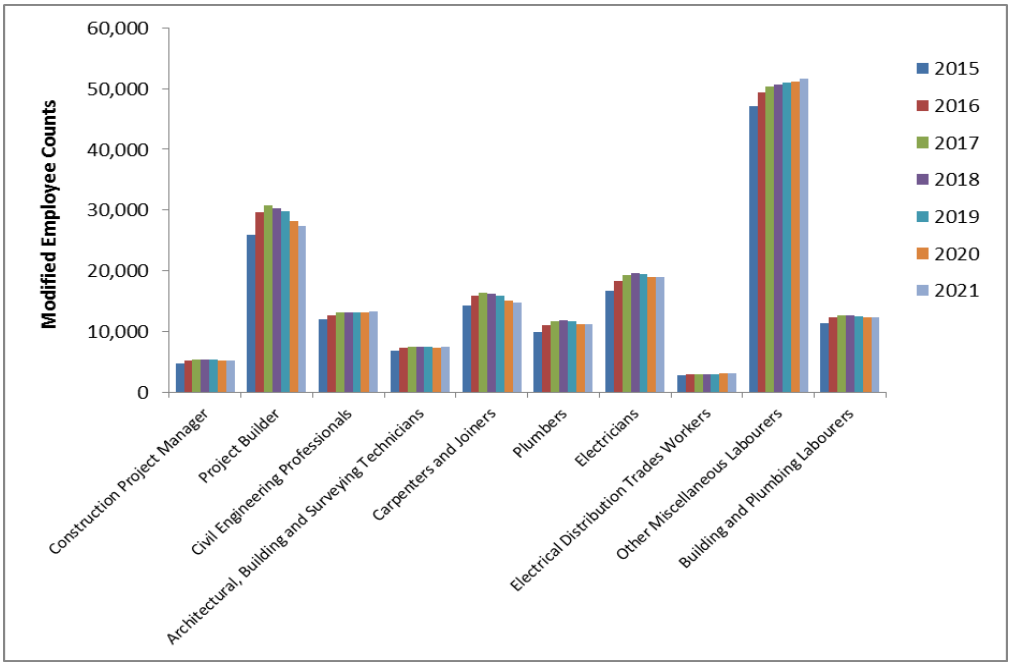


Table 2: Total New Zealand top 10 construction-related occupations, 2015 - 2021

Note: Based on 2013 Census crew mix	2015	2016	2017	2018	2019	2020	2021	*% change, 2015 - 2021*
Construction Project Manager	4,792	5,258	5,468	5,466	5,365	5,213	5,197	*8%*
Project Builder	25,943	29,618	30,821	30,276	29,765	28,174	27,455	*6%*
Civil Engineering Professionals	11,989	12,745	13,088	13,193	13,200	13,156	13,261	*11%*
Architectural, Building and Surveying Technicians	6,827	7,313	7,508	7,506	7,485	7,407	7,432	*9%*
Carpenters and Joiners	14,236	15,830	16,411	16,190	15,845	15,094	14,821	*4%*
Plumbers	9,953	11,113	11,769	11,820	11,651	11,273	11,235	*13%*
Electricians	16,696	18,389	19,369	19,561	19,409	18,971	18,975	*14%*
Electrical Distribution Trades Workers	2,858	2,975	3,013	3,012	3,057	3,105	3,147	*10%*
Other Miscellaneous Labourers	47,058	49,380	50,375	50,717	51,038	51,156	51,571	*10%*
Building and Plumbing Labourers	11,454	12,352	12,677	12,623	12,545	12,358	12,350	*8%*
Total (all occupations)	**490,114**	**521,753**	**535,957**	**539,021**	**540,102**	**536,922**	**539,503**	***10%***

5.5. Auckland

Auckland is expected to demand the largest numbers of construction-related occupations to 2021. Total employment levels increase by 21 per cent over the period. The most demanded occupations are '*Project Builders'* (up 39 per cent) and '*Plumbers*' (up 38 per cent).

Figure 11: Auckland key construction-related occupations, 2015 - 2021

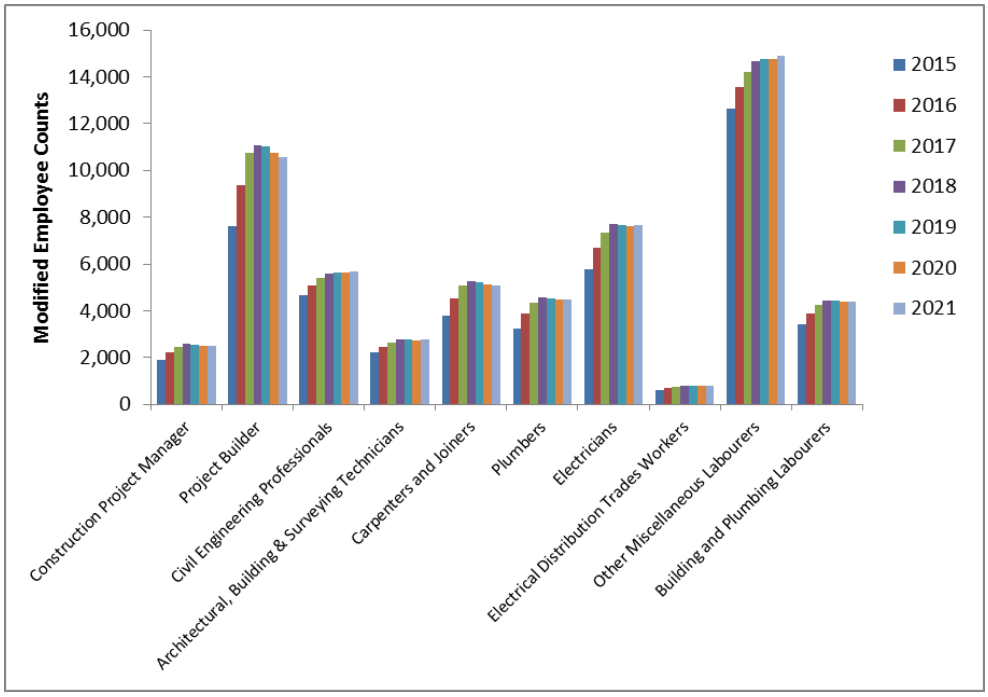


Table 3: Auckland top 10 construction-related occupations, 2015 - 2021

Note: Based on 2013 Census crew mix only.	2015	2016	2017	2018	2019	2020	2021	*% change, 2015 - 2021*
Construction Project Manager	1,927	2,217	2,438	2,585	2,556	2,513	2,525	*31%*
Project Builder	7,616	9,386	10,759	11,093	11,021	10,737	10,551	*39%*
Civil Engineering Professionals	4,689	5,099	5,388	5,613	5,627	5,615	5,674	*21%*
Architectural, Building & Surveying Technicians	2,222	2,471	2,655	2,773	2,774	2,755	2,773	*25%*
Carpenters and Joiners	3,787	4,520	5,082	5,278	5,237	5,127	5,083	*34%*
Plumbers	3,252	3,865	4,334	4,580	4,544	4,473	4,484	*38%*
Electricians	5,780	6,679	7,349	7,711	7,684	7,608	7,647	*32%*
Electrical Distribution Trades Workers	610	686	745	813	813	803	816	*34%*
Other Miscellaneous Labourers	12,635	13,573	14,218	14,649	14,744	14,771	14,913	*18%*
Building and Plumbing Labourers	3,437	3,901	4,250	4,437	4,429	4,386	4,402	*28%*
Total (all occupations)	**152,671**	**167,002**	**177,220**	**182,981**	**183,728**	**183,451**	**184,776**	***21%***

5.6. Waikato and Bay of Plenty

Demand for construction-related employees in the Waikato & Bay of Plenty region is expected to increase by an overall 9 per cent, from 2015 to 2021. While most occupations are forecast to increase, there will be a drop in demand for '*Project Builders*' from 2017 (down 2 per cent). On the other hand, demand for '*Other Miscellaneous Labourers*' will increase (up 10 per cent,) as well as demand for '*Electricians*' (up 8 per cent).

Figure 12: Waikato and Bay of Plenty key construction-related occupations, 2015 - 2021

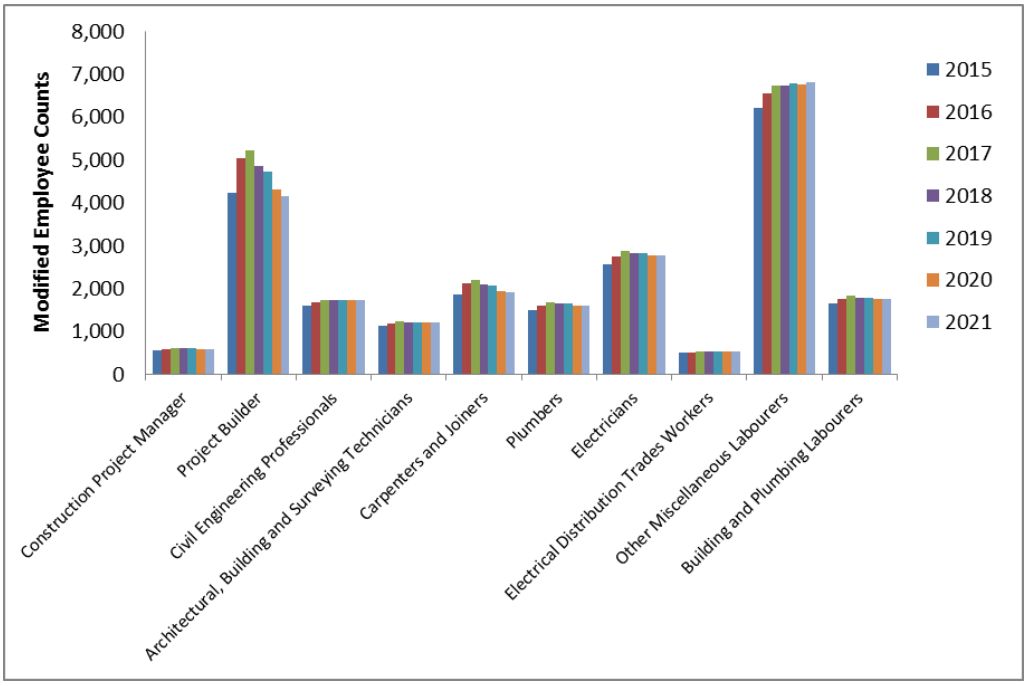


Table 4: Waikato & Bay of Plenty top 10 construction-related occupations, 2015 - 2021

	2015	2016	2017	2018	2019	2020	2021	*% change, 2015 - 2021*
Construction Project Manager	558	595	620	603	600	583	579	*4%*
Project Builder	4,231	5,037	5,218	4,860	4,731	4,296	4,145	*-2%*
Civil Engineering Professionals	1,599	1,674	1,722	1,720	1,731	1,726	1,738	*9%*
Architectural, Building and Surveying Technicians	1,123	1,188	1,224	1,216	1,220	1,209	1,214	*8%*
Carpenters and Joiners	1,871	2,123	2,202	2,104	2,071	1,947	1,908	*2%*
Plumbers	1,491	1,604	1,674	1,639	1,639	1,601	1,600	*7%*
Electricians	2,569	2,754	2,869	2,818	2,820	2,764	2,765	*8%*
Electrical Distribution Trades Workers	507	514	537	532	533	531	534	*5%*
Other Miscellaneous Labourers	6,204	6,538	6,723	6,724	6,772	6,752	6,799	*10%*
Building and Plumbing Labourers	1,644	1,761	1,825	1,790	1,787	1,746	1,742	*6%*
Total (all occupations)	**75,109**	**80,022**	**82,437**	**81,976**	**82,370**	**81,558**	**81,917**	***9%***

5.7. Wellington

Wellington is projected to have a 10 per cent growth in demand for construction-related employees to 2021. The most demanded occupations for the Wellington construction sector include '*Plumbers*' (up 13 per cent), '*Project Builders'* (up 12 per cent) and *'Electricians'* (up 12 per cent).

Figure 13: Wellington key construction-related occupations, 2015 - 2021

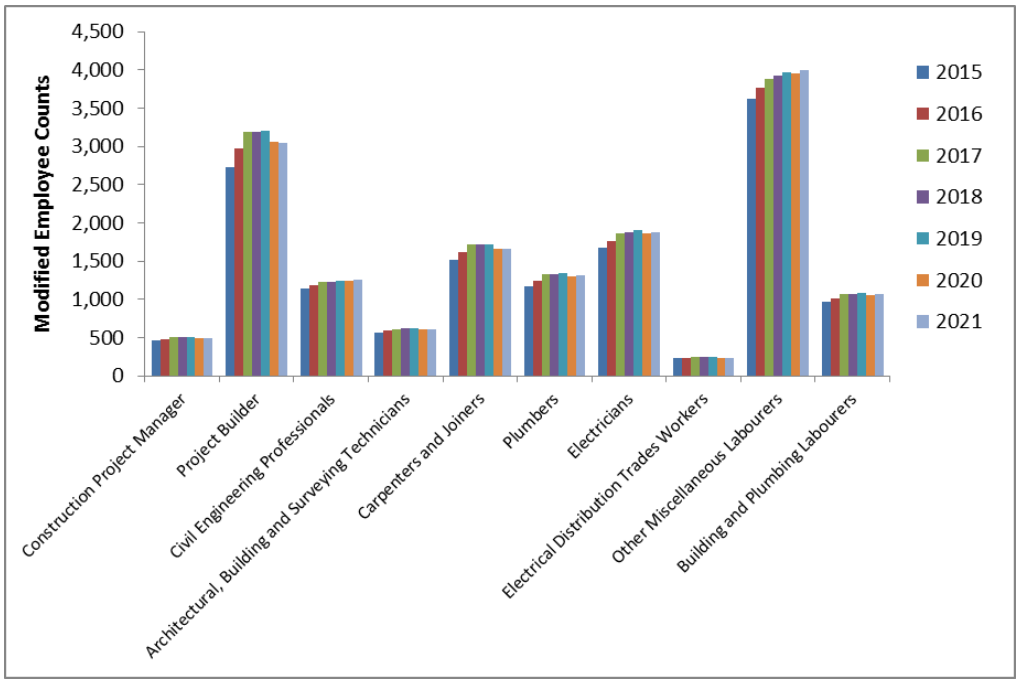


Table 5: Wellington top 10 construction-related occupations, 2015 - 2021

	2015	2016	2017	2018	2019	2020	2021	*% change, 2015 - 2021*
Construction Project Manager	462	484	510	510	513	493	494	*7%*
Project Builder	2,730	2,967	3,189	3,182	3,205	3,065	3,048	*12%*
Civil Engineering Professionals	1,138	1,184	1,221	1,234	1,249	1,245	1,259	*11%*
Architectural, Building and Surveying Technicians	560	586	612	615	620	608	613	*9%*
Carpenters and Joiners	1,513	1,614	1,713	1,714	1,724	1,659	1,657	*10%*
Plumbers	1,167	1,243	1,325	1,333	1,349	1,304	1,315	*13%*
Electricians	1,669	1,767	1,865	1,880	1,903	1,857	1,875	*12%*
Electrical Distribution Trades Workers	226	234	249	246	246	234	235	*4%*
Other Miscellaneous Labourers	3,628	3,773	3,888	3,924	3,968	3,953	3,992	*10%*
Building and Plumbing Labourers	970	1,018	1,064	1,070	1,080	1,059	1,066	*10%*
Total (all occupations)	**46,559**	**48,600**	**50,303**	**50,744**	**51,306**	**50,906**	**51,369**	***10%***

5.8. Canterbury

Following the peak in construction activity in the Canterbury region due to the earthquake rebuild, overall construction-related employment demand is projected to decline by 9 per cent to 2021. *'Project Builders'* and *'Carpenters and Joiners'* experience the largest declines in demand, with 37 per cent and 29 per cent reductions, respectively, between 2015 and 2021.

Figure 14: Canterbury key construction-related occupations, 2015 - 2021

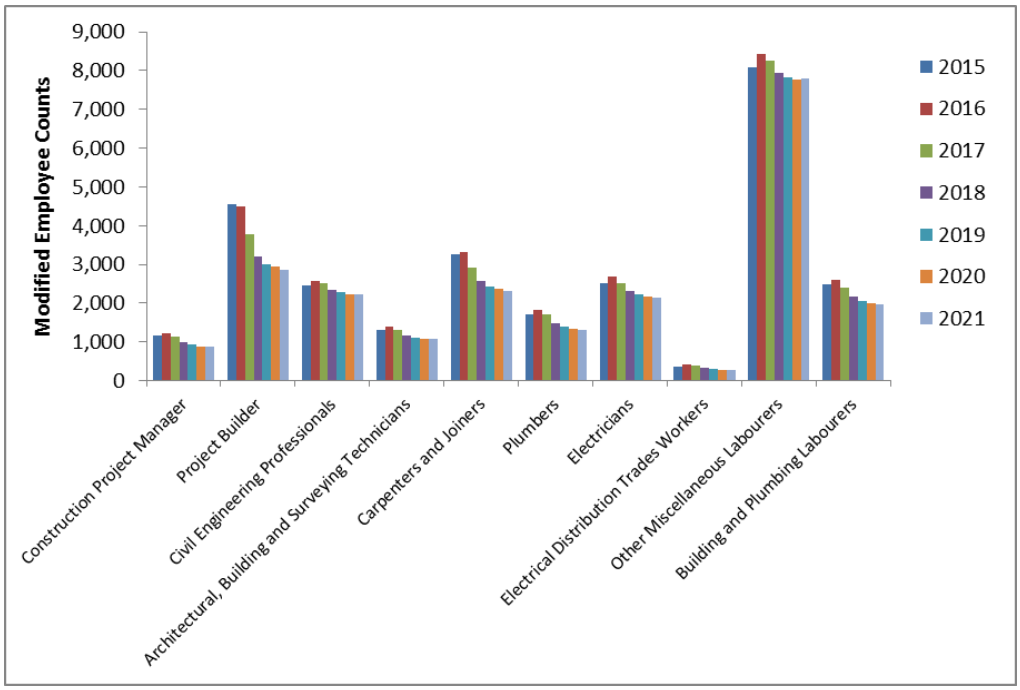


Table 6: Canterbury top 10 construction-related occupations, 2015 - 2021

Note: Based on 2013 Census crew mix only.	2015	2016	2017	2018	2019	2020	2021	*% change, 2015 - 2021*
Construction Project Manager	1,162	1,230	1,137	996	931	888	870	*-25%*
Project Builder	4,541	4,504	3,771	3,219	3,018	2,940	2,851	*-37%*
Civil Engineering Professionals	2,450	2,581	2,507	2,345	2,279	2,237	2,235	*-9%*
Architectural, Building and Surveying Technicians	1,315	1,384	1,307	1,172	1,117	1,080	1,071	*-19%*
Carpenters and Joiners	3,255	3,321	2,932	2,582	2,433	2,360	2,301	*-29%*
Plumbers	1,708	1,835	1,705	1,494	1,395	1,332	1,308	*-23%*
Electricians	2,524	2,677	2,526	2,320	2,222	2,171	2,148	*-15%*
Electrical Distribution Trades Workers	369	407	399	334	307	283	283	*-23%*
Other Miscellaneous Labourers	8,099	8,427	8,266	7,941	7,831	7,774	7,796	*-4%*
Building and Plumbing Labourers	2,478	2,598	2,413	2,170	2,065	2,005	1,979	*-20%*
Total (all occupations)	**79,655**	**82,978**	**79,738**	**75,265**	**73,542**	**72,693**	**72,565**	***-9%***

6 Appendix 1 – Auckland and Canterbury projections

Projections for change in construction occupations have previously been prepared for Auckland and Canterbury. The Canterbury projections were produced due to the rebuild following the 2010 and 2011 earthquakes, and the 2014 Auckland projections were initiated by the Construction and Infrastructure Sponsor Group in order to raise the visibility of current and future skill needs.

The NCOM is an enhancement of the Auckland and Canterbury projections in that it presents national and regional forecasts. As noted, the NCOM presents forecasts for construction-related *occupations* across all industries, and is not limited to only those occupations in the construction *industry*.

6.1. Auckland Construction Industry Occupations Model

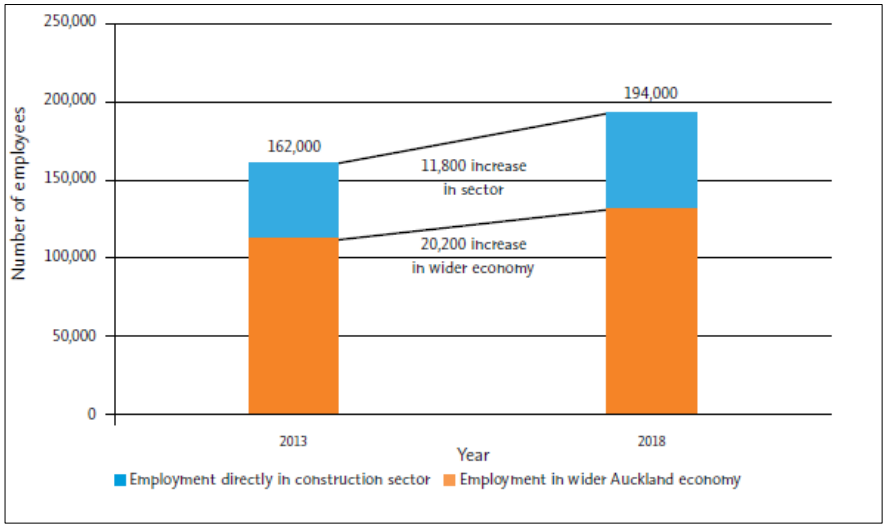
In June 2014 the Construction and Infrastructure Sponsor Group, consisting of key large construction firms and agency partners, released the *Workforce Skills Roadmap for Auckland Construction Sector (2013 – 2018)*. The report was a preliminary high level "roadmap" of anticipated workforce growth in the Auckland construction sector over the period to 2023. It focused primarily on industry sector skills growth in the period to 2018.

The projections for occupations growth in this document were based on the 1st National Construction Pipeline report released in 2013. A key finding was that employment in construction and infrastructure occupations in Auckland will be strong over the next several years, as the known and planned projects build to peak levels in 2018/2019.

The workforce skills roadmap noted that 162,000 construction and infrastructure occupations are located in a range of sectors across the Auckland economy, with 49,000 of those directly employed in the construction and infrastructure sector.

Based on expanding construction activity, the total employment in construction and infrastructure occupations in Auckland was anticipated to increase by 32,000. Around 11,800 of this employment growth will occur directly in the construction sector.

Figure 15: Auckland growth in construction and infrastructure occupations, 2013 - 2018



Source: Construction and Infrastructure Sponsor Group, June 2014

6.2. Canterbury construction workforce

Following the Christchurch earthquakes of 2010 and 2011, MBIE developed a construction investment and occupations model for the Greater Christchurch region. The projections from this model are regularly updated and released in the *Quarterly reports on Canterbury job matching*. The most recent report is for December 2015.

The figure below shows the number of construction-related workers required over the length of the rebuild. An estimated 31,000 construction workers were employed in Greater Christchurch as of December 2015, up from the 15,000 estimated pre-quake. This workforce is projected to continue at this peak level until mid-2017.

As the rebuild moves from residential to commercial, a different mix of occupations will be demanded, which should lead to significant movements within the labour market as specialised residential construction occupations are replaced by specialised commercial occupations.

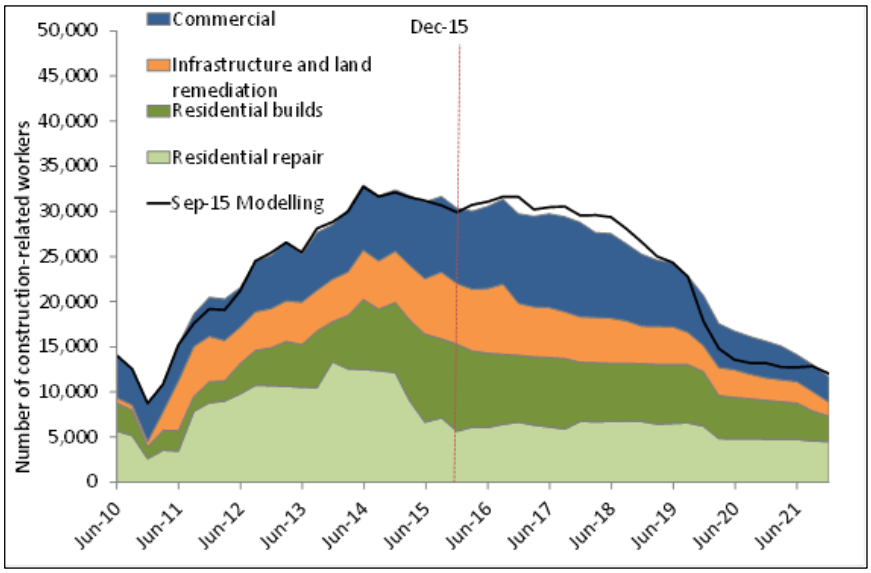
While the methodologies are similar for the NCOM projections for Canterbury, and the Greater Christchurch projections, there is a presentational difference in their results on the current numbers of construction occupations (i.e. 80,000 compared to 31,000).

This difference is because the NCOM estimates the total number of workers in construction-related occupations, while the Greater Christchurch projections reduce this number by estimating the workers in these occupations *who are employed on construction projects*.

For example, all plumbers are assumed to be working on construction projects, but only a portion of truck drivers. Over time, the Greater Christchurch projections will be adjusted so that they align with the approach in the NCOM.

Comparing the forecast shape of the two projections shows a comparable level of decrease in employment to the end of 2021 (i.e. by 10,400 for the NCOM projections, compared to 15,000 for the Greater Christchurch model).

Figure 16: Greater Christchurch construction-related employment projections



Source: MBIE, December 2015

7 Appendix 2 – Structure of the national construction occupations model

7.1. Design

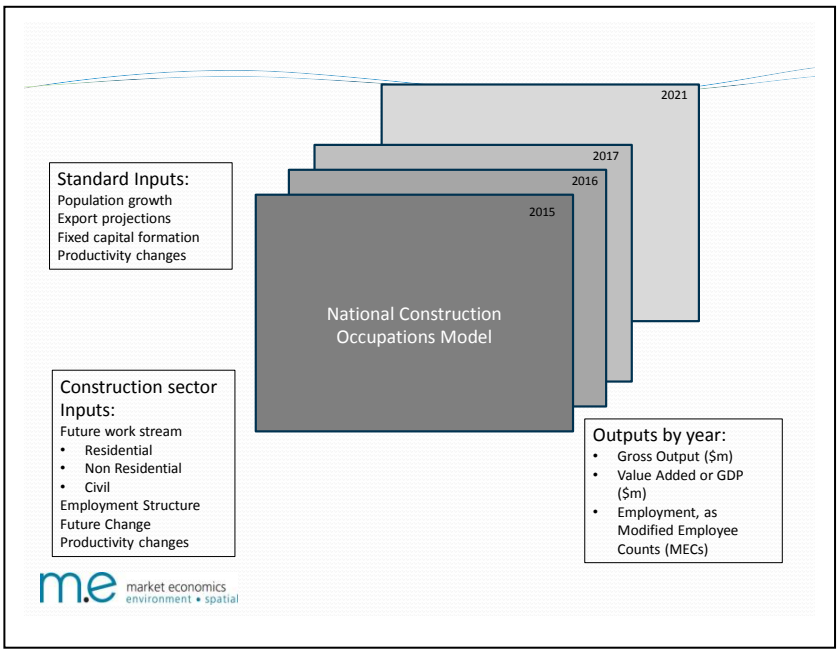
The NCOM combines demand vectors sourced from the Market Economics' *Economic Futures Model* and projected values from the *National Construction Pipeline Report 2016*. The demand vectors are multiplied using the Market Economics (M.E) inversed 2013 Input-Output (I-O) table, to produce projected gross output and growth vectors.

These growth vectors are available for each New Zealand region and by industry type, and reflect economic growth between 2013 and future years.

The growth vectors are then applied to the known Census 2013 employment figures (at a regional and industrial level, sourced from Statistics New Zealand Business Demography data) to estimate future employment levels.

In this calculation, multi factor productivity (MFP) growth as well as labour utilisation capacity adjustment is accounted for. It is important to include these factors in order to account for changes in the labour environment, as otherwise the future projected employment may be over or under estimated.

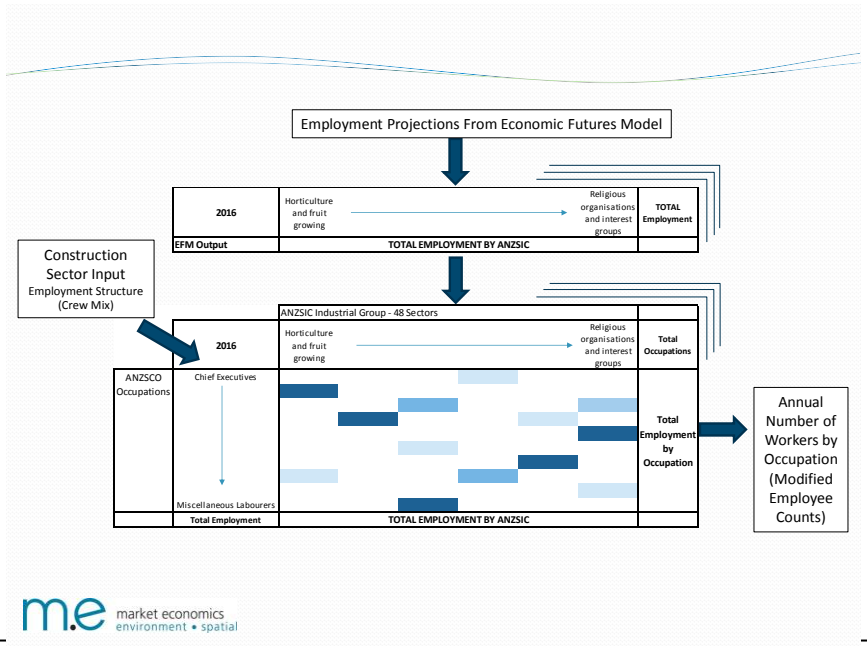
Figure 17: Design of the National Construction Occupations Model



Employment can be broken down into 1,022 different occupations that span the entire labour force. The break down (**or crew mix**) of which occupations make up a labour force varies in each region and industry.

Therefore, a specific ANZSIC by ANZSCO by Regional Council matrix is required to distribute the different employment projections (which are aggregated to 106 industries and five regions) into different occupations. Statistics New Zealand provides Census data on occupations by industry and by region, subject to confidentiality requirements.

Figure 18: Structure of the National Construction Occupations Model



7.2. Input-Output Modelling

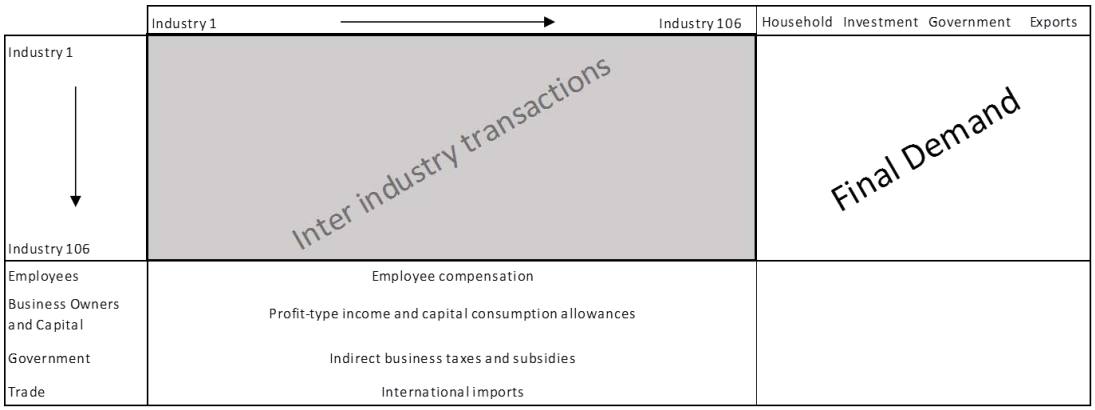
For this project M.E developed a 2013 based Input-Output (I-O) model, which essentially captures a quantified picture of interactions across the New Zealand economy at a point in time. To reflect the needs of this project, the 2013 I-O has been aggregated into five regions (Auckland, Bay of Plenty & Waikato, Wellington, Canterbury and Total New Zealand), and 106 economic sectors, resulting in 530 unique region-industry pairs. The data for the model was sourced from Statistics New Zealand, and was subjected to an optimisation process based on the 2007 model previously built by M.E.

Input-Output models replicate the transactions and purchase patterns within an economy, expressing these in tabular format. These tables form the core of any I-O modelling and they reflect the flows of money or goods among various sectors or industrial groups within an economy (or between economies).

These flows are recorded in a matrix or 'I-O table' using arrays summarising the purchases made by each industry (its inputs) and the sales of each industry (its outputs) from and to all other industries and sectors of final demand. The information contained within such a matrix enables calculations between industries for the whole economy.

These relationships describe the interactions between industries, specifically, the way in which each industry's production requirements depend on the supply of goods and services from other industries. With this information it is then possible to calculate, given a proposed change (such as a new development) to a selected industry, all of the necessary changes in production that are likely to occur throughout supporting industries within the wider economy.

Figure 19: Structure of an Input-Output (I-O) Model



The resulting 106 sector table reflects the economic structure and economic interrelationships between the 16 regional councils in New Zealand. The I-O table used in the NCOM has been regionalised, utilising the *Generating Regional Input-Output Tables* procedure, to reflect the regions of Auckland, Waikato & Bay of Plenty, Wellington, and Canterbury.

The I-O table models how the sectors within each region are interconnected with each other and with sectors in other parts of the country, so capturing interregional trade. In other words, these tables explain the supply chain interdependencies between sectors across the country.

Input-output analysis has strengths and weaknesses. Compared to some other economic models, I-O is relatively straightforward and easy to use. It is especially useful for identifying and understanding the nature of relationships within an economy, but it provides a snap-shot rather than a dynamic picture of the relationships among industries. These relationships are assumed to remain stable/static over time. This assumption implies that the sectors' input structures remain static through time, and that the type of technology used during production remains stable. A key issue is that I-O models do not include price changes as a result of increased demand.

In addition, technical relationships will change over time as a result of new technologies, relative price shifts and product substitutions, and the introduction of new industries. Therefore I-O modelling is not suited to long run analysis of change.

I-O modelling also assumes that there are sufficient resources of labour, land and capital to sustain projected growth or change, and that growth in one industry does not constrain growth in others (for example, through competition for labour or capital, affecting the supply and/or price of these). As a consequence of this limitation, the results of the NCOM present employment requirements of levels of construction activity, as opposed to supply-constrained estimates.

7.3. Modified Employee Counts

In the NCOM the measure used for employment is Modified Employee Counts (MECs), as opposed to Employee Counts (ECs) or Full Time Equivalents (FTEs).

The MEC is an indicator which captures both employees and working proprietors that are not captured as employees. M.E calculates MECs based on Statistics New Zealand estimates of employee counts (ECs) and working proprietors (WPs).

The Employee Count (EC) is a head count of all salary and wage earners for the reference period. This is mostly employees but can include a small number of working proprietors (who pay themselves a salary or wage). The employee count is mainly sourced from the Inland Revenue Department's Employer Monthly Schedule, although there are some enterprises whose employee counts are collected by Statistics New Zealand surveys.

A working proprietor is either a sole proprietor or partner who is actively engaged in a business, or a shareholder in a limited liability company actively engaged in its management and classified by the respondent as a working proprietor consistently across survey periods. It is important to capture both employees and working proprietors at the sector level, as the proportion of working proprietors to employees differs across economic sectors.

7.4. National Construction Pipeline

The *National Construction Pipeline Report 2016* provides a forward view of national construction demand for the six years ending 31 December 2021. It was commissioned by the Ministry of Business, Innovation and Employment and jointly prepared by Pacifecon (NZ) Ltd and the Building Research Association of New Zealand (BRANZ). The previous reports were commissioned by the Building and Construction Productivity Partnership. The first report was released in November 2013, the second in October 2014 and the third in July 2015.

The Pipeline report is based on a compilation of construction projects known to Pacifecon and BRANZ's economic forecasts of building and construction. It includes graphs and commentary on forecast and actual building and construction work. The year beginning January 2014 is used as the base year for any comparison with the forecasts.

The forecasts in the Pipeline report show the nature and timing of future building and construction work, by type and region, through to December 2021. These forecasts are complemented by information on known non-residential building and construction intentions from January 2016 to December 2021, and actual building and construction data.

The values sourced from the Pipeline report are gross fixed capital formation. Gross fixed capital formation (GFCF) is a measure of the net new investment by producers on durable real assets, such as buildings, motor vehicles, plant and machinery, roading, and improvements to land. In measuring the outlays, sales of similar goods are deducted. Land is excluded from gross fixed capital formation. Routine maintenance is not included in GFCF. However, alterations and additions that significantly extend the life or capacity of an asset are included (i.e. all work done with an addition and alteration building consent, is included).

7.5. Economic Futures Model

Apart from the National Construction Pipeline projections to end 2021, the economic projections used in the NCOM have been sourced from Market Economics' Economic Futures Model (EFM).

Developed by Market Economics, the EFM is a multi-regional scenario model which traces the economic implications of growth by economic sector and households over a 20 – 30 year timeframe. The model adopts a 'systems' perspective, acknowledging that many of the issues we face today are highly interconnected and complex. It uses an integrated approach to assess the possible implications of plausible scenarios, given a range of assumptions.

The EFM is based on a multi-regional economic input-output table, capturing the impacts of growth on a study area, as well as on the wider regional and national economies. The impacts resulting from each growth scenario are compared with the 'baseline' Business-As-Usual (BAU) scenario, which is established by estimating sectoral domestic and export final demand, and by developing projections of population and export growth.

The EFM analyses the economic impacts for 106 industries within the study area, focusing on key (strong) industries. Results from the econometric projections (and qualitative information if collected), are combined to project the full BAU evaluation of economic growth. The model projects domestic and export market growth, and the impacts of changes to the study area's population and business requirements.

7.6. Productivity Growth

The labour utilisation capacity adjustment, is a factor that has been included from the Christchurch model to account for the earthquake(s) affecting the regional industries. It can be used to estimate results when labour is over or under utilised by industry.

Due to the short term nature of the model outlook, multi-factor productivity growth (MFPG) does not have a large impact on the results. Within the model there are specific industry MFP values as well as a general number. The MFP growth value used for construction is small, which is consistent with Statistics New Zealand data on trend productivity growth in the industry.

The data provided through the National Construction Pipeline, takes the form of GFCF values for Residential and Non-Residential Construction. However in forming the view of the future (using I-O modelling), GFCF is not the only input – local and central and government, households and firms all demand services from the various construction industries above and beyond the new buildings included in GFCF. This is captured in the inter-industry transaction tables as purchases from the various construction subsectors.

8 Glossary and links

Building Research Association of New Zealand (BRANZ): *A independent research, testing and consulting organisation.* www.branz.co.nz

Market Economics Ltd (M.E): *A economic consultancy firm, based in Auckland*. www.me.co.nz

Ministry of Business, Innovation and Employment (MBIE): *The New Zealand Government department responsible for regulatory oversight of the construction industry*. www.mbie.govt.nz

Modified Employee Counts (MECs): *A measure which includes both employees and working proprietors.*

National Construction Pipeline (NCP): *The National Construction Pipeline Report 2016 provides a view of national construction demand for the six years ending 31 December 2021.*

Pacifecon (NZ) Ltd: *A business intelligence company, which provides future residential and non-residential project information to its client base*. www.pacifecon.co.nz

Key research web-links

National Construction Occupations Projections

http://constructionprojections.mbie.govt.nz

National Construction Pipeline Report 2015

http://www.branz.co.nz/cms_display.php?sn=273&st=1

National Construction Pipeline Report 2016

http://www.mbie.govt.nz

Workforce Skills Roadmap for Auckland Construction Sector

http://www.unitec.ac.nz/workforce/wp-content/uploads/2014/07/CI-Workforce-Roadmap-Summary.pdf

MBIE Quarterly reports on Canterbury job matching

http://www.mbie.govt.nz/info-services/employment-skills/labour-market-reports/canterbury-labour-market/?searchterm=quarterly%20reports%20on%20canterbury%20job%20matching

MBIE Occupation Outlook 2016

http://www.mbie.govt.nz/info-services/employment-skills/labour-market-reports/occupation-outlook

MBI3591_2364 - JUNE 2016