Population projections 2018-2051

for Matamata-Piako District Council

April 2020

Infometrics

Economics put simply

Authorship

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Table of contents

Executive summary

Infometrics was commissioned to provide comprehensive employment, population, household, dwelling and rating unit projections for Matamata-Piako District, covering the period 2019 to 2051. This includes both the district overall, and areas within the district. The population projections are driven by the demographic processes of ageing, births, deaths and net migration. Our projections of net migration are based on the district's projected employment, meaning that the population projection is economically driven.

Employment in Matamata-Piako district has grown steadily over the past decade, and this historic rate of growth is forecast to continue until 2031. From the 2030s, environmental regulation is expected to adversely affect agricultural employment, which will weigh on overall employment growth for the district. Labour constraints arising due to slowing growth in the labour force as the district's population ages will also limit employment growth.

Population growth in the district has been steady over the past 15 years. Under the medium scenario it is expected to continue growing to peak at 39,500 in 2039, before gently easing to 38,700 in 2051 as the ageing population weighs on population growth. Under the medium scenario, the population aged 0-14 and 15-64 is expected to ease slightly while the population aged 65 years and over will grow strongly.

Under a low population growth scenario, the population grows in the near term, but eases to 34,300 by 2051, while under the high scenario the population grows steadily to reach 43,600 by 2051.

The average household size in Matamata-Piako is expected to decrease, driven by an ageing population, growing life expectancy, and societal trends. This means that the number of households is projected to grow steadily from 14,300 in 2019 to 16,400 in 2051. As a consequence, the number of rating units is projected to grow from 15,119 in 2019 to 16,700 in 2051 under the medium scenario.

Infometrics recommends that Matamata-Piako District Council adopts the medium projection scenario.

Introduction

Infometrics was commissioned by Matamata-Piako District Council (MPDC) to produce projections covering the period 2018 to 2051. The purpose of the projections is to review and update the councils' growth projections, taking into account elements such as historic and current trends, relevant land-use policies, and relevant national, regional and local level drivers.

Population projections form the cornerstone of this report, driven by employment projections. Households, dwelling and rating unit projections were also produced based on the projected population.

Detailed outputs are provided for the district overall and subdistrict areas defined by StatsNZ, including Statistical Area 2 (SA2), urban, and rural settlement areas. A map of these areas is included in Appendix – District Map. Detailed outputs are provided in a spreadsheet and interactive online tool which accompanies this report and provides a greater level of detail and flexibility of analysis. This report describes the methodology employed in the projections, detailed findings at a district-wide level, and high-level findings at a sub-district level.

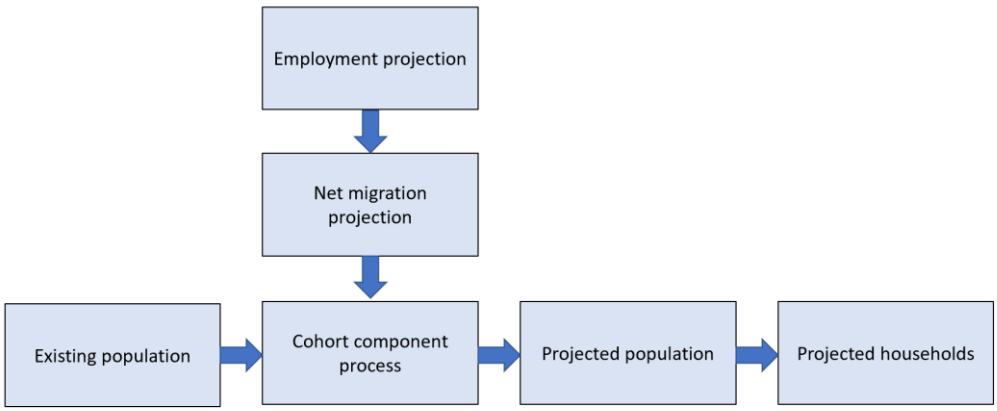
These projections were developed over the period November 2019 to February 2020, using the best information available at the time. These projections do not account for the effect of COVID-19, however in forming a recommendation of which scenario to adopt, the effect of COVID-19 has been considered.

Our approach

This section describes our projection approach in broad terms, intended for technical and non-technical audiences. A detailed methodology is also provided in the appendix for technical audiences.

We apply a unique approach to projecting population, by first projecting employment, which in turn informs volumes of net migration. In this sense our population projections are informed by the economic prospects of the area. From here, we follow a conventional cohort component approach to project population and households, before translating changes in households into dwelling demand. This process is summarised in the diagram in Chart 1. The distribution of the projected population across Statistical Areas 2 and settlements within the district is based on projected dwelling capacity, which is in turn based on where residential development is expected to take place in the district. This was informed by district plan zones and discussions with council planning staff.

Chart 1



Employment

Employment, the number of filled jobs in the district, is forecast using a combination of two approaches for the short-term and long-term. Unlike population, only a single projection scenario for employment has been produced.

The short-term forecast covers the period from 2020 to 2025. Export focused industries are projected with a national model, which reflects the broad economic conditions. Service and construction industries are projected based on recent local economic and population trends.

The long-term forecast covers the period from 2025 to 2051, and is based on modelling of the interactions between industries and our view of broad economic conditions using a general equilibrium model. This includes expectations of macro-economic factors such as interest rates as well as environmental factors such as carbon prices.

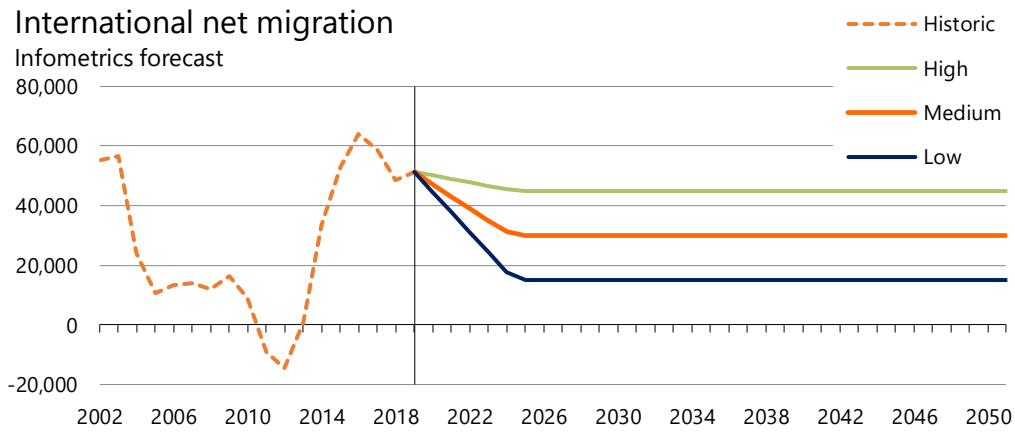
Migration

Migration is the permanent movement of people, including those moving between districts in New Zealand or to and from other countries. Net migration is how much an area gains from migration – for example if 150 people come to Matamata-Piako and 100 people leave, then net migration is 50.

In developing a projection for Matamata-Piako, we project the population for New Zealand overall, including international net migration – net migration from overseas into New Zealand. This is an important first step as it determines the size of the net migration 'pie' to be shared across New Zealand. When we project Matamata-Piako's population, we consider what share of the net migration 'pie' it is likely to get in the future. We do this by considering historic trends, especially people moving to Matamata-Piako for lifestyle reasons, and the future outlook, especially people moving to Matamata-Piako for a job.

We forecast long term international net migration to New Zealand by considering a wide range of factors affecting the New Zealand and global economy. While net migration to New Zealand has reached over 60,000 people per year in recent years, this is unlikely to be achieved for a sustained period in the future. However, with steady employment growth projected and an ageing population, we expect sustained positive net migration well into the future, aided by favourable work visa conditions. Between 2018 and 2024, we adopt The Treasury's forecast, which shows a transition from 50,000 in 2018 to 35,000 in 2024. Beyond this, we project a level of 30,000 to be maintained out to 2051. Our low and high scenarios represent net migration levels 50% lower and higher than the medium scenario respectively – this is based on the range that Stats NZ provide for their projections. This is plotted below in Chart 2.

Chart 2



Shares of the national net migration 'pie' are apportioned out to territorial authorities using a mix of two approaches. Firstly, historic migration trends are used to forecast the volume of non-employment driven migration, such as people moving towns for retirement. Secondly, forecast labour market shortfalls are used to forecast the volume of employment driven migration, such as people moving towns for a new job. Labour market shortfalls are assessed with consideration of the projected age structure of the local population; labour force participation and unemployment rates; and regional

labour supply. For both employment and non-employment driven migration, Stats NZ's projected age and sex profile of migrants to the district is assumed.

Existing population

The starting point for our population projection is the StatsNZ Estimated Resident Population (ERP) for 2018, which is based on the 2013 Census. This is the most current suitable population data, as the ERP from the 2018 Census has been delayed due to data quality issues. We project the existing population using a conventional cohort component method. Under this approach, the starting population is grouped into cohorts consisting of five-year age groups by males and females. We draw upon Stats NZ's analysis of historic and expected trends in births and deaths in each age group and sex to inform how each cohort changes throughout the course of the projection.

Births and deaths are driven by a combination of factors – the age structure of the population, and age-specific birth and death rates. Projected age-specific birth and death rates are sourced from Stats NZ. In the case of births, Stats NZ project an easing in birth rates for women under the age of 35, and a slight increase in rates for women aged 35 years and older. Stats NZ project a steadily easing death rate across all age group, as life expectancy increases due to advances in medical care.

Households

Households are defined as one or more people living and sharing facilities in a private dwelling. To determine the number of households, we break the population into cohorts by age and sex (e.g. 70-74 year old females) and then apply rates to determine what type of household they reside in. Stats NZ has analysed trends around population and households to determine what proportion of each age and sex group lives in what household type, and how this is expected to change in the future. For example, in 2013, 52% of 70-74 year old females were living in a couple household and 30% were living alone. Stats NZ projects that by 2038, 58% of people in that age-sex group will be living as a couple and 25% living alone. This is because people are expected to live longer (increased life expectancy), meaning that they are less likely to become widowers (living alone) in the 70-74 year old age group.

Once the population has been apportioned into a household type, the number of people living in each household type is divided by the average size of each household type to estimate the number of households. For example, the average size of a couple household is two people, so if there are 100 people in couple households, then there will be 50 couple households. This is done separately for each household type, then combined to produce the total number of households.

Dwellings

Dwellings are counted as occupied or unoccupied. It is assumed that there is one occupied dwelling for every household in the district. Thus, occupied dwellings are projected from household projections. Occupied dwellings include houses, apartments and retirement village units, but exclude institutional living arrangements such as rest homes or boarding houses. In comparing to Census data, it should be noted that our measure of occupied dwellings includes Matamata-Piako residents who were away from home on Census night.

Unoccupied dwellings are predominantly holiday houses, but can also include houses that are empty and waiting for renovations or new occupants to move in. Unoccupied dwellings are counted in the Census, and this data is used to project them forward. Due to inconsistencies in Census data, we were unable to assess trends in unoccupied dwellings and have assumed that the number of unoccupied dwellings counted in the 2013 Census will remain constant into the future.

Rating units

Each unique property – residential or non-residential – in the district is counted as a separate rating unit. Rating units are an important indicator for MPDC as they effectively indicate the number of properties which the council can rate to fund their activities. Rating units are counted across five categories:

- Residential
- Residential lifestyle
- Rural industry
- Industrial and commercial
- Other

Two approaches are taken to projecting rating units. Dwelling projections are used to project residential and residential lifestyle rating units, as these types of rating units generally have a dwelling. An adjustment is made to account for some rating units having multiple dwellings, for example properties with a main house and a granny flat. A further adjustment was made to spread future dwelling growth into the residential and residential lifestyle categories, based on the ratio between each category in each SA2 area.

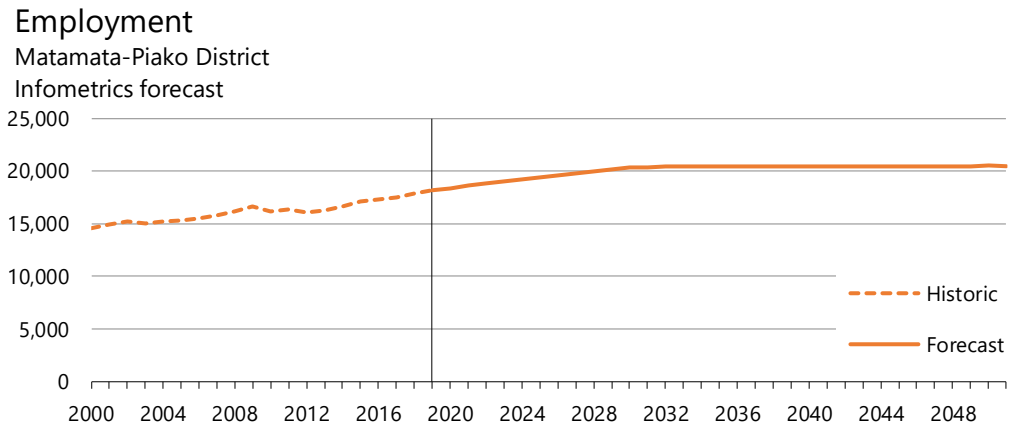
For non-residential rating units (rural industry; industrial and commercial; and other), because no historical data was available to assess trends in non-residential rating units, it is assumed that the number remains steady into the future.

Findings

Employment

Employment, the number of people employed in jobs, has grown steadily over the past decade in Matamata-Piako, and this historic rate of growth is forecast to continue until 2031. In the 2030s, the effect of more stringent environmental regulation is expected to be felt, in particular, higher carbon prices and greater regulation around freshwater quality. This will lead to a steady easing in agricultural employment, which will weigh on overall employment growth for the district. Labour constraints arising due to slowing growth in the labour force as the district's population ages will also limit employment growth.

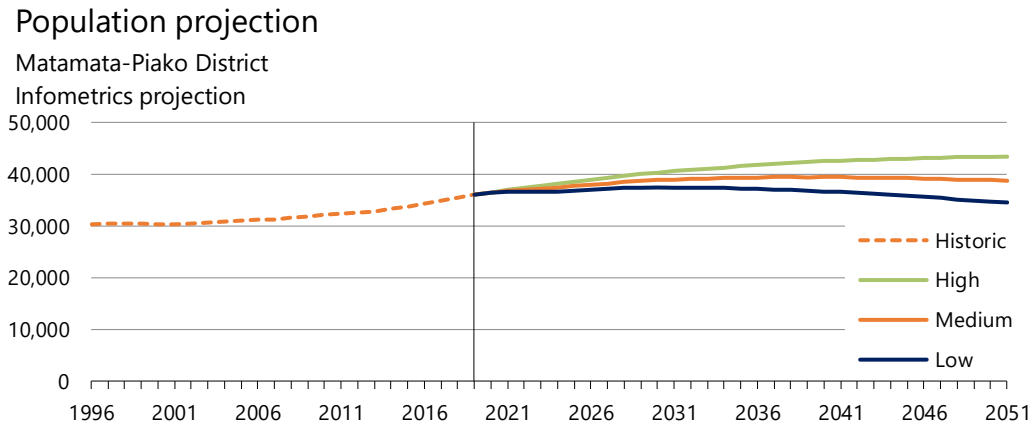
Chart 3



Population

Matamata-Piako District's population has grown steadily over the past 15 years, from 30,900 in 2004 to 36,000 in 2019. Under the medium scenario, the district is projected to gradually grow to peak at 39,500 by 2039, beyond when the population will stabilise for the remainder of the projection period, easing slightly to 38,700 in 2051. Higher levels of net migration under the high scenario lead to steady growth throughout the projection period, with the district reaching a population of 43,600 by 2051. Under the low scenario, the population does grow in the near term, reaching 37,400 by 2029, before gently easing to 34,300 by 2051.

Chart 4

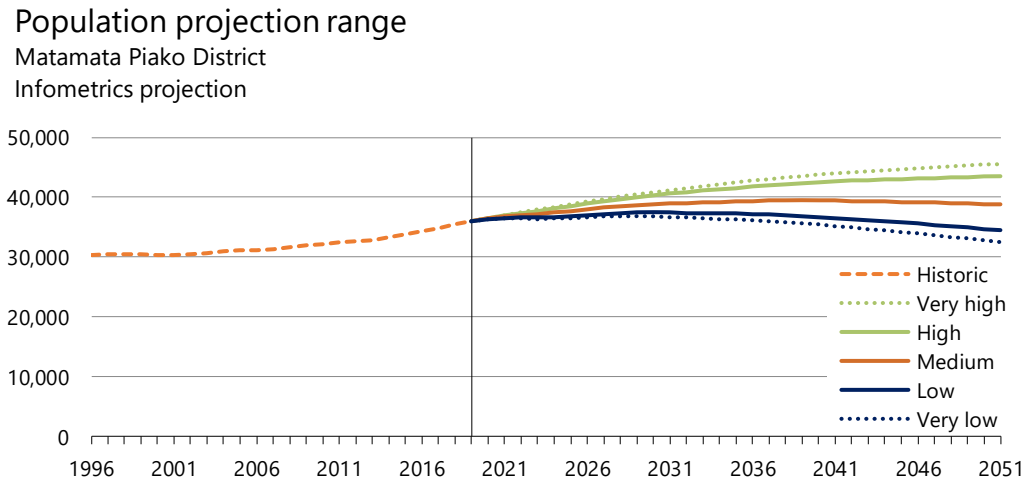


Sensitivity

The high and low scenarios presented prior represent a likely range of outcomes based on net migration, which is the most volatile component of population change. In order to convey the sensitivity of the projection to its input assumptions, a further set of scenarios has been produced by combining the highest and lowest possible combinations of population change components. As these scenarios are possible but not probable, they should not be used alone for planning purposes, but are useful to provide context for the likely scenarios.

The very low scenario is based on low net migration, low fertility rates, and high death rates. Under such a scenario, Matamata-Piako's population is projected to decline steadily to reach 32,500 by 2051. The very high scenario is based on high net migration, high birth rates, and low death rates, a strong scenario which leads to a population of 45,600 in 2051.

Chart 5



Sub-district population

Population growth is widely spread across the district in the near term, however as population growth at a district level starts to taper off later in the projection period, some parts of the district decline slightly. Overall, population growth is centred around Matamata and Morrinsville, with lesser growth in Te Aroha. Areas that neighbour Matamata and Morrinsville are projected to grow as the urban area expands, such as Hinuera and Tahuroa.

Table 1

Sub-district population

Infometrics medium projection

Statistial Area 2 (SA2)	2019	2051	Change
Hinuera	1,223	1,828	605
Mangaiti	1,386	1,250	-137
Matamata North	3,334	3,504	171
Matamata South	4,895	5,849	955
Morrinsville East	5,024	5,965	941
Morrinsville West	3,089	3,455	366
Okauia	1,085	1,088	3
Richmond Downs-Wardville	1,306	1,069	-236
Tahuna-Mangateparu	1,648	1,591	-57
Tahuroa	1,885	2,350	465
Tatuanui	1,423	1,190	-233
Te Aroha East	2,655	2,912	257
Te Aroha West	2,113	2,488	375
Te Poi	869	612	-258
Waharoa-Peria	1,593	1,495	-98
Waihou-Manawaru	1,252	1,133	-119
Waitoa-Ngarua	1,219	981	-238
Total	**36,000**	**38,761**	**2,761**

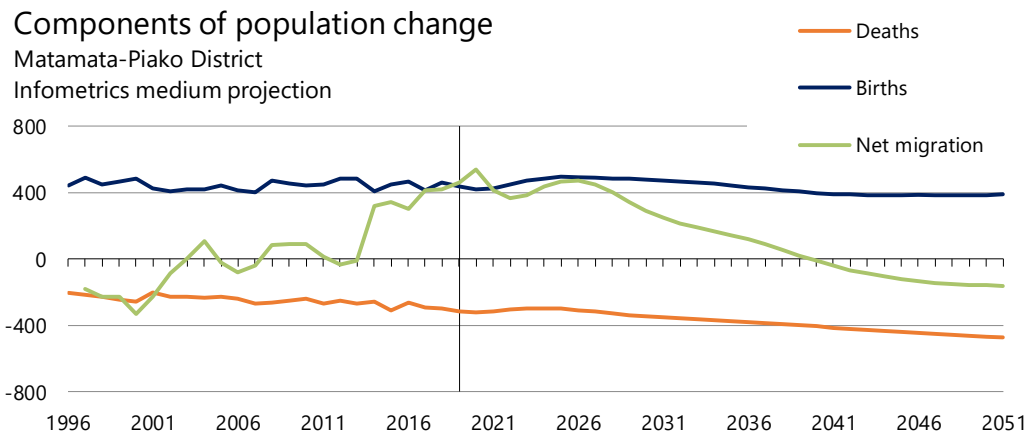
Settlement	2019	2051	Change
Waharoa	1,853	1,587	-266
Waihou	707	810	103
Waitoa	823	1,016	194

Components of population change

Population change consists of three major components – births, deaths and net migration. The difference between births and deaths is often referred to as natural increase – that is, the ability for a population to grow 'naturally', or internally. In Matamata-Piako District, births have exceeded deaths for some time – in 2019 for example, there were 441 births, compared to 312 deaths, meaning the natural increase was 129. Under the medium scenario, a convergence is projected in 2040, after which deaths will exceed births. At this point, positive net migration is required to merely sustain the population at a static level.

Net migration has been strongly positive recently, aided by very strong net migration into New Zealand. As net migration eases at a national level in the coming years, it is also projected to ease into Matamata-Piako. Strong employment growth in the mid to late 2020s is expected to sustain positive net migration to the district. However, with a weaker employment outlook in the 2030s and beyond, net migration will eventually ease and turn slightly negative. The main feature of the high and low projections is higher and lower net migration respectively, however this does have a compounding effect in the long term, as migrants tend to be younger than the population at large, contributing to higher numbers of births.

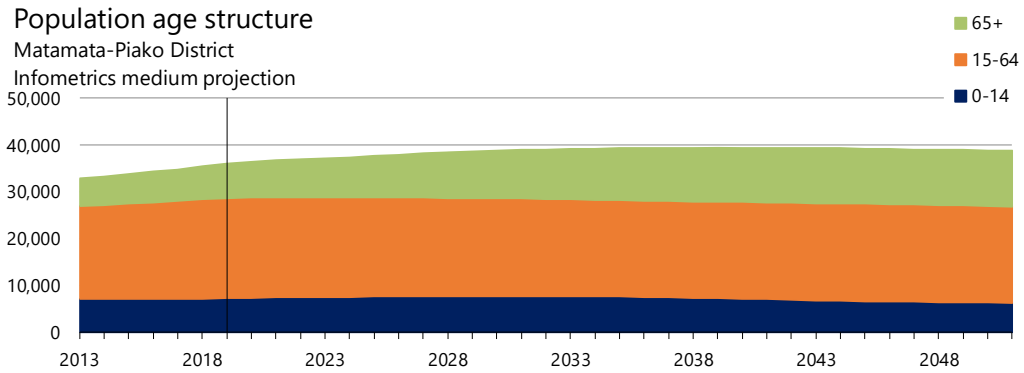
Chart 6



Age Structure

Along with the rest of New Zealand, Matamata-Piako's population is projected to age over the next 30 years. The number of youth (aged under 15) is projected to hold steady at around 7,500 until the late 2030s, and thereafter gradually decline as a result of easing net migration, births and population of childbearing age (a subset of the working age population). The working age population aged 15-64 is projected to ease steadily from 21,400 in 2019 to 20,600 in 2033. Beyond 2033, the working age population sits around 20,700. This is driven by the relatively numerous 'baby boomer' cohort moving into the 65 years and older age group. The population aged 65 years and older is projected to grow strongly, from 7,300 in 2019 to 11,800 in 2051, outnumbering youth throughout the projected period.

Chart 7



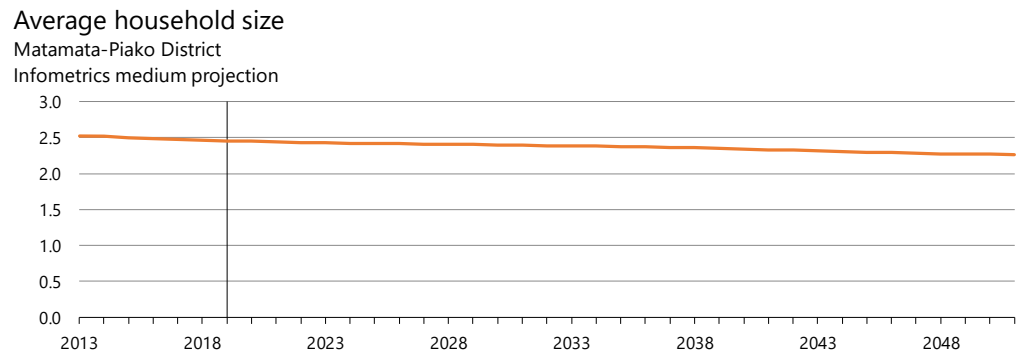
Households

A combination of factors are projected to drive down the average size of households in Matamata-Piako. This is driven by the changing age structure of the district's population, growing life expectancy, and societal trends.

- An ageing population leads to growth in households of couples without children or persons living alone (such as widows).
- Growing life expectancy means that people are likely to spend longer in these household types too.
- Societal trends include couples having fewer children (smaller families), greater numbers of childless couples, and delayed childbearing.

Combined, these trends all push down the average household size, from an estimated 2.5 persons per household in 2019 to 2.3 in 2051.

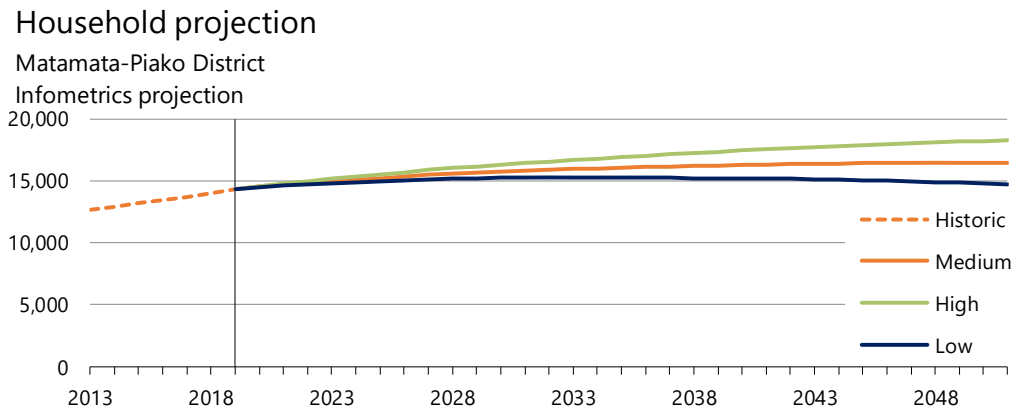
Chart 8



A decreasing average household size means that more houses are needed to house the same population, and thus the number of households grows faster than the population. Under the low scenario, despite a slight population decline to 2051, more houses will be needed than there are in the district today. Under the medium scenario, the number of households grows steadily from 14,300 in 2019 to 16,400 in 2051. The number of

households reaches 18,300 in the high scenario by 2051, and 14,700 under the low scenario.

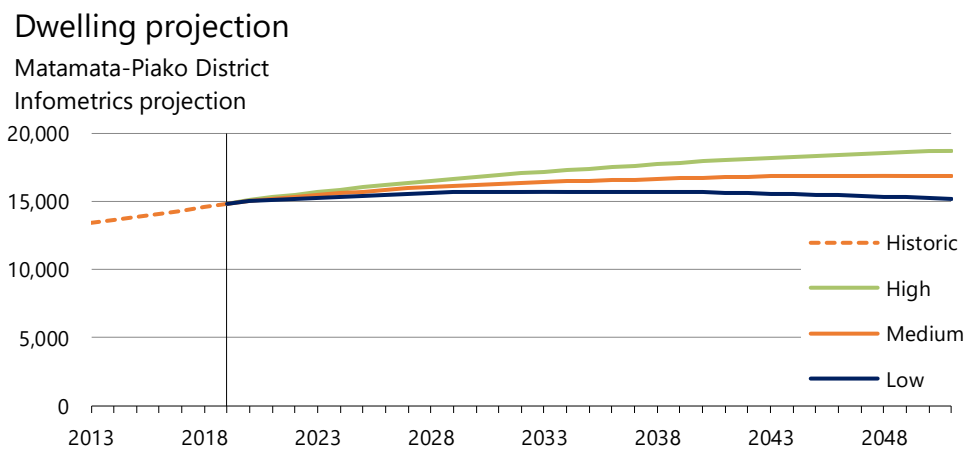
Chart 9



Dwellings

Dwellings are a measure of all houses in the district, whether they be occupied by households, unoccupied, or under construction. As there are relatively few unoccupied dwellings in Matamata-Piako, the number of dwellings is only slightly higher than the number of households – 14,900 in 2019. The number of unoccupied dwellings is assumed to remain constant over time at around 453, so this relationship holds throughout the projected period, with 16,900 dwellings in 2051 under the medium scenario. While the number of unoccupied dwellings can ease slightly due to housing pressures, they do tend to grow as the overall number of dwellings grows. Some level of unoccupied dwellings will always persist due to the lag time between people moving in or out of houses, or waiting for renovations. New dwellings under construction are expected to reach zero by 2051 as household growth tapers off. Residential construction activity will continue for renovations, maintenance and replacement of older housing stock.

Chart 10



Most SA2 areas within the district are expected to experience growth in dwellings between 2019 and 2051. This is because the easing household size leads to an increase in dwellings, even in areas with static populations. As with population, dwelling growth is concentrated in and around the three main centres.

As a consequence of projected population change, the number of occupied dwellings is projected to decline in some areas, with more areas declining under the low scenario. When the number of occupied dwellings decreases due to a decreasing number of households demanding dwellings, these dwellings are no longer counted. It isn't clear exactly what will happen these dwellings in practical terms. They may be left unoccupied for a period, before being repurposed or abandoned.

Table 2

Sub-district dwellings

Infometrics medium projection

Statistial Area 2 (SA2)	2019	2051	Change
Hinuera	515	816	301
Mangaiti	562	582	20
Matamata North	1,462	1,508	46
Matamata South	2,110	2,459	348
Morrinsville East	2,101	2,466	364
Morrinsville West	1,219	1,464	245
Okauia	436	513	77
Richmond Downs-Wardville	517	503	-14
Tahuna-Mangateparu	651	715	64
Tahuroa	751	1,023	271
Tatuanui	538	528	-10
Te Aroha East	1,158	1,280	121
Te Aroha West	923	1,088	165
Te Poi	334	316	-18
Waharoa-Peria	604	650	46
Waihou-Manawaru	508	522	14
Waitoa-Ngarua	477	466	-11
Total	**14,866**	**16,897**	**2,031**

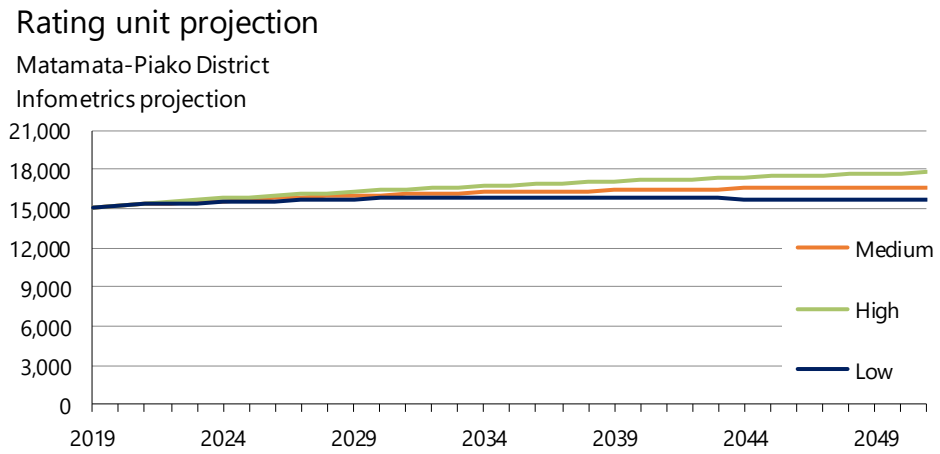
Settlement	2019	2051	Change
Waharoa	233	229	-4
Waihou	97	124	26
Waitoa	109	160	51

Rating units

Rating units in the district are projected to grow as population growth drives dwelling growth. Due to a lack of time series data, we have assumed that non-residential rating units will remain at current levels into the future. Rating units are projected to grow from

15,119 in 2019 to 16,700 under the medium scenario, 17,800 under the high scenario, and 15,600 under the low scenario.

Chart 11



Under the medium scenario, residential rating units are projected to grow by 1,254, and residential lifestyle by 297.

Table 3

Matamata-Piako District rating units

Infometrics medium projection

	2019	2051
Residential	8,993	10,247
Residential lifestyle	2,004	2,301
Rural industry	1,890	1,890
Industrial and commercial	972	972
Other	1,260	1,260
Total rating units	**15,119**	**16,670**

Scenario recommendation

MPDC have requested a recommendation as to which projection scenario should be adopted for their planning.

As a result of COVID-19, international net migration is likely to be negligible for 2020 and 2021, and employment in Matamata-Piako District will decline slightly. Overall, net migration into Matamata-Piako is likely to be lower than projected until 2025.

Given the soft outlook for net migration, the high projection scenario is not recommended as it is unlikely to be achieved in the near term. Furthermore, even when projected growth rates resume after 2025, they will be starting from a lower point, meaning that long term levels set out in the high projection are unlikely to be achieved either.

Near term growth rates are likely to be commensurate with the low projection. However, with lower growth in the low scenario, this may encourage decisions that preclude future growth. Therefore, it is recommended that the medium scenario be adopted by MPDC. The medium scenario provides an appropriate balance given the uncertainty in the near term due to COVID-19.

Appendix – Detailed Methodology

This section describes our methodology in a greater level of detail and is intended for technical audiences.

Employment

Short term forecasts (2020-2025)

In the first step of the process we develop forecasts of employment at the national level by 54 industries. Using econometric techniques, we develop approximately 50 separate statistical models for forecasting employment in each industry. The models draw on historic trends, patterns and relationships and extend these into the future.

Using machine learning we rank the models according to their track record of forecasting future employment in the industry. We can measure each model's forecasting ability by using historical data. For example, using data from 2000 to 2016 we can forecast employment to 2019 with each model and then compare the forecasts against actual numbers from 2017 to 2019. The model with the best track record is used to produce the final forecast for each industry to 2025. The industry forecasts are adjusted to ensure they are consistent with Infometrics' view of total employment growth over the forecast period.

In the second step we develop forecasts by territorial authority and region which are consistent with our national forecasts. We use a similar technique as in the national forecasts developing 50 models for each combination of 485 ANZSIC industries and 66 territorial authorities. Slightly different techniques are used for the various industries in the regions which accounts for different industry drivers.

The future performance of *agriculture, forestry, fishing, mining and manufacturing* industries are influenced predominately by macro-economic conditions which are not specific to local conditions. For example, a boost in forestry from strong demand in China is likely to benefit forestry in all regions. Hence the models we develop for these industries are driven by nationwide industry trends and the extent to which these trends historically deviate from the national. Using machine learning we choose the model which is most effective at mimicking and predicting these components.

The regional forecasts for the *service industries* (including trade, accommodation, education, health and professional services) consider more local drivers including population growth, local macroeconomic conditions and visitor numbers.

The regional forecasts for the *construction* industries incorporate Infometrics' forecasts of construction work-put-in-place from Infometrics' Regional Construction Outlook. They also take population growth into consideration.

After we have generated forecasts for each industry/territorial authority combination we ensure they are mathematically consistent with our national level industry forecasts.

Long term forecasts (2025+)

The method used in the short-term forecasts draws heavily on a statistical approach to forecasting: they draw on historic trends, patterns and relationships and extend these

into the future. This statistical approach becomes less accurate with longer forecast horizons. Therefore, we modify the forecasts from 2025 onwards to ensure consistency with the outputs of Infometrics' general equilibrium model of the New Zealand economy (ESSAM).

ESSAM considers the main inter-dependencies of industries in the economy, such as flows of goods from one industry to another, plus the passing on of higher costs in one industry into prices and thence the costs of other industries. The model presents a picture or scenario of the economy for the target years (in our case 2030 and 2050) based on plausible assumptions of economic factors including international commodity prices, population growth, carbon price, automation, changes in energy efficiency, and substitution between four energy types (coal, oil, gas and electricity). ESSAM's estimate of employment by industry in 2030 and 2050 provides a benchmark for our long-term employment projections. Some of the key macro-economic assumptions used by the model are shown in the table below.

Table 4. ESSAM macro-economic assumptions and outputs

Indicator	2025-2030	2030-2050
Population	1.0%pa	1.0% pa
Labour force	0.7%pa	0.46%pa
GDP	2.9%pa	1.7%pa*
World trade	2.7%pa	2.5%pa
Oil price	US$110/bbl in 2030	US$110/bbl in 2050
Carbon price	NZ$100/tonne CO_2 in 2030	NZ$200/tonne CO_2 in 2050
Government consumption	2.1%pa	1.7% pa
Investment in dwellings	2.0%pa	1.0%pa
Public investment	3.0%pa	2.5%

* These are model results, not input assumptions.

Migration

Considering a wide range of factors affecting the New Zealand and global economy, we project long term international net migration to New Zealand. While net migration to New Zealand has reached over 60,000 people per year in recent years, this is unlikely to be achieved for a sustained period in the future. However, with steady employment growth projected and an ageing population, we expect sustained positive net migration well into the future, aided by favourable work visa conditions. Between 2018 and 2024, we adopt The Treasury's forecast, which shows a transition from 50,000 in 2018 to 35,000 in 2024. Beyond this, we project a level of 30,000 to be maintained out to 2051. Our low and high scenarios represent net migration levels 50% lower and higher than the medium scenario respectively – this is based on the range that Stats NZ provide for their projections.

Migration is apportioned out to territorial authorities using a mix of two approaches. Firstly, historic migration trends are used to forecast the volume of non-employment driven migration, such as people moving towns for retirement. Secondly, forecast labour

market shortfalls are used to forecast the volume of employment driven migration, such as people moving towns for a new job. Employment driven migration is adjusted slightly to account for commuting patterns between districts. For both employment and non-employment driven migration, Stats NZ's projected age and sex profile of migrants to the district is assumed.

Labour market shortfalls

Labour market shortfalls exist when employers' need for labour exceeds the number of workers available at current wage rates. When labour market shortfalls exist in an area extra labour, and hence population, is attracted to the area.

We estimate future labour market shortfalls by separately considering the projected supply of labour and demand for labour (as measured by employment) and comparing them.

As our starting point for estimating the supply of labour we use Stats NZ's published population projections by 5-year age group and gender.

Labourforce participation rates (LFPR) by age and gender are projected based on Stats NZ national labour force projections. Then, historic LFPR for each regional council are analysed to identify their deviation from the national average. This deviation is applied to the national LFPR by age to project regional LFPR by age. Historic averages for the unemployment rate in each region are analysed and projected forwards. Our projected LFPR by age is applied to the Stats NZ population projection, and our projected unemployment rate is applied to this to estimate labour supply.

This is done for each TA, enabling the balance between labour supply and demand (measured by employment) in each labour market region to be assessed. In periods when there is insufficient supply in a TA and across it's broader regional labour market to meet projected labour demand, the area is apportioned additional migration. The additional migration is apportioned to TA based on their share of the national labour market shortfall, but as this is constrained by our international net migration forecast, they may not necessarily receive enough migration to entirely fulfil their labour market shortfall. Our projected LFPR and unemployment rates are applied to the additional migration, reflecting that it is rarely possible to import only workers – workers tend to come with family members who may not be economically active such as stay at home parents and children, and some of those migrants may not gain employment immediately (spend a period of time unemployed).

Population

Population base

The appropriate population to use for council long term planning (LTP) purposes is estimated resident population (ERP). This represents all of the people who permanently reside in an area, and could be considered a 'maximum' as a proportion of them is likely to be away at any given point in time.

The base, or starting point, used in these projections is the 2018 Estimated Resident Population (ERP). This is produced by Stats NZ with the most recent available Census (2013), and births, deaths and migration that has been recorded since. An ERP based on

the 2018 Census is expected to be released at the end of March 2020, too late for inclusion in this projection.

As most population projection parameters from StatsNZ are published for five-year intervals, our projection model also operates at five-year intervals, from 2018 to 2053. We then use a cubic-spine process to interpolate population to single years, and also incorporate the Stats NZ 2019 ERP in this process to produce a realistic projection while incorporating the most recent data available.

Fertility

Stats NZ publishes regional age specific fertility rates, for five-year age groups. This includes an open bounded 45+ age group, however we have chosen to only apply this to the 45-49 year age group. This ensures that a growing population beyond the age of fertility does not artificially inflate the projection of births. The impact is expected to be negligible, as between 2012 and 2014, there were an average of eight births per year to women aged 49 and over, nationally. Similarly we have ignored births under the age of 15 due to lack of reliable fertility rates, and again this is not significant as nationwide there were only 21 births to woman under the age of 15 annually on average between 2012 and 2014.

We have used the Stats NZ assumed sex ratio, of 105.5 males per 100 females born, throughout the projection period, which is based on the historic average ratio at the national level. This phenomenon is common around the world, and is understood to be a function of slightly higher miscarriage rates amongst females, not selective abortion.

Mortality

Projected age and sex specific mortality rates by TA from StatsNZ are applied to the population by age and sex to accurately project the number of deaths.

Distribution within district

Population is distributed across the district by considering historic settlement patterns and expectations of future residential development. Projections are produced for Statistical Area 2 areas (SA2) and selected settlements, made up of Statistical Area 1 areas. Both SA2 and SA1 areas vary widely in geographic size, but are defined by Stats NZ to have similar populations – SA2 tend to have populations of 1,000 to 3,000, and SA1 between 100 and 200. In the Infometrics projection model, population, households and dwellings at a SA2 level are projected using a full cohort component approach. For settlements made up of SA1 areas, these are modelled based on their historic and projected share of population, dwellings and households in their SA2 area.

The distribution is refined through an iterative process.

1) Each SA2's share of historic net migration to the district was used to apportion the district's projected net migration to each SA2. A full cohort-component approach was applied at an SA2 scale to produce initial SA2 population and occupied dwelling projections.

2) Unoccupied dwellings were projected based on historic trends evident in the 2006, 2013 and 2018 Census. Few clear trends could be identified due to variable data quality between Census, so for most SA2, a steady number of

unoccupied dwellings is assumed into the future. This is added to the number of occupied dwellings to project the total demand for dwellings.

3) Projected dwelling demand was presented to council planning staff, and their feedback on where development was permitted and/or likely was used to refine the distribution of net migration such that projected dwellings could be accommodated by expected residential development in each SA2.

4) Historic trends, district plan zones, and discussions with council planning staff were used to project each settlement's share of population, dwellings and households in their SA2 area.

5) Draft settlement projections were provided to council staff, and feedback taken incorporated to refine each settlement's share of its SA2 area.

Households

Living arrangement types

The number of households at an SA2 and district level are projected by applying Living Arrangement Type Rates (LATR) to the projected population. Stats NZ projects LATR to 2038 off a 2013 Census base across two scenarios – A and B. The A scenario assumes that LATR remain constant into the future at 2013 rates, while the B scenario projects a linear change to 2038 based on observed historic trends and future expectations. These trends include delayed childbearing (discussed under fertility), decreased rates of single parenting, and life expectancy improvements enabling older persons to live independently for longer[1]. While we use the A scenario for sensitivity testing, we follow Stats NZ's recommendation to use the B scenario as it is considered more realistic. This means that LATR transition out to 2038, and we hold them constant at 2038 rates out to 2053.

Applying LATR to the population provides an estimate of the number of people in each living arrangement type; we then translate this into the number of households based on expected family structures – for example, couple households consist of two people. For other multi-person households, we follow Stats NZ assumptions, and assume 2.6 persons per household. We then divide the number of people by the number of households to project average household size.

Due to rounding, our projected household size varies slightly from 2018 Census measures. This can arise for several reasons:

1) Census counts are randomly rounded to the nearest multiple of 3, or supressed entirely, to ensure confidentiality of Census respondents. However, Census outputs such as average household size are produced based on actual data – meaning that it is impossible for third parties to precisely replicate these outputs.
2) LATR projections are national, representing an average across NZ, so local patterns will differ – this can, for example, be driven by differences in ethnic

[1] Full discussion available here http://archive.stats.govt.nz/browse_for_stats/population/estimates_and_projections/NationalFamilyAndHouseholdProjections_HOTP2013base/Data%20Quality.aspx#Livingarrangementtyperates

makeup, with some non-European ethnic groups exhibiting a greater propensity to form multi-generational households, leading to larger households.

3) Household sizes can change in response to non-demographic factors such as housing costs.

Dwellings

We assume that each household demands one private dwelling, a reasonable assumption used by other demographers[2]. In comparing to Census data, it should be noted that our measure of occupied dwellings includes residents who were away from home on Census night. We have assumed that unoccupied dwellings will remain constant into the future, as variability in data between the 2006, 2013 and 2018 Censuses prevented trend analysis.

Rating units

Rating units were projected across five categories. While residential and residential other could be related to dwelling projections, the ability to project non-residential rating units was far more limited as no time series data was available, preventing any analysis of trends. The number of dwellings tended to exceed the number of rating units, so an adjustment was applied based on the ratio between the two numbers in each SA2 area in 2019. Dwellings were apportioned as either residential or residential lifestyle rating units, based on the 2019 ratio for each SA2 area.

[2] Jackson et al (2014)

Appendix – District Map