



TN 11 - WTSM 2013 Demographic Report

Final version

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1. Introduction

1.1 Context

Greater Wellington Regional Council (GWRC) re-validated the Wellington Transport Strategy Model (WTSM) from a 2011 to 2013 base year.

The subsequent stage of this project is the development of forecast versions of WTSM to reflect 2023, 2033 and 2043 scenarios.

Forecast versions of WTSM use input assumptions relating to variables such as fuel price, PT fares, parking costs and infrastructure investment, together with population, employment, household and school roll projections.

WTSM is subsequently run with these assumptions to create future year scenarios, from which outputs such as highway and public transport demand, travel times and congestion can be produced.

The forecast economic variables used in both the base and future year versions of WTSM are documented in “TN5 – WTSM Economic Parameters”, with the infrastructure assumptions for each forecast scenario documented in “TN12 – WTSM Model Testing Report”.

This report documents the development of the population, employment, household and school roll projections that are inputs to the WTSM 2023, 2033 and 2043 scenarios.

1.2 Purpose

The purpose of this report is to:

- outline recent trends and likely future trends in relation to population, households and employment
- outline the process of developing initial population, employment, household and school roll projections
- document the discussions that took place between GWRC and the various project stakeholders regarding these initial projections
- outline changes made to the projections as a result of these discussions
- present the final projections that will be used as inputs to forecast versions of WTSM

The projections outlined in this report are made at one point in time, drawing upon information and assumptions from a number of sources.

It is likely that the assumptions and information used for these projections will change through time, when new updated information becomes available.

The report documents not only the projections themselves but the process that has been followed, so that the process is transparent and repeatable should the projections require updating in the future.

1.3 Structure of report

The report is structured as follows:

- Chapter 2 outlines background information and recent trends that will be used as a basis for the development of the demographic projections
- Chapter 3 provides a detailed summary of the methodology and assumptions used for developing the initial projections
- Chapter 4 outlines the initial projections
- Chapter 5 summarises the TA discussions regarding the initial projections and outlines changes made to the projections as a result of these discussions
- Chapter 6 outlines the revised projections
- Chapter 7 summarises the primary, secondary and tertiary roll projections
- Chapter 8 presents several GIS maps showing the spatial distribution of forecast population and employment growth
- Chapter 9 provides a comparison of the previous WTSM 2011 and new WTSM 2013 projections
- Chapter 10 summarises both the purpose and content of the projections

2. Background information

2.1 Overview

This sections outlines:

- recent trends relating to population, household and employment growth within the region
- the process for developing new projections for WTSM 2013

2.2 Recent trends

Table 1 below shows the growth in population, households, household size, labour force, employed persons and labour force participation rate within the Wellington region between 2001 and 2013.

Table 1 Population, dwellings, labour force, employed persons – Wellington region, 2001 to 2013

	2001	2001 - 2006	2006	2001 to 2013	2013	2006 - 2013
Population	423,700	6%	448,900	11%	471,300	5%
Dwellings	172,500	6%	183,600	12%	193,900	6%
Household size	2.46		2.44		2.43	
Labour force	224,800	10%	246,800	13%	253,900	3%
Employed persons	208,900	12%	233,600	13%	235,600	1%
Labour force participation rate	68.1		70.3		71.1	

Source: Statistics NZ

It shows that over the period between 2001 and 2013, the employment / labour force growth rate has been slightly higher than the accompanying population growth rate.

This can be explained with reference to the labour force participation rate (population aged over 16 divided by persons seeking or in employment) which rose from 68.1 in 2001 to a historic high of 71.1 in 2013.

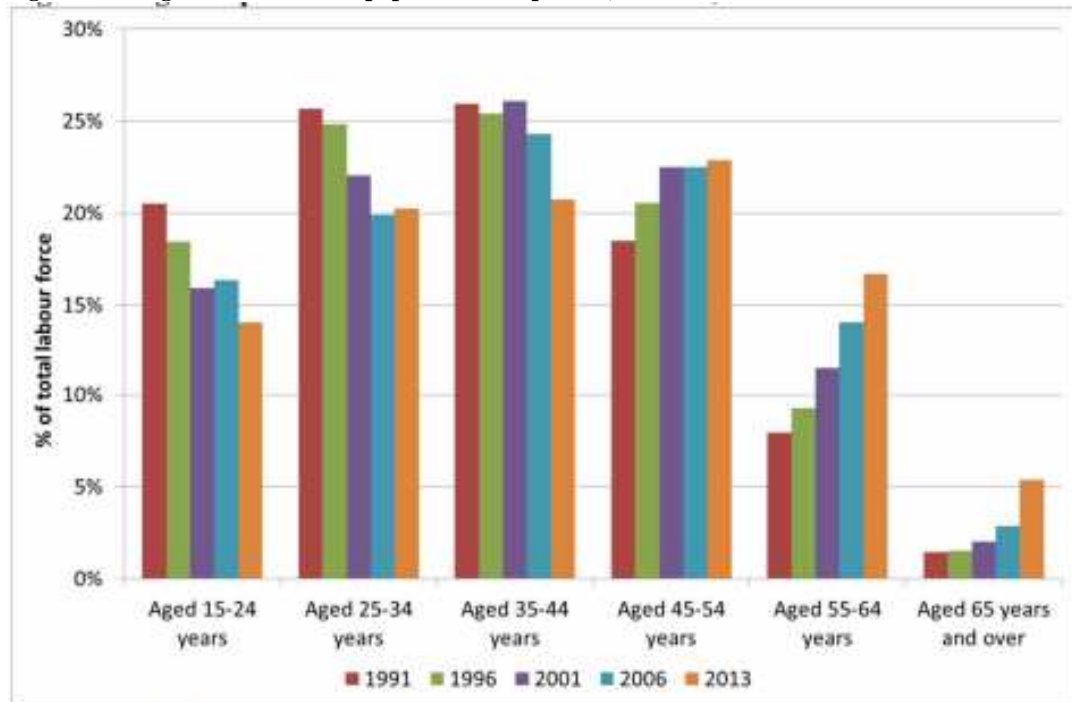
Lower growth in employment (in relation to population) between 2006 and 2013 is largely a result of the GFC (2008 onset) which resulted in an increase in unemployment and fewer available jobs yet no corresponding reduction in the rate of population growth.

Whilst historic trends such as those outlined above should not be used in isolation to understand drivers of growth and predict future trends, they are a useful indicator of what future trends might be.

2.3 Ageing population

There has been a significant increase over the last 5 to 10 years in the percentage of persons aged over 65 being actively involved in the workforce, as evidenced through a comparison of labour force data between 1991 and 2011 presented in **Figure 1** for the whole of New Zealand.

Figure 1 Change in New Zealand population composition, 1991 to 2013



Source: Statistics NZ

The demographic of the population mean that this trend is likely to continue into the future, albeit with the rate of increase slowing.

The net result is likely to be a future where ‘older adults’ comprise an increasing percentage of the total population and of those older adults, an increasing percentage of them are likely to remain working past 65 years of age.¹

2.4 Population

Regional population growth is likely to be influenced by the three major factors, listed below:

- fertility rates which will drive changes in birth rates
- changes to life expectancy which will affect death rates
- the net effect of migration (inward and outward) associated with the region.

Whilst demographers can forecast the impacts of changes to fertility rates, birth rates, death rates and an ageing population with some certainty, there is much less certainty surrounding migration as it is affected by a multitude of economic and societal factors.

Table 2 below shows the Statistics NZ estimates for regional population (2006 based estimates) between 2011 and 2046, by 5 year increment, including the main drivers of this increase.

¹ http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/changing-face-of-nzs-population.aspx

Table 2 Statistics NZ summary of population projections, 2006 base to 2046, Wellington region

Year	Population	Components of increase (five years to 30th June)				Population age distribution		
		Births	Deaths	Migration	Total	0-14	15-64	65+
2011	487,900	34,160	14,780	2,200	21,580	19.5	68.0	12.5
2016	501,600	33,010	15,670	-3,650	13,690	18.8	66.8	14.4
2021	515,700	33,230	16,450	-2,650	14,130	18.4	65.5	16.2
2026	528,700	33,110	17,410	-2,650	13,050	17.7	64.1	18.3
2031	539,700	32,320	18,740	-2,650	10,930	17.2	62.5	20.3
2036	548,000	31,440	20,460	-2,650	8,330	16.7	61.5	21.8
2041	554,600	31,160	22,260	-2,300	6,600	16.1	61.4	22.5
2046	559,900	31,090	23,850	-1,950	5,290	15.8	61.7	22.5

The trends outlined in **Table 2** can be split into two distinct periods – present day to 2031 and post 2031.

Looking at the present day to 2031, the projections suggest:

- birth rates will remain largely unchanged, with declining fertility rates balanced by an increasing population of child bearing age
- a slight increase in death rates, due mainly to baby boomers moving through the population being balanced by increased life expectancy
- a small net outflow of migrants
- an increase in the % of the population over 65 from 12.5% to around 20% in 2031
- a decline in population growth rates through time

Looking at the period 2031 to 2046, the projections suggest:

- a slow decline in the number of births
- an increase in deaths, a result of an increasingly older demographic
- a small reduction in the net outflow of migrants
- a slowdown in the rate of increase in the percentage of the population aged over 65
- a sharp slowdown in the rate of population increase

Given the acknowledged uncertainties relating to future trends in fertility, mortality, migration and their determinants, the projections should be used to convey the broad features of likely future dynamics and patterns rather than absolute numbers.

Statistics NZ summarise the trends likely to be seen in the coming decades as follows:

- continuing low fertility

- slower population growth
- further longevity gains
- an ageing population
- an older labour force

2.5 Households

Table 3 below shows how average household size across the region has changed between 2001 and 2013.

Table 3 Change in average household size, Wellington region, 2001 to 2013

TA	Average household size		
	2001	2006	2013
Kapiti Coast District	2.46	2.42	2.40
Porirua City	3.21	3.15	3.06
Upper Hutt City	2.78	2.72	2.67
Lower Hutt City	2.78	2.76	2.73
Wellington City	2.65	2.65	2.69
Masterton District	2.63	2.55	2.46
Carterton District	2.62	2.58	2.50
South Wairarapa District	2.55	2.45	2.42
Region	2.72	2.69	2.68

It shows that average household size has decreased between 2001 and 2013 at a regional level, though the rate of decrease slowed between 2001/2006 and 2006/2013.

At a TA level, Porirua, Upper Hutt and Lower Hutt have the highest average household size, as these TAs have a higher proportion of families (2 adults + children) than other TAs in the region.

The average household size within Wellington City actually increased slightly between 2001 and 2013, a result of greenfield development (attracting families) and multiple occupancy student dwellings in the Wellington CBD.

Kapiti and the Wairarapa have lower average household size, due to these areas being popular with retirees and older couples whose children may have left home.

It is likely that average household size will continue to decrease in the future, as a result of the following:

- an increasing proportion of younger adults living on their own
- an increasingly ageing population, with a corresponding increase in the number of one or two person households

- lower fertility rates
- couples waiting longer to start a family

At a regional level, Statistics NZ 2011 based household projections suggest that one-person households could account for around 30% percent of all households in 2031, up from 26% in 2011, with this growth mainly driven by an ageing population and increasing longevity.

The overall net effect is likely to be a slow but continual decrease in average household size, meaning that the percentage growth in the number of households is likely to be higher than the percentage growth in the population as a whole.

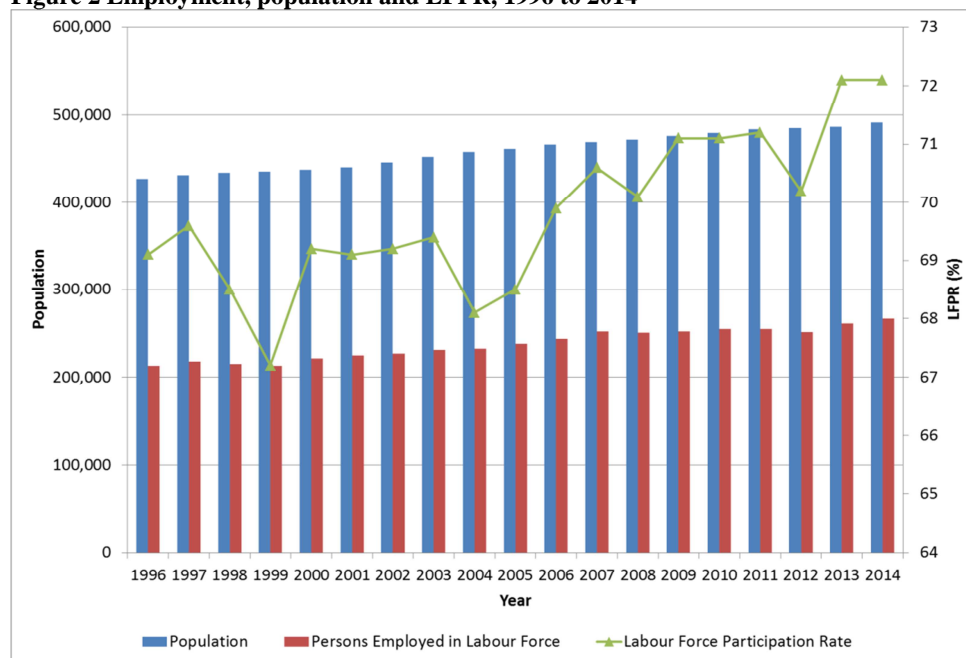
2.6 Employment

Table 2 showed that over the period between 2001 and 2013, the growth in the labour force was slightly higher than the accompanying growth in population.

This has largely been driven by migration, an improving education base, favourable economic conditions, people working later in life and lower fertility rates. These positive factors have balanced the ageing population and the increase in persons who are retired and economically inactive.

Figure 2 below presents historical data from Statistics NZ that shows the labour force (persons over 15 years of age and in work), the population and the labour force participation rate (LFPR)².

Figure 2 Employment, population and LFPR, 1996 to 2014



² LFPR - Persons employed divided by persons of working age (15 years and above)

The LFPR has increased steadily over the medium-term, the result of favourable economic conditions and an increasing labour force participation rate amongst persons over 55 years of age.

Looking towards the future, changes to the LFPR will be driven by a number of factors, including migration, birth rates, an ageing population and the extent to which labour force participation continues to increase in persons aged over 55.

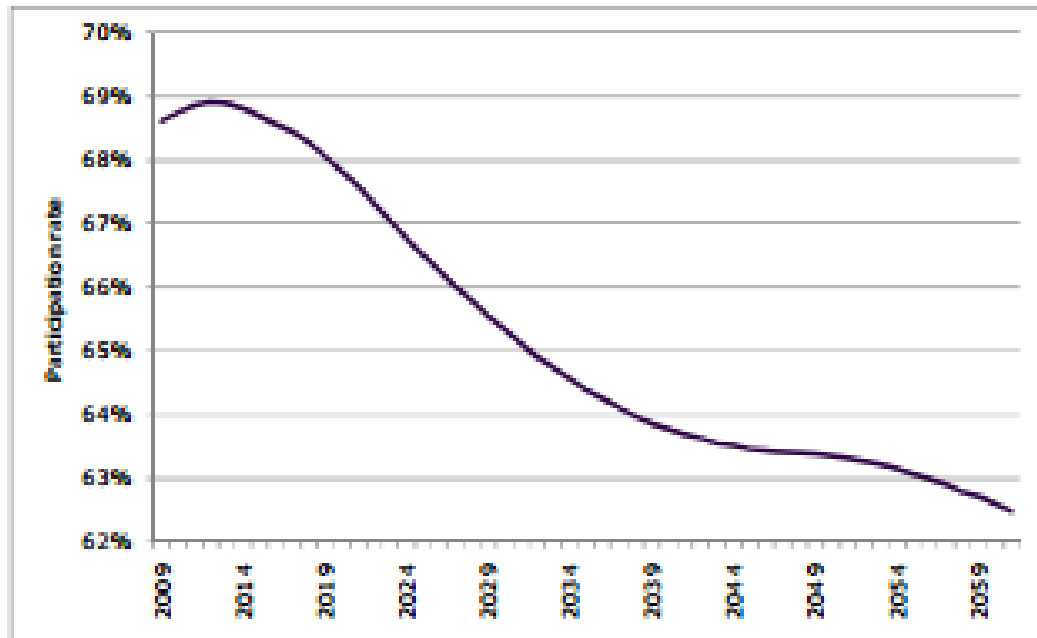
A research article published by Victoria University covers the topic of how the LFPR may change through time³.

It suggests that in the short term, a continuing (but slowing) increase in projected labour force participation rates amongst persons aged over 65 years and an increase in the labour force driven by migration might to a certain extent counter-act an ageing population, resulting in only small declines in the LFPR.

There will come a stage within the next 10 to 20 years, however, where increases in participation and hours worked for those aged 65+ years will not counter-balance the impact of an ageing population, leading to a more rapid decrease in the LFPR.

Figure 3 shows this future scenario, giving an indication of the potential rate of decline in the LFPR through time.

Figure 3 Projected total participation rates, 2009 to 2061 (Victoria University research, derived from Statistics NZ)



³ <http://ojs.victoria.ac.nz/LEW/article/viewFile/1719/1562>

This information was used when developing the WTSM population and employment estimates documented in this report.

2.7 Land use

Residential development can take various forms depending on the availability of land. These include new housing estates on greenfield sites, subdivision of existing residential areas (infill development), conversion of industrial land to residential land, conversion of commercial buildings to residential dwellings in the CBD, and medium to high density housing with the building of flats and apartments.

From previous experience, however, residential development (and consequently population growth) is likely to be focussed on key areas rather than being spread evenly across the region / TAs.

For example, the latest 2013 Census showed that, compared with 2006, around 1/3rd of Wellington City's population growth occurred in the CBD, with another 1/3rd occurring in northern development areas around Johnsonville.

Similarly with employment, most recent growth has been focussed on existing areas with high concentrations of employment, as opposed to new employment areas.

In order to account for the spatial and temporal distribution of growth within each TA, information from local development plans together with discussions between GWRC and the various territorial authority officers was input into the development of population, household and employment projections.

2.8 2013 base year

The 2013 WTSM base year population, household and employment data was derived from the 2013 Census.

GWRC submitted a data request to Statistics NZ, specifying the data definitions for input into WTSM, and Statistics NZ developed a bespoke query to extract this data.

The data produced by Statistics NZ relates to 'Usual resident population' (URP) and households – the population / households recorded on Census night.

After the Census, Statistics NZ adjust the URP figures to produce 'Estimated residential population' (ERP) and estimated household figures that account for under-representation on Census night due to factors such as people being away from their usual place of residence.

ERP is used as the basis for all population and households projections developed by Statistics NZ.

Historically, WTSM has used URP as the basis for both the base and demographic inputs to WTSM. Demographic projections used by the various TAs for their own forecasting work are usually based on ERP.

These differences in methodology have resulted in the following:

- a complex process in WTSM for converting ERP population / household projections into URP projections
- the need to explain to stakeholders the reasons (largely historic) behind WTSM using a different population and household forecasting base to the TAs

Having sought the direction of the Regional Transport Advisory Group (TAG), the decision was taken to re-base WTSM 2013 to use ERP rather than URP, in order to simplify the forecasting process and make the population / household input assumptions consistent with assumptions used by TAs for other forecasting work.

Statistics NZ meshblock level URP and ERP population data was used to develop a process to convert population and household estimates from a URP to ERP base.

This method was chosen as it is similar to the method that was used by .ID when undertaking similar adjustments to obtain ERP based household estimates. This process is discussed in more detail in section 3.2.

Table 4 below shows the TA level adjustment factors that were used to convert base year URP population / household figures to ERP figures

Table 4 Statistics NZ URP to ERP population and household adjustment factors

Area	2013 Population		Population growth (%)
	URP	ERP	Adjustment factor
Wellington City	191,000	200,400	4.9%
Lower Hutt	98,200	101,200	3.1%
Upper Hutt	40,200	41,400	3.0%
Porirua	51,700	53,700	3.9%
Kapiti	49,100	50,700	3.3%
South Wairarapa	9,500	9,800	3.2%
Carterton	8,200	8,500	3.7%
Masterton	23,400	24,100	3.0%
Total	471,300	489,700	3.9%

Development of the 2013 base year land use (i.e. population, household, employment and education) is detailed in ‘TN7 – Production of 2013 WTSM Land Use Data’, from the 2013 update of the model⁴.

Primary, secondary and tertiary roll numbers were sourced from the Ministry of Education, with addresses provided for schools and mesh blocks for tertiary institutions, enabling the establishment to be allocated to the relevant WTSM zones.

⁴ This TN does not summarise the URP to ERP conversion process as this super ceded the development of TN7 – the URP to ERP work is summarised in a validation report addendum

2.9 Forecasting process in WTSM

WTSM uses the spatial distribution of population, employment and (to a lesser extent) school roll to generate, distribute and assign trips to the public transport and highway networks.

The magnitude and spatial distribution of growth in the region's population and employment will change travel patterns. It is important that population and employment forecasts are realistic so that they can provide a basis for the development of robust model forecasts, upon which decisions regarding future investment in the region's transport infrastructure might be made.

The WTSM forecast years of 2023, 2033 and 2043 represent short, medium and long term future scenarios. However, the further any projections are made into the future, the greater the uncertainty attached to the projections and any associated outcomes.

In this regard, models are most valuable as a tool with which the relative impact of certain policy or infrastructure interventions can be understood.

Models require skilled interpretation and should not be used in isolation to provide a definitive answer or outcome. Rather, they should be used to provide a range of information that can be fed into a wider assessment framework.

2.10 Consistency between inputs

WTSM requires consistency at a high level between population, household, employment and educational roll inputs as these variables are, to a certain extent, dependent on each other. As an example:

- growth in children (5 to 11), children (11 to 16) and young adults (17 to 24) respectively will essentially provide child population inputs to fill primary, secondary and tertiary spaces
- growth in the number of persons who are employed (full or part time) will provide people to fill any employment growth

In common with most strategic models, WTSM models both an 'average two-hour time period' and an 'average future', including the implicit assumption that whilst growth might not be linear between forecast years, over the medium to long-term, economic growth and corresponding indicators such as GDP and unemployment will adhere to long term trends.

WTSM requires a broad balance between persons employed and jobs available. A future scenario where the growth rates for these two variables were significantly different would create inconsistencies in the model and potentially result in unrealistic forecasts.

3. Development of initial projections

This section outlines the methodology behind the population, household and employment projections.

In particular, it focuses on the data sources and rationale behind some of the assumptions that underpin the projections.

3.1 Recent growth rates

Historic data shows that actual population and employment growth in the Wellington Region between 1996 and 2013 generally tracked historic 'medium' forecasts.

There is no current evidence to suggest that future growth drivers and characteristics for the Wellington region are likely to be any different from those seen between 1996 and 2013.

Therefore given this information it was decided that the forecasts would assume Statistics NZ 'medium' growth as the core scenario. This is consistent with the 2001, 2006 and 2011 versions of WTSM.

3.2 Population

Initial population projections were developed from historic trends and Statistics NZ / .ID (Wellington City only) projections relating to changes in birth rates, death rates, migration and the composition of the labour force.

As mentioned previously in this report, the Australian demographer, .ID, has developed population and household growth projections for Wellington City (but not for the other TAs).

These projections, whilst based upon Statistics NZ data, have a greater level of granularity than Statistics NZ projections and draw upon discussions with local planning officers.

A decision was made to use .ID as the basis for Wellington City population and household projections and Statistics NZ as a basis for projections for the remaining TAs. Data relating to the age composition of both the population and workforce is derived from Statistics NZ data for the whole region.

3.2.1 Age composition

The WTSM population inputs are divided into 5 age categories:

- Infants – under 5
- Children 5-16
- Young adult – 17 to 25
- Adult – 26 to 64
- Older Adult – 65+

An estimate of the percentage of the future population attributable to each of these age categories was produced for all TAs. **Table 5** summarises changes in the projected age composition of the population at an aggregate regional level.

Table 5 Projected age composition of Wellington region population, 2013 to 2043

Year	Infants	Children	Young Adults	Adults	Older Adults
2013	6.9%	15.5%	13.6%	51.3%	12.7%
2023	6.1%	14.9%	12.4%	50.3%	16.3%
2033	5.9%	14.1%	12.2%	48.0%	19.8%
2043	5.5%	13.4%	12.1%	47.1%	21.8%

Statistics NZ

The data shows that the percentage of the population categorised as infants / children is forecast to decline significantly between 2013 and 2043, whilst the proportion of the population categorised as young adults / adults is forecast to decline at a slower rate.

These declines are driven by lower fertility rates and an ageing population, the later demonstrated by a near doubling in the percentage of the population categorised as 'older adults' between 2013 and 2043.

Table 6 below shows the average age by TA and year. The data shows the following:

- across the region, the average age is projected to increase from 37.3 (2013) to 42.5 (2043)
- Kapiti and the Wairarapa TAs have the highest current age of all TAs within the region, with these TAs forecast to experience similar rates of increase in the average age between 2013 and 2043
- Porirua, Lower Hutt and Upper Hutt have relatively low current average ages (between 35 and 39.4), though in all three TAs the average age is forecast to increase significantly between 2013 and 2043
- Wellington City has the lowest current average age (34.0) and is forecast to experience only a moderate increase in average age between 2013 and 2043

Table 6 Average age of population by TA, 2013 to 2043

	Kapiti Coast District	Porirua City	Upper Hutt City	Lower Hutt City	Wellington City	Masterton District	Carterton District	South Wairarapa District	Region
2013	46.6	35.0	39.4	37.0	34.0	42.5	44.2	44.9	37.3
2023	50.1	37.9	41.8	38.9	34.1	44.7	48.0	48.2	38.9
2033	51.1	41.1	44.4	41.4	35.9	46.5	50.4	49.6	40.9
2043	52.1	43.8	47.0	43.9	37.1	49.2	51.2	50.9	42.5

The trends in **Table 6** can be explained as follows:

- a projected increase in students and young professionals in Wellington City (particularly the CBD) will to a certain extent off-set any increase in average age due to an ageing population
- Kapiti and the Wairarapa are popular retirement and down-sizing locations for older persons whose children may have left home, hence they both have a higher average age than the region as a whole
- Lower Hutt, Upper Hutt and Porirua are currently family focussed areas – whilst this is forecast to continue into the future, an ageing population combined with lower fertility rates is likely to result in the average age increasing significantly between 2013 and 2043.

3.2.2 Labour force status

WTSM categorises persons of working age according to their labour force status – full-time employed, part-time employed or other – and their age – young adult (16 to 25), adult (26 to 64) and older adult (65+).

‘Other’ relates to persons who are not economically active – students, parents taking care of children, unemployed persons, persons who choose not to work, retirees.

The resulting categories are as follows:

- Young adult part-time employed
- Young adult full-time employed
- Young adult other
- Adult part-time employed
- Adult full-time employed
- Adult other
- Older adult part-time employed
- Older adult full-time employed
- Older adult other

Projections relating to how the labour force status of the population might change through time for WTSM 2013 were developed from the projections used as inputs to WTSM 2011, with a reconciliation process undertaken with the employment projections to ensure that both sets of projections reflect:

- a likely future increase in older adults in employment (full-time or part-time)

- that the number of employed persons assumed in WTSM (full-time or part-time) should increase broadly at the same rate as the number of jobs, to avoid a mismatch between the supply (jobs) and the demand (employed persons)
- a declining labour force participation rate (LFPR), as per the Victoria University study

Table 7 below shows the percentage of the labour force by age category / status, together with the estimated labour force participation rate (LFPR).

Table 7 Percentage of population by age group and employment status, 2013 to 2043, Wellington Region

	Young Adult employed (FT or PT)	Young Adult - Other	Young Adult - All	Adult employed (FT or PT)	Adult - Other	Adult - All	Older Adult employed (FT or PT)	Older Adult - Other	Older Adult - All	LFPR
2013	9.9%	7.2%	17.1%	51.3%	16.0%	67.3%	3.0%	12.6%	15.6%	64.2%
2023	9.0%	6.5%	15.5%	49.7%	15.4%	65.1%	5.0%	14.4%	19.3%	63.7%
2033	8.8%	6.4%	15.3%	47.4%	14.3%	61.6%	6.9%	16.2%	23.1%	63.1%
2043	8.6%	6.4%	15.0%	45.7%	14.1%	59.8%	7.8%	17.3%	25.2%	62.2%

Whilst the calculations in WTSM were undertaken at a TA level, only the aggregated regional summary is presented.

The projections show that:

- the percentage of the population categorised as young adults is forecast to decline
- the percentage of the population categorised as adults is forecast to decline significantly
- these declines are offset by an increase from 15% to 25% in the percentage of the population categorised as older adults
- the LFPR declines through time, largely driven by an increase in older adults (other) outweighing any increase in older adults who are employed.

3.2.3 Comparison of Wellington City Statistics NZ and .ID projections

As mentioned earlier in this chapter, .ID was commissioned to develop population and household projections for Wellington City.

Whilst based on Statistics NZ projections, the .ID projections have a greater level of granularity (projections cover 31 suburbs / clusters in Wellington City) and were developed in discussions with council officers and planners.

Given the differing methodologies used by Statistics NZ and .ID, the two sets of projections differ slightly.

Table 8 compares the Wellington City Stats and ID projections:

Table 8 Comparison of Statistics NZ and .ID Wellington City population growth projections

Area	Population growth (absolute)				Population growth (%)		
	2013	2023	2033	2043	2013 to 2023	2013 to 2023	2013 to 2043
Wellington City - Stats	197,500	215,400	229,500	241,000	9.1%	16.2%	22.0%
Wellington City - ID	200,500	213,500	228,900	246,700	6.6%	14.2%	23.1%

The main differences between the two, with reference to the .ID projections, are as follows:

- a slightly higher ‘current’ 2013 population starting point, probably due to methodological differences
- lower growth between 2013 and 2023
- higher growth between 2033 and 2043

The main difference between .ID and Statistics NZ is the temporal distribution of forecast population growth, with .ID forecasting that population growth rates will increase through time and Statistics NZ forecasting that growth rates will slow through time.

As mentioned previously in this report, whilst birth rates, death rates and life expectancy can be predicted with some certainty, migration is the major ‘unknown’ regarding forecasting future population.

Statistics NZ take a relatively conservative approach regarding migration, as seen in **Table 2** where migration is assumed to remain constant through time. This is likely to be the major point of differentiation between both sets of projections.

This issue, and the need for regional consistency in terms of high level assumptions, is addressed as part of the moderation process (Section 5).

3.2.4 Summary of population projections

Table 9 summarises the population growth projections (ERP) by TA that are used as the initial control inputs into WTSM. The Wellington City projections are based on .ID whilst projections for the remaining TAs are based upon Statistics NZ.

Table 9 Statistics NZ / ID Population projections

Area	Population growth (absolute)				Population growth (%)		
	2013	2023	2033	2043	2013 to 2023	2013 to 2023	2013 to 2043
Wellington City (ID)	200,500	213,500	228,900	246,700	6.6%	14.2%	23.1%
Lower Hutt	101,200	102,400	102,100	99,100	1.2%	0.9%	-2.1%
Upper Hutt	41,300	44,200	45,900	46,400	7.0%	11.1%	12.3%
Porirua	53,700	56,900	58,100	57,600	6.0%	8.2%	7.3%
Kapiti	50,700	54,300	57,700	60,000	7.1%	13.8%	18.3%
South Wairarapa	9,800	10,400	10,450	10,250	6.1%	6.6%	4.6%
Carterton	8,490	9,650	10,050	10,200	13.7%	18.4%	20.1%
Masterton	24,100	24,800	24,700	23,700	2.9%	2.5%	-1.7%
Region	486,790	518,050	538,500	548,250	6.4%	10.6%	12.6%

The projections highlight significant differences in growth rates between the various TAs:

- Wellington City is forecast to have the highest growth rates, followed by Kapiti
- Porirua and Upper Hutt are forecast to have medium growth rates, whilst the population of Lower Hutt is forecast to contract
- Carterton is forecast to grow significantly (from a low base) with little growth forecast for Masterton and South Wairarapa

3.3 Households

Changes in household size and household composition are driven by many of the demographic changes already highlighted in this report, such as declining fertility rates, increasing life expectancy, an ageing population and a greater tendency for younger people to wait longer before starting a family.

Table 10 shows how household composition is forecast to change between 2013 and 2043

Table 10 Change in household composition between 2013 and 2043

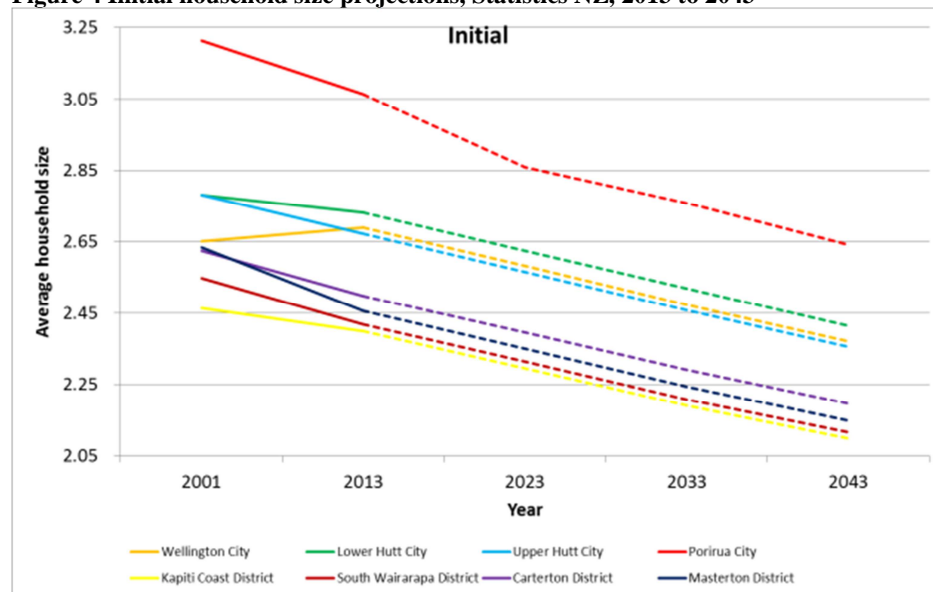
	1 Adult Employed	1 Adult Non-Employed	2 Adults (Min of 1 Employed)	2 Adults Neither Employed	3+ Adults	Total
2013	16.9%	13.8%	43.4%	7.6%	18.2%	100.0%
2023	17.4%	17.0%	40.3%	9.5%	15.8%	100.0%
2033	17.4%	20.4%	37.1%	10.5%	14.6%	100.0%
2043	17.4%	22.0%	35.7%	10.9%	14.0%	100.0%

It shows that the percentage of households with one adult (either employed or not employed) is forecast to increase from around 30% in 2013 to nearer 40% in 2043. The corresponding percentage of 2+ adult households is forecast to decrease from around 70% in 2013 to around 60% in 2043.

As a consequence, average household size is forecast to decrease going forwards.

Figure 4 below shows household size projections taken directly from Statistics NZ data, namely observed data for 2001 and 2013, projections for 2013 to 2033 and extrapolation of projections for 2033 to 2043.

Figure 4 Initial household size projections, Statistics NZ, 2013 to 2043



The initial projections suggest a broad continuation of recent (2001 to 2013) trends.

This is contrary to both the .ID household size projections for Wellington City – which suggest that the decline might be less severe than suggested by Statistics NZ and would flatten out through time – and the household projections developed for WTSM 2011, which suggested that the rate of decline in household size might decrease through time.

Based on this information, the following working assumptions were developed for estimating household size projections by TA for WTSM 2013 were used:

- .ID projections for household size would be used for Wellington City
- based on analysis of differences between the .ID and Statistics NZ Wellington City household size projections and forecast household size trends from WTSM 2011, only 2/3rd of the projected decline in household size derived from the Statistics NZ data would be taken for the period 2013 to 2033 for all TAs within the region except Wellington City

Whilst this method does result in the WTSM household size projections and trends differing slightly from those developed by Statistics NZ, it ensures a better level of consistency between what is assumed for Wellington City (which accounts for around 40% of housing stock in the region) and the other TAs.

Figure 5 below shows the resulting revised household size projections to be used for WTSM 2013.

Figure 5 Revised household size projections, Statistics NZ and .ID, 2013 to 2043

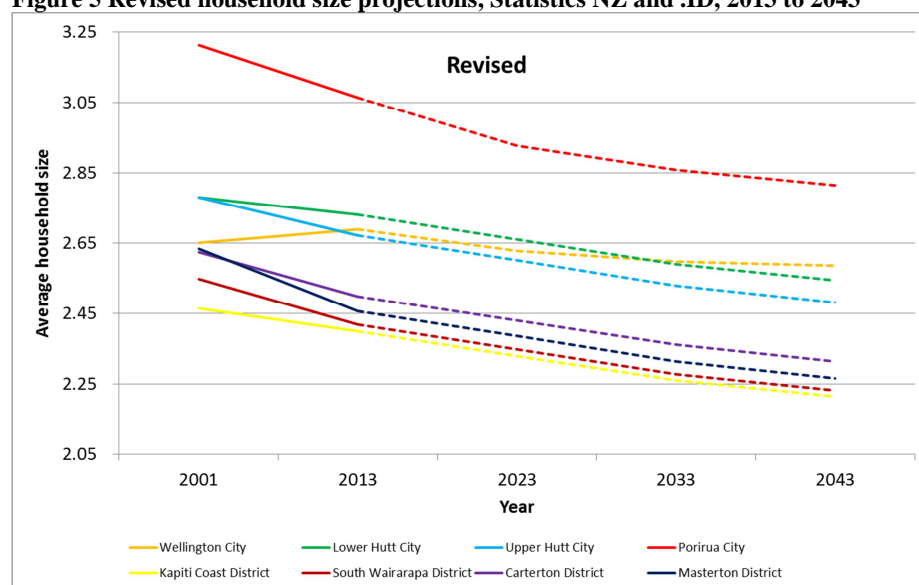


Table 11 shows the revised projections in tabular format, with household size in 2023, 2033 and 2043 also expressed as a percentage of 2013 household size.

At a regional level, the forecast average household size derived from WTSM 2011 is also provided for comparative purposes.

Table 11 Projected change in average household size between 2013 and 2043, by TA

Area	Average household size				Average household size (as % of 2013 size)		
	2013 (obs)	2023	2033	2043	2023	2033	2043
Wellington City	2.71	2.65	2.62	2.61	97.7%	96.6%	96.2%
Lower Hutt	2.76	2.69	2.62	2.57	97.4%	94.9%	93.2%
Upper Hutt	2.69	2.62	2.55	2.50	97.3%	94.7%	92.9%
Porirua	3.09	2.95	2.88	2.84	95.6%	93.3%	91.9%
Kapiti	2.42	2.35	2.28	2.23	97.1%	94.2%	92.3%
South Wairarapa	2.45	2.37	2.30	2.26	97.1%	94.2%	92.3%
Carterton	2.71	2.63	2.56	2.51	97.2%	94.5%	92.6%
Masterton	2.41	2.34	2.27	2.23	97.1%	94.2%	92.3%
Region (WTSM 13)	2.70	2.62	2.55	2.50	97.1%	94.4%	92.7%
Region (WTSM 11)	2.70	2.57	2.46	2.41	95.2%	91.1%	89.3%

The projections show the following:

- the rate of decline in household size between 2013 and 2043 is forecast to be similar across all TAs, with the exception of Wellington City
- the rate of decline for Wellington City is forecast to be much slower, due to young professionals, families and students (who tend to live in large household) balancing the effect of an ageing population
- across the region household size is forecast to decline from 2.70 in 2013 to 2.50 in 2043
- compared to WTSM 2011, the decline in average household size in WTSM 2013 is less significant
- the main driver of this trend is Wellington City, where WTSM 2011 forecast that the 2041 average household size would be 92% of the 2011 figures whereas WTSM 2013 (based on .ID) is forecasting that the average household size in 2043 will be 96% of the 2013 figure
- overall, however, the WTSM 2011 and WTSM 2013 projected change in household size show the same broad trends.

In terms of applying these projections in WTSM 2013:

- population projections are produced for each WTSM zone
- the average household size for that particular zone in 2013 are taken as a starting point, with future household size assumed to decline at the relevant TA rates shown in **Table 11**
- revised population projections and assumed rates of decline in household size are used to estimate future households on a zonal basis

3.4 Employment projections

3.4.1 Initial proposed method

It was initially envisaged that the employment projections would be based on either BERL or NZIER 'business as usual' projections.

Table 12 below shows the projected percentage growth in population (Statistics NZ / .ID), employment (BERL) and employment (NZIER).

Table 12 Comparison of forecast population and employment growth rates by TA, 2013 to 2043⁵

	2013 – 2043 population and employment projections		
	Stats NZ / ID Population	BERL Employment	NZIER Employment
Wellington	23%	28%	56%
Lower Hutt	-2%	9%	38%
Upper Hutt	12%	22%	30%
Porirua City	7%	107%	30%
Kapiti	18%	42%	31%
Wairarapa	4%	17%	33%
Region	13%	29%	47%

It shows that there are significant differences in growth rates between the population, BERL and NZIER growth rates at both a TA and regional level.

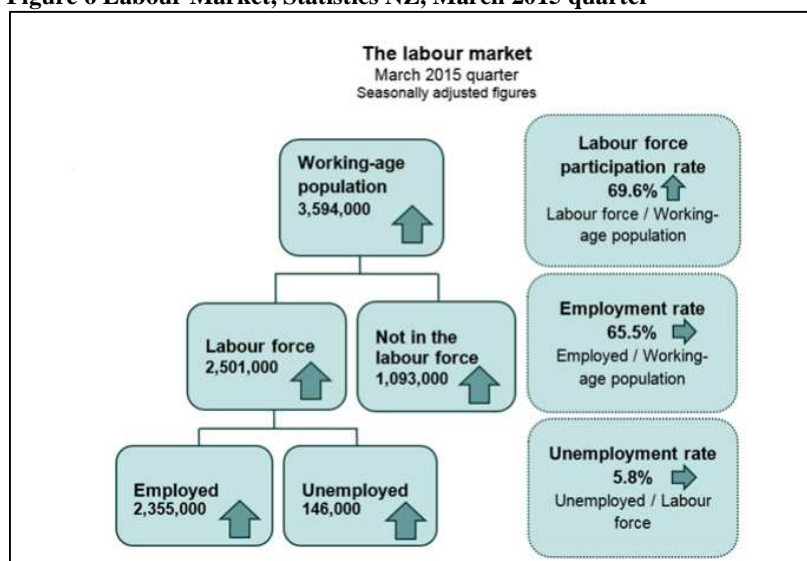
If applied in WTSM, this would result in inconsistencies and affect the performance of the model.

3.4.2 Revised method

Given the inconsistencies between the BERL, NZIER and population data, another method for estimating employment growth rates needed to be developed.

Statistics NZ use the working age population and the labour force as the basis for presenting quarterly market statistics regarding the strength of the labour market, as seen in **Figure 6** below.

Figure 6 Labour Market, Statistics NZ, March 2015 quarter



⁵ Note: WTSM forecast growth is for 2011 to 2021, 2031, 2041; BERL is for 2013 to 2023, 2033, 2043; NZIER is for 2013 to 2023, 2033, 2043

The WTSM population projections provide an estimate of the forecast increase in full-time, part-time and ‘other’⁶ persons between 2013 and 2043

Table 13 below shows the forecast increase in employed (full or part time) persons in the Wellington Region between 2013 and 2043.

Table 13 Forecast increase in employed persons, Wellington Region, 2013 to 2043

	Young Adult Employed	Adult Employed	Older-Adult Employed	All persons employed	% growth cf 2013
2013	37,900	195,700	11,500	245,100	
2023	36,500	200,600	20,100	257,200	4.9%
2033	37,400	200,600	29,200	267,100	9.0%
2043	37,600	200,700	34,400	272,800	11.3%

It shows that the number of young adults and adults employed in the workforce is forecast to remain relatively unchanged between 2013 and 2043. The major growth between 2013 and 2043 relates to older adults, where the number of older adults in the labour force is forecast to increase three fold from 11,500 to 34,400

The growth in the labour force between 2013 and 2043 is forecast to slow through time, a reflection of the ageing population and lower projected population growth.

As the forecast increase in employed persons (demand) will by definition need jobs to work in (supply), the working assumptions for the development of the WTSM employment projections was that the increase in jobs (FTEs) should be broadly equal to the forecast increase in employed persons.

Given that employed persons are a mix of full and part time employees (with no FTE assumptions known for part time employees in WTSM) yet jobs are represented in WTSM in terms of FTEs, it is not possible to accurately match employed persons in WTSM with jobs available.

However, given that part-time employees represent a relatively small percentage of the population, the impact of this limitation is thought to be small and the method is considered appropriate.

3.4.3 Employment growth projections by TA

Table 14 below shows the projected growth in jobs for the period 2013 to 2043, together with the corresponding growth in employed persons and the ratio of jobs located in a TA to employed persons resident in the TA.

⁶ Unemployed, not in labour force

Table 14 Projected employment growth by TA, 2013 to 2043

Area	Year	Jobs	Absolute increase	% increase of 2013	Employed persons	Absolute increase	Ratio (/jobs)	Increase in employed persons minus increase in jobs
Wellington	2013	137,300			110,700		1.24	
	2043	160,900	23,600	17.2%	132,700	22,000	1.21	-1,600
Porirua	2013	15,100			24,200		0.62	
	2043	16,500	1,400	9.3%	26,800	2,600	0.62	1,200
Kapiti	2013	14,000			21,500		0.65	
	2043	15,300	1,300	9.1%	23,800	2,300	0.64	1,000
Lower Hutt	2013	40,500			48,400		0.84	
	2043	41,300	800	2.1%	49,500	1,100	0.83	300
Upper Hutt	2013	11,300			20,100		0.56	
	2043	11,800	500	4.2%	21,100	1,000	0.56	500
Carterton	2013	3,000			3,800		0.78	
	2043	3,000	0	2.8%	3,900	100	0.78	100
Masterton	2013	10,900			11,400		0.95	
	2043	10,000	-900	-8.1%	10,400	-1,000	0.97	-100
South Wairarapa	2013	3,700			4,900		0.75	
	2043	3,400	-300	-6.0%	4,500	-400	0.76	-100
Region	2013	235,800			245,100		0.96	
	2043	262,300	26,500	11.3%	272,700	27,600	0.96	1100

The data shows that, at a regional level, the increase in jobs between 2013 and 2043 (~26,500) is projected to be broadly the same as the increase in employed persons (~27,600) over the same period.

Whilst the number of employed persons is slightly higher than the number of jobs, the difference is small and this inconsistency stems from the base year population and employment projections.

The ratio of jobs to employed persons shows that jobs and employed persons are not balanced evenly across the region:

- Wellington City is forecast to account around 58% of current jobs in the region in 2043 yet only 45% of employed persons will be living there
- Upper Hutt, Kapiti and Porirua have significantly more employed persons living there than there are jobs.

- the trends highlight the extent to which Wellington City is the focus of employment within the region, generating significant commuter trips to / from elsewhere in the region.

These differences between where jobs are located and where employees live will influence commuting patterns, resulting in additional commuter flows from areas where the growth in employed persons exceeds the growth in jobs (Porirua, Kapiti, Hutt Valley) to areas where the growth in jobs exceeds the growth in employed persons (Wellington City).

The net result is likely to be the reinforcement of Wellington City's position as the focus for employment within the region.

3.4.4 Employment categories

Employment in WTSM is split into 5 categories, which are based on ANZIC codes and were defined when WTSM was originally developed in 2001:

- service sector
- retail sector
- transport and communications sector
- manufacturing sector
- other (primary industries)

Table 15 below shows that the service sector accounts for around 60% of the region's jobs.

Table 15 Current WTSM 2013 employment within Wellington Region by sector

Category	Jobs	% of Total
Employment Other	4,138	2%
Manufacturing	29,017	12%
Retail	45,777	19%
Transport	11,399	5%
Service	145,257	62%
Total	235,589	100%

Whilst the absolute increase in employment obtained from the BERL projections were not appropriate for direct use in WTSM, they do give a reliable indication of relative difference in future growth rates between different employment sectors.

Table 16 below shows the projected change in employment by category between 2013 and 2043, obtained by taking the differential growth rates by category from BERL and applying these to the overall growth in employment as shown in **Table 14**.

Table 16 Projected growth in employment by sector, 2013 to 2043

Category	2013	2043	Growth	% growth
Employment Other	4,100	4,200	100	2.4%
Manufacturing	29,000	25,100	-3,900	-13.4%
Retail	45,800	56,500	10,700	23.4%
Transport	11,400	12,100	700	6.1%
Service	145,300	164,500	19,200	13.2%
Total	235,600	262,300	26,800	11.4%

It shows that, according to BERL, most growth is likely to occur in the service sector, followed by the retail sector. Manufacturing is forecast to see a decline in employment, from an already low base.

3.4.5 Spatial distribution of growth

Employment growth, including growth relating to specific developments, was distributed across the appropriate model zones as follows:

- standard TA growth rates were applied across the relevant zones to grow the base year employment to future year estimates
- information from local plans and discussions with TA representatives was used to identify areas zoned for future employment growth
- specific development growth is accounted for in the relevant zones, with remaining growth (where applicable) within the TA accounted for by organic employment growth
- the resulting totals were controlled to TA growth totals

Unlike the population projections, there is very little information to be gained from local planning documents relating to the location of future employment.

It was therefore assumed that employment growth would be located in:

- areas of current high employment density, such as Wellington CBD, Porirua CBD, Kapiti Town centre, Lower Hutt City Centre / Seaview
- areas where high residential growth is forecast, such as Newtown, Johnsonville, Tawa and Kilbirnie (all of which are identified in the Wellington City Council Structure Plan), the rationale being that some growth in employment will be required to support the increase in population

3.5 School roll

Base year school roll (primary and secondary) and tertiary roll data was obtained from the Ministry of Education and allocated to the appropriate WTSM model zones.

Whilst the MoE provide primary and secondary school roll projections to 2023, no projections are generated for 2033 and 2043 and none of the projections cover tertiary roll.

It was therefore decided that a simple and consistent process would be applied for all forecast years (2023, 2033 and 2043) to estimate school and tertiary roll numbers, based upon population by relevant age group.

This process was undertaken based on the final population projections and is documented in Chapter 7 of this report.

3.6 Summary

This chapter has summarised the background trends and information from which initial population, household, employment and school roll projections are developed.

When the information is applied to WTSM base year demographic data and controlled to overall regional population / household / employment totals, the out-turn numbers might be slightly different to those presented in this chapter but the overall trends will be the same.

4. Initial high level projections

This section outlines the initial population, employment and household projections that have been generated using the methodology outlined in Chapter 3.

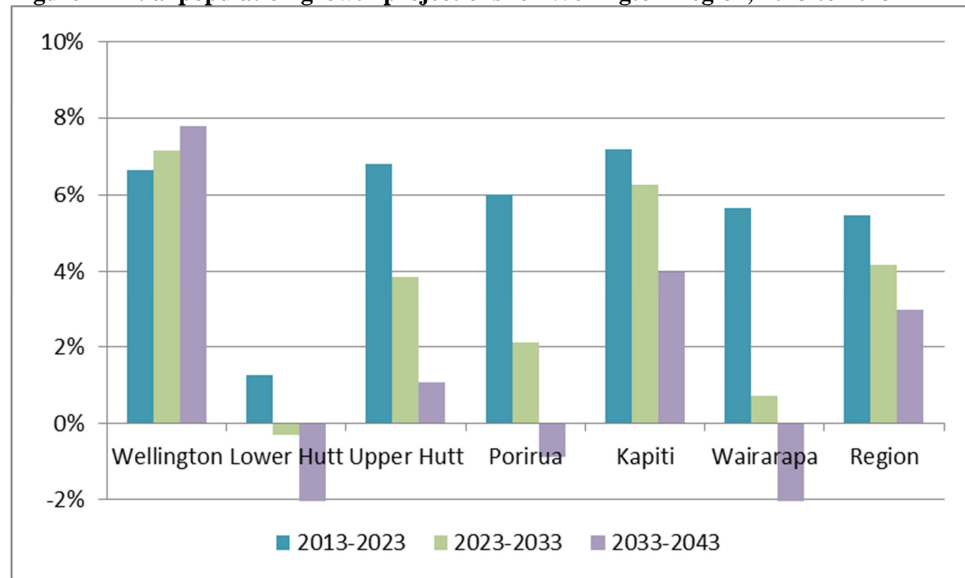
4.1 Population projections

Table 17 shows population projections by ten year intervals, by territorial authority (TA) and for the region.

Table 17 Initial population projections for Wellington Region, 2013 to 2043

	Absolute population				Population growth by 10 year period			Population growth from 2013	
	2013	2023	2033	2043	13 – 23	23 – 33	33 – 43	13 – 33	13 - 43
Wellington	200,300	213,600	228,900	246,700	6.6%	7.1%	7.8%	14.3%	23.2%
Lower Hutt	101,100	102,400	102,100	99,100	1.3%	-0.3%	-2.9%	1.0%	-2.0%
Upper Hutt	41,400	44,200	45,900	46,400	6.8%	3.8%	1.1%	10.9%	12.1%
Porirua	53,700	56,900	58,100	57,600	6.0%	2.1%	-0.9%	8.3%	7.3%
Kapiti	50,700	54,300	57,700	60,000	7.2%	6.3%	4.0%	13.9%	18.5%
Masterton	24,700	25,400	25,300	24,300	2.9%	-0.4%	-4.0%	2.5%	-1.7%
Carterton	7,900	9,000	9,400	9,500	13.7%	4.1%	1.5%	18.4%	20.1%
S Wairarapa	9,700	10,300	10,400	10,200	6.1%	0.5%	-1.9%	6.6%	4.6%
Region	489,500	516,200	537,800	553,900	5.5%	4.2%	3.0%	9.9%	13.1%

Figure 7 Initial population growth projections for Wellington Region, 2013 to 2043



The data shows the following:

- Wellington City has the highest absolute and percentage growth, with growth rates increasing through time
- looking at the region as a whole, growth rates decline through time
- Lower Hutt and Masterton both see overall declines in population between 2013 and 2043

- Western areas – Porirua and Kapiti – are forecast to grow at a faster rate than eastern areas

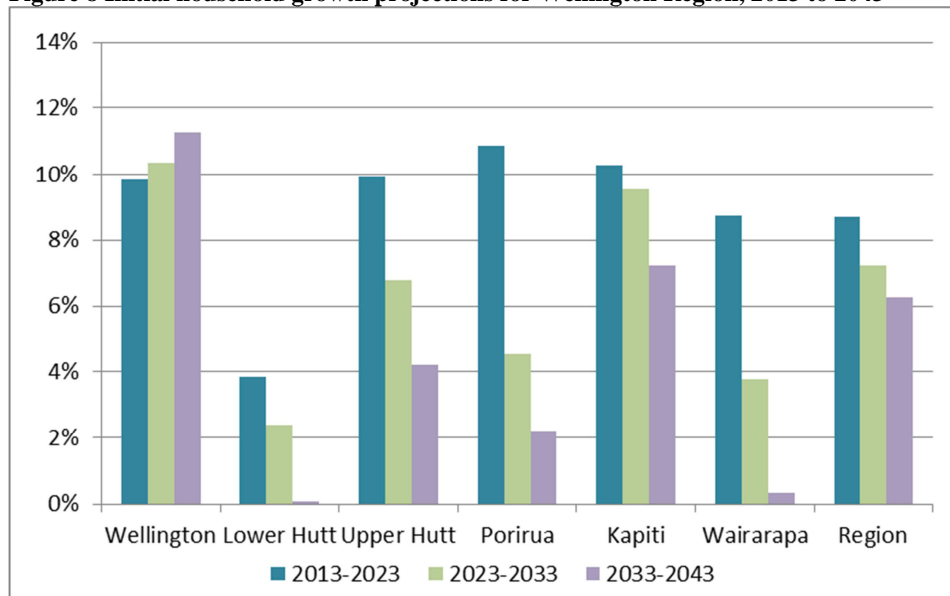
4.2 Household projections

Table 18 below outlines the initial household projections. These follows the same trends as outlined with respect to population, except the percentage growth rates are higher due to the fact that household size is forecast to decrease into the future.

Table 18 Initial household projections for Wellington Region, 2013 to 2043

	Number of household				Household growth by 10 year period			Household growth from 2013	
	2013	2023	2033	2043	13 – 23	23 – 33	33 – 43	13 – 33	13 - 43
Wellington	73,900	81,200	89,600	99,700	9.9%	10.3%	11.3%	21.2%	34.8%
Lower Hutt	36,700	38,100	39,000	39,100	3.8%	2.4%	0.1%	6.3%	6.4%
Upper Hutt	15,300	16,900	18,000	18,800	10.0%	6.8%	4.2%	17.4%	22.3%
Porirua	17,400	19,300	20,100	20,600	10.9%	4.5%	2.2%	15.9%	18.5%
Kapiti	20,900	23,100	25,300	27,100	10.3%	9.5%	7.2%	20.8%	29.5%
Masterton	10,000	10,600	10,900	10,700	6.0%	2.7%	-1.1%	8.8%	7.6%
Carterton	3,100	3,700	3,900	4,100	16.9%	7.2%	4.6%	25.3%	31.1%
S Wairarapa	4,000	4,400	4,500	4,500	9.3%	3.6%	0.0%	13.2%	13.2%
Region	181,400	197,200	211,400	224,600	8.7%	7.2%	6.2%	16.5%	23.8%

Figure 8 Initial household growth projections for Wellington Region, 2013 to 2043



The data shows that across the region from 2013 to 2043, the number of households is forecast to increase by around 24%, compared to a corresponding 13% forecast increase in population, the result of an ageing population and a corresponding decrease in average household size.

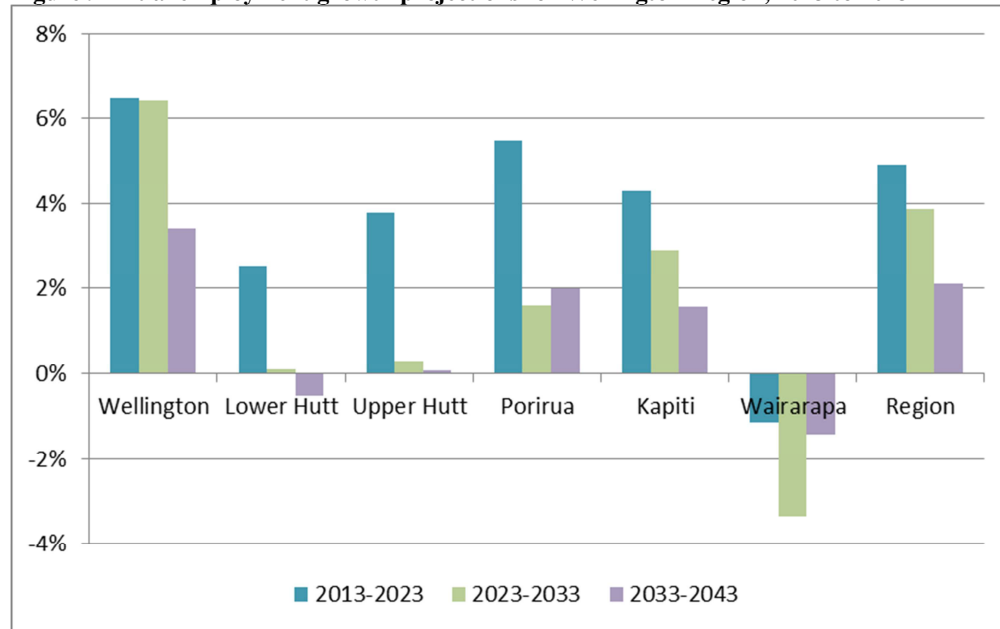
4.3 Employment projections

Table 19 below shows the initial employment projections. As stated in Chapter 3, these are broadly based on corresponding growth in employed persons at both a TA and regional level.

Table 19 Initial employment projections for Wellington Region, 2013 to 2043

	Employment				Employment growth by 10 year period			Employment growth from 2013	
	2013	2023	2033	2043	13 – 23	23 – 33	33 – 43	13 – 33	13 - 43
Wellington	137,300	146,200	155,600	160,900	6.5%	6.4%	3.4%	13.3%	17.2%
Lower Hutt	40,500	41,500	41,500	41,300	2.5%	0.1%	-0.5%	2.6%	2.1%
Upper Hutt	11,300	11,800	11,800	11,800	3.8%	0.3%	0.1%	4.1%	4.2%
Porirua	15,100	15,900	16,200	16,500	5.5%	1.6%	2.0%	7.2%	9.3%
Kapiti	14,000	14,600	15,100	15,300	4.3%	2.9%	1.6%	7.4%	9.1%
Masterton	10,900	10,700	10,200	10,000	-1.7%	-4.6%	-2.0%	-6.2%	-8.1%
Carterton	3,000	3,000	3,000	3,000	1.7%	0.6%	0.5%	2.3%	2.8%
S Wairarapa	3,700	3,600	3,500	3,400	-1.7%	-3.0%	-1.4%	-4.7%	-6.0%
Region	235,800	247,300	256,900	262,300	4.9%	3.9%	2.1%	9.0%	11.3%

Figure 9 Initial employment growth projections for Wellington Region, 2013 to 2043



The data shows that across the region from 2013 to 2043, employment is forecast to increase by around 11%, in line with growth in employed persons.

Growth is forecast to be concentrated in Wellington City, both in percentage and absolute terms, resulting in the percentage of the region's jobs located in Wellington City increasing from 58% in 2013 to 62% in 2043.

5. Territorial authority discussions

The initial population, household and employment projections were developed from limited knowledge of local plans and without any direct involvement from regional stakeholders.

At the start of this process it was agreed that GWRC would discuss these initial projections with the regions TAs and NZTA, to gain a better understanding of local and regional growth plans and aspirations, with the projections revised and moderated accordingly based on these discussions.

This section of the report documents the rationale behind these discussions and provides a qualitative assessment of the discussions.

5.1 Moderation

From the TA discussions, GWRC wanted to understand the following in relation to significant residential and commercial developments in the region:

- the potential size of the development
- its location
- a commencement date for development
- a development priority compared with other developments in the area
- the probability of the development reaching its maximum size
- the phasing – i.e. likely time it might take to reach capacity
- the development mix – i.e. high density, low density, retirement

Whilst any development is dependent on market conditions to a greater or lesser extent, a development that is included in local plans, has the required consents, has a developer on-board and agreement with the local TA regarding utilities and services could be considered more likely to go ahead than a development that is merely a piece of land that the TA envisage could be developed at some point in the future.

Getting an indication of a development's priority / likelihood is important, particularly as some elements of planned growth, often looking to the medium / long term, is often 'aspirational' in nature.

As the WTSM demographic projections are controlled back to regional totals, there could be a future scenario where the sum of all committed development (as obtained from TA discussions) might exceed both regional and TA level totals, resulting in the significant 'controlling' of growth back to regional levels.

Therefore if any zonal projections need to be adjusted / controlled, the intention is to use all available information and apply a balanced approach to any changes and to remain

consistent with the higher level regional and TA population and employment totals provided by Statistics NZ and other sources as stated in chapter 3.

5.2 Adjustments resulting from TA discussions

This section summarises the TA discussions and the high level adjustments made to the projections following these discussions.

5.2.1 Wellington City Council

The details of the discussions with Wellington City Council can be summarised as follows:

- strong inner city housing demand likely to continue
- greenfield focus on northern suburbs
- longer term opportunities for growth constrained by topography
- Wellington Urban Growth Plan is key document. Outlines residential growth focussed in:
 - Stebbings Valley, Takapu Valley, Lincolnshire Farms (greenfield)
 - Urban growth and intensification – Te Aro, Newtown, Karori, Johnsonville, Tawa

Given that the initial WCC population projections were based on .ID forecasts at a TA level, which themselves were developed from discussions similar to those that took place between GWRC and WCC, there was broad agreement amongst WCC officers with the general trends and focus of the projections.

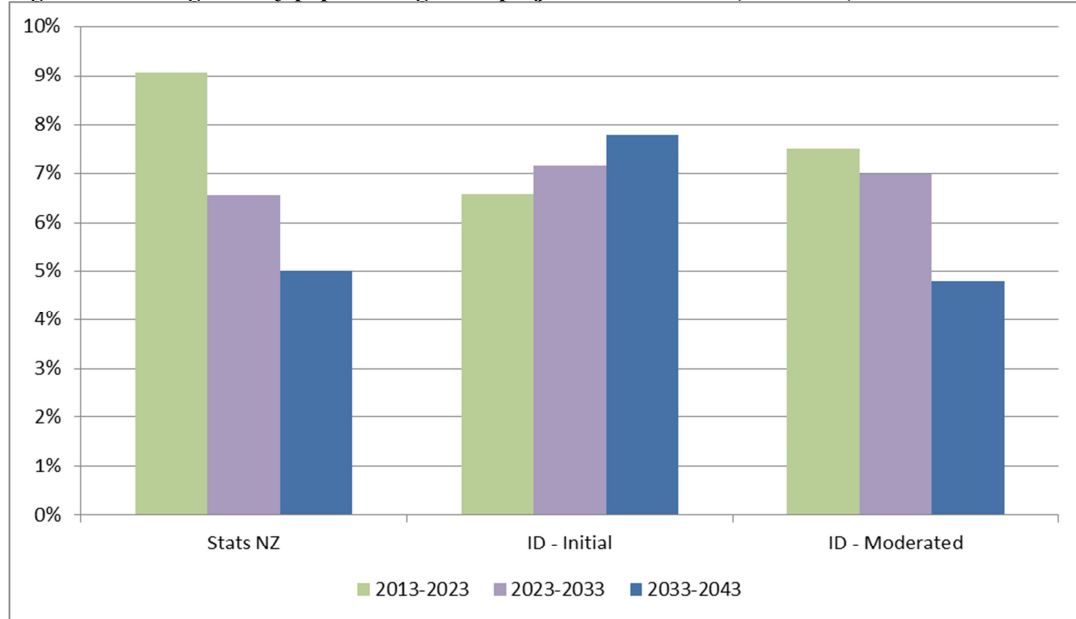
The .ID development information, in common with similar information gathered from other TAs across region, is likely to have a greater level of uncertainty attached to the specific details of developments that might occur post 2033 compared with development that is forecast to occur between 2013 and 2033.

Taking into account such uncertainties, together with differences in population trends between .ID and Statistics NZ, some small changes were made to the ID based Wellington City projections to:

- broadly align the Wellington City .ID population projection trends with the Statistics NZ projection trends, namely population growth rates decreasing through time
- accommodate slightly higher (less pessimistic) growth rates for other TAs within the region in the period 2033 to 2043

Figure 10 below shows the projected population growth by 10 year period for Wellington City for three scenarios – Statistics NZ, initial projections (ID based) presented in Section 4 of this report and revised projections presented in section 6.

Figure 10 Wellington City population growth projections – Stats NZ, ID initial, ID moderated



The data shows that, when comparing the Statistics NZ and initial .ID projections, Statistics NZ suggest that growth rates will decline through time (in common with other TAs across the region and New Zealand as a whole) whilst ID suggests that they will increase.

The net result of changes between the initial and moderated .ID projections is slightly higher population growth in the period 2013 to 2023, no change in growth rates between 2023 and 2033 and lower population growth between 2033 and 2043

5.2.2 Hutt City Council

The details of the discussions with Hutt City Council can be summarised as follows:

- an additional 3,000 to 4,000 households may be required out to 2033
- the total population in 2033 could be around 101,000
- Hutt Urban Growth Strategy envisages a higher growth scenario where population could reach 110,000 in 2032
- rezoning in Wainuiomata could create the potential for 3000 homes in 20 to 30 years
- infill around Waterloo / Epuni and low-rise intensification (apartments) around Petone and Lower Hutt CBD could lead to population growth

Statistics NZ population growth rates for Lower Hutt suggested a 1% increase in population from 2013 to 2033 and a decline from 2033 to 2043, leading to a net overall decline during the period 2013 to 2043.

Whilst there was general agreement between GWRC and Hutt City Council that population growth rates are likely to be low, the officer's view was that if some of the growth aspirations and development opportunities envisaged for Lower Hutt as part of their Urban Growth Strategy were to materialise then there could be a small increase in population between 2013 and 2043 as opposed to a small decrease as envisaged by Statistics NZ.

Therefore on this basis the Lower Hutt projections were revised to show small levels of growth between 2013 and 2043. At a regional level, however, these changes are fairly insignificant as the numbers involved are fairly small (~3,000).

5.2.3 Upper Hutt City Council

The details of the discussions with Upper Hutt City Council can be summarised as follows:

- population could reach between 44,700 and 46,600 by 2033
- greenfield development likely to make-up over 50% of future growth
- development areas are to the north – Gillespies Road, Maymorn – and around Wallaceville / CIT Campus

From discussions with Upper Hutt City Council it was agreed that the population growth rates in the initial projections, based on Statistics NZ projections, were reasonable and broadly aligned with UHCC's own projections for the period 2013 to 2043.

Some residential developments are underway and others are at the initial planning stage . It became apparent during the discussions, however, that several large future developments such as Gillespies Road and Maymorn have a degree of uncertainty attached to them, relating to the likelihood of the maximum extent of each development being realised.

Taking this information, combined with the fact that the Lower Hutt population projections were revised slightly upwards, the Upper Hutt population and employment growth rates for the period 2013 to 2033 and 2023 to 2033 were revised down slightly to balance growth rates across the Hutt Valley between the initial and moderated projections.

The resulting projections still broadly align with Stats NZ and UHCC projection yet also remain faithful to the regional control totals.

5.2.4 Porirua City Council

The details of the discussions with Upper Hutt City Council can be summarised as follows:

- Porirua City growth model is consistent with Statistics NZ forecasts and initial projections

- development in the short to medium term is likely around Kenepuru Hospital site and Aotea block
- in the longer term, development will be focussed on the northern gateway north of Plimmerton

From discussions between GWRC and PCC, there was general agreement that the initial population projections broadly aligned with PCC's own projections that were developed from their own growth model.

Porirua grew by 8% in the last ten years and has the highest fertility rates and largest proportion of young adults in the region. The district is expecting strong household growth to 2031 as the population increases and household size slowly decrease, with development likely to be focussed on areas to the north and east of the district (Paekakariki Hill).

Given this information, the only change made to the projections was that population and employment growth in the period 2033 to 2043 changed from being slightly negative to slightly positive, in order to balance changes made elsewhere within the region (particularly Wellington City).

The rationale behind this slight adjustment was that high fertility rates and a young population could still contribute to population increases post 2033, whilst realignment of Wellington City's population growth profiles with Statistic NZ trends (growth rates declining through time) result in some growth being displaced from Wellington City to Porirua.

5.2.5 Kapiti Coast District Council

The details of the discussions with Upper Hutt City Council can be summarised as follows:

- growth is forecast to be focussed on greenfield development areas north of Waikanae
- some development is also forecast to occur in Raumati on land that will become available after the completion of the Kapiti Expressway

The initial population and employment growth rates between 2013 and 2043 aligned well with KCDC's view of future population and employment growth, with high (but decreasing) growth rates for each 10 year period.

There was also broad agreement that the attractiveness of Kapiti Coast with retirees could result in population growth rates increasing at a faster rate than employment growth rates.

Based on this information, only minor changes were made to the initial projections, largely to balance changes made elsewhere in the region.

5.2.6 Wairarapa

The details of the discussions with South Wairarapa District Council, Carterton District Council and Masterton District Council can be summarised as follows:

- limited greenfield development is forecast for Masterton
- residential development in Carterton and South Wairarapa is likely to be mainly focussed around lifestyle block expansion

The initial population projections suggested that the Wairarapa's population may grow 5% in the ten years to 2023 followed by a decline in the period between 2023 and 2043.

From discussions with the Wairarapa TA's, there was broad agreement that whilst the population might not grow significantly between 2013 and 2043, the increasing popularity of lifestyle blocks and urban fringe living, combined with a few small scale residential developments planned for Masterton, might result in limited population growth through time.

Based on this information, the growth in population has been smoothed across the 30 year period between 2013 and 2043, to reflect regional trends, namely decreasing population and employment growth rates through time.

Given the fact that the Wairarapa comprises less than 10% of the region's population, the impact of this change will be small.

5.2.7 NZTA

Discussions with NZTA focussed around the need to ensure that any population and employment projections are realistic rather than aspirational, accepting the fact that whilst territorial authorities might envisage and plan for certain levels of growth as part of their long term plans, this should be balanced against the reality (based upon historic evidence) that elements of these growth plans might not be realised.

A discussion also focussed on uncertainty, with a general consensus being reached that whilst these core forecasts are developed around a 'medium' growth future, they will need to be supplemented by alternative future scenarios to provide decision makers with information about how alternative views of the future might affect the assessment of a particularly piece of infrastructure or policy decision.

5.3 Summary

In summary, the following broad changes were made to the initial population and employment projections:

- Wellington City projections were revised to reflect Statistics NZ local and regional trends, namely decreasing population and employment growth rates through time, the main effect being a reduction in population growth between 2033 and 2043
- Lower Hutt projections were revised upwards slightly, to partly reflect officer's less pessimistic view of the future

- Upper Hutt projections were revised down slightly, particularly in the period 2033 to 2043, to balance the revisions made to Lower Hutt
- Porirua projections for the period 2033 to 2043 were increased slightly, whilst Kapiti projections remained broadly unchanged
- Wairarapa projections were adjusted to reflect growth rates that decline through time

The most significant change between the initial and revised projections occurs between 2033 and 2043 and relate to the differences between Statistics NZ regional (and national) trends – declining population growth rates through time – and Wellington City .ID trends.

The further into the future that you forecast, the greater the uncertainty and the greater the margin of error contained within your forecasts.

The forecasting of population growth is dependent upon a number of assumptions about the rate of natural population increase (births / deaths) and net migration. Migration has historically been hard to predict even ten years into the future.

For transport modelling purposes, a 15 to 20 year horizon (2033 in the case of WTSM) would generally be used for design / evaluation purposes, with a shorter-term scenario (2023) often used to evaluate operational impacts of a scheme.

Historically, forecasts up to 30 years into the future (in this instance, 2043) are used the least as they are the most distant and have the greatest degree of uncertainty attached to them. Even when 30 year forecasts are used, their use is often confined to economic analysis and limited scheme design.

Given the increased uncertainty when projecting further than 20 years into the future, combined with the likely importance and use of the 2043 forecasts, it is felt that the adjustments made to the 2043 initial population and employment projections can be justified.

6. Revised high level projections

This section outlines the revised population, household and employment projections, based on the TA discussions and revisions documented in the previous section.

6.1 Population

Table 20 show the revised population projections developed by GWRC for WTSM 2013:

Table 20 Population projections by TA and region 2013-2043

	Absolute population				Population growth by 10 year period			Population growth from 2013	
	2013	2023	2033	2043	13 – 23	23 – 33	33 – 43	13 – 33	13 - 43
Wellington	200,300	215,400	230,400	241,400	7.5%	7.0%	4.8%	15.0%	20.5%
Lower Hutt	101,100	102,200	102,700	103,200	1.0%	0.5%	0.5%	1.5%	2.0%
Upper Hutt	41,400	43,900	44,700	45,500	6.0%	1.9%	1.9%	8.0%	10.0%
Porirua	53,700	57,200	58,500	59,600	6.5%	2.3%	1.9%	9.0%	11.0%
Kapiti	50,700	54,200	57,000	59,000	7.0%	5.1%	3.5%	12.5%	16.5%
Masterton	24,700	25,000	25,200	25,400	1.0%	0.9%	1.0%	1.9%	2.9%
Carterton	7,900	8,400	8,700	8,900	6.0%	3.8%	1.8%	10.0%	12.0%
S Wairarapa	9,700	10,100	10,300	10,400	4.0%	2.0%	0.9%	6.1%	7.0%
Region	489,500	516,200	537,500	553,400	5.5%	4.1%	3.0%	9.8%	13.1%

Figure 11 Percentage change in population by TA and region 2013-2043

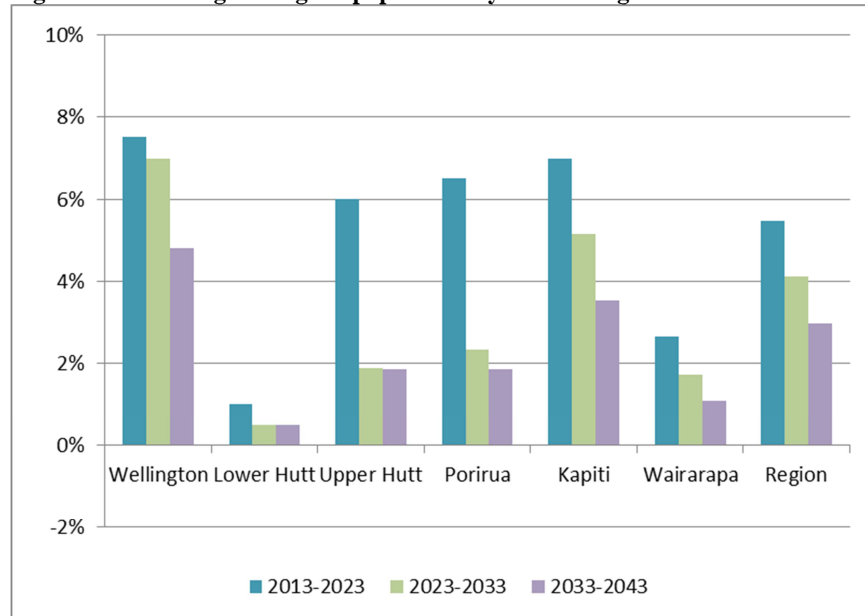


Figure 11 shows that all the TAs and the region as a whole show declining projected growth rates between 2013 and 2043.

The main difference between the initial and revised projections is that the initial population growth trend through time for Wellington City – increasing population growth rates – has been adjusted to represent a scenario where growth rates are high between 2013 and 2033 and decline between 2033 and 2043. This is consistent with

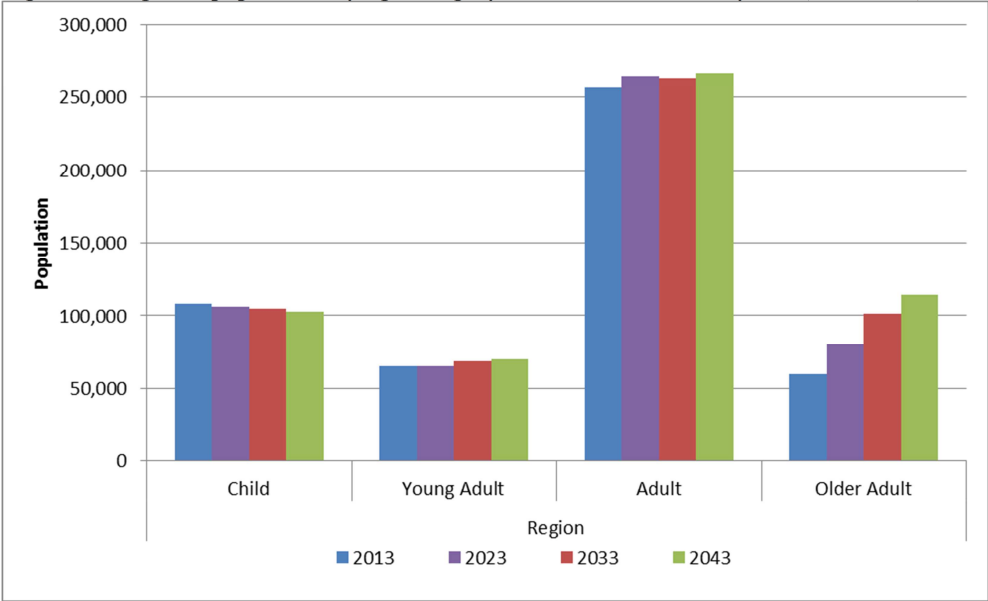
Statistics NZ trends for the other TAs within the Wellington Region and indeed the region itself.

For Lower Hutt, Porirua and the Wairarapa, small declines in population growth, particularly between 2033 and 2043, have been replaced with small increases, in part to compensate for lower growth in Wellington City (whilst remaining within regional control totals) and in part to account for some of the territorial authority aspirations regarding growth.

6.1.1 Population projections by age

Figure 12 shows the projected regional population by age category for each ten year period from 2013 to 2043.

Figure 12 Regional population by age category for base and forecast years (2013-2043)



A decline in the child population is forecast between 2013 to 2043, a result of declining fertility rates.

The 17-25 year olds (young adults) population cohort shows low growth between 2013 and 2043, the result of low fertility rates balanced by migration, whilst the adult population increases slightly, largely a result of migration

The biggest change occurs amongst the older adult (66 years and above) demographic with the population increasing during each ten-year period due to increased life expectancy and a large birth cohort (baby boomers) moving through the population. Growth rates tail off a little between 2033 and 2043, a reflection of the fact that by then, many ‘baby boomers’ will have moved through the population to older adulthood and beyond.

6.2 Households

Table 21 shows the revised household projections from 2013 to 2043.

Table 21 Household projections by TA and region 2023-2043 and cumulative percentage growth.

	Absolute household				Household growth by 10 year period			Household growth from 2013	
	2013	2023	2033	2043	13 – 23	23 – 33	33 – 43	13 – 33	13 - 43
Wellington	73,900	81,900	90,200	97,600	10.8%	10.2%	8.2%	22.0%	32.0%
Lower Hutt	36,700	38,000	39,200	40,700	3.6%	3.2%	3.6%	6.9%	10.7%
Upper Hutt	15,300	16,700	17,400	18,300	8.5%	4.7%	5.0%	13.7%	19.3%
Porirua	17,400	19,500	20,400	21,400	12.2%	4.7%	4.9%	17.5%	23.2%
Kapiti	20,900	23,100	25,100	26,800	10.4%	8.5%	6.9%	19.8%	28.0%
Masterton	10,000	10,400	10,800	11,200	4.0%	4.0%	4.1%	8.2%	12.6%
Carterton	3,100	3,400	3,700	3,800	9.0%	6.8%	4.9%	16.5%	22.2%
S Wairarapa	4,000	4,300	4,500	4,600	7.1%	5.1%	2.8%	12.6%	15.8%
Region	181,400	197,300	211,400	224,500	8.7%	7.1%	6.2%	16.5%	23.7%

Changes to the number of households and the associated growth rates are directly driven by changes in population as the average household size by year / TA remains an unchanged assumption between the initial and future projections.

Overall, household growth rates are higher than population growth rates due to decreasing household size, a result of an ageing population, lower fertility rates and younger people waiting longer to start families.

Figure 13 shows the percentage growth in households by 10-year intervals to 2043.

Figure 13 Percentage change in household numbers by TA & region

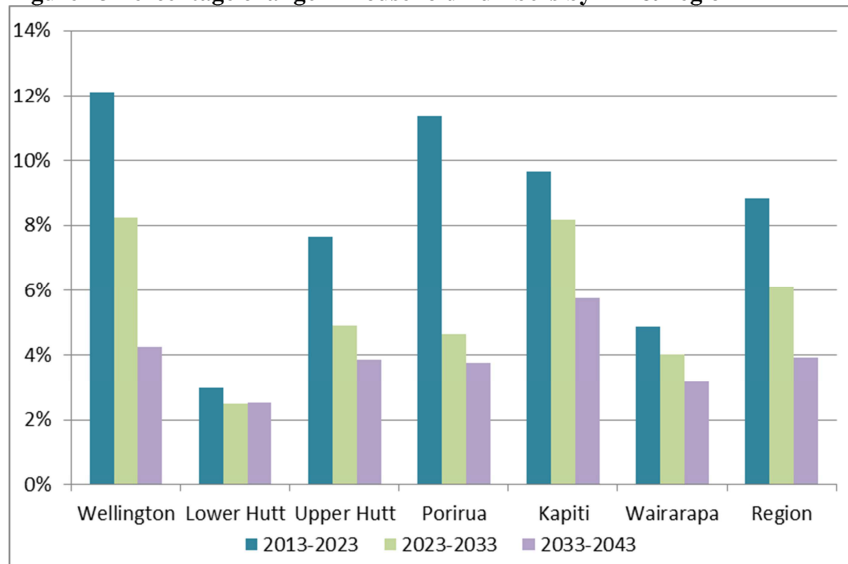


Figure 14 shows the change in household composition between 2013 and 2043.

Figure 14 Change in household composition, 2013 to 2043



It shows that the number of 1 adult households is forecast to increase by over 50%, the number of 2+ adult households is forecast to increase by around 10% whilst there is forecast to be a slight decline in the percentage of 2+ adult households

6.3 Employment

Table 22 below summaries the revised projected employment growth by TA.

Table 22 Revised employment projections, 2013 to 2043

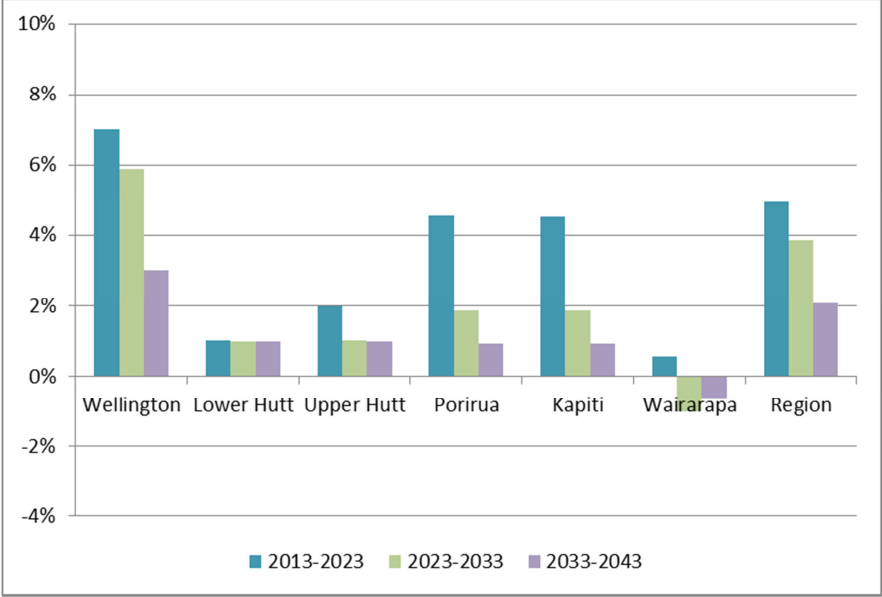
	Employment				Employment growth by 10 year period			Employment growth from 2013	
	2013	2023	2033	2043	13 – 23	23 – 33	33 – 43	13 – 33	13 - 43
Wellington	137,300	146,900	155,500	160,200	7.0%	5.9%	3.0%	13.3%	16.7%
Lower Hutt	40,500	40,900	41,300	41,700	1.0%	1.0%	1.0%	2.0%	3.0%
Upper Hutt	11,300	11,600	11,700	11,800	2.0%	1.0%	1.0%	3.0%	4.1%
Porirua	15,100	15,800	16,100	16,200	4.6%	1.9%	0.9%	6.5%	7.5%
Kapiti	14,000	14,700	14,900	15,100	4.5%	1.9%	0.9%	6.5%	7.5%
Masterton	10,900	11,000	10,800	10,700	0.4%	-1.3%	-1.0%	-0.9%	-1.9%
Carterton	3,000	3,000	3,000	3,000	1.0%	0.8%	0.9%	1.8%	2.7%
S Wairarapa	3,700	3,700	3,600	3,600	0.6%	-1.5%	-0.9%	-0.9%	-1.8%
Region	235,800	247,400	257,000	262,400	4.9%	3.9%	2.1%	9.0%	11.3%

The projections show that across the region from 2013 to 2033, employment is forecast to increase by around 9%, with a smaller 2% increase between 2033 and 2043. Wellington City has both the highest percentage growth rate through time (17% between 2013 and 2043) and the greatest number of absolute jobs added (23,000 between 2013 and 2043).

In absolute terms, Wellington City is forecast to account for 23,000 of the overall forecast 27,000 increase in jobs.

Figure 15 below shows the forecast employment growth rates (%) by TA for each 10-year time period. It further highlights Wellington’s high growth rates compared with the rest of the region.

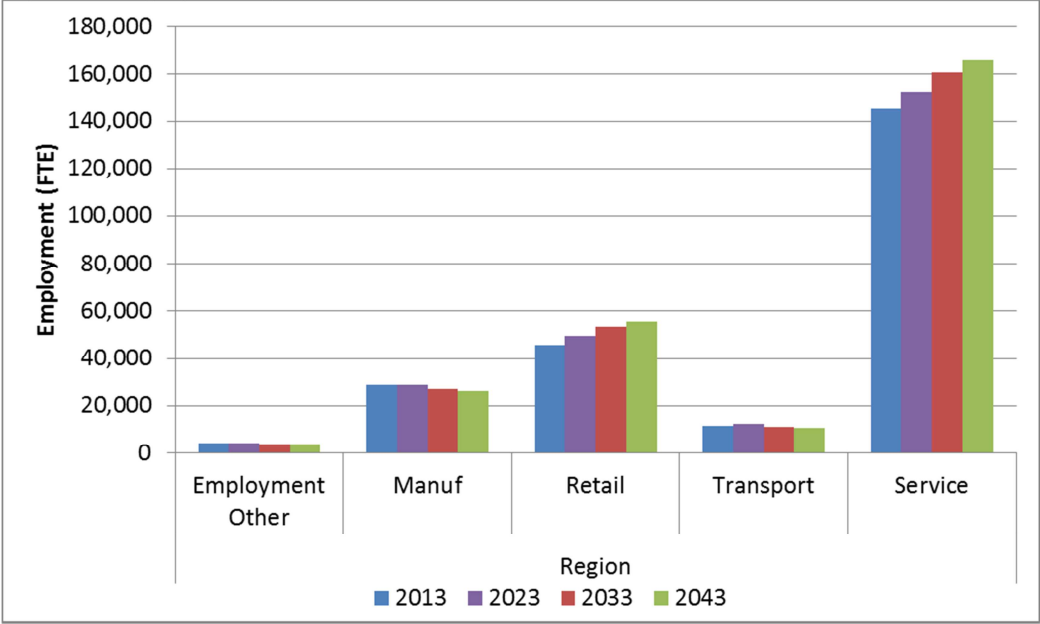
Figure 15 Forecast regional employment percentage growth by TA at ten year intervals 2013 to 2043



6.3.1 Employment by sector

Figure 16 below shows how employment by sector is forecast to change through time.

Figure 16 Employment by sector, 2013 to 2043



It shows that most growth in employment between 2013 and 2043 will occur in the dominant service sector and, to a lesser extent, the retail sector. Manufacturing and transport are both forecast to see slight declines in employment between 2013 and 2043.

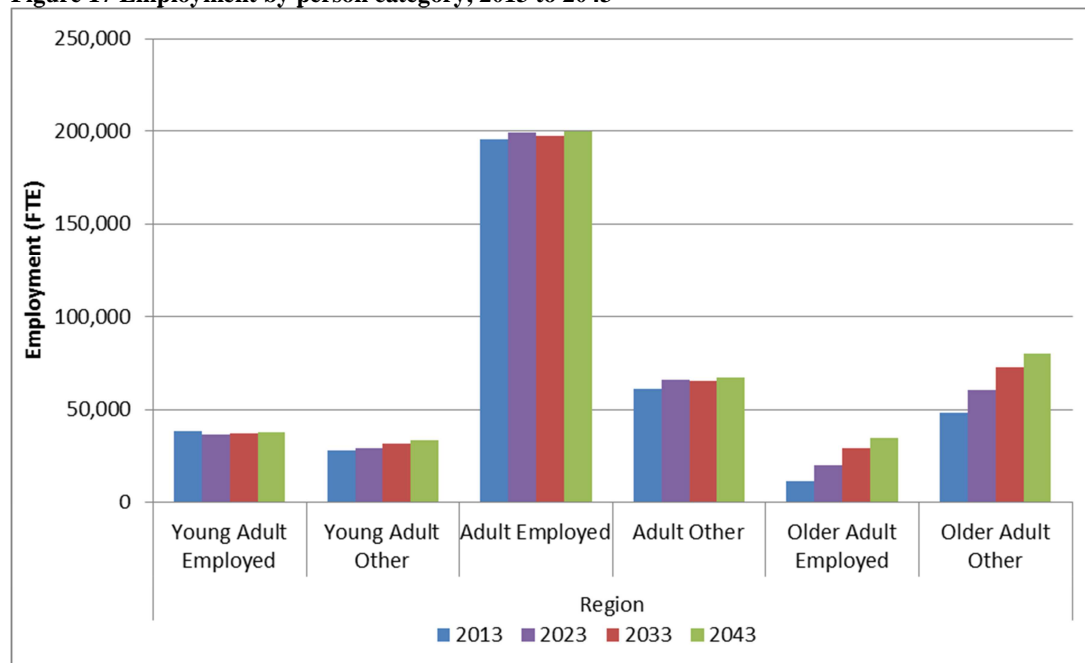
This is based upon trends derived from the BERL employment projections (documented previously in section 3.4.3) that suggest employment growth will be strongest in the retail and service sectors.

6.3.2 Employment by person category

Figure 17 below shows how employment by person category (employed, part-time or full-time, or other) is forecast to change through time.

These figures are inputs into WTSM, derived from Statistics NZ future projections – this process was documented in section 3.2.3 of this report).

Figure 17 Employment by person category, 2013 to 2043



It shows that whilst there is forecast to be some small growth in the number of younger adults and older adults in employment, most growth in employment is forecast to occur amongst the older adult segment of the population.

This growth rate, which slows through time, is a reflection of recent trends and a result of an increasingly ageing population combined with increased life expectancy, meaning that more older adults are able and willing to stay in employment past 65.

6.3.3 Population, Labour Force and Employment

Table 23 below shows the percentage of the current regional population and employment attributable to each TA, together with the percentage of the forecast growth in population / employment attributable to each TA.

Table 23 Percentage of regional population and employment by TA, 2013 to 2043

	% of regional total		% of regional growth						% of regional total	
	2013 Base		2013 to 2023		2023 to 2033		2033 to 2043		2043	
	Pop	Emp	Pop	Emp	Pop	Emp	Pop	Emp	Pop	Emp
Wellington	41%	58%	56%	82%	71%	91%	69%	87%	44%	61%
Lower Hutt	21%	17%	4%	3%	2%	4%	3%	8%	19%	16%
Upper Hutt	8%	5%	9%	2%	4%	1%	5%	2%	8%	4%
Porirua	11%	6%	13%	6%	6%	3%	7%	3%	11%	6%
Kapiti	10%	6%	13%	5%	13%	3%	13%	3%	11%	6%
Wairarapa	5%	5%	4%	1%	4%	-2%	3%	-2%	8%	7%
Region	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

The data shows that in 2013, Wellington City had 41% of the region's population but 58% of the region's employment.

The projections suggest that Wellington City's will account for around 2/3rd of regional population growth between 2013 and 2043 and between 80% and 90% of employment growth during the same period.

The net result will be Wellington City's share of regional population increasing to 44% in 2043 (from 41% in 2013) and employment increasing to 61% (from 58%).

As highlighted previously in this report (section 3.4.2), Wellington City has more jobs than employed persons whilst other TAs have more employed persons than jobs, resulting in more peak commuter trips between other TAs and Wellington City.

The projections suggest that the current patterns will be reinforced in the future, with most future new jobs located in Wellington City. These jobs will be filled, primarily, by persons living in Wellington City, augmented persons living elsewhere in the region.

Table 24 shows how population, employed persons and jobs are forecast to change (in absolute and percentage terms) between 2013 and 2043, together with 2013 and 2043 labour force participation rates.

Table 24 Change in population, employed persons, jobs and LFPR, by TA, 2013 top 2043

	Population		Employed persons		Jobs		LFPR	
	Abs	%	Abs	%	Abs	%	2013	2043
Wellington	41,100	20.5%	20,900	18.9%	22,900	16.7%	68.6%	65.5%
Lower Hutt	2,000	2.0%	1,300	2.7%	1,200	3.0%	63.0%	60.5%
Upper Hutt	4,100	9.9%	900	4.5%	500	4.4%	63.2%	56.9%
Porirua	5,900	11.0%	2,000	8.3%	1,100	7.3%	62.3%	57.1%
Kapiti	8,400	16.6%	1,700	7.9%	1,000	7.1%	53.8%	48.0%
Carterton	700	2.8%	-400	-3.5%	-200	-1.8%	60.3%	53.4%
Masterton	900	11.4%	100	2.6%	100	3.3%	61.9%	53.1%
S Wairarapa	700	7.2%	-200	-4.1%	-100	-2.7%	63.9%	54.1%
Region	63,900	13.1%	26,200	10.7%	26,600	11.3%	64.2%	60.2%

Table 24 shows the following:

- growth in population (13.1%) is forecast to exceed growth in employed persons (10.7%) due to an ageing population, a significant proportion of which won't work, outweighing migration of employed persons and any older adults who themselves might remain employed after 65 years of age
- at a regional level, growth in jobs is slightly higher than growth in employed persons
- growth in jobs in Wellington City is forecast to exceed the growth in employed persons within Wellington City, whilst elsewhere in the region any growth in employed persons is forecast to exceed any growth in jobs, with the net effect likely to be a small but significant increase in employed persons commuting to Wellington from elsewhere in the region for work
- the labour force participation rate is forecast to decline, a result of an ageing population and the fact that the growth in the number of older people not working is likely to exceed any growth in older people who remain in the workforce, which combined with little change in employment rates amongst young adults / adults results in a decline in the LFPR

7. School and tertiary rolls

7.1.1 Primary roll

It is assumed that changes in the primary school roll will be largely driven by changes in the number of children aged between 5 and 10 years old at a TA and local level.

Table 25 below shows the projected change in the number of children aged 5 to 10 years of age, by TA, for each modelled year, together with the forecast growth rate. The data is taken from the projections documented in Chapter 6.

Table 25 Children aged 5 to 10 years of age by TA, 2013 to 2043

	2013	2023		2033		2043	
		Abs	% cf 2013	Abs	% cf 2013	Abs	% cf 2013
Wellington	13,600	13,500	-1%	14,200	4%	14,200	8%
Lower Hutt	8,500	8,100	-5%	7,900	-7%	7,600	-11%
Upper Hutt	3,200	3,200	-2%	3,200	-1%	3,100	1%
Porirua	5,200	5,200	1%	5,100	0%	5,000	0%
Kapiti	3,800	3,800	1%	4,000	6%	3,900	6%
Wairarapa	3,400	3,300	-4%	3,200	-6%	3,100	-9%
Region	37,700	37,100	-2%	37,700	0%	37,000	0%

It shows that, across the region, the number of children aged 5 to 10 yr is forecast to remain largely unchanged between 2013 and 2043, a result of decreasing fertility rates.

This overall regional trend masks differences at a TA level. Only Wellington City is forecast to see any significant growth in children aged between 5 and 10 years of age, with no growth or indeed declines (Lower Hutt and the Wairarapa) across the remainder of the region.

The growth rates above were firstly applied to current base year school roll numbers at a TA level, with the implicit assumption that school roll numbers would increase in proportion to the number of children of primary age in each TA. This assumes that no children live in one TA and go to primary school in another.

The second part of the process was to review the school roll projections at a local zonal level to ensure that significant committed development was accounted for in terms of increase primary school roll numbers in that or neighbouring areas. For example, in Wellington's northern suburbs, population growth is forecast to generate a significant increase in children of primary school age, which would need to be reflected in school roll projections for schools in the vicinity of the growth areas.

7.1.2 Secondary roll

It is assumed that changes in the secondary school roll will be largely driven by changes in the number of children aged between 11 and 16 years old at a TA and local level.

Table 26 below shows the projected change in the number of children aged 11 to 16 years of age, by TA, for each modelled year, together with the forecast growth rate. The data is taken from the projections documented in Chapter 6.

Table 26 Children aged 11 to 16 years of age by TA, 2013 to 2043

	2013	2023		2033		2043	
		Abs	% cf 2013	Abs	% cf 2013	Abs	% cf 2013
Wellington	13,300	14,700	10%	14,500	9%	14,700	10%
Lower Hutt	8,400	8,300	-1%	7,600	-9%	7,300	-13%
Upper Hutt	3,500	3,400	-3%	3,200	-10%	3,100	-12%
Porirua	5,000	5,000	-1%	4,700	-6%	4,600	-8%
Kapiti	3,900	3,900	-1%	3,800	-2%	3,700	-5%
Wairarapa	3,500	3,300	-6%	3,100	-13%	2,900	-17%
Region	37,700	38,600	2%	37,000	-2%	36,300	-4%

It shows that, across the region, the number of children aged 11 to 16yr is forecast to decline by around 4% between 2013 and 2043.

This overall regional trend masks differences at a TA level. Only Wellington City is forecast to see any significant growth in children aged between 11 and 16 years of age, with declines elsewhere in the region.

The growth rates above were firstly applied to current base year school roll numbers at a TA level, with the implicit assumption that secondary school roll numbers would increase in proportion to the number of children of secondary age in each TA.

This assumes that no children live in one TA and go to secondary school in another TA. Whilst limited anecdotal evidence suggests that some inter TA school travel may occur in peak periods - rail alighting counts at Wellington Station suggest that around 1,000 school children arrive there each morning – we do not know enough about school children’s travel patterns to accurately incorporate this information into the secondary school roll projections.

The second part of the process was to review the school roll projections at a local zonal level to ensure that significant committed development was accounted for in terms of an increase in secondary school roll numbers in the vicinity of the development.

Whilst it is acknowledged that there are only a limited number of secondary schools across the region and that students might not (particularly in the case of Wellington) study at the school that is nearest to them, not enough is known about school travel patterns to accurately incorporate this information into the future secondary roll projections.

7.1.3 Tertiary Roll

Tertiary roll is more difficult to estimate than primary / secondary roll due to uncertainties relating to:

- future migration (many students are temporary migrants to New Zealand)
- poor quality base year information regarding current tertiary rolls – some institutions (language schools) are registered at addresses that are different from the actual location of the school / college
- lack of information from tertiary institutes regarding future expansion plans and aspirations.
- no direct correspondence between persons attending a tertiary education establishment and an age category in WTSM – whilst it is assumed that young adults (17 to 25) should account for the majority of full or part time students, a small but growing percentage of adults (over 25) will attend tertiary establishments

Table 27 below shows the WTSM projections for the number of young adults who are not employed, by TA, for each modelled year, together with the forecast growth rate. The data is taken from the projections documented in Chapter 6.

Table 27 Young adults by TA, 2013 to 2043

	2013	2023		2033		2043	
		Abs	% cf 2013	Abs	% cf 2013	Abs	% cf 2013
Wellington	14,200	16,700	18%	19,900	40%	21,300	50%
Lower Hutt	5,100	4,500	-12%	4,200	-17%	4,100	-20%
Upper Hutt	1,700	1,700	1%	1,600	-5%	1,600	-6%
Porirua	3,100	2,900	-5%	3,000	-4%	3,100	-1%
Kapiti	1,600	1,500	-8%	1,500	-10%	1,500	-11%
Wairarapa	1,600	1,300	-17%	1,300	-19%	1,300	-16%
Region	27,400	28,700	5%	31,500	15%	32,800	20%

Around 75% of current tertiary places are situated in Wellington City, many centred on the two Universities (Victoria and Massey), the hospital, language schools and further education establishments such as Weltec.

Table 27 shows that the number of young adults in Wellington City is forecast to increase by 50% between 2013 and 2043, with a decline in young adults elsewhere in the region. This is likely to reflect a future scenario where a possible increase in the popularity of distance learning will be outweighed by an increasing number of foreign students and local students are attracted to the two Universities, higher education establishments and language schools.

Therefore in the absence of any more detailed information it is assumed that tertiary roll numbers will increase in line with the absolute increase in young adults presented in **Table 27** for Wellington City and in line with percentage changes for the other TAs, with growth focussed on the two Wellington universities.

The rationale for this approach is that there is a significant difference between the number of young adults classified as ‘other’ (~27,000 in 2013) and tertiary roll numbers (~51,000) in 2013. Even if young adults working part-time were included in the analysis, it would only add an additional ~13,000 persons, still resulting in a significant shortfall compared with the number of tertiary places.

Therefore as the student cohort is not as simple and homogenous as others, our preferred approach was to use a simple assumption.

The resulting tertiary roll projections from this process are shown in **Table 28** below:

Table 28 Tertiary Roll projections, by TA, 2013 to 2043

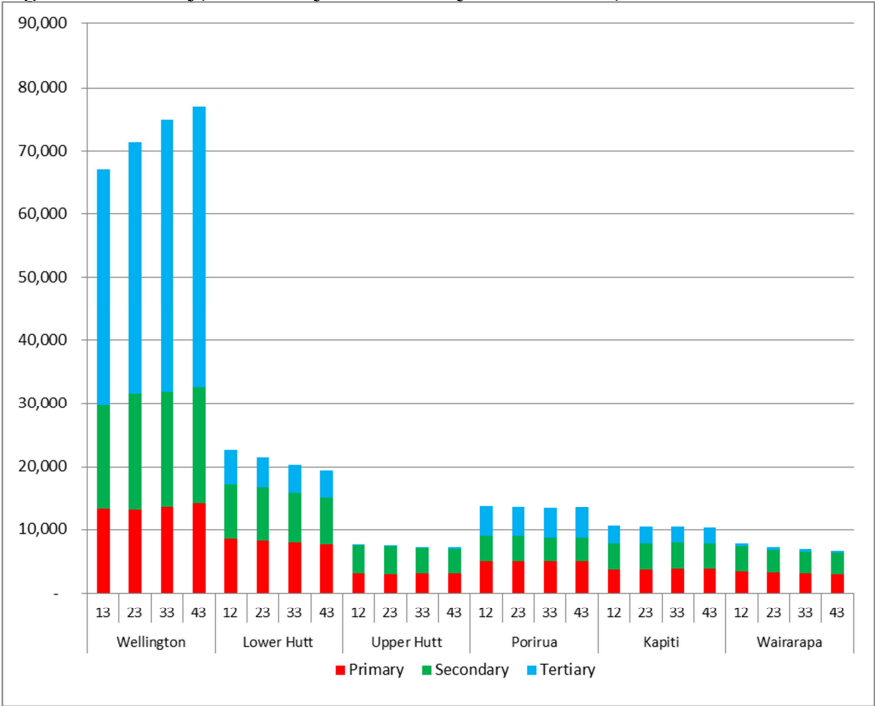
	Tertiary		
	2013	2043	% change cf 2013
Wellington	37,300	44,300	18.8%
Lower Hutt	5,400	4,300	-20.4%
Upper Hutt	200	200	0.0%
Porirua	4,900	4,900	0.0%
Kapiti	2,800	2,500	-10.7%
Wairarapa	500	300	-40.0%
Region	51,100	56,500	10.6%

The data shows that currently, Wellington accounts for around 75% of the total tertiary roll in the region. There is forecast to be a 7,000 increase in the tertiary roll in Wellington between 2013 and 2043, with a corresponding decrease of around 1,500 in the tertiary roll across the remainder of the region between 2013 and 2043.

The net result is forecast to be a 10% increase in tertiary roll between 2013 and 2043, with all growth focussed on Wellington City for reasons outlined previously in this section.

Figure 18 below summarises projected changes in primary, secondary and tertiary school roll numbers between 2013 and 2043, highlighting again how the current dominance of Wellington City, particularly in relation to tertiary roll numbers, is forecast to increase in the future

Figure 18 Primary, Secondary and Tertiary roll numbers, 2013 to 2043



7.1.4 Summary

The approach taken for developing future primary, secondary and tertiary projections was deliberately simple, due to limitations in terms of data and understanding (particularly relating to the tertiary roll).

Home-based education trips comprise a relatively small proportion (around 5%) of daily trips within the region. Therefore whilst there are some acknowledged uncertainties regarding the assumptions and the projections themselves, given that education accounts for such a small proportion of daily trips, the potential impact of this uncertainty is low.

Therefore the approach taken to developing the primary, secondary and tertiary school roll projections is approximate but considered appropriate.

8. Spatial distribution of growth

A number of GIS plots have been produced to show forecast changes in population, employment and households between 2013, the various intermediate years and 2043.

The purpose of these plots is to:

- provide a visual representation of where growth is forecast to occur
- provide a visual representation of the magnitude of this growth
- provide a means of checking that the growth areas identified by the various territorial authorities are the areas where the projections suggest that growth will occur

Figure 19 Population growth, 2013 to 2043

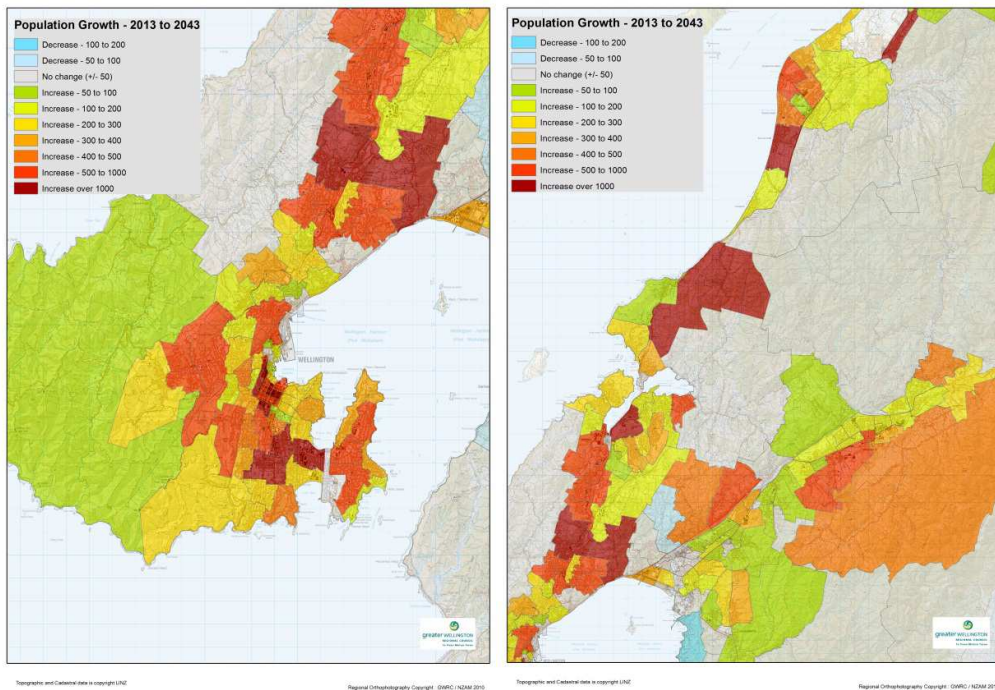


Figure 19 above show that population growth is forecast to be located in the following areas:

- Wellington CBD – Te Aro
- Wellington's southern suburbs of Newtown, Berhampore and Kilbirnie, driven by growth and intensification
- Wellington's northern suburbs, driven by growth associated with the Lincolnshire Farms and Stebbings Valley developments and intensification
- Upper Hutt – Wallaceville, Maymorn and Whiteman's Valley

- Porirua – Aotea block and north of Plimmerton
- Kapiti – Raumati south and Waikanae North

These areas correspond to the areas identified during the TA discussions and incorporated into the demographic inputs, allowing us to conclude at a high level that the forecasts appear representative of the input assumptions relating to the spatial distribution of forecast population growth across the region.

Figure 20 Employment growth, 2013 to 2043

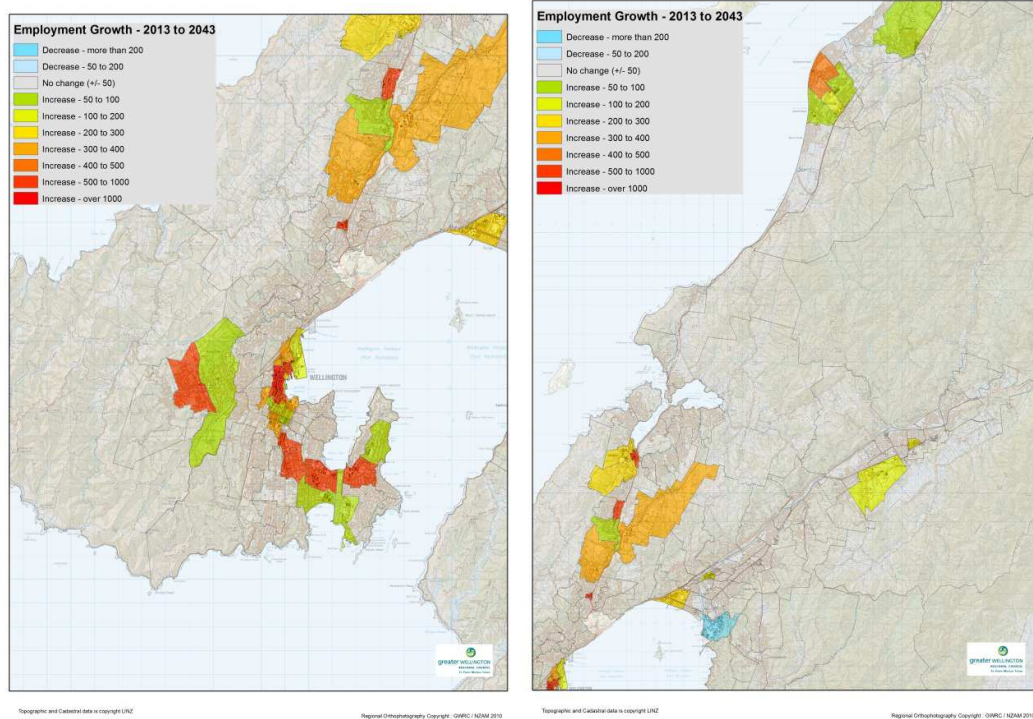


Figure 20 above show that employment growth is forecast to be located in the following areas:

- Wellington CBD – Lambton Quay
- Wellington’s growth nodes – Newtown, Berhampore, Kilbirnie, Tawa, Johnsonville, Karori
- Kapiti and Porirua city centres

These areas correspond to employment areas that were identified during TA discussions and incorporated into the input demographic assumptions.

9. Benchmarking against previous projections

The demographic projections developed for the previous 2011 version of WTSM were essentially re-based versions of the projections developed by MERA for WTSM 2006.

Whilst the projections and growth rates documented in this report will be different to those developed in 2006, the drivers of changes are no different in 2013 compared with 2006:

- ageing population
- declining fertility rates
- declining labour force participation rates
- lower household sizes.

Therefore the 2013 and 2011 (rebased from 2006) WTSM projections should exhibit similar trends and relationships.

9.1 High level population and employment comparisons

Table 29 below presents the following:

- a comparison of 2006 and 2013 Census population and employment figures, by TA, showing observed trends in the region between 2006 and 2013
- population and employment growth, by TA, between 2011 and 2041 according to WTSM 2011
- population and employment growth, by TA, between 2013 and 2043 according to WTSM 2013

Table 29 Population and employment projections – WTSM 2011 and WTSM 2013

Population												
	Census – 2006 to 2013					WTSM 2011 to 2041				WTSM 2013 to 2043		
	2006	Abs diff 06 to 13	% diff 06 to 13	2013		2011	Abs growth 11 to 41	% growth 11 to 41		2013	Abs growth 13 to 43	% growth 13 to 43
Wellington	179,900	10,900	+6.1%	190,900		191,200	46,600	+24.4%		200,300	41,100	+20.5%
Porirua	48,700	3,000	+6.2%	51,700		51,400	400	+0.8%		53,700	5,900	+11.0%
Lower Hutt	97,900	300	+0.3%	98,200		99,700	-1,400	-1.4%		101,100	2,000	+2.0%
Upper Hutt	38,600	1,600	+4.1%	40,200		40,200	-1,200	-3.0%		41,400	4,100	+9.9%
Kapiti	46,300	2,800	+6.0%	49,100		49,100	13,600	+27.7%		50,700	8,400	+16.6%
Wairarapa	38,700	2,500	+6.5%	41,100		39,400	-3,000	-7.6%		42,400	2,400	+5.7%
Region	450,000	21,100	4.7%	471,100		471,000	55,000	11.7%		489,500	63,900	13.1%
Employment												
	Census – 2006 to 2013					WTSM 2011 to 2041				WTSM 2013 to 2043		
	2006	Abs diff 06 to 13	% diff 06 to 13	2013		2011	Abs growth	% growth		2013	Abs growth	% growth

						11 to 41	11 to 41			13 to 43	13 to 43
Wellington	129,900	7,300	+5.6%	137,300	134,000	25,000	+18.7%		137,300	22,900	+16.7%
Porirua	14,700	400	+2.7%	15,100	17,000	2,000	+11.8%		15,100	1,100	+7.3%
Lower Hutt	44,100	-3,600	-8.2%	40,500	44,100	3,700	+8.4%		40,500	1,200	+3.0%
Upper Hutt	12,100	-800	-6.6%	11,300	11,900	1,000	+8.4%		11,300	500	+4.4%
Kapiti	14,500	-500	-3.4%	14,000	15,200	3,000	+19.7%		14,000	1,000	+7.1%
Wairarapa	18,200	-700	-3.8%	17,500	18,300	300	+1.6%		17,500	-200	-1.1%
Region	233,600	2,200	0.9%	235,800	240,500	35,000	14.6%		235,800	26,600	11.3%

The information shows the following:

Census comparison

- the regional population grew by 4.7% between 2006 and 2013, yet employment grew by only 0.9% during the same period, largely a result of the GFC
- Wellington, Porirua and Kapiti had similar population growth rates (~6%) whilst Upper Hutt (4.1%) and, particularly, Lower Hutt (0.3%) had lower growth rates
- over 80% of population growth was focussed in Wellington and up the western coast towards Porirua and Kapiti
- employment declined in all TAs apart from Porirua (+400 jobs) and Wellington (+7,300 jobs), further highlighting the dominance of Wellington as the place for employment

WTSM comparison - population

- the WTSM 2011 projections had Wellington City (24%) and Kapiti (27%) as the only TAs where population would grow between 2011 and 2041
- in WTSM 2011, Wellington City (+46,000) was forecast to account for around 75% of population growth between 2011 and 2041 with Kapiti (+13,600) accounting for the remainder
- in WTSM 2013, forecast growth is more evenly spread across the region, largely reflective of observed growth rates between 2006 and 2013
- Wellington City is projected to have slightly lower growth between 2013 and 2043 (+41,100; 20.5%) compared with WTSM 2011, although it is still forecast to account for 2/3rd of population growth in the region
- WTSM 2013 forecasts lower population growth in Kapiti (16.5% vs 27.7%)
- population growth projections for other TAs in the region largely follow the same general trends as seen in the 2006 and 2013 Census data

WTSM comparison - employment

- in WTSM 2011, whilst employment growth in absolute terms was focussed on Wellington City, there was also forecast to be growth in employment of between 8% and 11% in other TAs even where the population was forecast to decline
- in WTSM 2013, employment growth is more closely correlated with population growth
- in both WTSM 2011 and 2013, Wellington City accounts for between 70% and 80% of growth in employment over each models 30 year time periods

9.2 Detailed comparison of WTSM 2011 and WTSM 2013 projections

Table 30 below summarises some of the key metrics between WTSM 2011 and WTSM 2013 demographic projections.

For each model, growth over the entire 30 year period is reported – i.e. for WTSM 2011 that is from 2011 to 2041, for WTSM 2013 that is from 2013 to 2043

Table 30 Comparison of trends between WTSM 2011 and WTSM 2013

	WTSM 2011: 2011 to 2041	WTSM 2013: 2013 to 2043
% increase in population	11.7%	13.1%
Population composition		
% increase in children	-4.0%	-5.1%
% increase in young adults	-2.8%	7.6%
% increase in adults	6.5%	3.8%
% increase in older adults	89.2%	91.5%
Labour Force		
% increase in labour force	16.4%	18.2%
% increase in employed persons	18.1%	10.7%
% increase in older adults (employed)	383.8%	197.6%
Households		
Increase in households	25.0%	23.7%
Change in average HH size	2.70 to 2.41	2.70 to 2.47
Employment and LFPR		
% increase in jobs	14.6%	11.3%
Change in labour force participation rates	64.8 to 65.7	64.2 to 60.2
Education		
% increase in primary roll	-7.8%	-0.1%
% increase in secondary roll	-5.9%	-3.0%
% increase in tertiary roll	-0.4%	10.7%

The similarities and differences between the WTSM 2011 and WTSM 2013 models are summarised and explained below:

- population growth rates are broadly similar – 11.7% (2011) vs 13.1% (2013)
- there is a larger increase in younger adults in WTSM 2013 (7.6%) compared with WTSM 2011 (-2.8%). This can be explained as follows:

- the WTSM 2013 base number of young adults (~65,000) is greater than the previous estimate used for WTSM 2011 (~60,000)
- growth in young adults is driven by students numbers within Wellington City – this trend is also apparent when looking at the .ID population projections that forecasts strong growth in persons in the 15-19 and 20-24 age groups in Wellington

- the increase in the size of the labour force is broadly the same between WTSM 2011 (16.7%) and WTSM 2013 (18.1%)
- the increase in employed persons is lower in WTSM 2013 (10.7%) compared with WTSM 2011 (18.1%) for the following reasons:

- the percentage increase in older adults employed is much lower in WTSM 2013 compared with WTSM 2011 – this is because WTSM 2013 starts from a much higher base, as there has been a significant increase in the number of older adults employed between 2006 (effectively the base for the WTSM 2011 projections) and 2013, meaning that any further increase in older adults employed will be less (in percentage terms)
- a slight reduction in the growth in adults (26 to 64 years olds) between WTSM 2011 (6.5%) and WTSM 2013 (3.7%); these are the cohort that provide most of the labour force
- an increase in young adults, particularly those who are students (and thus not employed), driven by increased student numbers in Wellington

- the increase in households is broadly similar between WTSM 2011 (25%) and WTSM 2013 (23%) with a correspondingly similar reduction in average household size
- the percentage increase in jobs is lower than the percentage increase in employed persons in WTSM 2011 but the same in WTSM 2013, since growth in jobs being tied to growth in employed persons in WTSM 2013
- the LFPR increases in WTSM 2011 (from 64.8 to 65.4) yet decreases in WTSM 2013 (from 64.8 to 60.2), as WTSM 2013 reflects recent information and likely future trends which suggest that an ageing population will start to outweigh any increase in older persons working beyond retirement age, leading to a reduction in the LFPR over the medium to long term
- primary and secondary school roll figures are projected to decline in WTSM 2013, though not to the same extent as was forecast in WTSM 2011
- tertiary roll numbers are forecast to increase in WTSM 2013 (7%) compared with a decline in WTSM 2011 (2%), this difference being driven by forecast increases in the number of 17 to 24 year olds living and studying in Wellington City, a trend that is apparent from the .ID profile forecasts for Wellington City

10. Summary

10.1 Purpose of projections

The projections outlined in this report have been made at one point in time (March 2015) based upon available evidence and a range of assumptions.

Their main purpose is to provide inputs to 2023, 2033 and 2043 versions of WTSM that is a tool for, amongst others, evaluating transport policy and schemes.

Uncertainty relating to the projections and underlying assumptions increases through time, meaning that less confidence is placed upon longer term projections compared with shorter to medium term projections.

Whilst a degree of certainty exists around future birth and death rates, migration is the factor that has the greatest uncertainty around it yet has been the major factor behind recent increases in population (and will remain the major factor in the future).

It is therefore important that the projections developed and documented in this report are not taken as a single point of truth relating to the future, but rather what could be considered an 'expected future' based on historic trends and current information, that can form the starting point for the development of additional future scenarios that will be developed to determine how sensitive a project or set of outcomes might be to variations to this 'expected future'.

10.2 Summary of projections

This report documents the process for developing population, employment, household and school roll projections for input into the 2023, 2033 and 2043 versions of WTSM

In summary, the process was as follows:

- initial population, employment and household projections were developed, drawing upon data from Statistics NZ, .ID, BERL and local authority plans
- these initial projections were summarised and circulated to project stakeholders – local authorities and NZTA
- discussions were held between these parties and GWRC, focussing on the initial projections and obtaining local insight that could be used to develop and add detail to the projections
- based on these discussions, the initial projections were revised and moderated, to take into account new information, be faithful to local development plans / areas whilst also remaining constrained by Statistics NZ regional growth totals and trends
- school roll projections were developed from the relevant population projections
- the revised population, employment, household and school roll projections were presented and analysed, to verify the process and identify the emerging demographic trends

- pictorial representations of future growth were produced as a visual means to verify the projections

The most significant change between the initial and revised projections related to population growth in Wellington City between 2033 and 2043. Whilst the .ID projections, used for the initial forecasts, suggested population growth rates would increase through time, this was contrary to Statistics NZ local, regional and national projections that suggest population growth rates will decline through time, partly the result of an ageing population.

The fact that the period 2033 to 2043 is 20 to 30 years into the future, where a greater level of uncertainty can be applied to the projections, combined with the fact that longer range forecasts (such as 2043) have historically not been used as extensively as short to medium term forecasts such as 2023 and 2033, it was considered appropriate to slightly adjust the 2043 projections to make the local trends more comparable with regional and indeed national trends.