

The mathematics of electorate
allocation in New Zealand based on the
outcome of the 2018 Census and
Māori Electoral Option 2018





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Purpose and summary

The mathematics of electorate allocation in New Zealand based on the outcome of the 2018 Census and Māori Electoral Option 2018 outlines how the number of electoral districts (also known as electorates) in New Zealand is calculated, as specified in the [Electoral Act 1993](#). It describes how concepts from the Electoral Act 1993 were implemented in the Government Statistician's electoral population calculations, using the results of the 2018 Census and the Māori Electoral Option 2018.

Once the Government Statistician has carried out these calculations and reported them to the Surveyor General and other members of the Representation Commission, it is the task of the Surveyor General to draw up provisional boundaries. The Commission releases the proposed names and boundaries for public consultation and will hear objections and counter-objections before finalising the new electoral boundaries by (date to be advised).

Background to electoral population and district calculations

The Electoral Act 1993 arose from a redesign of the New Zealand electoral system, with major changes being made to the representation of the Māori population. As a result, the number of Māori electoral districts varies according to the proportion of Māori who choose to be on the separate Māori electoral roll. The number of general electoral districts was already variable and this ensured consistency. The allocation of electoral districts to the two electoral populations – Māori and general – is effectively based on four concepts.

Concept 1

Electoral representation is based on the usually resident population count in New Zealand, including children and others not eligible to vote. This is sourced from the Census of Population and Dwellings which is normally held every five years. Refer to section 3(1) of the Electoral Act 1993.

Concept 2

The census usually resident population count is split into two segments:

- The Māori electoral population (MEP) – a proportion of the census Māori descent usually resident population. This is based on the percentage of Māori descent electors who choose the Māori electoral roll. Included are electors who are registered on the main Māori electoral roll or the dormant Māori electoral roll. Refer to *Deriving the 2018 Māori descent electoral population* (Stats NZ, 2019) for a description of how Māori descent is calculated in the census for electoral purposes.
- The general electoral population (GEP) – the census non-Māori descent usually resident population and a proportion of the census Māori descent usually resident population that corresponds to the percentage of Māori descent electors who choose the general electoral roll. Included are electors who are registered on the main general electoral roll or the dormant general electoral roll. Refer to section 3(1) of the Electoral Act 1993.

Concept 3

There are approximately equal electoral populations in each Māori and general electoral district. Refer to sections 35(3) and 45(3) of the Electoral Act 1993.

Concept 4

There are 16 general electoral districts in the South Island. Refer to section 35(3)(a) of the Electoral Act 1993.

Electoral population calculations

The following sections outline the mathematics for the allocation of electoral districts. The mathematics have not changed since the Electoral Act 1993 was enacted.

Sections 35(3)(b), 35(3)(c) and 45(3)(a) of the Electoral Act 1993 specify that the calculations of electoral populations be carried out separately for New Zealand and the North and South islands.

To determine the number of electoral districts, the Electoral Act divides the census usually resident population of New Zealand into three groups:

- the North Island general electoral population (NI GEP)
- the South Island general electoral population (SI GEP)
- the Māori electoral population (MEP).

The methods for calculating the three electoral populations are provided below.

Māori electoral population

See [Concept 2](#).

We define the Māori electoral population (MEP) as the proportion of enrolled Māori descent electors who choose the Māori electoral roll, multiplied by the 2018 Census Māori descent usually resident population count. This means that the MEP includes people who are not enrolled on the electoral roll (such as children).

The calculation uses the following formula:

$$MEP = \frac{m}{m + g} d$$

where:

m is the total number of Māori descent electors registered on the Māori electoral roll

g is the total number of Māori descent electors registered on the general electoral roll

d is the total number of people of Māori descent in the census.

The proportion of enrolled Māori descent electors who choose the Māori electoral roll is of critical importance in all these calculations. We will refer to it as the Māori ratio (r):

$$r = \frac{m}{m + g}$$

The MEP is calculated at the national level using national totals, see table 1.

Table 1

Calculation of the 2018 Māori electoral population of New Zealand		
Population	Source	Number
Usually resident population count (u)	Census	4,699,755
Māori descent usually resident population count (d)	Census	896,567
Māori on Māori electoral roll (m)	Māori electoral roll	268,407
Māori on General electoral roll (g)	General electoral roll	240,273
Percent of Māori choosing Māori electoral roll (Māori ratio, r)	$r = m/(m + g)$	52.8
Māori electoral population	$MEP = r \times d$	473,077
Note: The New Zealand MEP is 473,077 (not 472,397), as it is calculated using the Māori ratio of New Zealand rather than the Māori ratios for the North and South islands.		

General electoral population

See [Concept 2](#).

The general electoral population (GEP) is the census usually resident population count (u) less the Māori electoral population.

$$GEP = u - MEP$$

To calculate the number of general electoral districts we need to calculate the GEP for each island, see table 2. The MEPs calculated here, at the island level, are only used for calculating the NI GEP and the SI GEP.

Table 2

Calculation of 2018 general electoral populations for each island			
Population	North Island	South Island	Chatham Islands
Census usually resident population count (u)	3,594,553	1,104,539	663
Māori descent population (d)	760,165	135,956	446
Māori on Māori electoral roll (m)	236,913	31,352	142
Māori on general electoral roll (g)	197,553	42,602	118
Percent of Māori choosing Māori electoral roll (r)	54.5	42.4	54.6
Māori electoral population (MEP) ($r \times d$)	414,516	57,637	244
General electoral population (GEP) ($u - MEP$)	3,594,553 – 414,516 = 3,180,037	1,104,539 – 57,637 = 1,046,902	663 – 244 = 419

The Electoral Act 1993 divides the census usually resident population into three groups as stated previously. Section 46(2) of the Electoral Act specifies how the GEP and MEP for the Chatham Islands will be treated. To complete the calculation of the GEPs (NI and SI), the Chatham Islands GEP is added to the South Island, while the Chatham Islands MEP is added to the North Island, shown in table 3.

Table 3

Calculation of 2018 electoral populations in the North and South islands		
Population	North Island	South Island
Total electoral population (u plus Chatham Island MEP and GEP)	3,594,553 + 244 = 3,594,797	1,104,539 + 419 = 1,104,958
Māori electoral population (Chatham Island MEP to North Island)	414,516 + 244 = 414,760	57,637
General electoral population ($u - \text{MEP}$)	3,594,797 - 414,760 NI GEP = 3,180,037	1,104,958 - 57,637 SI GEP = 1,047,321

Electoral district calculations

South Island electoral districts and quota

See [Concept 4](#).

The number of general electoral districts in the South Island is fixed at 16. Therefore, dividing the SI GEP by 16 gives the South Island quota (q_s), the average size of a South Island general electoral district.

For the 2018 calculations:

$$\begin{aligned} q_s &= 1,047,321 / 16 \\ &= 65,458 \end{aligned}$$

Māori electoral districts and quota

See [Concept 3](#).

The populations for each electoral district should be approximately equal. Therefore, the South Island quota is used to determine the number of Māori and North Island general electoral districts.

In the 2018 calculations, the number of Māori electoral districts (n_m) is determined by:

$$\begin{aligned} n_m &= \text{MEP} / q_s \\ &= 473,077 / 65,458 \\ &= 7.23 \end{aligned}$$

The result is rounded to the nearest whole number, where the fraction must exceed 0.5 to be rounded up (section 45(3)(b) of the Electoral Act), to give seven Māori electoral districts in 2018. The Māori quota (q_m), or average population for Māori electoral districts, is:

$$\begin{aligned} q_m &= \text{MEP} / n_m \\ &= 473,077 / 7 \\ &= 67,582 \end{aligned}$$

North Island electoral districts and quota

The South Island quota is used to determine the number of North Island electoral districts.

In the 2018 calculations, the number of North Island electoral districts (n_n) is determined by:

$$\begin{aligned} n_n &= \text{NI GEP} / q_s \\ &= 3,180,037 / 65,458 \\ &= 48.58 \end{aligned}$$

The result is rounded to the nearest whole number, where the fraction must exceed 0.5 to be rounded up (section 35(3)(c) of the Electoral Act), to give 49 North Island electoral districts. The quota for North Island electoral districts (q_n) is:

$$\begin{aligned} q_n &= \text{NI GEP} / n_n \\ &= 3,180,037 / 49 \\ &= 64,899 \end{aligned}$$

Approximately equal district populations

The method for calculating the number of electoral districts ensures that the individual quotas are as near to equal as possible, given that the number of electoral districts in each case has to be rounded to a whole number.

Sections 36 and 45(7) of the Electoral Act 1993 state that electoral district populations at formation may vary by up to 5 percent of their quota, shown in table 4.

Table 4

Summary of the 2018 electoral calculations			
Population	Māori	North Island general	South Island general
Electoral population	473,077	3,180,037	1,047,321
Number of electoral districts	7	49	16
Quota	67,582	64,899	65,458
Minimum district population	64,203	61,654	62,185
Maximum district population	70,961	68,144	68,731

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