Functional urban areas – methodology and classification

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Purpose and summary of methodology

Purpose

Functional urban areas – methodology and classification describes the methodology used to create the functional urban areas (FUA) classification.

The purpose of the FUA classification is to identify small urban areas and rural areas that are integrated with major, large, and medium urban areas to create FUAs, using an approach that:

- is realistic

- is consistent

- has transferability to a range of users

- produces results that can be understood and applied by users

- is easily maintained.

FUAs are based on the linkages between where a person lives and where they work, shop, access health care, and recreate – what can be called a person's activity space. According to the OECD, 'a functional urban area consists of a city and its commuting zone. Functional urban areas therefore consist of a densely inhabited city and a less densely populated commuting zone whose labour market is highly integrated with the city'.

Methodology

The FUA classification is based on the urban rural (UR) 2018 classification of urban areas and underlying statistical area 1s (SA1s). We used workplace address and usual residence address from the 2018 Census of Population and Dwellings to create FUAs by calculating the percentage of workers commuting from rural SA1s and urban areas with less than 5,000 residents to urban areas with 5,000 or more residents.

An FUA includes UR2018 urban areas, rural settlements, and rural SA1s where there is:

- an *urban core* – a major, large, medium, or small urban area with more than 5,000 residents, and may also include
- *one or more secondary urban cores* – major, large, or medium urban areas where at least 40 percent of workers commute to the urban core
- *one or more satellite urban areas* – small urban areas where at least 40 percent of workers commute to the urban core or associated secondary urban core
- *hinterland* – rural settlements or rural SA1s where at least 40 percent of workers commute to the urban core or associated secondary urban core, plus other rural SA1s that link satellite urban areas and secondary urban cores to the urban core.

We created 53 FUAs, which are categorised by population size. FUAs that have more than 100,000 residents living in their urban core are known as metropolitan areas, while smaller FUAs are divided into large, medium, and small regional centres.

We anticipate that the new FUA classification will be used widely. The term metropolitan area is often used by media and researchers but there are no commonly recognised boundaries for them.

With the release of the FUA classification, New Zealand metropolitan areas will be officially recognised and defined for the first time.

The FUA methodology and shapefile will be sent to the OECD for publication on their Functional urban areas by country webpage.

Go to the interactive webmap to view the FUA components and their population counts.

You can download, view, and query the FUA classification geospatial layer on the Stats NZ Geographic Data Service. The FUA classification and concordance to the UR classification is available to view and download in Stats NZ's classification system, Ariā.

Key words

Functional urban area; urban-rural; urban influence

Background

The [Statistical standard for geographic areas (SSGA) 2018](#) replaced the New Zealand Standard Areas Classification 1992. It is Stats NZ's official standard for statistical geographic areas in New Zealand. It allows statistical units, such as households, people, or businesses, to be assigned to the location where they live, work, and operate.

The SSGA includes the urban rural classification (UR) 2018, which classifies New Zealand into areas that share common urban or rural characteristics. It is a form-based geography, that is, urban and rural areas are delineated by what you can see on the ground.

There is a need for urban-rural geographies with a broader definition, especially for a geography that links semi-rural areas surrounding urban areas to the urban area where the rural residents work and access services.

In 2004, we published the Urban/rural (experimental) profile (UREP), which explored the diversity of social and economic characteristics of people in all areas of the urban-rural spectrum. We have reviewed the concepts and methodology used to create the UREP and developed the following two new classifications, grouped under the term urban influence (UI).

1. Urban accessibility (UA) classification – published in September 2020, this classification distinguishes rural areas based on their degree of accessibility to urban areas. For information about the methodology, visit [Urban accessibility – methodology and classification](#).
2. Functional urban area (FUA) classification (this paper) – delineates an urban core and its commuting zone. A draft FUA classification using 2013 Census commuting patterns was circulated to users for comment in 2018. After incorporating feedback, the methodology was applied to 2018 Census data and the revised FUAs and methodology are described in this paper.

The two UI classifications will provide increased understanding of the heterogeneity of rural areas and small urban areas and allow more extensive analysis and reporting. They are consistent with SSGA 2018 and international best practice. [Appendix 1](#) summarises the three urban rural classifications: UR, FUA, and UA.

This paper discusses urban concepts and describes the FUA methodology and classification. FUAs are shown on maps of the North and South Islands. [Appendix 2](#) lists the FUAs and their component urban areas and associated hinterland. It also shows the 2018 Census usually resident population (URP) counts for each FUA and its components.

You can download, view, and query the FUA classification geospatial layer on the Stats NZ [Geographic Data Service](#). The FUA classification and concordance to the UR classification is available to view and download in Stats NZ's classification system, [Ariā](#).

We thank stakeholders for their feedback on the 2013 draft FUAs and welcome further feedback on the new 2018 FUAs.

Urban concepts

The term urban is widely used and one that people intuitively understand – a concentration of population at a high density. It is the opposite of rural, where population is not concentrated but dispersed at a low density. But where does urban end or rural begin and are there different degrees of urban and rural?

There are at least three ways to measure urban areas:

1. from an administrative (and often historical) perspective
2. in terms of spatial characteristics (the form perspective)
3. in terms of social and economic processes (the functional perspective).

The administrative perspective

The administrative perspective refers to areas that are organised into incorporated municipalities, such as cities, districts, and regions, to establish governance and administer the provision of local services. Prior to 1974, New Zealand's local government areas were organised into city, borough, and county councils, with boroughs representing self-governing towns of more than 1,000 people. A borough of more than 20,000 people could become a city by proclamation. Boroughs and cities were collectively known as municipalities, and were enclaves separate from their surrounding counties. Boroughs proliferated in the suburban areas of the larger cities, for example, Port Chalmers, Mosgiel, St. Kilda, and Green Island borough councils, which were merged into the newly constituted Dunedin City Council in 1989 (Dunedin City Council, 2019).

The Local Government Act 1974 began the process of bringing urban, mixed, and rural councils into the same legislative framework. Its successor, the Local Government Act 2002, made provision for the establishment of 75 territorial authorities which replaced 205 territorial local authorities. The more populated councils are classified as cities and the more rural councils are classified as districts. In 2021, there are 67 territorial authorities: 12 city councils, 54 district councils, Auckland Council, and the Chatham Islands Council. The term 'city' is still used informally for all large towns.

Local government administrative areas are explained in more detail in the SSGA 2018 document.

The form perspective

The form perspective refers to physical form – what you can see on the ground. The attributes relating to physical form include population concentration, population density, and land use (for example, residential, commercial and industrial, transportation network development, farming, and open space). Urban and rural can be perceived as being opposite ends of a continuum. The urban end has high population concentration and density, intensive transportation development, residential, commercial and industrial land use but little – if any – farming and open space. Rural is the opposite (Statistics Canada, 2009).

The form perspective is similar to land use where urban areas can be distinguished from rural areas according to the proportion of land use dedicated to artificial landscapes such as residential/non-residential buildings, business areas, parks, and recreational areas.

Form perspective urban areas are used:

- to compare the economic performance and demographic characteristics of populations living in similar sized urban areas

- to measure and compare population densities between similar sized urban areas
- as a proxy for commercial, residential, and recreational land use zones within a local authority's district planning area.

The UR2018 classification, which replaced Stats NZ's urban area geography used until 2017, was designed on a form perspective. UR2018 separately identifies urban areas, rural settlements, other rural areas, and water areas. The urban areas represent densely developed spaces, and encompass residential, commercial, and other non-residential urban land uses. Rural settlements, other rural areas, and bodies of water represent areas not included within urban areas.

The functional perspective

The functional perspective is based on linkages between where a person lives and where they work, shop, access health care, and recreate – what can be called a person's activity space. When the activity spaces of many people are aggregated a socially and economically integrated area can be defined. This is referred to as a "functional area" (Statistics Canada, 2009).

From a socio-economic standpoint, the functional perspective distinguishes 'rural' areas according to their economy's accessibility to inputs (for labour market) and to outputs (transformation or consumption) and their population's accessibility to services and the labour market.

The functional perspective is more abstract than the form perspective in the sense that you cannot see the settlement limit as easily and because it can include what in the form perspective would be both urban and rural areas.

Functional urban areas include a central urban core and highly integrated outlying areas that can extend beyond a single urban area and often include more than one adjacent urban area. In general, the larger the central urban core, the stronger its influence over surrounding areas and the larger the functional area.

Functional urban areas are used:

- to monitor urbanisation and compare the performance of urban areas
- to analyse the competitiveness of large metropolitan areas to guide regional development policy
- as an evidence base to shape the linkages among cities for better strategic planning
- for international comparability with other countries.

Examples of functional areas internationally include: OECD functional urban areas, metropolitan and micropolitan areas (USA), census metropolitan areas and census agglomerations (Canada), and significant urban areas (Australia). All these methodologies use census commuting data as a proxy for socio-economic linkages.

The 1992 Urban areas (UA1992) geography main and secondary urban areas (with populations over 30,000) were designed on a functional form. They had to satisfy at least three of the following criteria:

1. strong economic ties
2. cultural and recreational interaction
3. serviced from the core for major business and professional activities
4. an integrated public transport network

5. significant workplace commuting to and from the central core
6. planned development within the next 20 years, as a dormitory area to, or an extension of, the central core.

The new FUA classification, described below, is designed using a functional perspective, where linkages between areas are measured using census commuting levels, based on numbers of people travelling regularly between their usual residence and their place of work.

Creating the FUA geography

Building blocks

The FUA classification is applied at the statistical area 1 (SA1) level. The geography also uses the UR2018 and IUR2018 classifications to define urban areas within FUAs. Rural settlements are not separately identified but those which are included in an FUA along with other rural SA1s are classified as hinterland.

SA1s are an output geography built by joining meshblocks, Stats NZ's smallest geography, to reach an ideal size range of 100-200 residents. They are small enough to allow enough granularity to separate hinterland from more remote rural areas.

Stats NZ is moving away from publishing data by meshblock because of the possibility of inadvertent disclosure of individuals' information. Although the target meshblock size is 30-60 dwellings, many meshblocks have only a few dwellings. Confidentiality rules imply that multi-variate meshblock tables, for example, census usually resident population by 10-year age group and sex, often contain many suppressed cells. The SA1 geography was designed to replace meshblock as an output geography and allow the release of more low-level data.

Data from the SA1 2018 Census individuals' and dwellings' datasets in the Stats NZ Geographic Data Service can be linked to the FUA classification to analyse demographic characteristics of people living in FUAs.

Definition

FUAs can be defined as:

> 'a functional urban area consists of a city and its commuting zone. Functional urban areas therefore consist of a densely inhabited city and a less densely populated commuting zone whose labour market is highly integrated with the city' (OECD, 2012).

FUAs can be useful as a proxy for determining socially and economically integrated areas based on the linkages between where people live and where they work, and subsequently learn, trade, and access facilities and services. They are centred on an urban core and include a peri-urban hinterland where a significant percentage of the working population commutes to the urban core.

FUA components

An FUA includes UR2018 urban areas, rural settlements, and rural SA1s where there is:

- an *urban core* – a major, large, medium, or small urban area with more than 5,000 residents, and may also include
- *one or more secondary urban cores* – major, large, or medium urban areas where at least 40 percent of workers commute to the urban core
- *one or more satellite urban areas* – small urban areas where at least 40 percent of workers commute to the urban core or associated secondary urban core
- *hinterland* – rural settlements or rural SA1s where at least 40 percent of workers commute to the urban core or associated secondary urban core, plus other rural SA1s that link satellite urban areas and secondary urban cores to the urban core.

Urban cores and secondary urban cores that are contiguous are generally known as conurbations. The joined-up Wellington, Upper Hutt, Lower Hutt, Porirua urban areas are an example of a conurbation.

Labour market areas are similar to FUAs. Labour market areas are self-contained geographic areas where the bulk of the labour force lives and works, and where employers can find the bulk of their labour force. The European Commission document Guidelines for labour market area delineation process: From definition to dissemination provides more information about labour market areas.

Methodology

FUAs were created using workplace address and usual residence address from 2018 Census of Population and Dwellings to identify workers commuting from an urban area with less than 5,000 residents or rural SA1 to a major, large, medium, or small urban area with 5,000 or more residents.

The percentage of workers commuting is derived from those workers with a valid usual residence address and workplace address response. The workplace address variable was given a "moderate" quality rating by Stats NZ. Where a workplace response could not be coded to meshblock, an attempt was made to code to SA2, territorial authority, or regional council. These higher-level geography responses are not used in the FUA derivations. See Change in commuting criteria applied for more information.

We tested different commuting percentages: 15 percent recommended in the OECD functional urban areas, 25 percent used in metropolitan and micropolitan areas (USA), 50 percent used in census metropolitan areas and census agglomerations (Canada), and an intermediate 40 percent cut-off.

The 40 percent commuting rule was chosen for the FUA classification because it delivers a reasonably consistent and compact FUA. A 15 or 25 percent cut-off delivers very large geographical areas that do not represent typical integrated areas for the New Zealand situation. A 50 percent cut-off results in a 'patchy' hinterland that needs to be filled in to create a solid FUA.

A commute-in criteria was used: workers commuting from a secondary urban core, satellite urban area, or rural SA1 into the urban and secondary urban cores. We also looked at outward commuting, that is, workers commuting from urban cores to satellite urban or rural areas, to determine whether workplace destinations should be included in an FUA. For example, the SA1 where the Tiwai Point aluminium smelter is located is included in the Invercargill FUA because many of its workers live in the Invercargill urban area and commute to Tiwai Point. Outward commuting was identified using Stats NZ business demography data to identify rural SA1s that had high employment counts in non-agricultural industries. We also used Google Maps to locate workplaces for organisations that are typically in rural areas, for example, dairy processing plants and prisons.

Initially, each urban area with a population of more than 5,000 was assumed to be an FUA urban core. Secondary urban cores were associated with a larger urban area, that is, joined to an FUA, when at least 40 percent of workers commuted to the larger urban area, or when more workers living beyond the smaller urban area commuted to the larger urban area. Multiple cores within an FUA were treated as a single destination, for example, rural SA1s south of Pukekohe were added to the Auckland FUA if more than 40 percent of workers commuted to the Auckland or Pukekohe urban areas.

Small regional centres were created for independent small urban areas with 2018 URP of 5,000– 9,999 and their surrounding hinterland.

A broader definition was used for small regional centres, as commuting was more diverse:

- at least 40 percent of workers living in a rural SA1 commute to an urban area of any size.

Many of these small regional centres extend over quite large rural geographic areas, and the population living in the hinterland often reaches 30 percent of the total population of the functional area. Examples include Alexandra, Kaitaia, Kerikeri, and Warkworth. Small regional centres often provide services to surrounding farmland and may be more like labour market areas than FUAs.

Adjustments

Some adjustments were made to take account of the local geography, underlying SA1 pattern, non-working populations, and tourist areas. The perimeter of each FUA was examined to adjust for any anomalies. Some rural SA1s that exceeded the commuting rule were left out of their adjacent FUA because they had small populations (fewer than 20-30 workers) unless they had a very high percentage commuting, were sparsely populated, or were very large in land area. Some rural SA1s that did not meet criteria were left in to act as corridors to high commuting areas.

For rural SA1s and small urban areas where more than 40 percent of workers commuted to more than one urban core in opposite directions, we joined the statistical area to the FUA with the highest level of commuting. But sometimes, we had to join the statistical area to the nearest FUA. For example, some rural SA1s to the south of Warkworth had higher percentage of workers commuting to Auckland, which is a larger labour market, but they were joined to the Warkworth FUA to ensure compact shapes for both the Warkworth and Auckland FUAs.

The use of SA1s as the underlying building block to create the FUAs, has resulted in some FUAs being larger in area than they may have been if meshblocks had been used. Some rural SA1s cover a large area with a scattered population or population concentrated in a small part of the SA1, which is typically closer to the urban area than more distant parts of the SA1. In these cases, there was a trade-off between adding a large area to the FUA and including the population that met the commuting criteria. The number of workers, percentage commuting, the SA1 area, and neighbouring SA1s were considered when choosing whether to include it in the FUA or not. We may split or reconstitute some SA1s and underlying meshblocks to separate more densely populated areas from sparsely populated areas during statistical geography maintenance scheduled for 2021. Note if these changes are made, the FUA boundaries will change, and although the population affected will be minimal, the FUA geographic areas could be noticeably smaller.

Summary of steps taken to construct the classification

The aim was to keep the methodology as simple and easy to maintain as possible while attaining adequate accuracy and consistency. The steps are described below.

Step 1.   Identify target FUAs

Firstly, we created a list of potential functional areas from UR2018, that is, urban areas with more than 5,000 residents.

Step 2.   Prepare dataset

We then prepared the travel-to-work dataset at statistical area 1 (SA1) level and linked rural SA1s to the UR2018 urban areas. Commuting percentages for each rural SA1, rural settlement, and large, medium, or small urban area were calculated, using the formula:

$$\text{Commuting percentage} = \frac{\underline{\text{commuted to a major, large, or medium urban area}}}{\text{total workers in the statistical area}} \times 100$$

Step 3.   **Connect urban cores/conurbations**

For major, large, and medium urban areas, we applied the *integrated urban core rule* where: at least 40 percent of workers commute to another nearby urban core.

Step 4.   **Identify satellite urban areas**

For small urban areas, we applied *the urban area forward commuting flow rule* where: at least 40 percent of workers living in the (satellite) small urban area work in the urban core or associated secondary urban core.

Step 5.   **Identify hinterland SA1s and settlements**

For rural settlements and other rural SA1s, we applied the *rural area forward commuting flow rule* where: at least 40 percent of workers living in the area work in the urban core or associated secondary urban core.

Step 6.   **Apply spatial contiguity rules**

We identified outliers to *include or exclude* from the FUA.

We included: 'patchy' holes where small urban areas and rural SA1s do not meet the rural area commuting flow rule but are closer to the urban core than more distant areas that do meet the rule.

*We excluded: '*outlier' SA1s and meshblocks that meet the rural area commuting flow rule but are further away from the urban core than areas that do not meet the rule.

Step 7.   **Make final manual adjustments**

We applied manual adjustments in situations where the rules cannot be easily applied, where for example:

- commuters within a small urban area or rural SA1 travel to more than one FUA
- there is outwards commuting. We used Stats NZ business demography data where rural SA1s had high employment counts and websites to find worksites, such as dairy processing plants and prisons, in rural areas.
- we adjusted for rural SA1s that contained a very small number of commuters.

Step 9.   **Classify FUA by population size**

We assigned FUAs a category of metropolitan area (urban core 100,000+), large regional centre (urban core 30,000–99,999), medium regional centre (urban core 10,000–29,999), or small regional centre (urban core 5,000–9,999).

Findings

Typically for the urban cores, at least 60 percent of workers live and work in the same urban core. In some small and medium regional centres close to major and large urban areas, lower percentages of people live and work within their respective FUA because a good proportion of workers commute to the larger urban areas. For example, in 2018, 91 percent of Hamilton workers lived and worked in the Hamilton urban area, whereas 58 percent of Cambridge workers lived and worked in Cambridge and 27 percent commuted to Hamilton or Te Awamutu urban areas.

Although not tested or included in the criteria, we noted that for many FUAs in farming regions, there is a significant amount of outward commuting to rural SA1s either inside or beyond the FUA boundary. From the Blenheim urban core, 30 percent of workers commuted to rural SA1s, while for the Hastings urban core the figure was 23 percent. Tokoroa, which markets itself as a "[timber town at the heart of New Zealand's massive forestry, timber, and paper industries](#)", had 23 percent of workers commuting from the urban core to rural SA1s. Many of these workers commute to the Kinleith Mill, included within the Tokoroa FUA. Of the small regional centres, seven had 20 percent or more workers commuting from their urban core to rural SA1s. They were, in descending percentage order: Motueka (24 percent), Katikati, Matamata, Te Puke, Kerikeri, Morrinsville, and Marton (20 percent).

We also noted that when more than 50 percent of workers live and work within their respective statistical area – a rural SA1 or an urban area – the statistical area is less likely to be joined to an FUA.

Some FUAs are contiguous, that is, touch each other, but are separate FUAs. The paired FUAs may be of similar population size, for example, Napier and Hastings, but mostly joined FUAs consist of a smaller FUA attached to a larger FUA. The Hamilton-Cambridge pairing is an example of a regional centre close to a metropolitan area. Each pair of FUAs were tested but did not meet the 40 percent integrated urban core commuting rule so were not joined together. There were quite independent of each other, at least in terms of commuting to work, but they are integrated in other ways. For example, paired FUAs often share services such as hospitals and airports.

Table 1 shows the percentage of workers commuting between the urban and secondary urban cores of contiguous FUAs. Percentages commuting from the smaller FUA to larger FUA (first three columns) are generally higher than reverse commuting (last three columns) because the smaller urban core has a smaller working population and therefore a smaller denominator.

Table 1. Percentage of workers commuting between adjacent urban cores, 2018 Census

From usual residence	To workplace	Percent	From usual residence	To workplace	Percent
Warkworth	Auckland*	30.4	Auckland*	Warkworth	0.1
Cambridge	Hamilton	23.4	Hamilton	Cambridge	1.0
Te Awamutu	Hamilton	18.0	Hamilton	Te Awamutu	0.7
Te Puke	Tauranga	20.9	Tauranga	Te Puke	0.9
Hastings*	Napier	7.9	Napier	Hastings*	11.9
Feilding	Palmerston North	29.7	Palmerston North	Feilding	1.7
Kapiti Coast*	Wellington*	31.4	Wellington*	Kapiti Coast*	0.2
Masterton	Wellington*	7.2	Wellington*	Masterton	0.0
Cromwell	Queenstown	6.3	Queenstown	Cromwell	0.1

* Auckland – Auckland and Hibiscus Coast urban cores
   Hastings – Hastings and Havelock North urban cores
   Kapiti Coast – Paraparaumu and Waikanae urban cores
   Wellington – Wellington, Porirua, Lower Hutt, Upper Hutt urban cores

The FUA classifications

FUA indicator (IFUA)

The FUA indicator classifies UR2018 urban areas and rural SA1s according to their character within their FUA. The term 'indicator' is consistent with the UR2018 classification in that the UR indicator separately identifies urban and rural areas. Land outside FUAs (9991 Land outside functional urban area) is not differentiated by UR type. To ensure that the classification covers all of geographic New

Zealand, water is coded separately and is outside FUAs (9992 Water outside functional urban area). Inland lakes, such as Lake Pupuke (Takapuna) in the Auckland FUA and Lake Hood in the Ashburton FUA are excluded from the FUA geospatial polygon.

The FUA indicator code structure is shown in table 2.

Table 2. Functional urban area indicator classification

Level 1 code	Level 2 code	Description
1		**Urban area within functional urban area**
	101	Urban core
	102	Secondary urban core
	103	Satellite urban area
2		**Rural area within functional urban area**
	201	Hinterland
9		**Area outside functional urban area**
	901	Land area outside functional urban area
	902	Water area outside functional urban area

Appendix 2 shows the FUAs and their components. Note that throughout this paper we have used the term component instead of the more technical term 'indicator'.

FUA type (TFUA)

FUAs are classified by population size. The urban core's population rather than the entire FUA's population is used to maintain consistency between the descriptions of UR2018 urban area and FUA type. For example, the Timaru urban area (2018 Census usually resident population 27,501) is a medium urban area. The 2018 Census usually resident population for the Timaru FUA (38,559) exceeds 30,000 but it is classified as a medium regional centre.

FUAs that have more than 100,000 residents living in their urban core are known as metropolitan areas, while smaller FUAs are divided into large (core population 30,000–99,999), medium (core population 10,000–29,999), and small regional centres (core population 5,000–9,999).

The Greymouth urban area population is less than 10,000 so is a small urban area in the UR2018 classification. However, the Greymouth FUA (2018 Census usually resident population 11,604) is classified as a medium regional centre, consistent with its treatment as a medium urban area in the UA2018 classification.

The FUA type code structure is shown in table 3.

Table 3. Functional urban area type

Code	Description
1	Metropolitan area
2	Large regional centre
3	Medium regional centre
4	Small regional centre
9	Area outside functional urban area

Small urban areas with 5,000–9,999 residents that are not part of other FUAs form the nucleus of small regional centres. Small urban areas within FUAs are known as satellite urban areas.

Table 4 shows the possible compositions, in terms of the urban rural indicator, for each type of FUA. For example, the Dunedin metropolitan area includes the UR2018 Dunedin major urban area (urban core), the Mosgiel medium urban area (secondary core), Brighton and Waikouaiti small urban areas (satellite urban areas), and several rural settlements and rural SA1s. The Warkworth small regional centre includes the UR2018 Warkworth small urban area (urban core), Snells Beach small urban area (satellite urban area), and several rural settlements and rural SA1s.

Table 4. Relationship between FUA type and the urban rural indicator

FUA type	Urban rural indicator (IUR) 2018						
	Urban area					Rural area	
	Major urban area (100,000+)	Large urban area (30,000–99,000)	Medium urban area (10,000–29,999)	Small urban area (5,000–9,999)	Small urban area (1,000–9,999) (satellite urban area)	Rural settlement (200–999) (hinter-land)	Rural other (hinter-land)
Metropolitan area	√	√	√		√	√	√
Large regional centre		√	√		√	√	√
Medium regional centre			√		√	√	√
Small regional centre				√	√	√	√

FUA classification (FUA)

The FUA classification identifies FUAs by name. A multiple core FUA is named after the largest urban area it contains, for example, Christchurch FUA, which includes the Christchurch urban core and Rangiora, Kaiapoi, and Rolleston secondary urban cores.

There is one exception to the naming rule. The Paraparaumu-Waikanae-Paekakariki conurbation and surrounding hinterland is named Kapiti Coast, as it was known in the UA1992 geography. The Kapiti Coast FUA has strong socio-economic links to the Wellington FUA and users may wish to combine the two FUAs for analytical purposes.

To differentiate from the UR2018 classification, when referring to FUAs by name, their FUA type should also be mentioned, for example, Christchurch metropolitan area, Whangarei regional centre.

Code structure

The FUA classification has a two-level hierarchical structure. Level 1 is classified by FUA type:

1. metropolitan area
2. large regional centre
3. medium regional centre

4. small regional centre.

Level 2 has four-digit codes, including the level 1 FUA type, followed by FUAs numbered north to south for each FUA type.

The FUA code structure is shown in Appendix 3.

Comparing the 2018 FUAs with other urban accessibility geographies

2013 draft FUAs

In 2016, we drafted FUAs using UR2018 urban areas and rural meshblocks and 2013 Census travel to work data. The FUA shapefile and methodology was made available to interested users for comment. Users were pleased to see the development of FUAs and envisaged them being used to monitor housing, business, and labour growth and development. Because FUA areas were independent of local government boundaries, users felt that independently designed and created FUAs could be used to encourage councils to work together to respond to the requirements of the 2016 National policy statement on urban development capacity and enable the supply of housing and business space to meet future demand.

The redrawn 2018 FUAs differ from the 2013 draft FUAs for the reasons explained in the following paragraphs.

Use of SA1s rather than meshblocks as the building block

The SA1 geography was designed to replace meshblocks as an output geography to enable the release of more census data than could be provided at meshblock level. For the SA1s, meshblocks are added together to reach a target population size of 100–200. As a result, some of the 2018 FUAs are potentially larger geographically than the 2013 FUAs. The SA1 geography will be reviewed in 2021 and some SA1s may be reconstituted to improve the delineation of FUA and UA categories. The homogeneity principle will be applied to SA1s on the boundaries of FUAs and urban accessibility categories to ensure that meshblocks within SA1s have similar drive times or commuting percentages.

Change in commuting criteria applied

For the 2013 draft FUAs, a 50 percent commuting rule was applied to rural SA1s. However, when the 50 percent rule was applied to the 2018 census data, the resulting FUA geographical areas were much smaller than the 2013 areas. After lowering the criteria to 40 percent and comparing the resulting FUAs with the urban and peri-urban areas in the UA classification, we decided to apply the 40 percent forward commuting rule. We are unsure why the 2013 and 2018 census travel to work data produced different results. Possible reasons include changes in the census design (including the lower than anticipated response to the 2018 Census and the use of alternative data sources), processing systems and rules, differences in valid responses for usual residence and workplace addresses, or genuine changes in commuting patterns.

Workplace address responses

Table 5 shows the workplace address responses for the 2013 and 2018 censuses. The percentage of responses for the employed census usually resident population aged 15 years and over that could be coded to a meshblock (and subsequently an SA1) in the 2013 and 2018 censuses, were 83.2 percent and 75.4 percent respectively. For 2018, administrative data was used to code 342,700 responses to SA1s.

Table 5. Employed usually resident population aged 15 years and over, 2013 and 2018 Census

	2013	2018
Number employed	2,001,009	2,445,141
Number coded to SA1 workplace address	1,665,629	1,844,800
Percentage coded to SA1 workplace address	83.2	75.4

Changes in commuting patterns

Between 2013 and 2018, loss of job opportunities in some small urban areas may have resulted in more people having to travel to larger urban centres for work. Improvements in road and rail networks make it easier to commute to larger urban centres, especially metropolitan areas. Cheaper housing prices in the rural hinterland encourage households to settle in satellite urban areas and rural settlements and commute to larger urban centres. We noted that the geographical area for the Otaki FUA has decreased in size since 2013 with a higher percentage of people commuting from rural SA1s south of Otaki to the Wellington FUA.

On the other hand, it is possible that more people are choosing to work from home rather than commuting to their work headquarters. Additionally, business demography statistics recorded an almost 10 percent increase in employment in agriculture, forestry, and fishing between 2013 and 2018, resulting in more jobs in rural areas and reducing the need to travel to work in urban centres.

Urban accessibility (UA) classification

As noted earlier, we published the UA2018 classification in September 2020. While the FUA classification measures actual accessibility of rural SA1s and small urban areas to larger urban areas using Census usual residence and workplace address data, the UA measures potential urban accessibility or rural remoteness at SA1 level using estimated drive times. For the UA, the open-source router designed for use with data from the OpenStreetMap project was used to calculate drive time (duration) from an SA1 address-weighted centroid to the nearest medium, large, or major urban area. Rural SA1s and small urban areas were then categorised on a scale from high urban accessibility to very remote based on the drive time to their closest major, large, and medium urban areas.

In the UA, the category peri-urban was created for UR2018 small urban areas, rural settlements, and other rural areas that were within 25 minutes' drive to a major or large urban area, or within 15 minutes' drive to a medium urban area.

The 40 percent commuting flow rule used in the FUA was partly chosen because the resulting FUAs represented areas similar to the UA urban areas and their surrounding peri-urban areas. Differences between the two classifications tend to occur where people are living and working locally, often in agricultural industries, and do not travel into the city.

An example of the difference between UR2018 urban areas, UA urban areas, and FUAs is shown in figure 1. Note that Napier and Hastings are contiguous but separate FUAs and the UR2018 Napier and Hastings urban areas are the urban cores for each FUA.

Figure 1. UR2018 urban areas, UA urban areas, and functional urban areas, Napier and Hastings
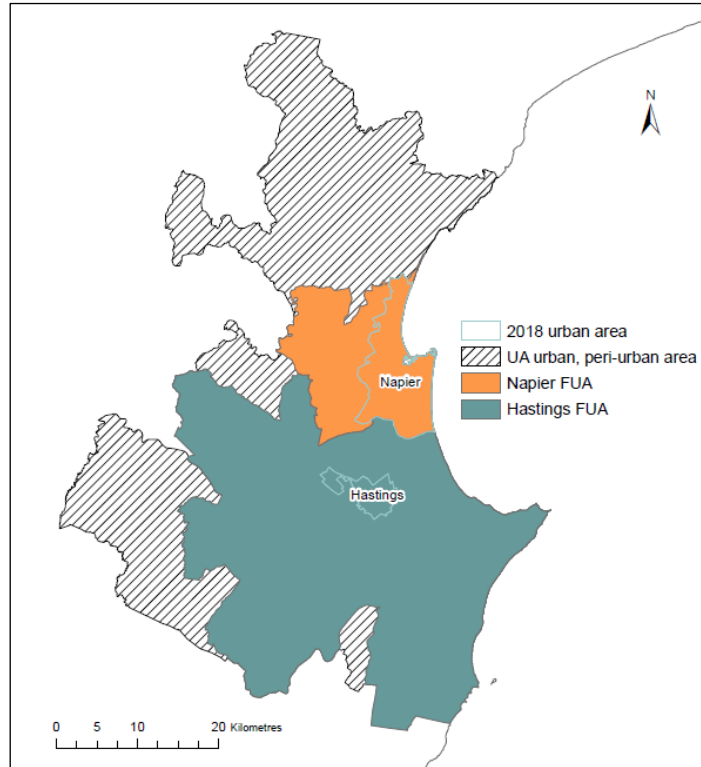
Maintenance

The SA1 and urban rural geographies will be reviewed 18–24 months prior to each census. Boundaries will change over time to reflect changes in population distribution and expansion of urban boundaries. SA1s may be divided to maintain the 100–200 population target size range. As mentioned previously, some SA1s may be reconstituted in the 2021 review to improve the FUA and UA classifications' delineation of areas.

The FUA classification will be reviewed and updated every five years after the release of census data.

Results

lists the FUAs and their components and also includes 2018 Census usually resident population counts for each component. Figures 2 and 3 show the location and extent of the FUAs for the North and South Islands.

Table 6 summarises the composition of FUAs: the number of FUAs by type, 2018 Census usually resident populations for the FUA components, and total FUA population. Each FUA has one urban core and may have one or more secondary urban cores and satellite urban areas. The component boundaries are defined by UR2018. Urban cores and secondary urban cores for metropolitan areas, large and medium regional centres have 10,000 or more residents. Urban cores for small regional centres have 5,000–9,999 residents. Satellite urban areas have 1,000–9,999 residents.

Table 6. Composition of functional urban areas, 2018 Census

Functional urban area type	Number of functional urban areas	2018 Census usually resident population					Percent of New Zealand
		Components					
		Urban cores	Secondary urban cores	Satellite urban areas	Hinterland (rural SA1s)	Functional urban area	
Metropolitan area	6	2,303,448	338,403	83,289	187,386	2,912,526	62.0
Large regional centre	11	541,038	42,324	38,124	105,525	727,011	15.5
Medium regional centre	14	245,535	-	29,592	46,872	321,999	6.9
Small regional centre	22	148,524	-	9,213	35,427	193,164	4.1
Total functional urban areas	53	3,238,545	380,727	160,218	375,210	4,154,700	88.4
Outside functional urban areas						545,055	11.6
Total New Zealand						4,699,755	100.0

In 2018, almost 4.2 million (88.4 percent) of New Zealanders lived in the FUAs, including 3,779,490 (80.4 percent) in UR2018 urban areas (the sum of columns 3–5 in table 6) and 375,210 (8.0 percent) in the rural hinterlands. Of the remaining 545,055 people living outside the FUAs, 166,422 (3.5 percent) lived in UR2018 small urban areas, and the remaining 378,633 lived in rural settlements and rural SA1s. By adding the FUAs and small urban areas outside FUAs together, 92 percent of New Zealanders lived in the more broadly defined urban areas, compared to 84 percent in urban areas as defined in the UR2018 classification.

The six metropolitan areas in order of population size are: Auckland, Christchurch, Wellington, Hamilton, Tauranga, and Dunedin. Over 60 percent of New Zealanders live in these metropolitan areas. One third (or 1,547,661) of New Zealanders live within the Auckland metropolitan area, including 28.6 percent (1,346,091) in the UR2018 Auckland urban area (the urban core). The Christchurch metropolitan area is slightly larger than Wellington with 470,814 residents compared to Wellington's 414,033 residents; 10.0 percent and 8.8 percent of New Zealand's population respectively. The Hamilton metropolitan area contains 198,957 residents (4.2 percent of New Zealanders), of whom almost 16 percent reside in the rural hinterland, mainly towards the west and south of Hamilton. The Tauranga metropolitan area, with a population of 156,096 (3.3 percent of New Zealanders), also has a high percentage of people living in its hinterland, at 10.4 percent, compared with 5.4 percent residing in the Auckland hinterland. Dunedin is the smallest metropolitan area, with 125,007 residents (2.7 percent of New Zealanders), including 99,885 living in the UR2018 Dunedin urban area.

Palmerston North is the largest regional centre with a population of 92,004 or 2 percent of New Zealand's total population. Whangārei, another large regional centre, is spread over a large area,

reaching past Matapouri on the northern coast and taking in Ruakaka and the Marsden Point Refinery in the south. It has a very high proportion (30.6 percent) of its people living in its hinterland.

Small regional centres play an important role servicing New Zealand's regional economies. Approximately 4 percent of New Zealand's population (193,164 people) live in these areas.

Figure 2. Functional urban areas by type 2018, North Island
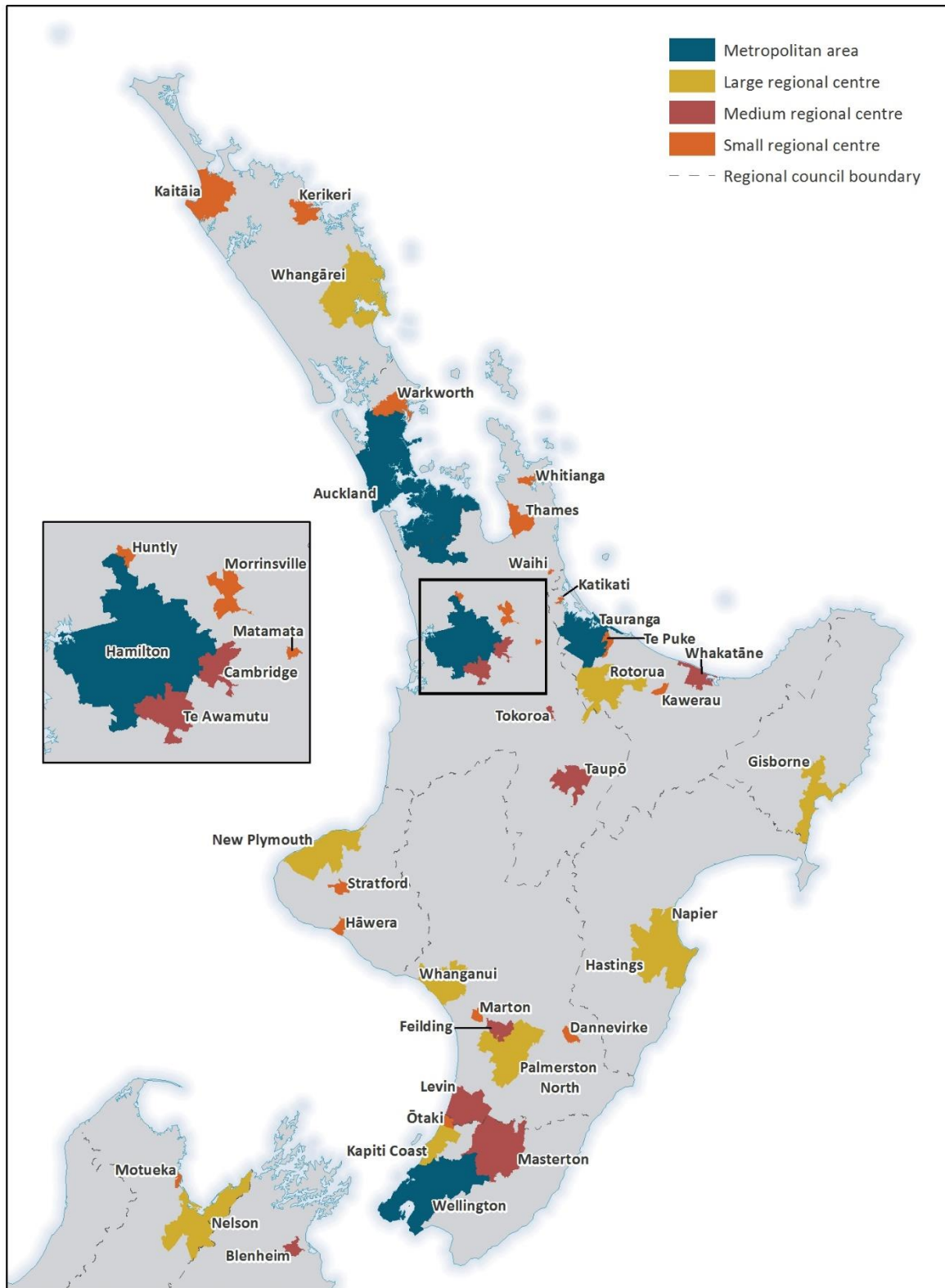
Go to the [interactive webmap](#) to view the FUA components and their population counts.

Figure 3. Functional urban areas by type 2018, South Island

Source. Stats NZ
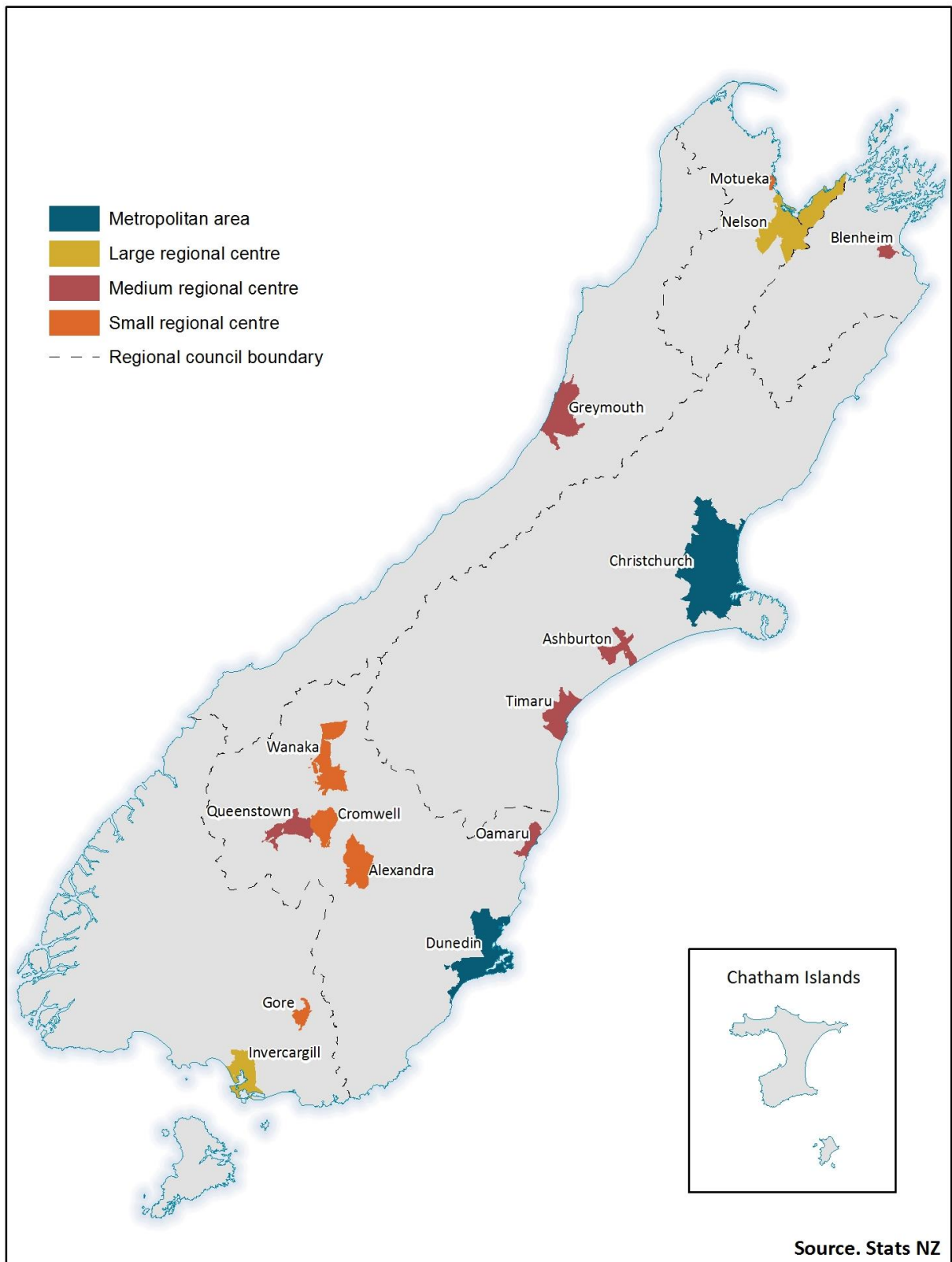
Go to the interactive webmap to view the FUA components and their population counts.

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Appendix 1: Comparison of urban rural classifications

	Urban rural (UR)	Urban rural indicator (IUR)	Functional urban area (FUA)	Urban accessibility (UA)
Concept	Classifies urban areas and rural settlements by name, rural by territorial authority	Classifies urban, rural, and water areas by type	Measures actual commuting Proxy for measuring economic ties The population of interest is generally those living within the FUA	Measures potential accessibility The population of interest is generally those who live outside the larger urban areas
Description	Classifies urban and rural areas according to "what is on the ground", ie represents the urban footprint Urban areas have: • more than 1,000 residents • high population density • high coverage of built physical structures Rural areas are land-based areas outside urban areas Bodies of water are classified separately	Urban areas further defined by resident population: • urban major (100,000+) • urban large (30,000–99,999) • urban medium (10,000–29,999) • urban small (1,000–9,999) Rural area • rural settlement (200–999) • rural other Water • inland water • inlet • oceanic	An FUA consists of a city and its commuting zone, that is, a densely inhabited city and a less densely populated commuting zone whose labour market is highly integrated with the city Uses census data to identify the proportion of residents commuting from home to work The term hinterland describes rural SA1s within the FUA	Classifies rural SA1s, rural settlements and small urban areas according to their proximity to larger urban areas or degree of remoteness from the urban areas Uses open source routing software to measure drive time
Examples of use	Business, population, and demographic characteristics of urban vs rural areas Comparing population and demographic change over time	Identifying and comparing similar population-sized areas	Urban development and transport planning Proxy for level of interaction and service uptake between an urban area and surrounding rural areas Proxy for labour market areas	Measuring level of accessibility to healthcare, education, or other services usually located in larger urban areas Comparing health outcomes, education outcomes, etc, of populations according to level of accessibility

Appendix 2. Functional urban area components and 2018 usually resident population

FUA type	Functional urban area name (also urban core)	Secondary urban cores	Satellite urban areas	2018 Census usually resident population				
				Urban core	Secondary urban cores	Satellite urban areas	Hinterland	Functional urban area
Metropolitan area	Auckland	Hibiscus Coast, Pukekohe	Beachlands-Pine Harbour, Clarks Beach, Helensville, Kumeu-Huapai, Maraetai, Muriwai, Parakai, Patumāhoe, Pōkeno, Riverhead, Tuakau, Waimauku, Waiuku	1,346,091	77,484	40,620	83,424	1,547,619
	Christchurch	Kaiapoi, Rangiora, Rolleston	Diamond Harbour, Leeston, Lincoln, Lyttelton, Pegasus, Prebbleton, West Melton, Woodend	358,062	47,223	25,218	40,311	470,814
	Dunedin	Mosgiel	Brighton, Waikouaiti	99,885	13,632	2,667	8,823	125,007
	Hamilton		Ngāruawāhia	160,911		6,621	31,425	198,957
	Tauranga		Ōmokoroa	136,713		3,210	16,173	156,096
	Wellington	Lower Hutt, Porirua, Upper Hutt	Featherston, Greytown	201,786	200,064	4,953	7,230	414,033
Large regional centre	Gisborne			34,527			4,920	39,447
	Hastings	Havelock North	Clive	44,940	14,334	2,247	13,734	75,255
	Invercargill			47,625			6,459	54,084
	Kapiti Coast (Paraparaumu)	Waikanae	Paekākāriki	28,701	12,708	1,746	3,528	46,683
	Napier			62,241			2,526	64,767
	Nelson	Richmond	Brightwater, Hope, Māpua, Wakefield	48,072	15,282	6,756	9,888	79,998
	New Plymouth		Inglewood, Ōakura, Waitara	53,988		11,997	13,089	79,074
	Palmerston North		Ashhurst	76,236		2,934	12,834	92,004
	Rotorua		Ngongotahā	54,204		4,869	8,106	67,179
	Whanganui			39,720			4,683	44,403
	Whangārei		Hikurangi, Ngunguru, One Tree Point, Ruakākā	50,784		7,575	25,758	84,117
Medium regional centre	Ashburton			19,284			2,388	21,672
	Blenheim			26,832			3,267	30,099
	Cambridge			18,651			2,610	21,261
	Feilding			15,990			1,737	17,727
	Greymouth		Runanga	7,965		1,185	2,454	11,604
	Levin		Shannon	17,670		1,398	6,735	25,803
	Masterton		Carterton	19,818		5,343	6,882	32,043
	Oamaru			13,107			2,148	15,255
	Queenstown		Arrowtown, Arthurs Point, Lake Hayes	13,533		8,619	2,541	24,693
	Taupō			23,622			4,446	28,068
	Te Awamutu		Kihikihi, Pirongia	12,195		4,032	3,450	19,677
	Timaru		Pleasant Point, Temuka	27,501		5,838	5,220	38,559
	Tokoroa			13,572			138	13,710
	Whakatāne		Ōhope	15,795		3,177	2,856	21,828

FUA type	Functional urban area name (also urban core)	Secondary urban cores	Satellite urban areas	2018 Census usually resident population				
				Urban core	Secondary urban cores	Satellite urban areas	Hinterland	Functional urban area
Small regional centre	Alexandra		Clyde	5,475		1,161	1,890	8,526
	Cromwell			5,610			1,695	7,305
	Dannevirke			5,505			855	6,360
	Gore		Mataura	7,908		1,629	516	10,053
	Hāwera			9,792			1,926	11,718
	Huntly			7,905			147	8,052
	Kaitāia			5,868			6,423	12,291
	Katikati			5,010			432	5,442
	Kawerau			7,146			273	7,419
	Kerikeri			7,164			5,535	12,699
	Marton			5,268			408	5,676
	Matamata			7,806			213	8,019
	Morrinsville			7,758			1,437	9,195
	Motueka			8,007			1,494	9,501
	Ōtaki		Ōtaki Beach	4,500		1,818	666	6,984
	Stratford			5,784			1,239	7,023
	Te Puke			8,688			1,230	9,918
	Thames			7,293			1,995	9,288
	Waihi			5,403				5,403
	Wānaka		Lake Hāwea	9,555		1,200	1,878	12,633
	Warkworth		Snells Beach	5,586		3,405	5,046	14,037
	Whitianga			5,493			129	5,622
Total functional urban areas								4,154,700
Outside functional urban areas								545,055
New Zealand				3,209,844	409,428	160,260	375,210	4,699,755

Go to the interactive webmap to view the FUA components and their population counts.

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Appendix 3. Functional urban area code structure

Level 1 code	Level 2 code	Name	Level 1 code	Level 2 code	Name
1		**Metropolitan area**	**4**		**Small regional centre**
	1001	Auckland		4001	Kaitaia
	1002	Hamilton		4002	Kerikeri
	1003	Tauranga		4003	Warkworth
	1004	Wellington		4004	Whitianga
	1005	Christchurch		4005	Thames
	1006	Dunedin		4006	Waihi
				4007	Huntly
2		**Large regional centre**		4008	Morrinsville
	2001	Whangārei		4009	Matamata
	2002	Rotorua		4010	Katikati
	2003	Gisborne		4011	Te Puke
	2004	Hastings		4012	Kawerau
	2005	Napier		4013	Stratford
	2006	New Plymouth		4014	Hāwera
	2007	Whanganui		4015	Marton
	2008	Palmerston North		4016	Dannevirke
	2009	Kapiti Coast		4017	Ōtaki
	2010	Nelson		4018	Motueka
	2011	Invercargill		4019	Cromwell
				4020	Alexandra
3		**Medium regional centre**		4021	Wānaka
	3001	Cambridge		4022	Gore
	3002	Te Awamutu			
	3003	Tokoroa			
	3004	Taupō			
	3005	Whakatāne			
	3006	Feilding			
	3007	Levin			
	3008	Masterton			
	3009	Blenheim			
	3010	Greymouth			
	3011	Ashburton			
	3012	Timaru			
	3013	Oamaru			
	3014	Queenstown	**9**		**Area outside functional urban area**
				9001	Land outside functional urban area
				9002	Water outside functional urban area