

# Indigenous coverage of protected areas on land

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October 2022

Document #: 23610599

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Date August 2022

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# Acknowledgement

Significant input to this work was provided by Daniel Tait and Craig Briggs, Waikato Regional Council who designed the GIS queries and prepared datasets and maps. Yanbin Deng, Waikato Regional Council, provided scientific oversight and peer reviews. The Waikato Regional Council Communications Team created a web version of this report.

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# Abstract

This technical report documents the extent of legally protected indigenous habitat on land in the Waikato Region. It is based on 2018 land cover and 2022 legal protection overlays.

Waikato Regional Council monitors changes in the amount and proportions of indigenous vegetation and lightly vegetated or un-vegetated natural land cover that is in some form of legal protection, including government reserves and private protected land.

This document reports on what land cover types are protected, who is protecting it, and where it is protected. It also reports on 5-yearly changes in the extent of vegetation and natural land cover that is under some form of legal protection, and the proportion of land protected in each Threatened Environment.

This indicator shows that:

- As of March 2022, around 17 per cent of the Waikato region is in some form of legal protection. Most of that is in natural cover, mainly indigenous forest (71 per cent of all protected land), followed by scrub and shrubland (16 per cent), with bare or lightly vegetated land and indigenous sedgeland or grassland each contributing just 2 per cent. The rest (9 per cent) is built land (e.g. car parks), wetland or water, or non-indigenous cover such as grass or exotic trees.
- Reserves and covenants protect 59 per cent of the region's remaining indigenous land cover. Bare or lightly vegetated surfaces, and indigenous tussock sedgeland or grassland are relatively well protected, with over 83 per cent of region's current extent in protection. Of our remaining extent of indigenous forest, 67 per is legally protected, while just 37 per cent of the remaining areas of scrub and shrublands are protected.
- The Department of Conservation (DOC) owns or administers 89 per cent of the protected natural land cover, while 8 per cent is on private land and the rest is in district or regional council reserves. Relatively little indigenous land cover is protected in district council reserves, however this amount may be an under-estimate as data on district council reserves is less complete than for DOC or covenant data.
- Private landowners have been protecting indigenous land cover in QEII Open space covenants in the Waikato region since 1979. Between 1996 and 1 January 2022, the amount of land in QEII covenants in the region increased from 4,607 to 15,234 hectares, an average rate of 425 hectares per year.
- Nga Whenua Rahui kawenata (NWRK) offer 25-year term renewable covenants over Māori land. The first kawenata in the Waikato region was registered in 1993. Between 1996 and 2022 the amount of land protected by NWRK in the region increased from 903 to 15,695 hectares, an average rate of 592 hectares per year. That rate has slowed in recent times (since 2005 for QEII and since 2010 for kawenata).
- Over 46,000 hectares of terrestrial indigenous cover remains unprotected in our most depleted land environments (Category 1 and 2 Threatened Environments).
- In alpine and sub-alpine areas, almost all of the remaining indigenous land cover is protected, while in montane and submontane areas over 69 per cent of the remaining indigenous cover is protected. Indigenous vegetation in coastal and lowland areas have the least amount of protection, (25 per cent and 45 per cent respectively).

- Within the district council areas, Thames-Coromandel District has the highest proportion of land in some form of protection (41 per cent of the district is legally protected), while Hamilton City and Waipa District have the least amount of their total land area in protection (however the Hamilton City values may be under-represented owing to incomplete data on district council reserves). Of the amount of terrestrial indigenous cover remaining in each district, 71 per cent is protected in South Waikato District, and over 50 per cent in each of Waitomo, Taupo, Thames-Coromandel, Otorohanga, Matamata Piako, and Hauraki districts.



# 1 Introduction

The Waikato Regional Policy Statement has a policy to provide for (among other things) the promotion of voluntary legal protection, restoration or enhancement of indigenous biodiversity. Terrestrial indigenous vegetation formerly covered most of the Waikato region, providing vital habitat for indigenous plants and animals. Clearance of indigenous vegetation, along with fragmentation and introduction of alien species, is considered one of the main causes of indigenous biodiversity decline. Legal protection in a gazetted reserve or other legal instrument is one method to protect indigenous habitat and biodiversity from deliberate destruction.

Maintaining a network of protected indigenous land cover is a core strategy in protecting biodiversity and the environment. Protected areas designated for the purpose of conserving biodiversity are set aside to maintain functioning natural ecosystems, to provide a refuge for species, and to maintain ecological processes that cannot otherwise be maintained in most of our intensely managed landscapes. Long-term or permanent legal protection of indigenous land cover, coupled with effective management, is therefore an important tool for the conservation of indigenous biodiversity.

In New Zealand, legally protected indigenous land cover can be on publicly or privately owned land, and include:

- Department of Conservation reserves
- Ngā Whenua Rāhui Kawenata (protected Māori-owned land)
- QEII covenants (private protected land)
- other areas protected by territorial authorities or state-owned land.

Some land is legally protected for the express purpose of protecting natural features from deliberate destruction/ development. In other cases, land has been set aside for another purpose such as for recreation or future use for cemeteries, road widening or other public amenities. If such land has been gazetted under the Reserves Act, there is a secondary requirement to protect natural features in that parcel, to the extent compatible with the reserve's stated purpose.

Waikato Regional Council has analysed the extent of indigenous vegetation on land (dryland forest, scrub, tussock, fernland or lightly vegetated indigenous land cover) in the region that is in a form of legal protection (for example gazetted as a reserve or identified as an open space covenant on land title). We also analyse protection of the region's Nationally Threatened Environments (TEC) and calculate the indigenous coverage of our unprotected areas.

Monitoring trends in the type, location, and extent of protected areas gives us valuable information on how much protection we are giving to our region's unique biodiversity and whether our protected indigenous land cover network contains the full range of natural ecosystems in the region.

Monitoring protected natural ecosystems on land helps us to:

- assess overall progress of total area protected as a measure of policy response to biodiversity loss.
- track changes in extent of protected areas in relation to geographical and political units, and to different measures of biodiversity (such as priority areas, ecosystem or habitat maps and species distributions)
- ensure a full range of habitats are protected to ensure that biodiversity is preserved.
- find out what geographic areas are under-represented in the current reserves system.

- identify priority areas for conservation, including opportunities to provide for landward, southward, or altitudinal migration of species or ecosystems in response to changes in sea level or temperature induced by climate change, and to improve connectivity of fragmented landscapes and seascape.

The monitoring outcomes can therefore guide adaptive management and policy decisions for biodiversity management planning.

## 2 Definitions

### 2.1 Terrestrial indigenous coverage

Terrestrial indigenous coverage refers to natural areas on land that are dominated by indigenous species. We use classes from the Land Cover Database (LCDB v5) to select areas of native forest, scrub, fernland, herbfields and tussock grassland, as well as naturally occurring bare or lightly vegetated land such as alpine gravel and rock, coastal dunes, and permanent snow and ice. Water bodies and wetlands are not included.

### 2.2 Protected areas

Legally protected areas are defined as: places where natural or cultural resources and biodiversity are protected, maintained and managed, usually by law (Molloy 2015).

We have limited our definition of legal protection to areas protected in perpetuity or for a specified period under one of the following acts:

- Conservation Act 1987
- National Parks Act 1980
- Reserves Act 1977
- Wildlife Act 1953
- Queen Elizabeth the Second National Trust Act 1977
- Local Government Act 2002

The Reserves Act 1977 and Conservation Act 1987 offer the most common methods for protecting public land in perpetuity, particularly with a focus on biodiversity protection. Either Act can be used to register land as a conservation covenant or Ngā Whenua Rāhui (with the same text appearing in each act).

The general purpose of the Reserves Act 1977 is to provide for the preservation and management, for the benefit and enjoyment of the public, areas of New Zealand possessing the following values: recreational use or potential; wildlife, indigenous flora or fauna; environmental and landscape amenity or interest; natural, scenic, historic, cultural, archaeological, biological, geological, scientific, educational, community, or other special features or value. It further aims to ensure as far as possible the survival of all indigenous species of flora and fauna, both rare and commonplace, in their natural communities and habitats, and the preservation of representative samples of all classes of natural ecosystems and landscape which in the aggregate originally gave New Zealand its own recognisable character.

The purpose of the Conservation Act 1987 is to promote the conservation of New Zealand's natural and historic resources, and for that purpose, to establish a Department of Conservation. Land under legal protection for conservation purposes is managed in New Zealand by a number of agencies. The main tenure types are described below.

The Department of Conservation (DOC) is the central government organisation charged with conserving the natural and historic heritage of New Zealand. DOC is responsible for protecting and preserving the majority of legally protected public land in New Zealand. Most of the DOC reserves come under the Conservation Act 1987, with some under the Reserves Act 1977. They include Stewardship land which is subject to potential disposal but until such time are to be managed for their natural and historic values.

The Queen Elizabeth the Second National Trust (QEII Trust) works with private landowners who wish to have some or all of their land legally protected. A covenant is registered on the title to the land, providing legal protection that binds the current and all subsequent landowners. The Trust generally contributes to the establishment of the covenant and regularly monitors the land to ensure it is managed in accordance with the covenant conditions. The first covenant was registered in 1979.

Ngā Whenua Rāhui was established in 1991 to provide a vehicle for protection of Māori owned land in multiple titles. Ngā Whenua Rāhui kawenata can be registered under the Reserves Act 1977 (s77a) or the Conservation Act 1987 (s27a). Kawenata are vested for 25 years and are renewable. Trend reporting will indicate the extent to which such protected areas remain protected after their renewal period ends. Kawenata Management Agreements are not treated as protected land for the purposes of this indicator.

Local authority reserves are a range of reserve types protected under the Reserves Act 1977, including Esplanade Reserves, Scenic Reserves and Recreation Reserves. Local purpose reserves may be set aside for specific purposes such as drainage, water supply or sewage management. Local purpose road reserves were treated as not protected for the purpose of this indicator as the assumption is that this land is set aside for future road widening purposes.

Regional parks were established under the Local Government Act 2002. In the Waikato Region, as of 2022, this was limited to the section of the Hunua Ranges and other regional parks, inherited as part of the local authority boundary adjustments in 2012.

The following types of land designations are not included in this indicator:

- District Council Covenants issued as consent notices under the Resource Management Act 1991 (s108) or Conservation covenants on private land established under the Reserves Act 1977 (s77) or the Conservation Act 1987 (s27). The data sets for these areas are incomplete and many have not been digitised.
- Māori reserves and Māori reservations. The relevant Acts do not specifically require protection of biodiversity or natural values, although it is noted that many such sites are effectively managed for those values.
- Private covenants entered as consent notices on land titles (e.g. Forest and Bird land). The data for private covenants other than those registered through the QEII National Trust is inconsistent and difficult to extract as many had not been digitised at the time of the indicator development.
- Areas of land classified in the CRS (Core Record System) as "declared a reserve" as such land is presumed to be pending registration in the Gazette, and therefore not formally reserved at the time the indicator was published. These will be incorporated in future updates of this indicator once they have been gazetted, assuming their CRS\_Purpose field is updated.
- Parcels in the Nga Whenua Rahui database classified as "management agreements" - these are not registered on the title, or binding on future owners.
- Parcels that are classified as potential reserve types in the Core Record System attribute CRS\_Purpose (e.g. scenic reserve) but are not included in either the DOC, QEII or NWRK data layers, and are not listed as being owned or occupied by a local authority, are treated as "Indeterminate".
- Parcels where CRS\_purpose is not clear regarding reserve status, e.g. water supply, are treated as "Indeterminate".

## 2.3 Threatened environments

In 2007, the Government released a statement of national priorities for protecting rare and threatened biodiversity on private land (Ministry for the Environment & Department of Conservation, 2007). The priorities are also relevant to public land.

Protecting biodiversity in Category 1 and 2 threatened land environments (see Table 1) is a National priority (Ministry for the Environment & Department of Conservation, 2007). Here, 20 per cent of remaining habitat is a critical threshold for measuring ecosystem vulnerability - the rate of biodiversity loss increases dramatically when the amount of available habitat drops below 20 per cent of its original extent. Therefore, National Priority 1 Environments are the habitats most in need of protection.

**Table 1: Threatened Environment Classification description for National Priority 1 Environments**

Category	Category criteria
1	<10% indigenous cover left
2	10-20% indigenous cover left

## 3 Methods

### 3.1 Monitoring area

This indicator covers the entire 2022 Waikato region boundary.

Data are reported within four spatial frameworks:

- Waikato Region (2022) - POL\_2022\_REGIONAL\_AUTH\_WRC
- District/city councils (2022) - POL\_2022\_TERRITORIAL\_AUTH\_FULL\_WRC
- Bioclimatic zones (1994) - BIOCLIMATIC\_ZONES
- Threatened environments - LENZ\_THREATENED\_ENVIRONMENT\_CLASSIFICATION\_TEC

### 3.2 Monitoring frequency

The indicator is monitored on a 5 yearly basis and/or when relevant data are updated. The next one is scheduled for 2027.

### 3.3 Monitoring history

This replaces an indicator published on the Waikato Regional Council's website in 2017. The indicator has been recalculated for all Landcover Database time periods to incorporate corrections to earlier LCDB layers in the 2018 LCDB version 5 release.

### 3.4 Measurement technique

We use the LCDB v5 to find out the regional extent of indigenous cover on land. The LCDB (Land Cover Database) minimum mapping unit is 1 hectare, and the data are suitable for applications down to 1:25,000 scale.

We use the following databases to determine areas that are legally protected:

- Land Information New Zealand (LINZ) tables and spatial layers downloaded from the LINZ data service website. These included:
  - Parcel (layer id: 51976)

- Statutory Action Parcel (table id: 51700)
- Protected Areas (layer id: 53564)
- Not all Territorial Authority (TA) reserves were included in this indicator. Only TA reserves that existed in the LINZ Protected Areas layer were included. These TA reserves were identified by their purpose as stated as a form of reserve in the PURPOSE column of the Statutory Action Parcel table.
- DOC layer - DOC\_CONSERVATION\_AREA\_WRC – Derived from data sourced from the Department of Conservation.
- QEII layer - QEII\_TRUST\_COVENANT – Provided by QEII Trust.
- NWRK layer - DOC\_NGA\_WHENUA\_TRUST\_COVENANT – Provided by the Department of Conservation.

GIS analysis is used to calculate the boundary administrated by different agencies.

The quantities of the data for each protected area's category are calculated through Excel and GIS software.

The statistics were compiled using Feature Manipulation Engine (FME) software. Relevant indigenous cover classes were selected from the land cover database. See Waikato Regional Council document #7890739 for the complete list of selected indigenous cover classes for the Land Cover Database spatial layers (LCDB v5). See Waikato Regional Council document #2991195 for a description of the processes used to calculate the statistics in FME.

Legally protected areas in New Zealand for this indicator include:

- Department of Conservation Reserves (DOC\_SOURCE)
- QEII Covenants (QEII\_SOURCE)
- Ngā Whenua Rāhui Kawenata, excluding management agreements (NWRK\_SOURCE)
- Other - typically protected under the Reserves Act by local authorities or other state-owned entities identified from the Owner/ Occupier attributes in the CRS\_PROPERTY\_WHOLE\_REGION layer i.e. from District Valuation Roll data. Note, that an occupier is defined as the legal ratepayer which in most cases is also the owner. Furthermore, reserves are identified by the PURPOSE attribute sourced from the LINZ Statutory Action Parcel table.

### 3.4.1 Regional boundary

The total land area of the regional boundary has been estimated using data from both the Land Cover database as well as the POL\_2022\_REGIONAL\_AUTH\_WRC layer.

For this indicator, the 2022 regional boundary was used a baseline for all time periods reported on. In future updates of this indicator, any change in the size or shape of the regional boundary will affect the total area of indigenous coverage, due to areas of indigenous cover being included or excluded from the new boundary. To account for this issue either all previous results need to be recalculated or the update should retain the 2022 boundary as a baseline rather than any new regional boundary layer.

The same holds true for the indicator results pertaining to territorial authorities in which the 2022 territorial boundaries (POL\_2022\_TERRITORIAL\_AUTH\_FULL\_WRC) have been clipped to the 2022 regional land boundary. Because the Landcover Database includes all prior versions then it's straightforward to recalculate statistics for each version (time-period) based on the most recent regional and territorial authority boundary layers. This is indicator is a regional analysis and as such the does not cover the Waitomo, Taupō, and Rotorua territorial authorities in their entirety.

### 3.4.2 LCDB v5

For the current extent of indigenous cover on land in the Waikato region, the following LCDB v5 classes are used. Indigenous cover is calculated by capturing all LCDB v5 names listed in Table 2.

**Table 2: Indigenous land cover groups and land cover names (LCDB v5)**

Land cover group	Indigenous land cover name
1. Bare or lightly vegetated surfaces	Sand or gravel Landslide Gravel or rock Permanent snow and ice
2. Grassland and sedgeland	Alpine grass / herbfield Tall tussock grassland Depleted tussock grassland
3. Scrub and shrubland	Fernland Manuka and/or kānuka (excluding areas in a wetland context) Matagouri or grey scrub Broadleaved indigenous hardwoods Sub alpine shrubland
4. Forest	Indigenous forest

## 3.5 Quality control procedures

This indicator was primarily created using Feature Manipulation Software (FME). However, a sample of queries were tested in GeoMedia to ensure that results from both are aligned.

For information on data quality (lineage, positional accuracy, attribute accuracy, logical consistency and completeness) see the metadata for the LCDB, available on the LRIS portal website.

## 3.6 Limitations

1. Indigenous land cover is based on LCDB Version 5 data. The LCDB gives a 'snapshot' of vegetation at the time when the data were collected and should not be considered as a definitive measure of present-day vegetation cover.
2. Mānuka is typically a scrub vegetation class, while kānuka is typically a forest class, however these vegetation types are mapped as a single class in the LCDB series and cannot be separated for this indicator. They have been allocated to the "Scrub and shrubland" class. Therefore, the amount of protected forest vegetation may be underestimated in this indicator while the extent of scrub may be over-estimated.
3. District council reserves data with the LINZ Protected Areas layer is determined from both the District Valuation Roll - which district councils provide - and on the PURPOSE field in CRS\_PARCEL layer. The PURPOSE field is originally sourced from the LINZ Statutory Action Parcel table. That field is not comprehensive or consistent and may not include all local purpose reserves. In addition, the LINZ Protected Areas layer does not include all district council reserves. Hamilton City is particularly affected by omissions of city council reserves in the LINZ Protected Areas layer.
4. Some local purpose reserves may have a lesser requirement for protection of biodiversity where that is inconsistent with the purpose of the reserve type (e.g. road reserve, water supply) and have been treated as indeterminate protection status in the analysis of the extent of legally protected indigenous land cover.
5. There are some areas of overlapping protection status. Where this occurred, the parcel was allocated to a single entity using the best information available. Two DOC reserves in the

region are also QEII covenants, these parcels were treated as DOC land, being the most recent legal status. Some minor areas of overlap are the result of digitising discrepancies between GIS layers sourced from different agencies.

6. Some vegetation types may be incorrectly identified in LCDB 5 which may result in errors in extent of indigenous land cover legally protected.
7. Shelterbelts composed of indigenous vegetation do not contribute to the total area of indigenous vegetation in the analysis as shelterbelts exceeding 150m have been captured as line features in the LCDB2 spatial layer.
8. The 2022 district council boundaries clipped to the regional land boundary were used for this indicator. Some district councils extend beyond the regional boundary, and statistics compiled at the district scale for the Waikato region may not reflect the pattern for those districts as a whole.
9. Trend analysis has been conducted on the basis of change in reserve status over time, rather than change in the underlying vegetation cover. Data layers accessible to the Waikato Regional Council do not have date registered for Department of Conservation or local authority reserves. Gazette notice dates reference only the most recent gazette notice and so may not reflect the date of original registration. Therefore, trend data are presented only for QEII covenants and Ngā Whenua Rāhui kawenata, for which reliable registration dates are available.
10. In April 2010, the Ministry for the Environment published a State of the Environment indicator for the extent of “Areas of native land cover under legal protection”. The data for the Waikato region is based on the region’s boundary prior to boundary adjustments in 2011. The MfE indicator data may also include areas that are non-indigenous in character or non-terrestrial. For these reasons the MfE data are unable to be used to present temporal trends in extent of protection of indigenous land cover.
11. The National Threatened Environment Classification (TEC) – has not been updated for 2018 using the LCDB5 layer, which may affect the classification level of some land environments.

## 4 Results - data and trends

### 4.1 Types of land cover in legal protection

Today 27 per cent of the region's land area remains in terrestrial indigenous cover, of which 59 per cent (390,416 hectares) is legally protected (Figure 1).

As of March 2022, almost 18 per cent of the Waikato region is in some form of legal protection (Figure 2). Most of this reserve network is protecting terrestrial indigenous cover (91 per cent), with the balance comprising wetlands, exotic vegetation, pasture (for instance grazing leases within conservation land) or infrastructure such as carparks.

Most of the protected terrestrial indigenous cover (TIC) is currently in native forest (78 per cent), followed by scrub and shrubland (17 per cent), with bare or lightly vegetated land and sedgeland or grassland each contributing just 2 per cent (see Figure 3).

Within the region, the proportion of remaining TIC that is legally protected varies. Bare or lightly vegetated surfaces, and tussock grassland are relatively well protected, with over 80 per cent of the region’s current extent in legal protection. These vegetation types tend to occur in high altitudes where land is less suitable for agriculture or other uses. Almost 67 per cent of the

region's indigenous forest is legally protected. Scrub and shrublands are the least well protected, with just 37 per cent of the remaining cover in protected land.

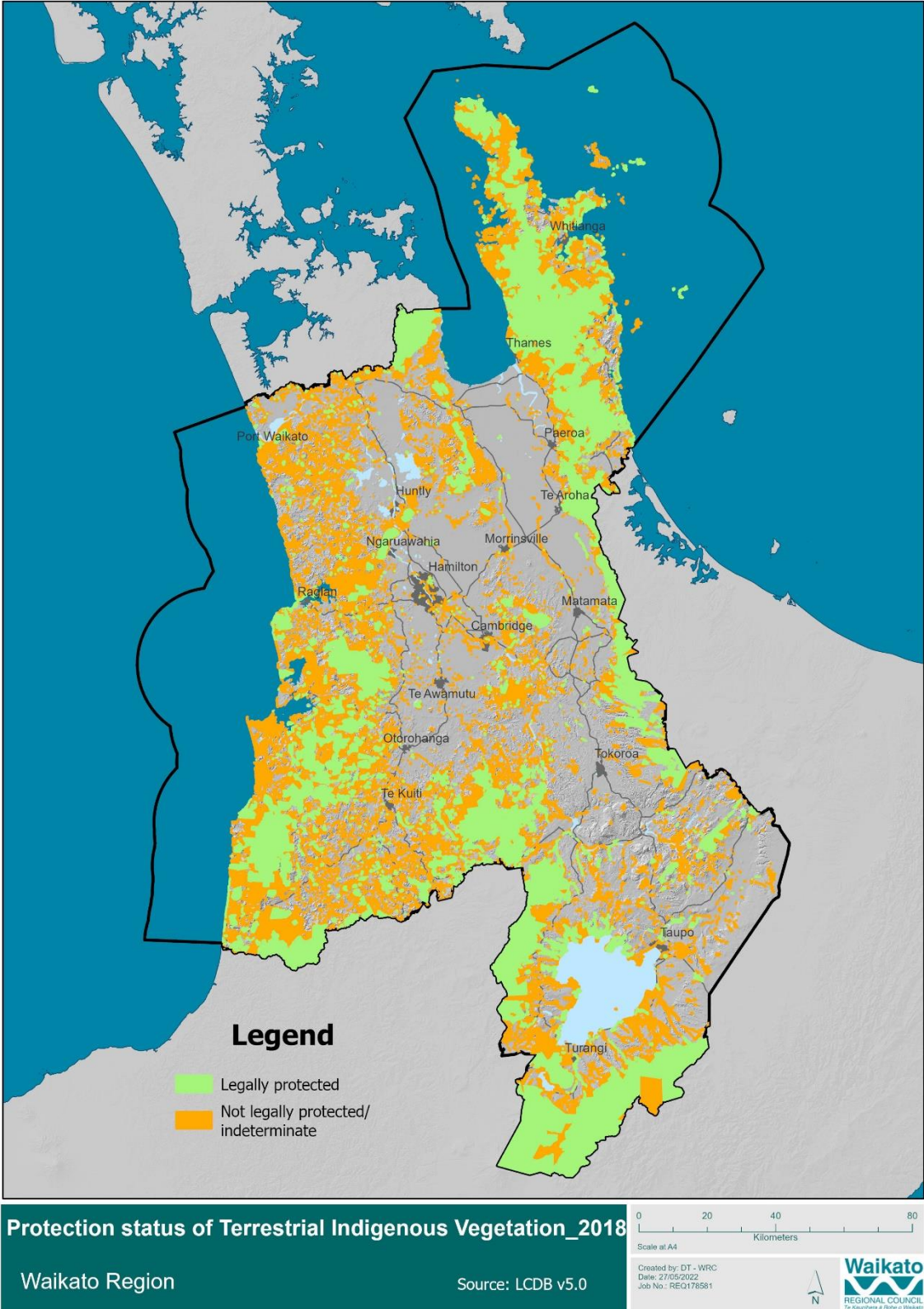


Figure 1: Protection status of indigenous vegetation on land in the Waikato region



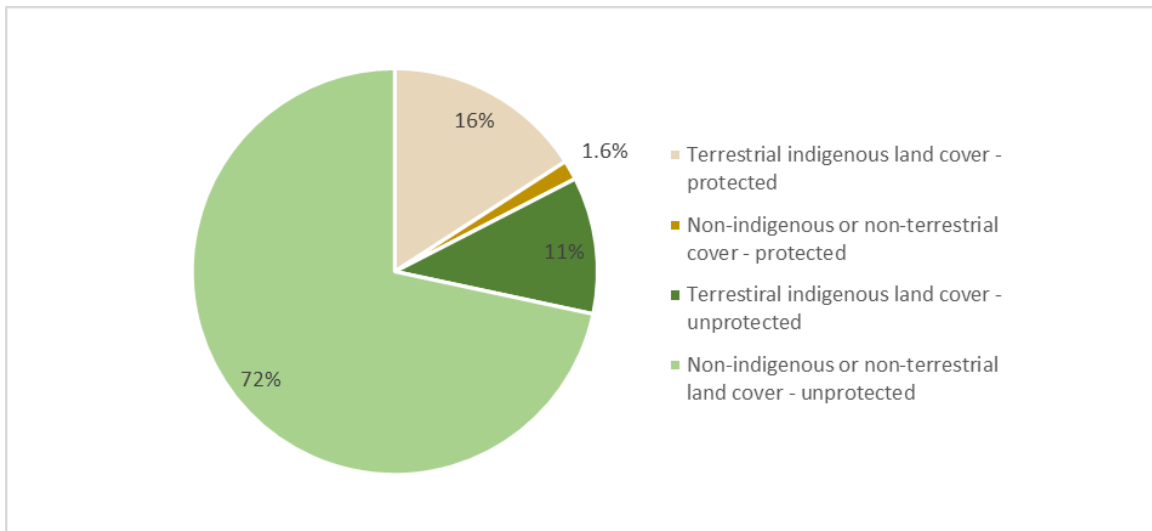


Figure 2: Land cover and protection status in the Waikato region

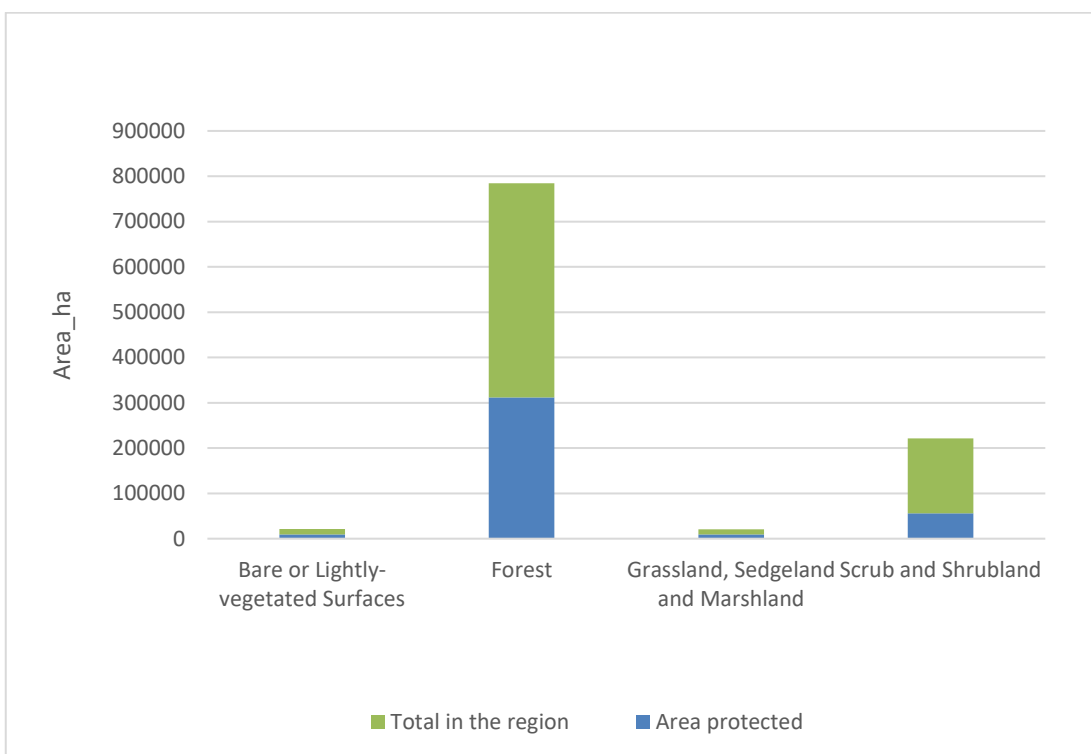


Figure 3: Amount of the region's protected areas by land cover type

## 4.2 Types of protection

In 2022, 92 per cent (359,165 hectares) of the region's legally protected TIC is on public land, and 8 per cent (30,930 hectares) is on private land (Figure 4). Relatively little TIC is protected in district council reserves, however this amount may be an under-estimate because data on district council reserves is less complete than for Department of Conservation or private covenant data.

Department of Conservation (DOC) owned or administered land accounts for 347,053 hectares (89 per cent) of all protected TIC. On private land, QEII covenants (15,234 hectares) and Ngā Whenua Rāhui kawenata (15,695 hectares) each account for 4 per cent of the protected TIC. Other protected areas including local authority reserves comprise the remaining 3 per cent.

Figure 5 shows the increasing amount of private land protecting terrestrial indigenous cover since 1997. On average 1017 hectares of privately owned land in the region has been protected

under QEII covenants or Ngā Whenua Rāhui kawenta every year since 1996. In recent times however the rate of land protection via covenants has slowed significantly. In total, 4.6 per cent of all remaining terrestrial indigenous cover in the region is within private protected areas.

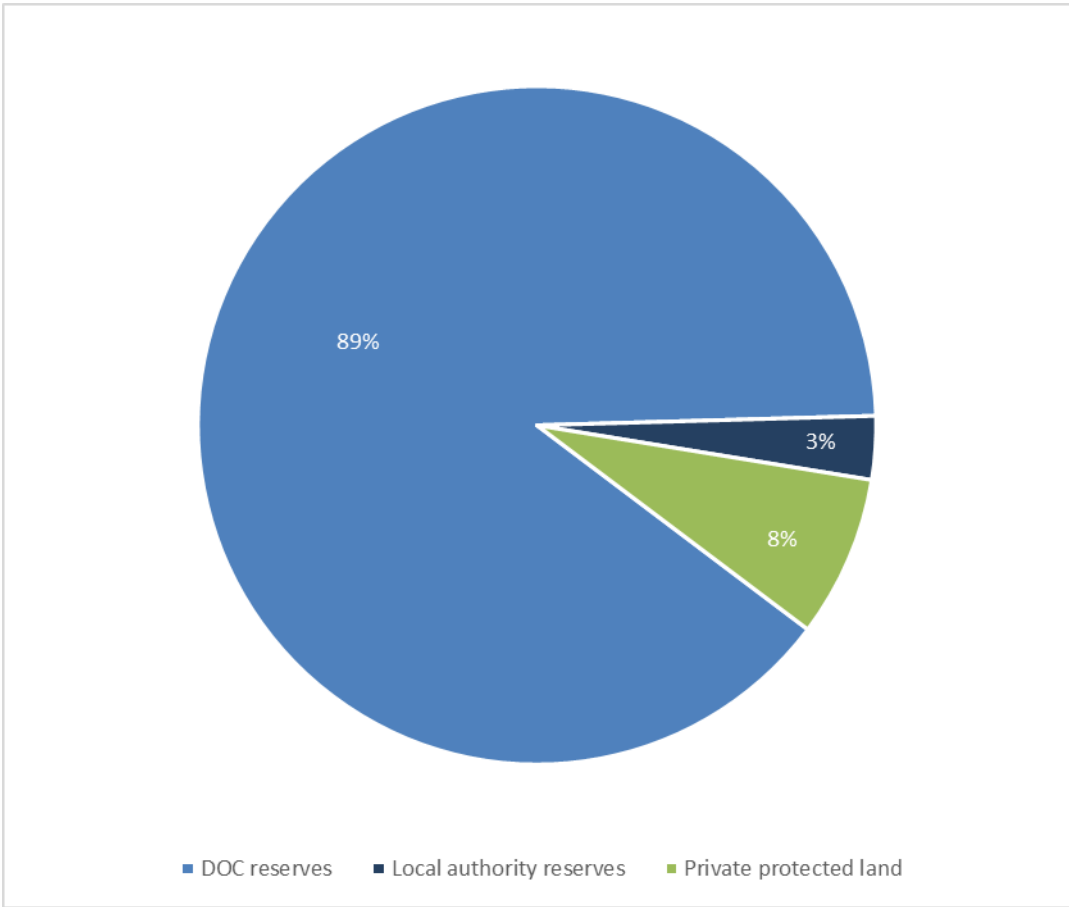


Figure 4: Type of legal protection for areas of terrestrial indigenous land cover in the Waikato region

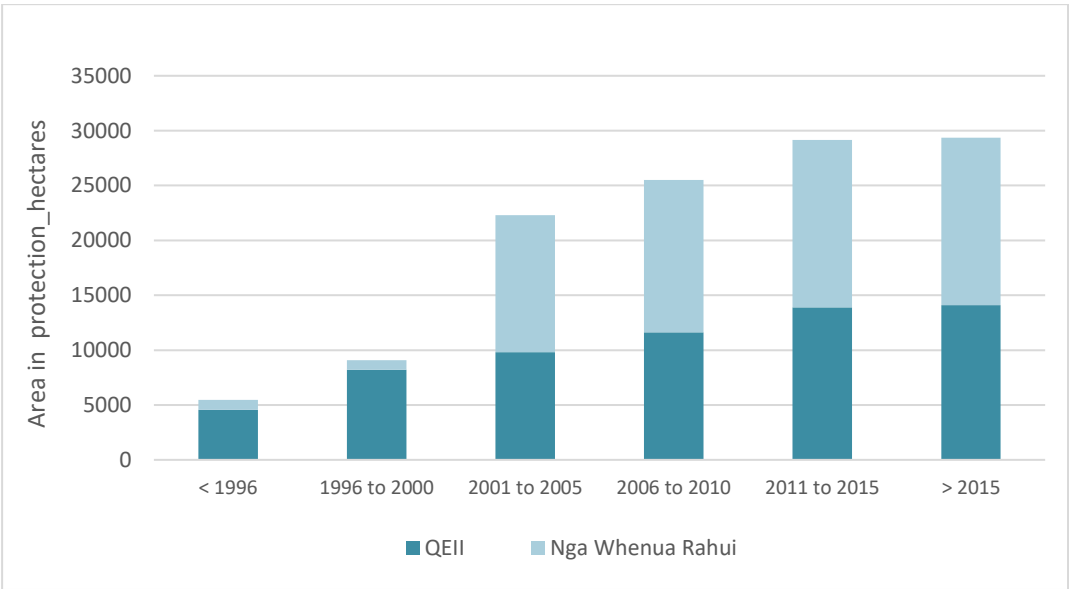


Figure 5: Amount of land protected by QEII or Ngā Whenua Rāhui Kawenata

### 4.3 Protection within National Priority 1 Environments

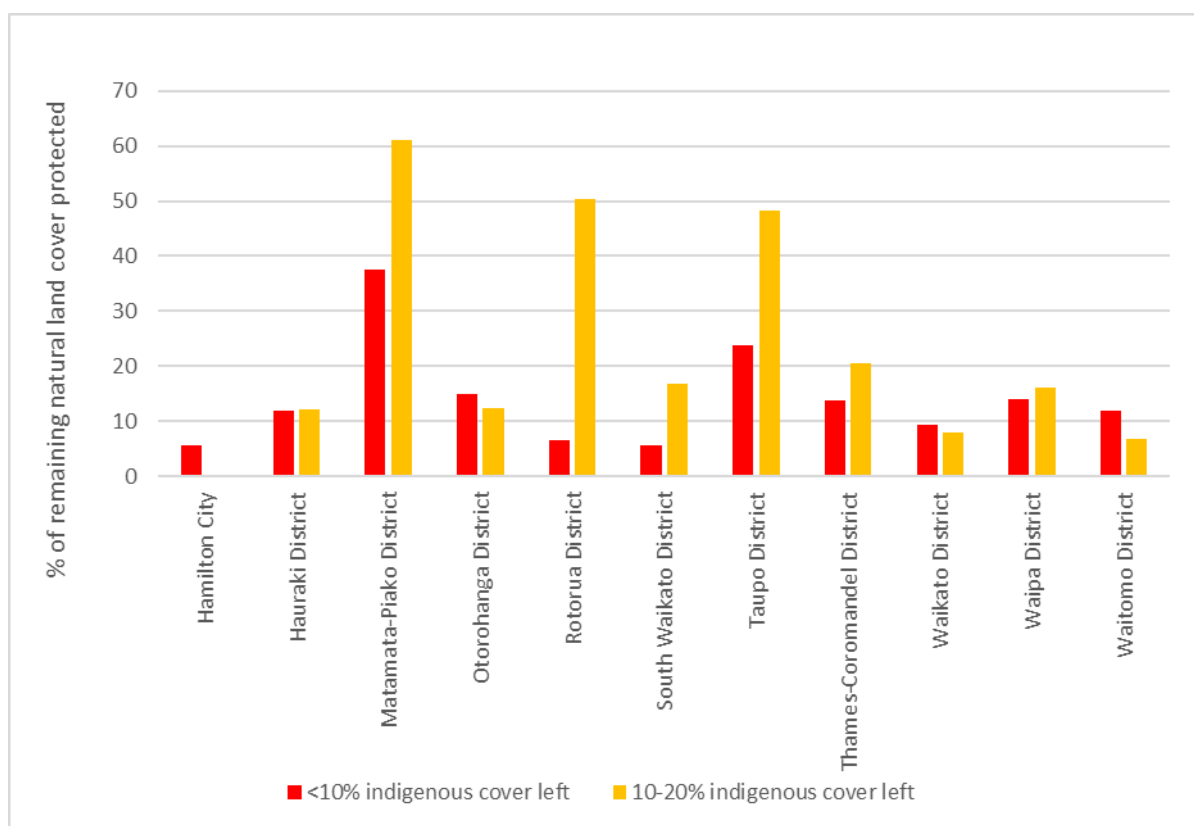
Across the region over 46,473 hectares of indigenous vegetation remains unprotected in the two most threatened environments, Category 1 (<10% indigenous cover left) and Category 2 (10-20% indigenous cover left). As of March 2022, the total area of indigenous land protected in Category 1 and 2 Threatened Environments was 23,071 hectares (2,658 hectares in Category 1

and 20,413 hectares in Category 2). This is just 33 per cent of the natural land cover that remains in those environments.

There is great scope for protecting indigenous forest and scrub in Category 1 environments where over 90 per cent of native vegetation cover has been lost, yet the smallest proportion of the remaining areas are legally protected (just 15 Per cent). Almost 15,000 hectares of indigenous vegetation cover remains unprotected in Category 1.

There is also potentially scope for restoring reserve land in Category 1 environments. Nearly 30 per cent of the land that is protected in Category 1 environments is exotic pasture grass (2,699 hectares) which could potentially be restored into indigenous cover.

Figure 6 shows the amount of current natural land cover that is protected in threatened environments for each local authority. In Category 1 environments, less than half of the remaining amount of indigenous land cover is legally protected in every local authority.



**Figure 6: Proportion of remaining indigenous cover of protected in each National Priority Environment by local authority**

## 4.4 Protection per Bioclimatic Zones

Figure 7 shows the proportion of remaining terrestrial habitats protected in each bioclimatic zone in 2022.

The proportions of remaining natural areas that are protected increase with elevation (Figure 7). In alpine and sub-alpine areas (above 1300 m elevation), almost all of the remaining indigenous land cover is protected. Montane and sub-montane areas (300 to 1300 m) are also relatively well protected with 70 per cent of the remaining indigenous cover there protected. Indigenous vegetation in coastal and lowland areas have the least amount of protection (25 per cent and 45 per cent respectively).

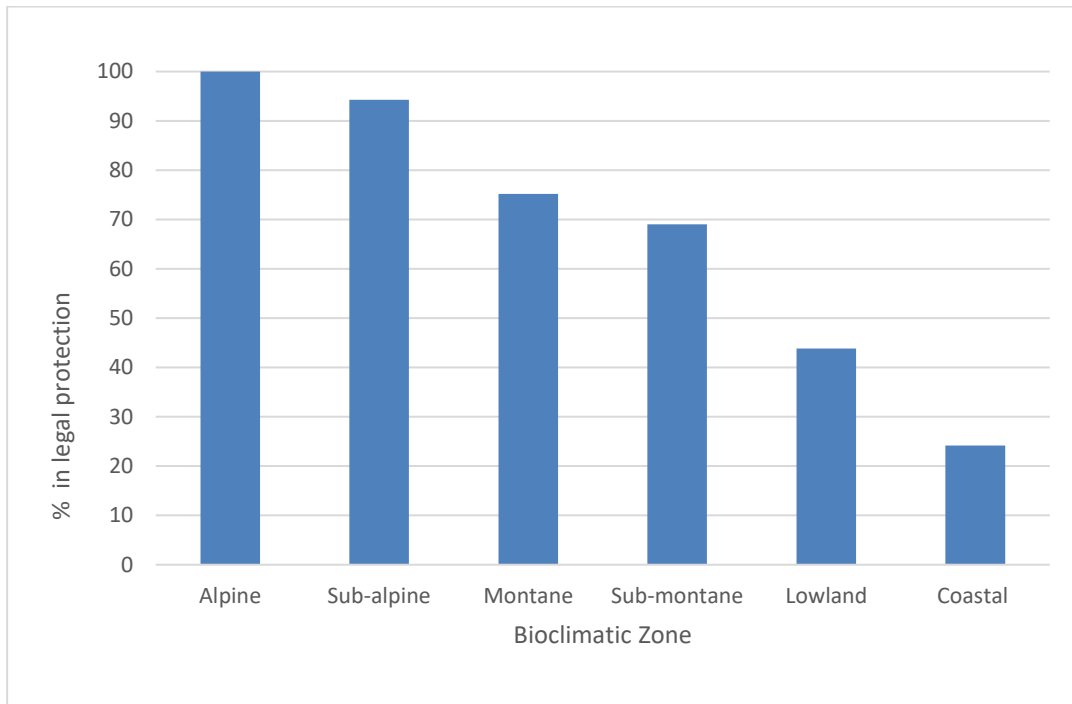


Figure 7: Proportion of remaining indigenous cover protected in each bioclimatic zone

## 4.5 Protection per local authority

Within the district council areas, Thames-Coromandel District has the highest proportion of its total land cover in some form of protection (41 per cent of the district), while Hamilton City and Waipa have the least amount of their total land area in protection (1 and 3 per cent respectively). Of the amount of indigenous land cover remaining in each district, 71 per cent is protected in South Waikato District, and over 50 per cent in each of Waitomo, Taupō, Thames-Coromandel, Ōtorohanga, Matamata-Piako, and Hauraki districts (see Figure 8).

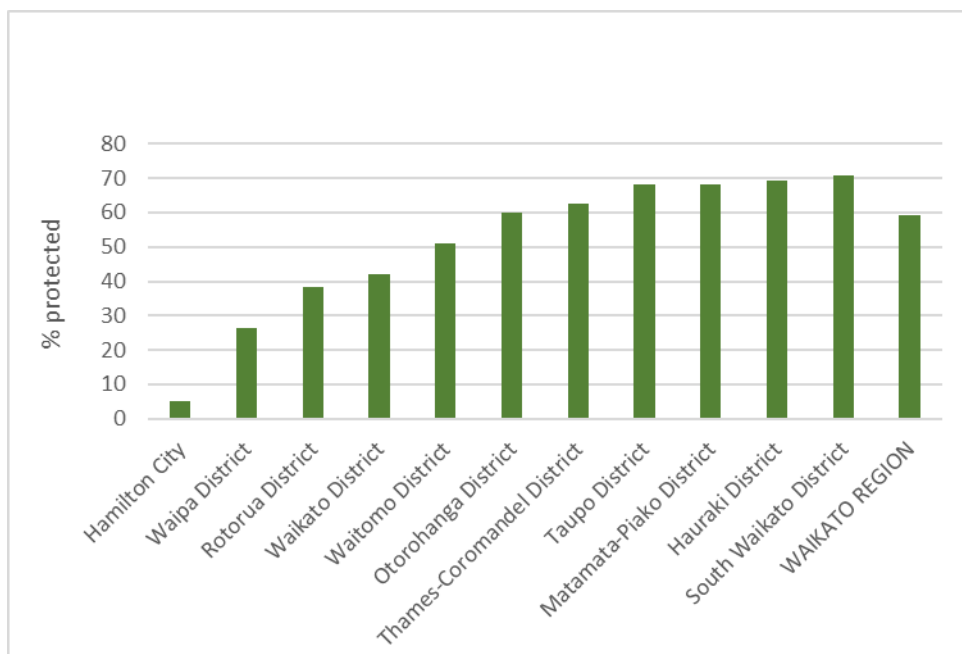


Figure 8: Proportion of remaining indigenous cover protected in each local authority

## 5 Further indicator developments

### 5.1 Updates

Updates will happen as new (region-wide) vegetation/cover spatial layers become available. It is estimated that this will be updated every five years. The last update was July 2017. The data presented in this report replaces the earlier indicator because of changes in extent of vegetation cover and some boundaries since 2017.

### 5.2 Future developments

Waikato Regional Council created a region-wide indigenous vegetation spatial layer (Bioveg 2012) using aerial imagery captures in 2012, and is developing a biodiversity inventory with more detailed vegetation classes, following Singers and Rogers (2014). When the biodiversity inventory is completed, it is expected to be a high-quality layer which could be used as an alternative or to supplement the Land Cover database. However, the biodiversity inventory will only be a snapshot in time predominantly using aerial imagery taken in 2017 and oblique aerials from 2016-2018, and unable to present trend data over time.

Changes to the Land Cover database classification scheme are likely to influence the indicator results. In addition, it is expected that the accuracy of the Land Cover database will increase with new technology and remote sensing information and this will influence the extent to which any change in indigenous cover can be accurately interpreted.

When/ if an updated version of the Threatened Environments Classification is released, this indicator will be updated to assess the amount of indigenous terrestrial cover within the new TE framework. This will only affect the results in Figure 3.

The LINZ protected area dataset includes reserves but it is not a complete set. Privately owned reserves are excluded from the dataset as they are not crown land. Also, the dataset does not contain a complete list of reserves “vested” in Local Authorities or “controlled and managed” by other organisations. The dataset is continually being updated however as errors or omissions are discovered and new land transactions are completed.

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