

Guidelines for Monitoring Land Fragmentation:

Review of Knowledge, Issues, Policies, and Monitoring

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Guidelines for Monitoring Land Fragmentation: Review of Knowledge, Issues, Policies, and Monitoring

Georgina Hart¹, Daniel Rutledge², Robbie Price²

Landcare Research

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¹*Landcare Research, 231 Morrin Road, St Johns, Private Bag 92170, Auckland 1142, New Zealand, Ph +64 9 574 4100, Fax +64 9 574 4101, www.landcareresearch.co.nz*

²*Landcare Research, Gate 10 Silverdale Road, Private Bag 3127, Hamilton 3216, New Zealand, Ph +64 7 859 3700, Fax +64 7 859 3701, www.landcareresearch.co.nz*

Reviewed by:

Approved for release by:

Trevor Webb
Soil Scientist
Landcare Research

Chris Phillips
Portfolio Leader
Enhancing Policy Development

Landcare Research Contract Report:

LC 1705

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Summary

Project and Client

- The Envirolink Tool Project: Guidelines for Monitoring Land Fragmentation is a collaboration between Landcare Research and the Regional Council Land Monitoring Forum, acting on behalf of all 16 regional councils and unitary authorities. The project will develop national guidelines and methodologies for monitoring land fragmentation trends and an associated tool to assist councils with processing and analysing data to monitor and report on land fragmentation trends consistently. This report presents the results of the first stage of the project.

Objectives

- Summarise the state of knowledge and issues regarding land fragmentation from an international, national, and regional perspective.
- Identify current and proposed regional policies, plans, and rules that address land fragmentation.
- Assess current practices in monitoring and reporting land fragmentation.

Methods

- Review of selected international and national literature.
- Review of relevant sections of operative and proposed regional policy statements.
- Survey regional councils and unitary authorities regarding their knowledge of land fragmentation issues, policies, plans, monitoring, and reporting. A direct survey of territorial authorities (city and district councils) was beyond the scope of the project, although regional councils were asked to distribute the survey to city and district councils within their regions and invite them to participate. Unitary authorities could, by default, respond from both a regional and territorial authority perspective.

Results

- All regional councils and unitary authorities responded to the survey as well as three city/district councils (Hamilton City, Matamata-Piako, and South Waikato).
- Land fragmentation is a process in which land is divided or partitioned in various ways (e.g. biophysically by infrastructure, legally through division of property titles, etc.) such that the actual and potential future use(s) of land may be altered.
- No common term or definition of land fragmentation is used across regional councils and unitary authorities.
- Rural subdivision is an important type of land fragmentation process in which a single parcel of rural land is divided into two or more parcels of land. The resulting smaller land parcels can often limit the uses of land for primary production.

- The relative importance of land fragmentation as a regional issue varies widely. Four regions and three unitary authorities identified land fragmentation as an important issue in their regional policy statements. However, almost all regions have “hotspots” where land fragmentation is an important local issue.
- Demand for lifestyle block living is considered a key driver of land fragmentation, as are the financial gains for property developers and permissive district plan provisions regarding rural residential subdivision.
- Twelve of sixteen regional councils have operative or proposed Regional Policy Statement (RPS) objectives and policies to address land fragmentation.
- RPS issues and objectives are broadly consistent around the country and centre on conservation of soil resources and/or efficient new development in rural areas. However, policies and methods to address land fragmentation vary considerably around the country.
- Policies to address land fragmentation have progressed from first to second generation RPSs including introduction of rural zoning and buffer strips, transferable development rights, and title amalgamation.
- District Plans and their implementation are seen as key factors in RPS policy effectiveness or ineffectiveness.
- In some cases regional councils and district and city councils work together effectively to address land fragmentation by coordinating regional and city/district planning to give effect to regional objectives and policies.
- Unitary authorities reported easier and better internal relationships and coordination between regional and district matters than regional councils that must coordinate with multiple district councils.
- Currently three of sixteen councils monitor and report on land fragmentation. Two councils noted ad hoc reporting of land fragmentation, and two other councils noted a commitment to monitor land fragmentation in the future.
- No consistent land fragmentation monitoring method currently exists either internationally or nationally, although council monitoring efforts tend to track aspects of (rural) subdivision, e.g. the number and size of parcels over time.
- Additional data needed to monitor and report confidently on land fragmentation trends include aerial photography, up-to-date land cover and land-use databases, consistent definitions and methods (especially of “high quality soils” or “versatile land”), and information sharing.

Conclusions

- Land fragmentation is occurring around New Zealand, but not uniformly within or across regions.
- While fragmentation is commonly a regional or local issue, the understanding of land fragmentation and its associated issues and effects varies across councils, stemming partly from a lack of consistent terminology and definitions.
- Policy trends indicated that many councils, including several where land fragmentation is currently of low regional importance, expect land fragmentation to increase in

importance in the future, given that many councils are currently strengthening their land fragmentation policies or introducing new policies.

- Regional policies to address land fragmentation are focussed primarily on limiting unplanned rural subdivision.
- Rural residential development is not seen as a negative process in its own right, but scattered, un-managed, and un-planned rural residential development can be expensive for councils as well as having potential financial and social impacts.
- Few regional plans included specific rules targeting land fragmentation except for plans prepared by unitary authorities, indicating that regional councils lacking unitary powers may lack the ability to manage land fragmentation effectively under current governance arrangements.
- Nationally, regional and district coordination of land fragmentation issues varies. While land fragmentation is increasing in importance, few councils currently monitor land fragmentation. Those councils that do monitor do not use consistent methods or indicators for measuring and reporting land fragmentation.
- Of all councils that responded to the survey, Matamata-Piako District Council currently undertakes the most comprehensive monitoring of land fragmentation.
- The review reinforced the compelling need to develop effective guidelines to help councils monitor and report on trends in land fragmentation. Any guidelines that are developed should
 - help foster consistent understanding including defining important terms and processes
 - include standard methods, indicators, and reporting formats
 - initially rely on existing data and information
 - outline how councils could improve monitoring and reporting over time.

Next Steps

- Develop guidelines for monitoring and reporting trends in land fragmentation, including:
 - Definition of key terms such as land fragmentation, versatile land or versatile/high class soils
 - Consistent methods for monitoring trends in land fragmentation
 - Suitable indicators for reporting on land fragmentation trends
 - Reporting content and format.
- Develop, test, and implement a tool to support monitoring and reporting of land fragmentation by regional councils.

1 Introduction

1.1 Overview

As global and national population growth continues, competition for land and soil resources will also increase (Godfray et al. 2010; Smith et al. 2010). Ensuring land is allocated to the highest value use is key to an economically efficient allocation of resources (e.g., Hartwick & Olewiler (1998)). Efficient allocation depends on the value of commercial output such as agricultural or industrial produce, or rental income, as well as non-market values (e.g. Miranowski & Cochrane 1993). For example, the market value of agricultural production must be adjusted to reflect any externalities (positive or negative) that arise as a result of farming, while imputed rents should be included for residential development.

Modelling studies suggest that future policy decisions in the agriculture, forestry, energy and conservation sectors could have profound effects on the availability of land for production, with different demands for land to supply multiple ecosystem services usually intensifying competition for land in the future (Smith et al. 2010). In New Zealand, Mackay et al. (2011) state the importance of science-informed policy and suggest the way forward for effective land-use management should include central guidance but with flexibility to encompass local conditions and provide parameters for regional policy development. Explicitly stated are the need for land-use data collection and coordination for informed policy development.

1.2 What is the issue?

In New Zealand all classes of productive land are under pressure from competing uses, in particular land with highly productive or highly versatile soils. Just over 5% of the New Zealand's land area (about 1.39 million ha) is classified as having high capability land (Rutledge et al. 2010), defined as land with Land Use Capability classes I or II by the New Zealand Land Resource Inventory (Stephens et al. 1996; Lynn et al. 2009). Land use capability is defined as

a systematic arrangement of different kinds of land according to those properties that determine its capacity for long-term sustained production.
(Lynn et al. 2009, p. 8)

The LUC divides the landscape into eight broad classes based on land's capability for use taking into consideration physical limitations and versatility (Fig. 1).

To date, LUC classes I and II have experienced the highest urbanisation rates as a percentage of original area (5.6% and 3.9% respectively) over the period 1985 to 2002. In addition, based on historical census data, housing density has increased across almost all areas of New Zealand, indicating that the extent of urbanisation may be broader than currently assessed. However, census data do not indicate the exact location of new houses, which limit the ability to assess which land use capability classes have been affected (Rutledge et al. 2010).

Increasing limitations to use	LUC Class	Arable cropping suitability†	Pastoral grazing suitability	Production forestry suitability	General suitability	Decreasing versatility of use
	1	High ↓ Low	High ↓ Low	High ↓ Low	Multiple use land	
	2					
	3					
	4					
	5	Unsuitable	Low ↓ Unsuitable	Low ↓ Unsuitable	Pastoral or forestry land	
	6					
	7					
	8					
			Unsuitable	Unsuitable	Conservation land	

Figure 1 Land use capability system classes. (Source: Lynn et al. 2008, Fig. 2, p. 9)

Some land uses impact the future versatility or capacity of the land for certain uses. For example, urban development may preclude or limit future use for agricultural production either directly through reduction of area available or indirectly via the introduction of adjacent incompatible uses (e.g. reverse sensitivity) (Andrews & Dymond 2012). The restriction of future land-use options represents an opportunity cost that should be considered in policy, planning, and resource management decisions that affect the allocation of land use, e.g. zoning (Salant 1995).

Under the Resource Management Act (RMA), local authorities (regional councils, unitary authorities, city/district councils) share responsibility for the sustainable management of natural and physical resources, which encompasses the issue of land fragmentation. Their responsibilities include

- providing for the people and communities’ social, economic and cultural wellbeing while sustaining the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations (Section 5)
- safeguarding the life-supporting capacity of air, water, soil, and ecosystems, and avoid, remedy or mitigate any adverse effects of activities on the environment (Section 5)
- giving particular regard to any finite characteristics of natural and physical resources (e.g. finite stocks of land or soil) (Section 7)
- establishing, implementing, and reviewing objectives, policies, and methods to achieve integrated management of natural and physical resources (Sections 30 and 31)
- monitoring and assessing the impacts on the land resource to help ensure that resource management interventions (policy) are appropriate and effective in maintaining land and soil resources (Section 35).

Therefore regional councils and territorial authorities (i.e. city and district councils) should in theory consider and manage the effects of land fragmentation, both individually and cumulatively.

Many councils have existing policies in place to protect the production potential of highly versatile land including subdivision restrictions; however, land fragmentation continues to occur. Long-term and nationally consistent monitoring is required to assess the cumulative impacts of land fragmentation across national, regional, and local scales. Councils also lack consistent monitoring methods and tool to track trends in land fragmentation and its associated effects and to provide the evidence needed to gauge policy effectiveness.

The absence of standard guidelines, methods and indicators hampers councils' ability to monitor and report land fragmentation accurately. As a result, the communication of information regarding land fragmentation among councils (regional and local) by council staff and other land managers can be confused and inaccurate. Furthermore, the correlation of regional indicators for land fragmentation at the national level and the sharing of data between regions become difficult, if not impossible, given the current lack of nationally consistent guidelines.

1.3 Proposed Land Fragmentation Tool: Needs and Benefits

To address current gaps in monitoring and reporting land fragmentation and its associated effects and risks, national guidelines are needed to:

- ensure consistent characterisation of land fragmentation and the drivers of land fragmentation (e.g. land valuation and demographics) at local, regional and national scales
- quantify the effects of land fragmentation on land and soil resources
- understand the implications for allocation of land resources and long-term productive opportunities of the land and thresholds for productive use options, including maintenance of on-going land use versatility.

Development of the proposed tool will yield several key benefits:

- provide consistent, enduring monitoring of land fragmentation trends nationally, regionally, and locally
- support nationally consistent State of Environment monitoring and reporting guidance for land fragmentation
- inform policy decisions by helping identify where land fragmentation policies are effective and where they are not effective
- improve the clarity and accuracy of communicating the impacts of land fragmentation on primary production and raising the issue across scales.

1.4 Review of Land Fragmentation Knowledge, Issues, Policies and Monitoring

This report summarises the first stage of the Envirolink Tool Guidelines for Monitoring Land Fragmentation project. The first stage involved a review of the current state of knowledge, issues, policies, and monitoring regarding land fragmentation in New Zealand. The review focused on policies at the regional council level in New Zealand, including a review of relevant sections of operative and proposed regional policy statements and regional plans, and a survey of regional councils and unitary authorities in New Zealand to identify salient knowledge, issues, policies and monitoring. Inclusion of all territorial authorities (city and district councils) was beyond the scope of the current project, although city and district councils were invited via regional councils and unitary authorities to participate in the survey.

2 Background

2.1 Global Context

Humanity faces the challenge of ensuring an adequate food supply for a population that may approach 9 billion or more by the middle of the 21st century (FAO 2009; Godfray et al. 2010a, 2010b; Satterthwaite et al. 2010) and potentially 10–15 billion by the end of the 21st century (UNDP 2010) (Fig. 1). Both population growth and increasing standards of living mean we can expect increasing demands among competing land uses such as housing, farming, recreation, food and fibre production, and bioenergy production (Smith et al. 2010). At the same time, conservation of natural ecosystems and managed agro-ecosystems will be needed to ensure an adequate supply of associated ecosystem services, such as provision of food and fibre production, regulation of climate and pollution, and maintenance of socio-cultural services (Lambin & Meyfroidt 2011).

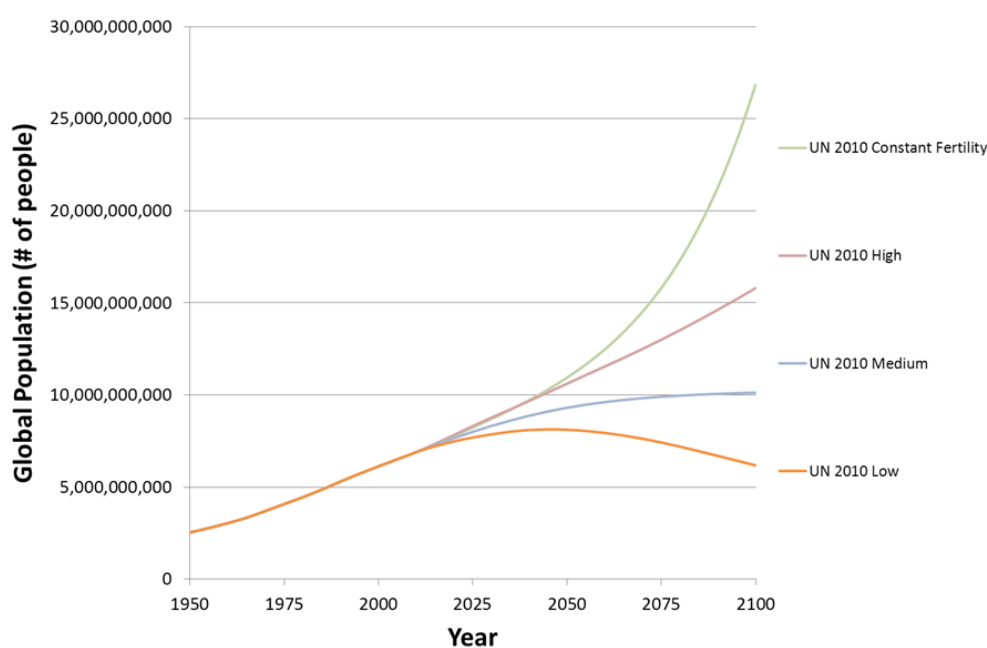


Figure 1 UN Global Population Projections to 2100. (Source: United Nations Population Division, World Population Prospects 2010 Revision)

Increased land use competition generates particular concerns for food and fibre security. While significant advances in agricultural knowledge, productivity and technology have expanded the range of possibilities for agricultural production and increased productivity, not all land is equally suitable for all types of food and fibre production. Land suitability or capability relates inversely to costs: as land suitability *decreases*, risks, management, the need for inputs, and therefore costs of production *increase*. Beyond some threshold, first economic and second ecological, food and fibre production becomes untenable. Also conversion of particular land and associated soils from food & fibre production to others uses, particularly for human infrastructure such as housing or industry, often involves significant soil disturbance that reduces soil quantity and/or quality.

Land fragmentation is one threat to global food production and security. For the purposes of this project land fragmentation refers to the process whereby contiguous pieces of land are partitioned into smaller units (Forman 1995; Rutledge 2003). Fragmentation can be physical, for example, dividing a farm into smaller lots, some of which may then be put to different uses such as housing, while others remain for primary production purposes. Fragmentation can also be virtual, for example, subdivision of a single title into multiple titles without physical changes to the land, or a division of property rights from a single to multiple owners.

A review of land fragmentation literature determined that numerous definitions for land fragmentation currently exist. For example, Forman (1995) defined fragmentation as *the breaking up of habitat, ecosystem or land use type into smaller parcels (considered to be one of several processes in land transformation)*. Similarly, but with a tighter focus on rural residential development, Gill et al. (2010) characterise landscape fragmentation as *increasingly diverse land ownership...(and)...an increase in the subdivision of farms for residential or hobby farm development* (Gill et al. 2010, p. 319).

While no single or common definition exists, most definitions focus on one or more of the following points about the process, usually in relation to primary production (e.g., Forman 1995; Niroula & Thapa 2005; Tan et al. 2006):

- land divided into a greater number of parcels, units, plots/lots, titles, etc.
- decreasing average farm size
- increasing number and distance between scattered parcels that are farmed by a single owner/operator
- decreasing average size of (scattered) parcels in farm holdings.

In addition, international research tends to focus on two aspects or types of land (or rural) fragmentation. The first focus concerns the changing of rural landscapes due to urban and residential development (e.g. Gulinck & Wagendorp 2002; Brabeca & Smith 2002). The second focus concerns the impact of land fragmentation on the number, size and spatial distribution of lots owned and/or managed by a single farmer for farm efficiency (e.g. Niroula & Thapa 2005; Bizimana et al. 2004).

2.2 New Zealand Context

2.2.1 Overview

Similar to the global situation, New Zealand faces increased competition for land resources as a result of competing demand from an increasing population (Fig. 2), increased demand for primary production exports resulting from increased global demand (FAO 2009), and a desire to maintain critical ecosystem services including maintaining indigenous biodiversity (Mackay et al. 2011; RSNZ 2011).

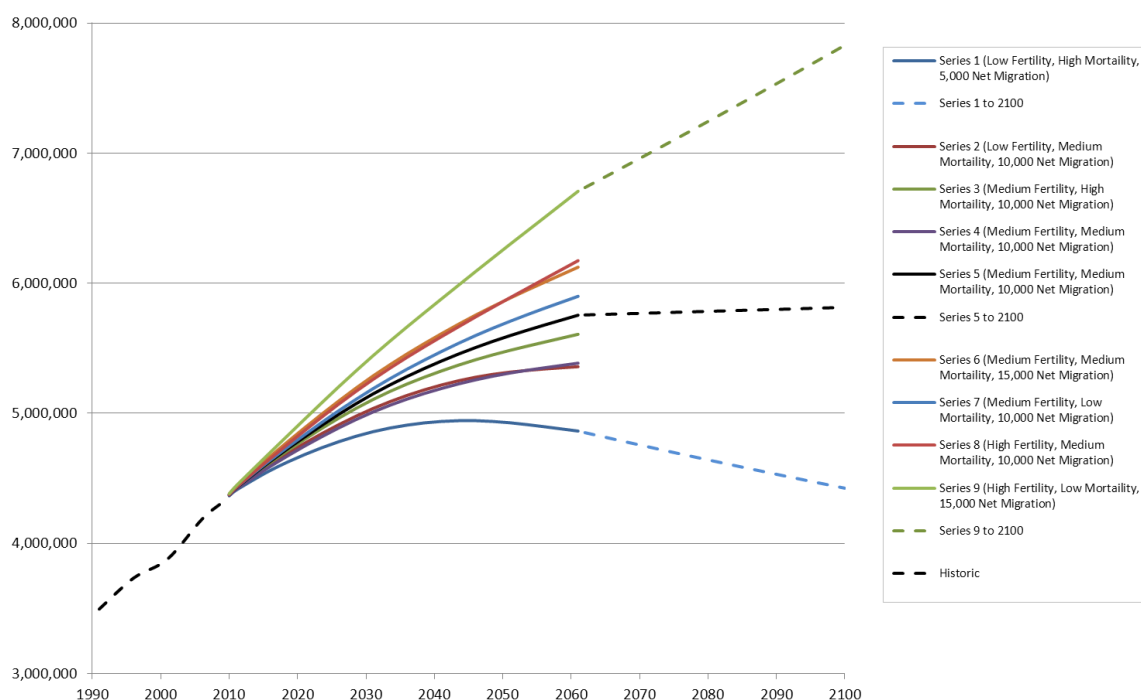


Figure 2 New Zealand population projections to 2061 and extrapolations to 2100. (Source: Statistics New Zealand Population Projections to 2061, 2009 Base)

2.2.2 Land Fragmentation Trends

Land fragmentation trends have been reported at national, regional, and local levels across New Zealand. The report *Competition for Productive Land: Rural-Urban Pressures in New Zealand* (Healy 1974), by the NZ Institute of Agricultural Science, summarised knowledge on issues of urban-rural land dynamics at that time. The report identified approximately 10% of New Zealand land as having high actual or potential value for food production, which was consistent with provisions of the Town and Country Planning Act in force at the time. One paper in the report (Smith & Forbes 1974) outlined several issues in attempting to measure and assess impacts of land fragmentation, specifically including those impacts associated with the creation of land parcels 4 hectares or smaller in size.

Hunter et al. (1998) evaluated impacts of rural subdivision by assessing the environmental effects of subdividing large farms into rural lots ranging in size from 1 to 10 hectares. They

found a range of positive and negative effects, including a loss in the stock of versatile soils, which they defined as “soils that are highly valued for primary production”.

In the 2007 State of the Environment Report the Ministry for the Environment noted increased pressure on highly versatile soils, which typically include soils with a land use capability (LUC) rating of I or II (and sometimes LUC III) as classified by the New Zealand Land Resource Inventory (Lynn et al. 2009; MfE 2007). Statistics New Zealand includes “extinction of versatile soils” as an indicator in its sustainable development monitoring framework (Stats NZ 2008).

Several recent studies have also documented trends in land fragmentation. Northland Regional Council reported 10% of its LUC Class I–III land has been subdivided into lifestyle blocks between 2001 and 2007 (NRC 2010). If that rate were to continue (1.67% per year), all of Northland’s LUC 1-3 land will be subdivided in 60 years. A previous Envirolink Medium Advice Grant documented conversion rates of 2.32%, 1.78% and 1.52% for the period 1985–2001 for LUC Classes I, II, and III land, respectively, for Marlborough District (Rutledge et al. 2010a).

Also, as discussed above, land with LUC ratings of I or II has been experiencing the highest conversion rates compared with the original extent. In addition, housing densities outside identified urban areas, including built-up areas delineated by the Land Cover Database are increasing in most places, suggesting that land fragmentation impacts may be more pervasive than can be currently measured (Rutledge et al. 2010b). A similar study (Andrews & Dymond 2012) found that one sixth of the 175 000 lifestyle blocks occurring nationally occupy 10% of the total area of high-class land (as defined by Webb and Wilson 1995). Furthermore, an average of 5800 new lifestyle blocks has been created nationally each year since 1998.

2.2.3 Policy and Planning Context

The Resource Management Act 1991 (RMA) provides a clear mandate for the management, protection and enhancement of soil resources at all levels of local government, as set out in the purpose of the RMA (section 5), local government is responsible for:

managing the use, development and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while –

- a) *sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
- b) *safeguarding the life-supporting capacity of air, water, soil and ecosystems, and*
- c) *avoiding, remedying, or mitigating any adverse effects of activities on the environment (New Zealand Government 1991, p. 65).*

Section 7 of the RMA further requires that local government give particular regard to any finite characteristics of natural and physical resources (e.g. finite stocks of land). Section 35 of the RMA requires that local authorities monitor and assess impacts on the land resource to help ensure that resource management interventions (policy) are appropriate and effective in maintaining land and soil resources.

Implementation of the RMA is via a three-tiered administrative structure – central, regional and territorial government authorities. Policy and plan documents at each tier of government sit within a ‘hierarchy’, with each subsequent policy or plan document having to “give effect” to higher order documents. Regional and territorial authorities have been established to be complementary, cooperative bodies within the hierarchical structure of statutory documents under the RMA.

Central government agencies have a policy and advisory role, for example to develop national policy statements (NPS) and national environmental standards (NES) to provide national direction to local level decision making. Responsibility for regional policy and regional consenting matters is the responsibility of regional and unitary authorities¹, while local policy and consenting is the responsibility of territorial authorities (city and district councils) as set out in the RMA.

Below NPS and NES documents at the central government level sits Regional Policy Statements (RPS) and regional plans prepared by Regional or Unitary Councils. The RPS and Regional Coastal Plan are mandatory, while other regional plans (dealing with air, land and water resources) are discretionary. A regional plan must give effect to the RPS. City and district Councils are required to develop City and District Plans addressing land use and subdivision. City and District Plans must give effect to the RPS and must not be inconsistent with regional plans.

Local authorities have a responsibility to manage soil resources through developing and implementing informed policy. The policies and plans developed by councils in New Zealand include consideration of the allowable uses and activities for land among the many competing demands including agriculture, forestry, housing, recreation, tourism, and energy production, as well as being responsible for conserving biodiversity, managing biosecurity risks, maintaining clean water and air, iconic landscapes, and access to land for cultural and spiritual purposes.

3 Objectives

This Envirolink Tool project aims to develop national guidelines and methodologies for monitoring land fragmentation and an associated tool for councils to standardise data collation, analysis, monitoring and reporting. This report summarises the first stage of the project that consisted of a review and synthesis:

- summarise the state of knowledge and issues regarding land fragmentation from an international, national and regional perspective
- identify current and proposed regional policies, plans and rules that address land fragmentation
- assess current practices in monitoring and reporting land fragmentation.

¹ Unitary authorities carry out combined regional and district council responsibilities.

4 Methods

We undertook a literature review of land fragmentation both internationally and within New Zealand, reviewed relevant sections of operative or proposed regional policy statements, and conducted a survey of all 16 regional councils and unitary authorities. Councils could complete the survey via several methods including 1) on-line, 2) electronically (e.g. return a completed MS Word version of the survey or a scanned PDF of their responses), 3) regular mail (e.g. mail a hard copy of the results).

The survey was organised into three topics: a) issues, b) policies, plans, rules and consents, and c) information, data and monitoring. We prepared an initial set of questions and presented them for discussion at a Regional Council Land Monitoring Forum workshop in February 2013. We modified the questions based on feedback received at the workshop. Appendix 1 provides a copy of the final questionnaire.

We notified regional councils of the survey in mid-March 2013 via email. We transmitted an electronic copy of the questionnaire (Microsoft Word and PDF versions) and a link to an on-line version of the questionnaire to all Regional Council Land Monitoring Forum members. We gave councils the option of completing the questionnaire by sending responses as hard copies, electronically or via the on-line questionnaire. We encouraged each council to canvas their staff broadly to receive responses from a range of perspectives, e.g. resource management, policy, planning, and consents. Following the first round of notification, we followed up non-respondents via email and conducted phone interviews to complete the questionnaire until we achieved a 100% response rate among all 16 regional councils and unitary authorities. We closed the questionnaire at the end of June 2013.

We did not specifically target city or district councils in the survey, as including all 62 city and district councils across New Zealand was beyond the scope of the project. However, we requested that Regional Council Land Monitoring Forum members make city and district council staff within their regions aware of the survey and invite them to participate. Through the assistance of Waikato Regional Council staff, we obtained questionnaire responses from two district councils and one city council in the Waikato region.

We collated the results of the literature review, review of regional policy statements and the survey and summarised them in the following three sections of this report. The three sections follow the same organisation as the three survey topics: knowledge and issues, policies and plans, and monitoring. In some cases we quoted a particular council to illustrate a key point or finding. However, we maintained the anonymity of individual council staff respondents and in no case do we attribute a specific quote to a specific council staff member.

5 Land Fragmentation: State of Knowledge

Key Findings
<ul style="list-style-type: none"> • No single common term or definition of land fragmentation is used across regional councils and unitary authorities. • Land fragmentation is primarily a concern regarding the cumulative effects of conversion of land from primary production to other uses, resulting in a slow erosion of primary productive capacity. • The relative importance of land fragmentation as a regional issue varies widely. • Most regions have local “hotspots” where land fragmentation is an important issue • Demand for lifestyle block living is considered the key driver of land fragmentation in New Zealand, as well as the financial gains for property developers and permissive district plan provisions regarding rural residential subdivision.

5.1 Definitions

Most regional councils and unitary authorities do not formally define or use the term “land fragmentation” although several do have a formal definition (Box 1).

Box 1 Formal Definitions of Land Fragmentation	
Auckland Council	<i>the on-going subdivision of rural land that leads to increasingly smaller land parcels</i>
Bay of Plenty Regional Council	<i>development on land that is categorised as Land Use Capability (LUC) class I, II, or III</i>
Horizons Regional Council	<i>subdivision on land categorised as LUC class I and II</i>
Tasman District Council	<i>...any increase over time in the number of separately developed properties in any area, through successive land subdivision to form new land parcels and associated land development activities such as buildings and roads</i>

Auckland Council noted that:

Land fragmentation is an accepted and utilised term in both the planning and operational teams within the Auckland Council – and in a variety of land use contexts (rural and urban)...it occurs when large land parcels used for agriculture are subdivided into small and more intensive production units, hobby farms, or lifestyle blocks primarily for residential use. Rural fragmentation increases settlement density and also excludes land uses such as pastoral farming that, for practical or economic reasons, require large land parcels.

Most councils use other terms that relate to a similar concept or set of issues regarding land use. Auckland, Waikato, Gisborne, Nelson, Marlborough and Southland use the term ‘rural subdivision’. In most cases rural subdivision is defined as subdivision of rural zoned land. Other terms that regional councils identified as referring to a similar concept or issues related to land fragmentation included:

- subdivision, use and development
- inappropriate subdivision, use and development
- new use and development
- rural-residential development or expansion
- fragmentation of rural land
- unplanned or ad hoc development
- safeguarding productive capability
- regional form
- loss of rural or open space land (valued for its productive, ecological, aesthetic, and recreational qualities)
- fragmentation of titles.

Waikato Regional Council noted that:

The Proposed RPS does not define ‘land fragmentation’...Policy 14.2, which aims to avoid a decline in the availability of high class soils, uses the term ‘inappropriate subdivision, use and development’. It is expected that through robust district level decision making, there will be a determination of what constitutes ‘inappropriate’ in a particular situation...The term ‘rural-residential’ is also commonly used throughout the Proposed RPS, and is the focus of provisions seeking to manage development in the rural environment...the term ‘rural-residential development’ is defined in the Proposed RPS as: “residential development in rural areas which is predominantly for residential activity and is not ancillary to a rural or agricultural use”. Other terms used by Waikato Regional Council include: ‘rural-residential expansion’, ‘urban sprawl’, and ‘fragmentation of rural land’.

City and district responses highlighted the variability in the use of terminology and focus of district plan provisions. The operative Hamilton District Plan does not use the term land fragmentation but does have provisions focussed on new subdivision and development in terms of urban expansion and future urbanisation. The South Waikato District Plan also does

not use or define land fragmentation but has provisions to minimise the impacts of subdivision on the productive potential of rural land resources.

Matamata-Piako District Plan uses a range of terms including: rural subdivision, fragmentation of titles, and fragmentation of rural land, all of which have formal definitions and plan provisions around them. For example, Matamata-Piako District Plan notes that:

the successive subdivision of rural land into smaller lots can diminish opportunities to maintain larger rural holdings that are suitable for primary production

and aims to:

limit fragmentation of titles and the establishment of houses on high quality soils so as to conserve the land for the use of future generations (Matamata-Piako District Plan, Part A, Page 3:17).

5.2 Issues

Councils noted numerous issues associated with land fragmentation in New Zealand (Table 1). Loss of the productive potential of the rural land resource of a region was the key land fragmentation issue noted by councils. Loss of productive potential of land can occur through a number of processes, including:

- the physical removal of productive soils when land is developed for another purpose (e.g. residential buildings)
- the removal of land from productive use where the soil resource remains intact
- reverse sensitivity effects where some productive land uses become socially acceptable in what has traditionally been a rural or productive landscape
- property values increasing such that productive land uses become unprofitable or unviable in the area
- productive land uses becoming unprofitable or unviable because smaller property sizes or lot sizes limit management options.

Also of key concern to councils were the costs associated with developing and maintaining infrastructure and other facilities to distributed development across large distances within a region. Low density, fragmented development can increase the costs of infrastructure provision and maintenance in comparison to new development that is consolidated into designated areas of higher density.

Councils also noted concern about negative social impacts associated with changing rural landscapes. Examples provided included negative impacts for those who do not have access to social facilities because their property is isolated, undermining an existing rural centre's economic viability due to fragmented and disaggregated development, and undermining rural economies by reducing options for productive land uses and increasing reverse sensitivity that can impact negatively on rural livelihoods.

Table 1 Issues identified by councils as relating to land fragmentation

<i>Issue</i>	<i>Frequency</i>
Loss of land (especially 'versatile' or 'high quality' soils)	14
Reverse sensitivity effects	10
Social and economic impacts of a changing rural landscape (both positive and negative impacts, e.g. loss of rural open space)	10
Infrastructure provision (e.g. expense of servicing remote and very low density development)	9
Decreasing options for productive land use (i.e. due to smaller title size and/or increasing property values in traditionally productive/rural land areas)	6
Increased water supply/allocation pressure	3
Regional sustainability (i.e. unsustainable land uses, where cumulative effects of development put food production at risk)	3
Risk to local and global food production	3
Increased environmental pressure on land that remains in productive use	3
Increased pressure on water quality (e.g. as a result of increasing septic tank numbers)	3
Land contamination problems (depending on the land use adopted at new sites)	3
Increasing natural hazard risk (e.g. increased storm water pressures with increased impervious surface area)	3
Loss of access to regionally important resources (e.g. mineral extraction potential)	1
Degradation of soil ecosystem services	1
Inefficient development of rural land	1
Impacts on biodiversity	1
Lock in of further fragmentation (i.e. where fragmentation has occurred)	1

Although many of the issues related to land fragmentation via rural-residential subdivision described were negative, councils also noted several positive impacts including:

- potential for improved water quality when intensive farming practices are reduced
- potential for improved environmental outcomes on lifestyle blocks when changed from traditional farming practices (depending on the activity and management approach on the lifestyle block, among other things)
- increased protection of indigenous biodiversity on private property (e.g. Rodney District bushlot covenants²)
- revitalisation of rural towns via increased population and economic activity

² Rodney District Council rule that enables new rural subdivision where an area of indigenous biodiversity (e.g. bush or wetland) is covenanted by the owner. Areas to be covenanted must meet certain criteria to be eligible for the development right.

- growth in rural schools.

5.3 Importance

Land fragmentation was reported as a regionally important issue by seven regional councils and unimportant by nine councils (Table 2). Three (Hawke's Bay, Wellington, and Marlborough) of the nine councils that reported land fragmentation as not regionally important indicated that land fragmentation is locally important within the region. Several councils provided insights regarding why land fragmentation is important regionally, for example:

It is recognised in the Proposed RPS that the demand for rural-residential development is high in parts of the region... 'Managing the built environment' is one of six issues identified in the Proposed RPS;

and

It is important given the small proportion of high class soils available in the region.

In another example the potential that exists for development on versatile soils, due to existing vacant sites with development rights was identified as a key reason:

It's a significant issue in relation to the latent potential that exists. There are estimated to be 20 000 vacant sites, most of which will have rights to develop. Legacy councils provide for further subdivision. The Unitary Plan has provisions that are intended to end further fragmentation.

Where land fragmentation was identified as a regionally important issue, it also tended to rank medium to high relative to other issues (Table 2). The exceptions were Northland and Waikato, where land fragmentation ranked medium to low, and Otago, where land fragmentation ranked low (relative to air and water management issues).

Table 2 Importance of land fragmentation as an issue, relative rank compared to other key issues, and higher ranking issues reported by regional and unitary authorities

<i>Council</i>	<i>Important (Yes/No)</i>	<i>Relative Rank (High, Medium, Low)</i>	<i>Higher Ranking Issues (if present)</i>
<i>Northland</i>	Yes	Medium to Low	Water quality, natural hazards, infrastructure provision
<i>Auckland</i>	Yes	High to Medium	Housing affordability, transport, growth management
<i>Waikato</i>	Yes	Overall: Medium to Low Soils: High to Medium	Water quality, waste disposal, air pollution, general pollution, transport, erosion
<i>Bay of Plenty</i>	Yes	High	No answer
<i>Gisborne</i>	Yes	High	Hill country soil erosion
<i>Hawke's Bay</i>	Region: No Locally: Yes (Heretaunga Plains)	Medium to Low High	Urban planning, infrastructure planning
<i>Taranaki</i>	No	Low	Soil issues: accelerated erosion, soil compaction, soil nutrient depletion, and water quality
<i>Horizons (Manawatu-Wanganui)</i>	No	Low	Water allocation, water quality, hill country erosion and indigenous biodiversity
<i>Wellington</i>	No	Low	Water quality, soil erosion
<i>Tasman</i>	Yes	High	No answer
<i>Nelson</i>	No	Low	Natural hazards, Intensification, service provision, climate change, urban design
<i>Marlborough</i>	Region: No Locally: Yes (Wairau Plain)	Medium	Water allocation, landscapes, biodiversity, and water quality
<i>West Coast</i>	No	Low	Water quality, natural hazards
<i>Canterbury</i>	No	Low	No answer
<i>Otago</i>	Yes	Low	Water and air management
<i>Southland</i>	No	Low	Water quality

However, the issue is not straightforward and it can rank differently depending on what part of council is considering it, as discussed by Auckland Council:

As a policy issue for the Council executive, land fragmentation is probably considered to be of medium importance. For the political branch of the council, it is probably considered to be of high importance for rural councillors and local boards and of low importance for politicians in urban areas. Land fragmentation is significantly outweighed by issues like housing affordability and transport in Auckland. The reason

for this is that the population, economic drivers, makeup of voters and spending priorities in Auckland are overwhelmingly urban.

Where land fragmentation ranked low regionally, other more important issues included water quality, water allocation, transport, housing, natural hazards, biodiversity and soil erosion (Table 2). Examples of reasons given for the low importance of land fragmentation included:

...we have relatively stable population and benign urban spread

and

...not a high priority. It has occurred in isolated areas...however, not at a scale that merits council resources/concern.

While land fragmentation did not always rank as regionally important, 11 regions identified local areas where land fragmentation is an important issue, i.e. land fragmentation ‘hotspots’ (Fig. 3). Hotspots most commonly occur around or close to urban centres. However, councils reported that most hotspots resulted from rural-residential (peri-urban) development rather than urban expansion, with a few exceptions. Below we outline a few examples of land fragmentation hotspots provided by regional councils.

5.3.1 Northland

Otamatea County, Whangarei City fringes, coastal development areas between Whangarei and Kerikeri, and Kerikeri are the main hotspots for rural subdivision and concern about loss of productive soils in the Northland region. Most subdivision is occurring close to urban centres and in popular spots for coastal development and most of Northland’s towns are situated close to areas of high quality soils. It was reported that permissive district planning rules have allowed ad hoc development, which has subsequently led to concerns about loss of productive land and reverse sensitivity effects and infrastructure provision, as well as other issue related with land fragmentation (see section 5.4).

Otamatea County, on the Kaipara harbour, has new lifestyle block development that has largely been driven by demand from Auckland residents looking for a lifestyle change from urban to rural dwelling. These lifestyle blocks are not serviced by council and must provide individually for water supply and waste-water treatment. Whangarei City and coastal areas are experiencing an increase in subdivision for lifestyle block development and Kerikeri is experiencing a mix of urban expansion and lifestyle block development.

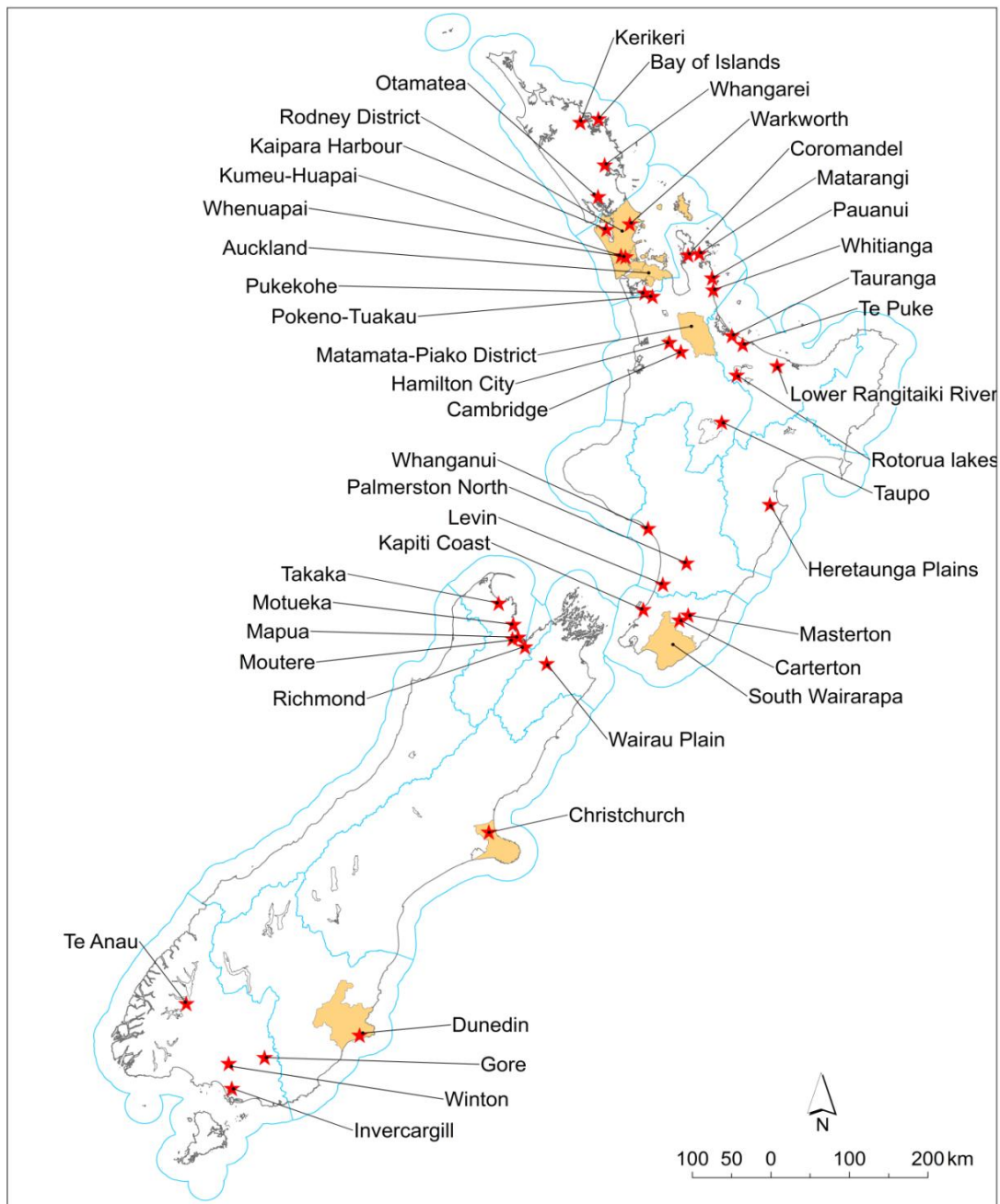


Figure 3 Land fragmentation hotspots identified by councils.

5.3.2 Auckland

The entire Auckland rural area was reported as experiencing high levels of subdivision and decreasing land parcel densities. In particular, the areas of Warkworth, Kumeu-Huapai & Whenuapai, and Pukekohe have been identified as areas of interest as they are preferred areas for future development. The key areas for land fragmentation impacts on indigenous biodiversity were reported as: Kaipara, Tamaki, Awhitu peninsula, and the Rodney and

Manukau ecological districts (indigenous biodiversity hotspots identified by Auckland Council are not included in Fig. 4).

5.3.3 Waikato

Waikato is experiencing development pressure in a number of key areas, reported as urban growth around Hamilton City; rural-residential development in Waipa and Waikato Districts around Lake Taupo, along the Waikato River and in coastal areas. Pressure for lifestyle block development in Cambridge, Matamata, Pokeno, and Tuakau was also reported. It was also noted that land fragmentation is occurring in ‘planned’ growth areas in the Coromandel peninsula (e.g. Whitianga, Pauanui, Matarangi, and Coromandel).

5.3.4 Bay of Plenty

Land fragmentation hotspots include the Western Bay of Plenty area, in particular around Tauranga and Tepuke; the lower Rangitaiki River; and the Rotorua Lakes areas. Much of the region’s versatile soils are in the Western Bay of Plenty District where the region’s largest city is also situated. Subdivision and lifestyle development pressure within commuting distance of Tauranga City makes this area a hotspot for land fragmentation and loss of versatile soils.

5.3.5 Hawke’s Bay

The Heretaunga Plains sub-region is the key land fragmentation hotspot in the Hawke’s Bay region. No other significant areas of concern regarding land fragmentation were identified by the council.

5.3.6 Manawatu-Wanganui (Horizons Regional Council)

Lifestyle block demand is driving land fragmentation hotspots around Palmerston North, Levin, and Whanganui.

5.3.7 Wellington

Wellington Regional Council’s response noted areas of LUC class I and II land rather than land fragmentation hotspots. LUC class I and II land is found in the Kapiti Coast, Masterton, Carterton and South Wairarapa Districts in the Greater Wellington region. These are all areas that could be considered at risk from land fragmentation if subdivision and development were to occur in these areas.

5.4 Drivers

Regional councils and unitary authorities identified numerous drivers of land fragmentation, summarised here in seven key categories (Fig. 4). Demand for lifestyle block living was identified most often (9 councils) as being a key driver of land fragmentation. The financial

gains by property owners subdividing and selling their land and permissive district plan provisions around rural subdivision were also noted by 8 and 6 councils respectively as key drivers of land fragmentation. The following quote from one regional council response summarises these three main drivers of land fragmentation:

...the key driver is considered to be the popularity of lifestyle block living...lifestyle choices driving subdivision, which can be an economically rewarding option for farmers. Added to this there has been permissive district council planning and rules around rural subdivision...

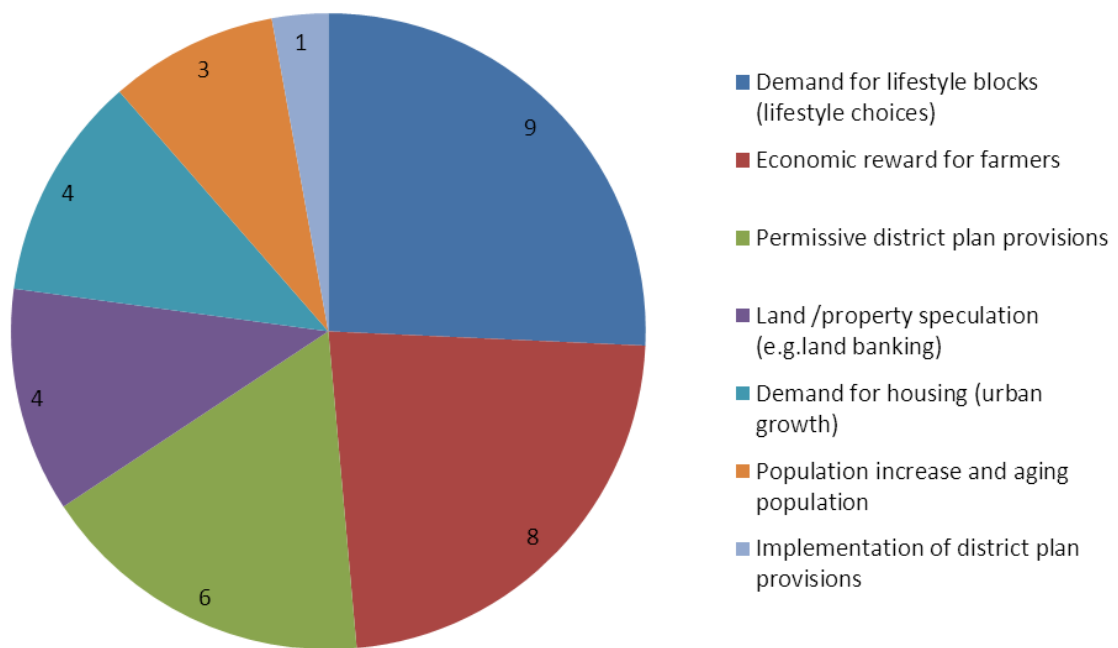


Figure 4 Type and frequency of land fragmentation drivers identified by councils.

6 Policies, Plans and Rules to Address Land Fragmentation

Key Findings
<ul style="list-style-type: none">• 12 of 16 regional councils have operative or proposed Regional Policy Statement (RPS) provisions to address land fragmentation.• RPS issues and objectives are broadly consistent around the country (e.g. conservation of soil resources and/or efficient new development in rural areas).• Land fragmentation policies and methods vary considerably around the country.• Policies to address land fragmentation have progressed from first to second generation RPSs including introduction of rural zoning and buffer strips, transferable development rights, and title amalgamation.• District Plans and their implementation are seen as key factors in RPS policy effectiveness (or ineffectiveness).• In some but not all cases regional councils and district and city councils work together effectively to address land fragmentation via giving effect to regional strategies, policies and plans.• Broadly, unitary authorities reported easier and better internal relationships over regional and district matters than regional councils that have relationships with multiple district councils.

6.1 Overview

This section outlines how regional and unitary councils have addressed land fragmentation through statutory and non-statutory planning documents; how effective these policies have been; and the degree and types of cooperation between regional councils and district and city councils to give effect to regional policies.

Regional councils have either:

- historically recognised land fragmentation as a regional issue and have existing policies that have aimed to plan for and limit rural-residential development and loss of productive potential of rural land; or
- recognised land fragmentation as a regional issue more recently and have subsequently introduced policy to address land fragmentation in a second generation RPS that has either recently become operative or remains at the proposal stage; and
- in some cases, have undated policies from the first to second generation RPS. This situation provided insights into how policy to address land fragmentation has evolved over time.

In this section we consider operative and proposed RPS policies and provide examples of how land fragmentation policy has evolved from first to second generation RPSs.

The assessment is based on a combination of a review of relevant parts of RPS and council survey responses. Some councils responded by explaining the full range of policies related to land fragmentation – from soil protection, to regional form, to infrastructure and water and waste water provision. Other councils responded with a focus just on soil and/or rural productivity protection. Therefore the assessment focuses on the key policies addressing land fragmentation as identified or highlighted by councils. Additional objectives, policies and implementation methods relating to land fragmentation may occur and would require an exhaustive review for complete identification and assessment.

6.2 Regional policies to address land fragmentation

Thirteen councils have provisions in their operative or proposed RPS that address land fragmentation: Northland, Auckland, Waikato, Bay of Plenty, Gisborne, Hawke’s Bay, Manawatu-Whanganui, Wellington, Marlborough, Tasman, Canterbury, Otago, and Southland. Taranaki, Nelson (unitary authority), and West Coast do not address land fragmentation in the RPS or other planning documents. Several councils reported that they also address land fragmentation in other statutory or non-statutory planning documents. Several examples of such cases are given below.

The Resource Management Act in 1991 requires regional councils to produce an RPS to guide resource management in each region. The RMA also requires that councils review and revise (if required) each RPS every 10 years, and for many councils a second generation RPS is either under development, proposed and undergoing public submissions and hearings or has been made operative. Of the 13 councils with land fragmentation policies:

- 4 have operative policies from a first generation RPS (Gisborne, Marlborough, Tasman and Otago)
- 3 have operative policies from a second generation RPS (Hawke’s Bay, Wellington and Canterbury)
- 6 have policies undergoing transition from the first to second generation RPS (Northland, Auckland, Waikato, Bay of Plenty, Manawatu-Whanganui, Southland).

Objectives related to land fragmentation are broadly consistent across RPSs and focus on the following (Table 3):

- protection of soil resources (e.g. versatile land, high quality soils, etc.)
- protection and enhancement of rural productivity
- development that is planned, and integrated with infrastructure and transport provision
- maintaining rural character and amenity.

Table 3 Examples of regional and unitary authority Regional Policy Statement objectives that address land fragmentation

<i>Council</i>	<i>Regional Objective(s)</i>
<i>Northland Proposed RPS 2013</i>	<p>3.6: Economic Activity: sets a broad goal of creating a regulatory environment that will encourage economic activity and investment in the region rather than deter it.</p> <p>3.7: Viability of important economic activities - reverse sensitivity and sterilisation: avoid reverse sensitivity and permanent removal of (high quality) land from productive purposes.</p> <p>3.12: Regional Form: planned development rather than allowing ad hoc development - to address a range of issues including efficiency of infrastructure provision, and the viability of rural area productivity.</p>
<i>Auckland Draft Unitary Plan (Section 2: RPS)</i>	<p>2.8.1 Rural activities: 1) significantly contribute to Auckland’s economic activities; 2) are undertaken while rural character is maintained; 3) rural areas are protected from inappropriate subdivision, urban use and development.</p> <p>2.8.2 Land with high productive potential: 1) subdivision, use and development of elite and prime land is managed to maintain its capability, flexibility and accessibility for primary production (elite and prime land defined in the draft Unitary Plan); 2) lower quality soils are recognised for their productive potential.</p> <p>2.8.3 Rural subdivision: 1) productive potential or the rural area will not be undermined; 2) prevent further sporadic, scattered subdivision for urban and rural lifestyle purposes; 3) use of development of existing titles (rather than new subdivision) is encouraged; 4) amalgamation and transfer of rural sites to best support rural activities is encouraged.</p>
<i>Waikato Proposed RPS 2013</i>	<p>3.11 Built Environment: 1) development of the built environment is integrated, sustainable and planned, that will include positive outcomes for: a) indigenous biodiversity, b) integrated land use and infrastructure, c) regionally significant infrastructure, d) protecting access to mineral resources, e) minimising land use conflicts, including minimising potential for reverse sensitivity, f) changing land use pressures, g) renewable electricity generation activities, and h) a viable and vibrant central business district in Hamilton city and other town centres.</p> <p>3.24: Values of soil: The values of the soil resource are maintained or enhanced, including: a) the existing and foreseeable range of uses; and b) its life-supporting capacity.</p> <p>3.25: High class soils: The value of high class soils for primary production is recognised and high class soils are protected from inappropriate subdivision, use or development.</p>
<i>Bay of Plenty Proposed RPS 2010</i>	<p>25: An efficient and sustainable transport network, integrated with the region's land use patterns.</p> <p>26: Subdivision, use and development (Western BoP) integrates with long term planning and funding mechanisms.</p> <p>30: Versatile soils’ productive potential and land and rural production activities are sustained for future generations.</p>
<i>Hawke’s Bay Operative RPS 2006 (2nd gen)</i>	<p>UD4: Planned provision of urban development, which avoids inappropriate lifestyle development, and ad hoc residential development in the rural parts of the Heretaunga Plains.</p>
<i>Marlborough Operative RPS 1995 (1st gen)</i>	<p>6.1.5: Soil productivity and avoidance of soil erosion and degradation: Practices that exacerbate soil erosion and degradation be avoided; and the potential and life supporting capacity of all soils be ensured by retaining the productive capability of those soils.</p>
<i>Tasman Operative RPS 2001 (1st gen)</i>	<p>6.1: Avoidance of the loss of the potential for land of productive value to meet the needs of future generations, particularly with high productive values.</p>

Objectives identified as addressing land fragmentation were noted as also addressing the following issues: integrated management; Māori issues and resource management; land management practices and soil health; a range of development principles and issues; rural character and amenity; and ecosystems and indigenous biodiversity.

To achieve the goals set in the regional objectives each RPS outlines policies and their implementation methods. Policies vary somewhat among council in their scope and detail and the methods outlined for their implementation. The following sections summarise key RPS policies and methods relating to land fragmentation.

6.2.1 Northland Regional Council

Northland is transitioning from its first generation (operative 1999) to its second generation (proposed 2013) RPS. The operative RPS included a policy to protect high quality soils. However survey responses indicated that the policy had not been effective because district plans had not implemented the policy. District plan provisions had been lacking until very recently regarding rural-residential subdivision, and very few controls around subdivision were enforced. The lack of control was cited as one reason why rapid unplanned rural-residential development has occurred at hot-spots (Section 5.3) around the region.

Northland Regional Council is currently operating under its proposed second generation RPS (2013). This summary of Northland's proposed RPS is made based on the latest available version (Proposed RPS Council Strikethrough) released September 2013. Policies discussed may be further revised and are not final until the RPS officially becomes operative.

Impacts of new use(s) and development on economic activity in the region are a key focus of the proposed Northland RPS. Loss of versatile soils as a result of subdivision is identified as a regionally significant issue (Table 3). The proposed RPS sets out three regional objectives related to avoiding adverse impacts from rural-residential subdivision: Objective 3.5 – enabling economic wellbeing; Objective 3.6 – economic activities: reverse sensitivity and sterilisation; and Objective 3.11 – regional form. To achieve these objectives the following policies and methods are prescribed.

Policy to address land fragmentation directs that use and development should be located, designed and built in a planned and coordinated way that takes into account two sets of development guidelines: The Regional Form and Development Guidelines and Regional Urban Design Guidelines (Section 5.1 Regional Form, Policy 5.1.1: Planned and co-ordinated development (A–G); Policy 5.1.3: Avoiding adverse effects of new use(s) and development). Policy 5.1.1 also directs that new use(s) and development must:

- consider cumulative effects when consenting development
- be integrated with infrastructure planning
- avoid potential reverse sensitivity
- avoid reduction of potential for soil based primary production
- maintain natural and cultural landscape values.

Methods to achieve Policy 5.1.1 include consideration of the policy in all statutory plan and strategy development and revision; consent applications (for key land fragmentation hotspots); and in the development of non-statutory plans and strategies.

Policy 5.1.3: ‘Avoiding adverse effects of new use(s) and development’ directly addresses Objective 3.7 to avoid reverse sensitivity and sterilisation of land by directing that new residential development will not cause reverse sensitivity or other adverse effects for primary production activities, as well as commercial industrial activities, infrastructure development or access to minerals of regional importance. Methods specified to achieve the policy are consideration in all relevant plan and strategy development; and consultation with key stakeholders when new use and development may have reverse sensitivity effects.

Monitoring the effectiveness of these policies is not detailed in the RPS, but it is noted that indicators to monitor policy effectiveness will be developed once the plan is made operative.

The Proposed RPS outlines regional form and development guidelines to use to implement the new policy framework (e.g. Policy 5.1.1). The regional form and development guidelines direct that new use and development must: have water supply; sewerage treatment; connect with existing development; avoid the need for greenfields development as much as possible; be situated so that physical and social infrastructures are easily accessible; and not be situated where mineral resources or key transport infrastructure routes are located; as well as several other guidelines not directly relevant.

There has been a significant shift in the policy approach adopted from the first to the second generation RPS – to plan for new development and maintain the productive potential of rural land. In its first generation, RPS Northland approached land fragmentation as a soil conservation issue only, which has been reported as having limited effect. Policies in the proposed RPS seek to maintain and develop rural productivity in the region and plan for new development to avoid negative impacts of rural productivity (e.g. reserve sensitivity and loss of productive soils). Methods to achieve the policies set out remain fairly permissive, in that in most cases methods include only that the policies be ‘considered’ in plan development – this provides little direction as to how they should be considered and with what weight provisions to limit subdivision and rural development should be given in comparison with other considerations of and pressures on district councils.

6.2.2 Auckland Council (Unitary Authority)

Auckland Council is transitioning from its first to its second generation RPS. The operative RPS 1999 sets a soil conservation objective of avoiding inappropriate use and development of soils, which refers to use and development that diminishes the versatility and productivity of soils regionally (Section 12: Soil Conservation). Policy 1 (Section 12.4.1) directs that use and development of soil resources must be managed to protect and maintain their versatility and productivity as much as is practicable. Methods to achieve this include regional and district planning and establishing a regional database identifying versatility and productivity of the region’s soil resources.

The operative RPS also includes provisions to address land fragmentation in both the former Rodney and Franklin districts, where Auckland region land fragmentation hotspots exist.

According to the survey the former Rodney and Franklin councils attempted to address land fragmentation for years through district plan provisions with little success.

Auckland's proposed Auckland Regional Policy Statement (Auckland Unitary Plan, Section 2) (Auckland Council 2013) addresses land fragmentation in Section 2.8: Sustainably managing our rural environment. The proposed Auckland RPS aims to sustainably manage the rural environment through its set of objectives and policies to enable rural Auckland to a) remain in rural production uses and to contribute to the regional economy, b) promote vibrant and liveable rural towns and centres, and c) enable rural residential development in designated areas. Rural land objectives and policies are focussed on rural activities, land with high productive potential, and rural subdivision. Here we focus on the policies set out to address rural subdivision, although several other policies within the RPS relate to limiting land fragmentation or addressing its effects.

Auckland is establishing 5 rural zones: rural production, mixed rural, rural coastal, rural conservation and countryside living (Section 2.8.3 'Rural Subdivision'). Each zone has policies, methods and rules that apply to it (Auckland Council, draft Unitary Plan, part 3). New subdivision in the four rural zones will be strictly limited. In areas zoned 'countryside living' subdivision will be allowed to provide for rural-residential development. Development within countryside living zones must adhere to numerous development principles including:

- avoiding areas of high indigenous biodiversity value or other high natural values
- avoiding development on elite and prime land
- maintaining and enhancing landscape, natural and amenity values
- avoiding reverse sensitivity effects of rural residential development so that rural activities can continue their operations.

New subdivisions outside countryside living zones will only be consented where they protect an identified significant ecological area (SEA) and where the title is then transferred to either a countryside living zone or another identified receiving area for 'transferable title rights'. Auckland aims to encourage and promote the use of existing rural sites rather than allow the subdivision of new sites. Auckland region has a large number of sites in the rural environment that have been subdivided but are yet to be developed. Auckland is also aiming to support and encourage the amalgamation of small property lots (existing subdivision) to better enable soil-based production activities that require large areas. Implementation methods are not included in the draft RPS.

One survey response outlined a situation playing out at Auckland Council where a recommendation to decline a resource consent for subdivision has been made, at least in part, because of the subdivision's contribution to land fragmentation. A decision is yet to be made on this resource consent application while further information is sourced for councillors. However, the outcome of this consent application may have significant implications for how 'land fragmentation' is dealt with in future consent applications.

Auckland's new policies suggest that the strategic direction regionally will be to 'clean-up' what has been a long history of ad hoc or unplanned subdivision in the rural area. A legacy that means many agricultural activities may be run on multiple small lots. Amalgamating where it is necessary, efficient, or practical, may begin to deal with the legacy of subdivision

of lots in the rural environment. Rather than creating new subdivisions as Auckland continues to develop, Auckland is aiming to develop existing sites where this is practical and/or efficient over amalgamation.

Example: Land fragmentation provisions in another statutory plan: The Auckland Plan

The Auckland Plan sets a strategic direction for the Auckland Region for the next 30 years. Chapter 9: Rural Auckland addresses land fragmentation in its ‘Strategic Direction 9’: to keep rural Auckland *productive, protected and environmentally sound*. The plan sets targets to limit rural subdivision in productive areas, coastal areas, and island areas. The plan also sets a target to increase the value added to the Auckland economy from the rural environment by 50% by 2050.

6.2.3 Waikato Regional Council

Waikato is transitioning from its first to its second generation RPS. The operative RPS 2000 does not address land fragmentation.

Waikato’s new policy to address land fragmentation is set out in the Proposed RPS Section 6: Built Environment and Section 14: Soils. Waikato aims to: limit the amount of urban and rural-residential development on high class soils; limit the amount of new impermeable surface on high class soils; promote that high class soils stay in primary production and facilitating the return of high class soils to primary production where they are not in that use now (for example through the amalgamation of small titles); and to allow for urban and rural residential development in areas where land does not have high class soils.

The Proposed RPS encourages growth strategies, structure plans, and other methods to identify areas where future development will occur (Policies 6.1.4 and 6.1.5 of the Proposed RPS). This includes planning for rural residential development where demand for such development is high. Specific mention is made of the need to avoid fragmentation in the vicinity of Hamilton city, particularly to avoid additional or unintentional demands on infrastructure.

A set of ‘development principles’ in Section 6A of the Proposed RPS directs development away from high class soils and prescribes for rural-residential development to:

- be more strongly controlled where demand is high
- not conflict with foreseeable long-term needs for expansion of existing urban centres
- avoid open landscapes largely free of urban and rural-residential development
- avoid ribbon development and, where practicable, the need for additional access points, along state highways and other arterial routes
- recognise the advantages of reducing fuel consumption by locating near employment centres or near current or likely future public transport routes
- minimise visual effects and effects on rural character such as through locating development within appropriate topography and through landscaping

- be capable of being serviced by onsite water and wastewater services unless services are to be reticulated
- be recognised as a potential method for protecting sensitive areas such as small water bodies, gully-systems and areas of indigenous biodiversity.

Methods to address built environment policies include that local authorities will give regard to Section 6A Development Principles when they are preparing, reviewing or changing regional plans, district plans, and other planning documents such as structure plans, town plans, and growth strategies. The outlined methods emphasise the need for local authorities to give particular regard to an activity's potential to cause reverse sensitivity effects. A method specific to rural-residential development prescribes that district plans should identify areas for rural residential development that are directed away from natural hazard areas, high-class soils, access routes, and potential energy or mineral resource sources. The proposed Waikato RPS also notes a number of other methods including: advocacy, development of manuals and design codes, development of growth strategies, urban development planning and information to support urban development, involvement of key stakeholders in the development of all mentioned planning documents, and the use of economic instruments to help direct rural-residential development.

Policy 14.2 prescribes that decline in high class soils will be avoided in the Waikato region and outlines that high class soils should not be used for activities other than those related to primary production, especially soil-based primary production. Implementation methods direct that District Plans will develop provisions to ensure that productive use of high class soils will be given priority over non-productive uses.

6.2.4 Bay of Plenty Regional Council

Bay of Plenty Regional Council (BoP) is transitioning from its first generation operative RPS (1999) to its second generation proposed RPS (2013). The operative RPS recognises land fragmentation as an issue (Section 6.2 Land Issues) in regards to the potential for urban expansion and rural subdivision to: a) limit the productive potential of the region's land resources and b) cause soil degradation if a new activity has increased land use intensity. The operative RPS sets out a single land objective to adopt sustainable land use and management practices (Section 6.3.1a) and specifies the following policies to meet the land objective:

- sustain productive potential of land resources
- safeguard the life supporting capacity of the soil (and associated ecosystems)
- avoid, remedy or mitigate the adverse effects of inappropriate subdivision, use and development of land on the environment.

Methods to achieve these policies include that BoP and district councils will work with landowners to promote sustainable land management and, through regional and district plans, will promote land management that protects and maintains soil and avoids adverse environmental effects of development. BoP will work with organisations producing environmental codes of practice, and identify and provide advice on the limitations of land for subdivision, use and development for productive purposes. District councils will consult BoP when land-use effects are of regional significance and are encouraged to promote integrated land use, development, and protection for soil conservation.

BoP's proposed RPS new policy sets new policy to address land fragmentation in the Urban Form and Growth Management and Water and Land policies sections (Section Three: Policies and Methods). BoP aims to manage subdivision, use and development to avoid adverse effects, including reverse sensitivity, on infrastructure operation (Policy UF 11B).

Subdivision, use, and development are not to result in versatile land being used for non-productive purposes outside the zones planned for urban and residential use and development. Any activity that could contribute to cumulative effects or reduce the productive potential of the land must be given particular regard (Policy WL 9B). Councils will provide for rural-lifestyle (rural-residential) development in such a way that it protects versatile soils (Policy WL 10B). Managing reverse sensitivity effects on rural production activities is also a priority. The Proposed RPS requires that all subdivision, use and development will not result in reverse sensitivity or compromise rural production and infrastructure operation (Policy WL 11B: Managing reverse sensitivity on rural production activities).

Implementation methods outlined to achieve the above policies include: their consideration in the development, review and changes to regional and district plans and structure plans; the development of structure plans for land-use changes; the promotion of sustainable management of versatile land; support from council for rural structure plans; and the inclusion of the above policies in the consideration of resource consents for subdivision.

6.2.5 Gisborne District Council (Unitary Authority)

Gisborne's policy to address land fragmentation is set out in the operative RPS Section Two: Land Management. This section identifies Issue 2.5 as the loss of highly productive and versatile soils as a result of subdivision. Gisborne aims to protect highly productive and versatile soils from subdivision and to recognise the value of highly productive soils to the community while enabling low-density residential development where that development will not put highly productive soils at risk or result in their loss. Methods to achieve these policies focus on having district plan rules that ensure highly productive soils are protected, in particular the soils of the Poverty Bay Flats area, where most of Gisborne's highly productive soils occur. District plans are also to include provisions to enable development in areas with lower quality soils.

Gisborne has reported that the hearings committee has sent a strong signal on controlling development in the Rural Productive zone. This suggests that subdivision controls for the rural productive zone are being implemented consistently and strongly, which may result in the effective avoidance of further land fragmentation of the rural land resource in those areas designated for protection.

6.2.6 Hawke's Bay Regional Council

Hawke's Bay policy to address land fragmentation is outlined in the operative RPS (2008) – Proposed Policy Statement Change 4 (2011) (partly subject to appeal): Managing the Built Environment. Prior to the introduction of this Policy Statement Change Hawke's Bay had no policies regarding land fragmentation. The Policy Statement Change 4 has had legal effect since notification in December 2011. However, parts of the Change remain subject to appeal, and those parts do not take legal effect until finalised.

The Proposed Policy Statement Change prioritises the protection of versatile land and the efficient use of existing infrastructure when making development decisions (Policy UD1) and directs district plans to include objectives and policies that discourage ad hoc development and establish zones specifically for planned, compact rural lifestyle development (Policy UD3). The Proposed Policy Statement Change also directs district plans to establish urban limits in the Heretaunga Plains sub-region (Policy UD4.1).

Policies to address land fragmentation are new in the Hawke's Bay, and examples or reporting on the policies' effectiveness are not yet available. Hawke's Bay reported that new additional regional guidance on rural-residential subdivision was requested by Napier City Council because provisions in their district plan to discourage rural residential subdivision were not proving effective. Part of the result of this call for further guidance has been the Proposed Plan Change 4, which should assist district level management of land use and development in the region.

Example - Land fragmentation provisions in a non-statutory plan: The Heretaunga Plains Urban Development Strategy

In 2011, the Hawke's Bay Regional Council, Napier City Council, and Hastings District Council adopted the Heretaunga Plains Urban Development Strategy (HPUDS). HPUDS is a high-level strategic document that plans where growth can be accommodated within the sub-region over the period 2015–2045. In the past, such growth was planned independently. The Strategy will assist local authorities to plan and manage growth in the Heretaunga Plains sub-region while recognising the value of soil and water as a significant resource for on-going food production and as a major contributor to the region's economy.

6.2.7 Manawatu-Whanganui (Horizons) Regional Council

Manawatu-Whanganui (Horizon's Regional Council) is transitioning from its operative RPS (1998) to its second generation proposed RPS (2010). The proposed RPS has had legal effect since 2007 for all sections not under legal appeal. The operative RPS identified urban expansion and its impact on productive potential of the rural area and on soils as a regional issue. *To achieve sustainable land use* is the single Land objective set by the RPS (Objective 5). Policy (Policy 5.1) to achieve this (related to land fragmentation) prescribes that:

All land in the Region shall be managed sustainably. In particular the adverse effects of land use activities resulting in a significant:

- a. loss of soil from subsidence, landslip or erosion; or*
- b. loss of soil structure; or*
- c. irreversible loss of the productive capability of Class I and II land; or*
- d. degradation of water quality shall be avoided, remedied or mitigated.*

Methods to achieve the policy include that the regional council will:

- commission research to detail land resources in the region
- consider land policies in the development of the regional plan

- consider sustainable land-use and management practices when processing resource consent applications
- budget for soil conservation in the annual plan
- monitor the impact of land use activities on the region's soil resources.

Also, the regional council and district/city councils should develop codes of practice to encourage land uses in the region that are sustainable, provide information on sustainable land use, and provide for sustainable land use in district plans.

Manawatu-Whanganui's proposed RPS outlines a new policy to address land fragmentation under Issue 3.1c: 'Adverse effects of subdivision on versatile soils' and related objectives, policies and methods. The proposed RPS directs that priority must be given to protecting LUC I and II versatile soils for use as production land when providing for urban growth and rural-residential subdivision. Consolidation of existing development must also be considered before allowing development in new areas (Policy 3-3b). Methods are that councils in the region will work together to identify priority sites where pressure for residential development exists (Methods 3-4).

6.2.8 Wellington Regional Council

Wellington's policy to address land fragmentation is outlined in the operative RPS (2013). The operative RPS addresses land fragmentation as part of its regional form objectives and policies. Regional form in the RPS is focussed on developing a compact well-designed and sustainable regional form for Wellington, with a strong focus on integrated design of all development and physical and social infrastructure.

When processing resource consents for rural-residential development councils must consider if the proposal will:

- cause the loss of productive land
- result in reverse sensitivities
- restrict access to mineral resources
- effect the aesthetics of the landscape and open space
- decrease and not increase demand for non-renewable energy consumption.

All proposals must be consistent with the relevant city/district growth strategy that addresses future rural development (Policy 56: Managing development in rural areas). As well as this, LUC class I and II land is to be protected by giving particular regard to new use, subdivision or development's effects on productive capability in all resource consent applications, notice of requirement, or a change, variation or review of all district plans (Policy 59: Retaining highly productive agricultural land (LUC class I and II land)).

Wellington's regional form policies are to be implemented through a wide range of methods. Those most relevant to rural residential development and land fragmentation are:

- regional and district plan provisions and implementation
- the region must develop a regional land transport strategy

- rural development must take account of and adhere to, through consideration of policies in resource consent applications, notices of requirement
- when changing, varying and reviewing plan, a regional structure planning guide will be made available
- principles for rural-residential use and development will be developed.

Wellington Regional Council has worked with Kapiti Coast District Council to develop a plan change for the Waikanae North expansion that developed 'rural hamlets' to plan for and manage rural residential development in that area.

6.2.9 Marlborough District Council (Unitary Authority)

Marlborough's policy to address land fragmentation is outlined in Chapter 6 of the operative RPS (1995): Protection of Land Ecosystems. The operative RPS identifies issues affecting water and soil resources as a result of land use and development and Objective 6.1.5 aims to protect the potential and life supporting capacity and productive capability of the region's soils. Policy 6.1.6: Soil Fertility and Avoidance of Erosion prescribes that Marlborough will avoid soil loss and degradation. Methods to achieve the policy include:

- controls for land disturbing activities in resource management plans
- Resource Management Plans to identify areas of highly productive soils based on NZ Land Resources Inventory definition and controls to retain and maintain their productive capability and potential
- education on land use and its effects on the environment
- support research in this area
- carry out pest control programmes.

Example – Land fragmentation addressed in a combined regional, coastal and district plan - Marlborough

In Marlborough land fragmentation is an important issue on the Wairau Plain, an area of fertile soils and rural productivity. The Wairau/Awatere Resource Management Plan (WARMP) is an operative regional, regional coastal and district plan promoting the sustainable management of the Wairau/Awatere area and recognising the dynamic inter-relationships between land, water and people. WARMP sets the objective of maintaining or enhancing the life supporting capacity of the versatile soils in the Wairau Plan, which has been designated as Rural 3 Zone, and support sustainable intensive agriculture. Activities in Rural Zone 3 require a 'rural location,' and proposed activities that do not require a 'rural location' are discouraged. Marlborough encourages the long-term retention of the productive capacity of the soils in Rural Zone 3, promotes sustainable land management and promotes vegetative cover and land management practices to improve soils and avoid erosion.

Methods for achieving WAMP's policies include:

- zoning (Wairau Plain is Rural Zone 3)
- rules in plans to control subdivision to protect productive capacity of Rural Zone 3

- performance conditions such as development guidelines to provide guidance about the location of subdivision and development in rural areas
- conduct research where appropriate around sustaining the productive capacity (versatile soil resource) of the Wairau Plain
- education to assist resource users to understand what is happening in regards the rural land resource and the effects land use patterns have on rural productive potential.

An example of a district rule in the WARMP is that subdivision under 8 hectares is a non-complying activity, meaning the subdivision must gain a resource consent to proceed, the consent may have conditions attached to it, and council has the power to refuse the consent application outright.

The WARMP makes the following explanation regarding plan rules (Marlborough District Council, Wairau/Awatere Resource Management Plan, Section One, p.12-10):

Rules to control subdivision are considered a useful tool to ensure that lot sizes are appropriate to enable sustainable management of rural land that results in the retention of the life supporting capacity of the land and soil resource, allows for a range of future uses, retains the character and amenity values of the rural environment and minimises conflict between activities in rural areas.

Rules to limit the use of rural resources to include those activities that are rural land based activities in nature, require a rural setting or are necessary to enable rural communities to provide for their social, cultural and economic wellbeing.

Marlborough introduced provisions to limit subdivision on versatile soils in the Wairau Plain in 1997 and reported that implementation has been broadly successful. Subdivision under 8 hectares as a non-complying activity was successfully defended by Marlborough District Council in the Environment Court in the Calapashi Holdings Ltd versus Marlborough District Council case in 2005. One Marlborough council respondent commented that that the introduction of the rule to limit rural subdivision has been broadly considered as a successful example of managing the issue of land fragmentation.

6.2.10 Tasman District Council (Unitary Authority)

Objective 6.1 (Table 3) of the Tasman District Council's operative RPS (2001) sets the goal of avoiding the loss of productive potential of land, particularly for land with high productive values.

Policies to meet Objective 6.1 include:

- protecting the productive values of its land resources, with particular regard to the effects of land fragmentation on productive values
- protecting land with high productive values
- protecting significant natural and heritage values
- maintaining availability of water to support productive values.

Methods to achieve the stated policy are specified as policies and rules in the District Plan and include consideration of regional policies in resource consent applications to:

- restrict or prohibit subdivision of land with high productive value if that value may actually or potentially be lost
- require amalgamation of titles where appropriate
- regulate subdivision on land with moderate productive values
- allow non-productive land use or activities where land has low productive values, taking into account other land use and activities criteria.

Example: Land fragmentation addressed in a combined regional and district plan – Tasman District

Tasman District Council further addresses land fragmentation through provisions in its combined regional and district plan – the operative Tasman Resource Management Plan 2010. Objectives are set in the plan to:

- avoid loss of productive land use, especially on highly productive land
- provide for activities that are non-soil-based
- avoid conflicts (e.g. reverse sensitivity effects) between uses and protect rural amenity, character and ecosystems.

Policies are outlined (Section 7.1.1.1: Cumulative adverse effects of subdivision, development, and non-soil-based production on the rural land resource) to achieve objectives set in the plan. Policies outlined include that Tasman will:

- avoid, remedy or mitigate adverse effects of subdivision and other activities on highly productive lands, mineral resources or other resource value
- require subdivision size and shape to maintain the productive potential of the land
- encourage and support amalgamation and boundary relocation of titles where this supports soil-based production and soil health
- actively discourage subdivision on highly productive land (especially class A or B) in the Takaka-Eastern Golden Bay area and support amalgamation and boundary adjustment.

Implementation methods focus on setting zones and threshold lot sizes (subdivision rules) for the various zones; and resource consent conditions for subdivision, particularly for non-soil based activities and building, and for buildings above certain thresholds.

6.2.11 Canterbury Regional Council

Canterbury's second generation Operative RPS (2013) addresses land fragmentation in its development (rural form/ planned development) objectives and policies (Canterbury Regional Council 2013). The Operative RPS focuses on achieving compact, sustainable growth in existing urban areas, enhancing the quality of the natural environment, and enabling rural

activities in the rural environment. Policy 5.3.12 aims to avoid permanent reduction to the productive potential of the rural land resource. To achieve that policy the proposed RPS directs territorial authorities to identify primary production areas (or zones) and control subdivision and its adverse effects (e.g., reverse sensitivity) in those areas.

Resource consent conditions and notices have been employed for a rural-residential development proposal in Christchurch City that are aimed at ensuring that the development did not undermine the rural land resource.

6.2.12 Otago Regional Council

Otago's policy to address land fragmentation is outlined in the land chapter (Chapter 5) of the operative RPS (1998). Otago aims to manage the region's land resources sustainably and maintain and enhance primary productive capacity and life-supporting capacity of the land (Objective 5.4.1). Part of this objective is to retain existing high-class soils and to avoid, remedy or mitigate activities that have an adverse effect on soil's life supporting capacity and/or productive potential.

Policy 5.5.2 addresses Objective 5.4.1 and is relevant to land fragmentation. Policy 5.5.2 aims to:

Promote the retention of the primary productive capacity of Otago's existing high class soils to meet the reasonably foreseeable needs of future generations and the avoidance of uses that have the effect of removing those soils or their life-supporting capacity and to remedy or mitigate adverse effects on the high class soils resource where avoidance is not practicable.

The Otago RPS describes high-class soils and discusses issues regarding their loss in the region (Otago Regional Policy Statement, p. 46):

Soils in many parts of Otago are not being used intensively but are still capable of producing a wide variety of crops. Whether a particular soil can be defined as being of high class or not is determined from soil, land and climatic characteristics. High class soils are defined as "Soils that are capable of being used intensively to produce a wide variety of plants including horticultural crops". This definition also requires good soil and other resource features that in combination are capable of producing a wide range of crops. It does not include areas that may be suited to one or two specialist crops, largely due to the climate rather than the soil quality. There is a need for the region's high class soils to be defined on maps to identify their location and extent. At the same time, urban expansion and other uses incompatible with preservation of the primary productive capacity of high class soils are encroaching onto these high class soils which are limited in extent around Otago.

Methods outlined to achieve the region's objectives and policies include:

- incorporation of policies and methods in the Land Regional Plan by regional councils
- consideration of RPS, regional and district plan provisions in resource consent assessment, including considering the need for consent conditions or the refusal of consent

- education programmes and information on land issues and the impacts of land-based activities; codes of practice for industries (e.g. for rural development or sustainable land management)
- identification of areas of high class soils in the region and create maps that clearly show their location and extent
- promotion and encouragement of integrated management and interagency cooperation
- research and monitoring programmes
- remediation of degraded land
- liaison with city and district councils over these issues
- development of guidelines that promote development on lower quality soils rather than high quality soils.

Methods outlined to achieve the region's objectives and policies include, that district and city councils will:

- consider all possible alternative options before approving a proposal that will have an adverse effect on high class soils
- include district plan provisions and resource consent implementation to avoid, remedy or mitigate soil degradation as a result of subdivision, use, development or protection of the land.

6.2.13 Southland Regional Council

Southland is transitioning from its first to its second generation RPS. While the RPS 1997 remains operative, council must also take into consideration the provisions of the proposed RPS 2012. The Operative RPS 1997 does not specifically address land fragmentation or rural-residential development. However, it does note other issues related to land fragmentation's effects on rural land and soil resources including soil, amenity and character loss due to the removal of plants and soil for development. Objective 8.1, which promotes the sustainable management of all soils, broadly or indirectly relates to avoiding or reducing land fragmentation.

Policies to achieve Objective 8.1 include that the region will maintain and enhance its soil resource, provide for the sustainable management of the most versatile soils in the region, and develop and monitor soil resource trend indicators. Methods to implement these policies are:

- information, education and public awareness
- promotion of sustainable land management practices
- advocating for the sustainable use of land resources
- consultation with land owners and user groups, etc.
- development of guidelines, protocols and accords for users for the sustainable use of land resources
- investigations and research to support sustainable land resource use and management

- preparation, implementation and administration of a Regional Sustainable Land Management Plan
- incorporation of policies into regional and district plans and other plans and documents
- and in resource consent applications, public works, and projects and financial assistance for projects to support sustainable land resource use and management.

In the proposed RPS 2012, Southland has developed policy addressing land fragmentation in the Rural Land/Soils section (Chapter 5). Southland aims to promote and manage sustainable use of the rural land resource and to maintain and enhance the life supporting capacity of the region's soils. The proposed RPS includes policy to avoid the loss of high value soils from productive use as a result of inappropriate subdivision, use and development (Policy Rural 4). Two methods (Rural 7 and Rural 10) require territorial authorities to prepare growth management strategies and establish controls for rural residential development, respectively, in accordance with achieving Policy Rural 4.

6.3 Cooperation between regional councils and territorial local authorities

Eight councils (Waikato, Bay of Plenty, Hawke's Bay, Horizons, Wellington, Canterbury, Otago and Southland) responded that they work with the relevant city and/or district councils on giving effect to regional strategies, plans and rules on land fragmentation. Two councils (Northland and Taranaki) responded that they do not work with the relevant city and district councils. While Northland noted that there has not been significant engagement across councils on this issue in recent years, they expect the situation to change when their new, second-generation RPS becomes operative. For the five unitary authorities (Auckland, Gisborne, Tasman, Nelson City, Marlborough) cooperation should not be an issue, given they have powers and authorities of both regional councils and territorial authorities. In the case of West Coast, the council does not have policies or plan provisions addressing land fragmentation.

Of those councils that do work with city and district councils on giving effect to regional strategies, policies, and plans at district and city level, the following types of cooperation and/or engagement were described:

- review of all territorial authority bylaws, subdivision consents, and district plan provisions and submissions made on these when relevant
- collaborative work to develop district plan provisions
- advice provided at both proposal stage and plan-review stage
- advice and/or submissions on subdivision consents
- advice and collaborative work to develop plan changes
- collaborative projects to develop a growth strategy and then reflect that strategy in RPS, and regional and district plans and other projects.

One unitary council noted that internal integration of and cooperation between regional environmental and district land-use planning was functioning well at their council.

Several examples of district/city councils working collaboratively with iwi and the regional council, to plan for future growth and development were also provided in questionnaire responses. Two of these examples are the Heretaunga Plains Urban Development Strategy (see section 6.1.6) and Future Proof.

Working collaboratively, Hamilton City Council, Waikato District Council, Waipa District Council, Matamata-Piako District Council, Waikato Regional Council, tangata whenua, and Transport New Zealand have developed Future Proof, a 50-year vision and implementation plan for future growth in the sub-region. One of the aims of Future Proof is to manage growth collaboratively by outlining a framework for ongoing cooperation and implementation by all the councils and other organisations involved.

In summary, Future Proof sets out goals to:

- avoid ad hoc development
- enforce tighter rules regarding rural residential development, including boundaries between urban and rural environment (to avoid reverse sensitivity effects)
- develop compact urban form
- improve public transport
- better manage transport corridors.

7 Monitoring of Land Fragmentation in New Zealand

Key Findings
<ul style="list-style-type: none">• Currently 3 of 16 councils monitor and report on land fragmentation.• Two councils noted ad hoc reporting of land fragmentation and two other councils noted a commitment to monitor land fragmentation in the future.• No consistent monitoring method currently exists, although monitoring efforts tend to track various aspects of subdivision (division of a single parcel into two or more smaller parcels), e.g. number and size of parcels over time.• Additional data needed to monitor and report confidently on land fragmentation trends include aerial photography, up-to-date land cover database, consistent definitions, and methods especially of “high quality” or “versatile soils”, and information sharing.

7.1 Monitoring of Land Fragmentation

Currently, one regional council (Waikato) and two unitary authorities (Auckland, Marlborough) monitor and report on land fragmentation. Horizons and Wellington regional councils indicated that they undertake periodic, ad hoc reporting of land fragmentation. The remaining 11 regional councils and unitary authorities do not currently monitor and report on land fragmentation. Among the city and district councils responding, both South Waikato and Matamata-Piako district councils monitor land fragmentation but do not formally report except in RMA Section 32 analyses.

Councils cited a number of reasons for not currently monitoring trends in land fragmentation, ranging from land fragmentation not being an issue to land fragmentation not being a regional council responsibility (Figure 5). In one case no reason was given for not monitoring land fragmentation.

Of the councils monitoring and reporting on trends in land fragmentation, the indicators and data sources vary (

Table 4). Despite the variation, broadly the methods aim to capture the process of land fragmentation by monitoring changes in the number, size, and location of land parcels or titles. Increasing numbers and decreasing sizes of titles and parcels indicate areas where certain land-use activities may become constrained or unfeasible due to size threshold effects or, in the case of the urban-rural interface, generation of future conflicts through reverse sensitivity.

Among the six councils undertaking land fragmentation monitoring, Matamata-Piako District Council's monitoring appears to be the most comprehensive. The council reports on six inter-related indicators across two thematic areas of "residential growth" and "rural area development." Together the six indicators provide a comprehensive picture of trends across the gradient of rural-rural residential-residential zones. As a result Matamata-Piako can monitor and report both broad and localised land fragmentation trends. Most interestingly, Matamata-Piako also tracks the number of consents declined on LUC Class I, II or III land, which potentially provides evidence to help track effectiveness of policies and plans designed to manage land fragmentation within the district. Finally, Matamata-Piako can track all these indicators because they record the details of every land-use and subdivision consent in their state of environment database. Similarly, Marlborough District Council appears to benefit from careful recording of geo-referenced consents data.

With regard to future monitoring activities, Tasman District Council (also a unitary authority) and Hawke's Bay Regional Council noted a commitment to monitor land fragmentation in the future. Auckland Council is also developing formal methods for the systematic monitoring of land fragmentation. They are considering various options which include:

- Using LINZ cadastral database information at various years and determining the change in number of land parcels, for example between 1998 and 2008. Cadastral information is available regionally and at yearly intervals which can be classified into parcel size categories to gain more detail about rural fragmentation.
- Using LINZ database of titles. This option will allow the assessment of average title size in an area or local board of interest. However, up until 2013 this information would only provide data of when a title was last subdivided and not illustrate re-subdivision.

The latter can now be calculated and will be undertaken at annual intervals by the Land Use Built Environment Team in the Research Investigations and Monitoring Unit (RIMU) at Auckland Council.

Both options of land fragmentation monitoring could be used in conjunction with the Land Resource Inventory database to provide information on the potential type of land (e.g. land with LUC classes I, II, or III) that may be affected.

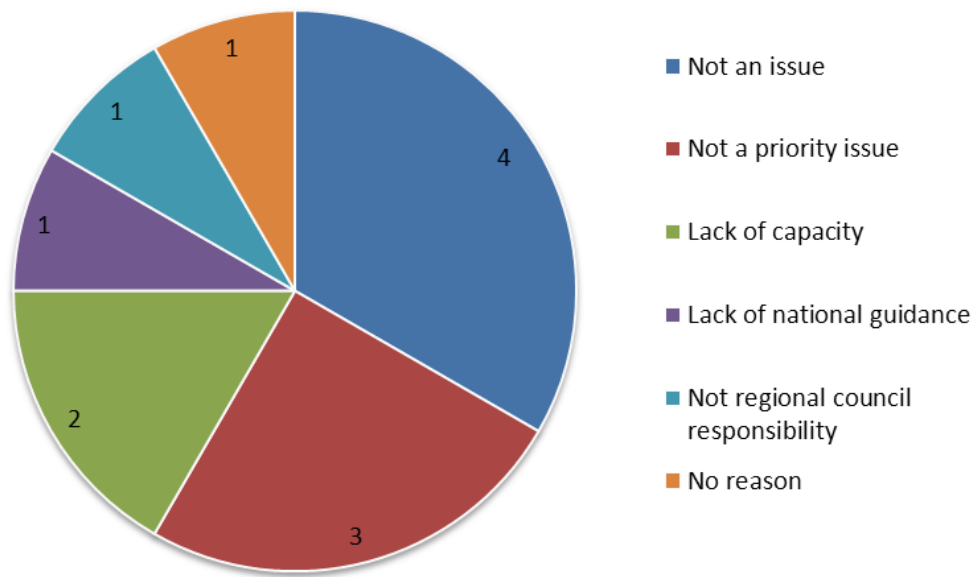


Figure 5 Frequency of reasons given for not currently monitoring land fragmentation.

Table 4 Existing council indicators and data sources used to monitor land fragmentation

COUNCIL	INDICATOR	DATA SOURCES
Auckland Council	Change in the number of titles	LINZ Cadastral Database
	Change in the number of vacant titles outside the existing Rural-Urban Boundary	LINZ Cadastral Database
Hamilton City Council	Number of new titles issued	Not specified
Marlborough District Council	Change in parcel size and number	Council consents database (geo-referenced)
Matamata-Piako District Council	Number of residential lots created as a result of subdivision	Council state of environment indicators database
	Number of lots between 2500m ² and 10 000m ² in the residential, rural residential, and rural zones	Council state of environment indicators database
	Applications received/granted to subdivide LUC Class I, II, and III land in lots < 8 hectares of size	Council state of environment indicators database
	Area of LUC class I, II and III land removed from the Rural zone through District Plan changes	Council state of environment indicators database
	Average lot size for rural subdivision on class I, II and III land	Council state of environment indicators database
	Number of consent applications declined for subdivision on Class I, II and III land	Council state of environment indicators database
South Waikato District Council	Number of new lots approved for development	Not specified
Waikato Regional Council	Amount and type of low-density rural land subdivided into smaller blocks (Low density = land with 1 or fewer houses per 4 hectares)	Statistics New Zealand Census of Population and Dwellings Meshblock Database Land Resource Inventory

7.2 Additional Information Needs

Councils identified a wide range of additional data sources and information needs that could be used to help monitor and report land fragmentation trends including:

- Aerial photography and/or remote sensing data for assessment of observed land-use changes, preferably at 5 year intervals
- More up-to-date land cover and land-use data (e.g. updates to the Land Cover Database, development of an equivalent land-use database, e.g. Morgan et al. 2010, Rutledge et al. 2009)
- Clear definition of land fragmentation and what is to be monitored as “land fragmentation”

- clear, trusted, reliable methodologies for monitoring that are nationally consistent
- real time reporting on subdivision based on a subdivision database
- Area of LUC I, II and III land lost to non-productive use every year
- good quality indicators that will show the rate and trends of land fragmentation annually
- better – more accurate – mapping of high quality land
- being able to start to get indicators for the impacts of different development – what is the pollution coming off lifestyle blocks versus intensive farming blocks
- national consistent definition of high class soils
- more detailed, accurate mapping of land use – land-use change
- larger scale spatial soils information to enable the identification of the locations and distributions of high class soils and other soils with better accuracy
- more cross organisational sharing of information.

Comment was made that sometimes the number and size of subdivision consents granted are not accurate enough measures of change, because they do not provide information of specific land-use changes occurring. It is worth noting that even if development does not occur immediately, the existence of multiple titles can be a driver of future development if development pressure occurs in the area. However, the point was made that land-use data showing actual current land use through time is required, and to achieve this aerial photography or remote sensing data were felt to be sufficient (bullet one above).

Four respondents noted that land fragmentation should be able to be monitored sufficiently using current tools and data. One respondent noted that the use of the Land Cover Database and the Land Resource Inventory would be sufficient to analyse land fragmentation trends in New Zealand.

District and city council responses suggested the following data and information would help with monitoring and reporting on land fragmentation:

- information on land holding sizes at the land title level
- information on the number of lots created, rather than the scheme plan approvals, which can lapse
- spatial data on land fragmentation.

8 Conclusions

This report summarises the state of knowledge regarding land fragmentation in New Zealand, including issues, policies and monitoring based on a review and analysis of regional policy statements, results of a land fragmentation survey of all regional councils and unitary authorities and three district/city councils, and subsequent discussions with council staff.

Although land fragmentation is occurring around New Zealand, it is not occurring uniformly within or across regions. Six regions identified land fragmentation as a regionally important issue; in remaining regions it was only of medium or low importance (Table 5). While

varying in importance at a regional level, most regions reported some localities or ‘hotspots’ where land fragmentation has become an important issue (e.g. the Wairau Plains in Marlborough). In those cases, hotspots most commonly include areas where subdivision for rural-residential (lifestyle block) is occurring close to urban centres on soils with relatively high productive potential.

While fragmentation is commonly an issue regionally or locally, the understanding of land fragmentation and associated issues varies across councils. The lack of shared understanding stems partly from a lack of consistent terminology or definitions to help characterise, measure, monitor, and report on land fragmentation trends, and many councils indicated a desire to develop more consistent terminology and definitions for land fragmentation. New Zealand is not alone in that regard. Based on a literature review, numerous definitions or conceptions of land fragmentation are used internationally such as the number and size of land uses and/or land parcels in the rural landscape; the number of parcels that make up an individual farm; and the spatial distribution of multiple parcels that make up a single farm.

While the importance of land fragmentation currently varies regionally, policy trends indicated that most councils expect land fragmentation to increase in importance. Several councils have introduced policies to address land fragmentation in their second generation regional policy statements (Table 5). Such thinking agrees with broader expectations for increasing competition for land in New Zealand (Mackay et al. 2011). Several councils have already had land fragmentation policies in place, even though land fragmentation was not considered a regionally important issue. Such cases suggest a more proactive and preventative policy approach designed to prevent land fragmentation from becoming an issue in the first place.

Regional policies to address land fragmentation are focussed primarily on limiting unplanned rural subdivision. Some councils use plan zoning to introduce defined rural-residential development zones close to existing centres to minimise loss of productive potential of rural land, provide infrastructure more efficiently, avoid potential negative social and cultural impacts, and take advantage of positive impacts. For example, enabling rural-residential development can increase population in rural areas, which can have subsequent flow-on effects in the community (e.g. school role numbers) and for the economy (e.g. increased income). In terms of managing development across the landscape, regional and district councils generally aim to meet the demands of their residents for this style of living while avoiding negative impacts and creating positive impacts for the region or district.

Second generation RPSs show substantial development of land fragmentation policy and implementation methods in comparison to first generation RPS, in particular in areas where land fragmentation is becoming a more pressing issue (e.g. Northland, Auckland, and Waikato, Canterbury) (Table 5). In second-generation RPS regional councils are much more involved in managing regional ‘rural form’ and subdivision (i.e. land use). Broadly speaking, second-generation RPSs contain more detailed and prescriptive policies and methods. Regional councils are consistently focussed on retaining and protecting the productive potential of rural areas, on ensuring that development is planned to avoid conflict with other land uses, on minimising environmental effects, and on enabling efficient infrastructure provision.

Table 5 Summary of land fragmentation importance, policies, rules and monitoring by region

Region	Regional Importance	Existing Policies		Plan Rules	Monitoring
		1st Generation RPS	2nd Generation RPS		
Northland	High	Yes Operative RPS 1999	Yes Proposed RPS 2013	No	No
Auckland	High	Yes Operative RPS 1999	Yes Proposed Unitary Plan 2013	Operative RPS 1999: No Proposed Unitary Plan 2013: Yes Rural Zones	Yes
Waikato	High	No Operative RPS 2000	Yes Proposed RPS 2013	No	Yes
Bay of Plenty	High	Yes Operative RPS 1999	Yes Proposed RPS 2010	No	No
Gisborne	High	Yes Operative RPS 2002	-	No	No
Hawke's Bay	Locally important – Heretaunga Plains	No Operative RPS 1995	Yes Operative RPS 2006 (RPS Change 4 2011)	No	No
Taranaki	Low	No Operative RPS 1994	No Operative RPS 2009	No	No
Manawatu-Whanganui (Horizons)	Low	Yes Operative RPS 1998	Yes Proposed One Plan 2010	No	Ad hoc reporting
Wellington	Low	Yes Operative RPS 1995	Yes Operative RPS 2013	No	Ad hoc reporting
Nelson	Low	No Operative RPS 1995	-	No	No
Marlborough	Locally important – Wairau Plain	Yes Operative RPS 1995	-	Yes Rural Zones	Yes
West Coast	Low	No Operative RPS 2000	-	No	No
Tasman	High	Yes Operative RPS 2001	-	Yes Rural Zones	No
Canterbury	Low	Yes Operative RPS 1998	Yes Operative RPS 2013	No	No
Otago	Medium	No Operative RPS 1998	-	No	No
Southland	Low	No Operative RPS 1997	Yes Proposed RPS 2012	No	No

Rural residential development is not seen as a negative process in its own right, but scattered, un-managed, and un-planned rural residential development can be expensive for council as well as having potential financial and social impacts. Policy makers have favoured introducing rural zones to limit and delineate rural subdivision and development, as well as

introducing policy and methods to implement transferable development rights, title amalgamation, and development guidelines.

Few regional plans (See Table 5) included rules targeting land fragmentation, except for plans prepared by unitary authorities. Such a result is not surprising given that unitary authorities combine the functions, powers and responsibilities of both regional councils and unitary authorities.

The lack of rules from regional councils (not unitary authorities) suggests that they may be challenged under current governance arrangements to implement rules to manage land fragmentation effectively. In those cases, a regional council must work effectively with city and district councils to ensure city and district plans contain rules and provisions that help meet regional objectives and policies.

Nationally, regional and district coordination regarding land fragmentation issues were mixed. Some relationships were considered strong and effective. The Future Proof strategy in the Waikato and the Heretaunga Plans strategy in Hawke's Bay are good examples of collaborative efforts among regional councils, territorial authorities, and iwi to develop and agree a coordinated plan to manage sub-regional growth over long time horizons. Several other successful cases were cited where district plan provisions are effectively managing rural residential subdivision on land with high productive potential.

Other relationships were considered dysfunctional or non-existent, thus creating fundamental barriers to achieving policy goals. Lack of district plan provisions regarding rural subdivision, and/or weak implementation of district plan provisions were noted several times as contributing to land fragmentation as an important issue. Therefore a key component in achieving successful management of land fragmentation requires effective coordination among regional policy statements, regional plans, district/city plans and district/city council implementation of the district plan provisions.

While land fragmentation is an increasingly important issue, few councils currently monitor land fragmentation (Table 5). Those councils that undertake monitoring do not use consistent methods or indicators for measuring and reporting. The lack of consistency prevents comparison among regional trends and, at a higher level, aggregation of results to support reporting at the national level. The reasons for a lack of monitoring vary, including a limited understanding of the physical processes and changes occurring on-the-ground in each region that result in land fragmentation, lack of a consistent time series of data needed for measuring land fragmentation trends, and lack of priority given to monitoring even in those regions where land fragmentation has been identified as an important issue.

Matamata-Piako District Council currently appears to have the most comprehensive monitoring programme for land fragmentation. They collect and record consent data in a state of environment database that supports the compilation and reporting of roughly a half dozen indicators to track different aspects of land fragmentation. The council even includes an indicator on the number of declined consent applications involving LUC Class I, II or III land. Together the suite of indicators provides the council with the ability to monitor and report on policy effectiveness (i.e. the difference being made via resource management policy) as well as physical changes to the landscape.

In summary, the current study demonstrates a compelling need to develop effective guidelines to help councils monitor and report on trends in land fragmentation. The guidelines should be formulated to help foster a consistent understanding of the different aspects of and processes leading to land fragmentation. In addition, the guidelines should include standard methods, indicators, and reporting formats to support robust reporting both within and across councils and at an aggregated national level. While the methods and indicators must initially rely on existing data and information, the guidelines could also outline how councils could begin to collect new data or, following the example of Matamata-Piako district council, more effectively use existing data (e.g. consents data) to guide gradual improvement in monitoring and reporting on land fragmentation in the future.

9 Next Steps

Stage Two of the project involves working with regional councils and unitary authorities, from the basis of the results of this review, to develop guidelines for monitoring and reporting trends in land fragmentation, including:

- suitable definition of key terms, including land fragmentation, versatile land, high-class soils, etc.
- consistent methods for monitoring trends in land fragmentation
- an indicator or set of indicators for reporting on land fragmentation trends
- reporting content and format
- developing, testing, and implementing a tool to support monitoring and reporting of land fragmentation by regional councils.

The goal by the end of the project is that all regional councils and unitary authorities will have used the tool to generate a first set of consistent regional reports on land fragmentation. The reports will in turn provide for the first time the ability to report nationally on land fragmentation.

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Appendix 1 Land Fragmentation Survey Questions

PART A: BACKGROUND INFORMATION

A1) Regional Council or Unitary Authority (please tick one)

Auckland	<input type="checkbox"/>	Horizons	<input type="checkbox"/>	Southland	<input type="checkbox"/>
Bay of Plenty	<input type="checkbox"/>	Marlborough	<input type="checkbox"/>	Taranaki	<input type="checkbox"/>
Canterbury	<input type="checkbox"/>	Nelson City	<input type="checkbox"/>	Tasman	<input type="checkbox"/>
Gisborne	<input type="checkbox"/>	Northland	<input type="checkbox"/>	Waikato	<input type="checkbox"/>
Hawkes Bay	<input type="checkbox"/>	Otago	<input type="checkbox"/>	Wellington	<input type="checkbox"/>

A2) Key Contact Person – name, title, email, phone (confidential, for project purposes only)
What is your role in the council? (e.g., soil scientist, policy, resource information, biodiversity, etc.)

A3) Survey Participants – please list all staff contributing to this survey by their role (e.g., policy analyst, resource manager, planner, etc.). Names are optional but not necessary, and if included will remain confidential. It is more important that we understand the different perspectives of different staff members, so there is no need to formulate a single response. Instead list all individual responses and indicate which participant provided the response or portion of a response by listing the role followed by the response, e.g. “Policy Response: ...” or “Resource Consent Response: ...”

PART B: ISSUES

B1) How does your regional council define land fragmentation? Does your council use other terms for the same or a similar concept (e.g., rural land fragmentation, rural subdivision)?

B2) How important is land fragmentation as an issue in your region?

B3) How does land fragmentation rank compared to other issues in your region, e.g. high, medium, low? What other issues rank more highly than land fragmentation and why

B4) What key concerns (e.g. economic, social, political, environmental, cultural, etc.) does your council have regarding land fragmentation?

B5) Do any other issues relate or link to land fragmentation? If yes, what are those issues and how do they link to land fragmentation? (e.g., revenue returns from farming land)

B6) What does your council view as the key drivers and processes of land fragmentation?

B7) Does your region have any “hotspots” of land fragmentation? If yes, please explain the situation at that/those ‘hotspots’.

PART C: POLICIES, PLANS RULES AND CONSENTS

- C1) Does your council address land fragmentation in the following (If yes, please explain how, and what policies, rules, methods etc. are included that relate to land fragmentation and any information about how these have been working in relation to their stated purpose):
- a) Regional Policy Statement
 - b) Regional Plan or Unitary Plan
 - c) Long Term Plan (Local Government Act)
 - d) Other Statutory Plans
 - e) Other Non-statutory Plans
- C2) If your council does not address land fragmentation in its policy statements, plans, non-statutory plans, etc., what are the reasons?
- C3) Does your regional council work with the relevant territorial authorities on giving effect to regional strategies, plans and rules on land fragmentation in District Plans? If yes, please provide examples including an explanation of how the process works. (Note: Does not apply to Unitary Authorities.)
- C4) Does your council have any examples or cases studies where policy, planning and resource management have dealt effectively with land fragmentation? Conversely, does your council have any examples where policy, planning, and resource management have not dealt effectively with land fragmentation?

PART D: INFORMATION, DATA AND MONITORING

- D1) Does your council currently monitor and/or report on land fragmentation?
- D2) If the answer to D1 is “yes,” what data, indicators, or other information does your council currently use to monitor and/or report on land fragmentation?
- D3) If the answer to D1 is “no,” what are the reasons for not monitoring or reporting on land fragmentation (e.g., not an important issue, lack of available indicators, lack of capacity or data, etc.)?
- D4) What new or additional knowledge, data or information would your council need to better understand, monitor and report on trends in land fragmentation in the region?

E) ADDITIONAL COMMENTS

Do you have any other information, comments, questions, concerns, etc. regarding land fragmentation that were not addressed by the other questions? If so, please state them here.