

# Understanding the Costs and Benefits of Planning Regulations: A Guide for the Perplexed

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# Understanding the Costs and Benefits of Planning Regulations: A Guide for the Perplexed

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## Executive summary

Urban planning involves regulating the use and development of land in and around cities. A range of plans, policies, and rules developed by local governments and legislation developed by central government seek to manage where residential and commercial activities can be located, or *how* development may occur. This may seem like a minor issue, but it is anything but. Planning policies directly or indirectly affect many important parts of society, such as urban labour markets, housing markets, and transport behaviours.

The aim of urban planning policy is simple in principle but challenging in practice: it seeks to manage the good and bad sides of urban growth. In order to do so, it often must balance competing priorities. Policy must enable cities to grow upwards and outwards, enabling people to find homes and access employment opportunities, while managing ill effects on the environment and on existing residents. And, in cases where there are trade-offs, it is important to weigh up the costs and benefits of alternative policy options.

The aim of this report is to assist in understanding these trade-offs. To that end, it identifies a framework that analysts can apply to identify, quantify, and compare the costs and benefits of individual planning regulations. This framework draws upon existing guidance on cost benefit analysis and regulatory impact analysis. It provides additional guidance for analysts seeking to apply cost benefit analysis techniques to planning regulations to inform decision-making at the local and central government level.

### **A process for cost benefit analysis (CBA) of planning regulations**

We identify five key steps that a good cost benefit analysis of a proposed planning regulation should follow:

1. Describe the proposed policy and (if within scope of the assessment) other regulatory and non-regulatory options. To assist in understanding the impacts of planning regulations on the use and development of land, we propose a taxonomy of planning regulations.
2. Identify the context and current state, including a counterfactual scenario that would occur in the absence of the proposed policies, including the state of the affected markets and other relevant regulations or legislation.
3. Define the problem statement – in other words, what market failures (or government failures) would prevent a socially beneficial outcome from occurring in the absence of regulation? In the absence of market failures, it is difficult to make the case for regulation.
4. Identify costs, benefits, and risks associated with options. To assist in doing so, we have described several types of costs that may arise as a result of planning regulations and identified a range of positive and negative externalities associated with the built environment that planning regulations could potentially manage.

5. Quantify and compare costs and benefits (if practicable). In many cases it is possible and desirable to quantify at least some costs and benefits. To assist with this process, we identify a range of methodologies that have been used to do so, and provide examples of their application.

### **Categorising planning regulations**

Urban planning policies are complex. It is common for multiple rules to affect development on an individual site. For example, the maximum size of buildings may be influenced by multiple rules, including building height limits, maximum site coverage rules, and yard setback rules. In this case, analysing the costs and benefits of planning regulations requires an analysis of how multiple rules interact.

Likewise, planning regulations can have complex and far-reaching impacts on urban development as a whole. For example, residential and business zoning may interact to make some areas more attractive for development than others.

Consequently, it is important to be able to clearly identify how planning regulations directly affect the use and development of land, to understand when rules may interact or when they may have distinct impacts. To assist in doing so, we identify eight broad categories into which most planning regulations can be grouped:

- Regulations controlling the location of urban activities (e.g. residential and business uses)
- Regulations controlling floor area ratios – i.e. the quantity of floorspace that can be developed per square metre of land
- Regulations controlling the density of dwellings or buildings – i.e. the quantity of land required per dwelling
- Regulations controlling the design of buildings, sites, and subdivisions
- Regulations controlling the demolition or alteration of buildings or sites
- Regulations controlling connections to public infrastructure networks
- Regulations managing environmental quality, including discharges into air or water
- Development and financial contribution policies, which attempt to internalise (or partly internalise) the infrastructure costs of new developments.

### **Identifying a counterfactual scenario**

In order to analyse the costs and benefits of proposed planning regulations, it is necessary to identify a counterfactual scenario that reflects what would occur in the absence of the proposed policies. Costs and benefits can only be considered relative to an alternative scenario.

Identifying a robust counterfactual can be difficult due to the dynamic nature of urban economies and land markets, and the role played by national-level legislation and

regulations. When defining one, we recommend that people seeking to analyse planning regulations consider both the existing market and social arrangements *and* the existing body of legislation, plans, policies, and rules.

The “market” aspects of the counterfactual should include information about demands, trends, and preferences in the affected markets, such as particular residential or commercial land markets. In order to establish this, we recommend considering sources such as demographic and economic data and projections, data on the structure of housing markets, building consent data, and outcomes observed in other cities with different planning regulations.

The “regulatory” aspects of the counterfactual should consider the impact of national-level legislation and regulations, such as the Resource Management Act 1991 (RMA), the Building Act 2004 and the Building Code, and National Environmental Standards and National Policy Statements issued under the RMA. In addition, it may also reflect the impact of other local government planning regulations that would stay in place even in the absence of the proposed policy.

### **Defining a robust problem statement**

Defining a problem statement for proposed regulations is arguably the most important step for ensuring good planning policy. In this step, it is necessary to investigate whether there is a rationale to regulate – i.e. whether there is reason to believe that people would be systematically incapable of arriving at a socially beneficial outcome in the absence of changes to regulations. In the absence of market failures, such as externalities, public goods, or information problems, there may be nothing preventing individuals from maximising their well-being.

To assist planners, policymakers and analysts in defining a robust problem statement, we have identified a range of market failures that may arise in the built environment. Planning regulations may raise well-being by efficiently addressing these market failures.

Even if there *are* market failures, it may be possible to address them through private arrangements between neighbouring property owners. It is therefore important to consider how these opportunities may arise, and how policy can respond to them.

### **Identifying the benefits of planning regulations**

Planning regulations (which include a variety of plans, policies, and rules) can benefit society and individuals where they address market failures that may arise in the built and natural environment. To assist in analysing the benefits of planning regulations, we have identified a number of types of externalities that can potentially be addressed by planning regulations. (Although it is also worth noting that poorly-designed planning regulations can have the unintended consequence of increasing negative externalities.)

First, regulations may manage negative externalities (harms imposed on other people who do not voluntarily choose to bear them) associated with new development, such as:

- Externalities resulting from neighbouring incompatible land uses (e.g. excessive noise or poor air quality from industrial activities in residential areas) or building form or location (e.g. overshadowing or loss of views from tall buildings)
- Transport-related externalities, such as excessive vehicle congestion, vehicle noise and emissions, or crashes
- Environmental externalities, such as negative effects on ecosystems from discharges to air and water (e.g. increased runoff from paved surfaces)
- Health and safety externalities resulting from factors such as poor air quality, neighbourhood designs that do not enable walking and hence result in increased public health costs, or neighbourhood designs that enable crime prevention through environmental design.

Second, regulations may facilitate positive externalities (benefits accruing to other parties) from new development or enable the provision of public goods that generate positive spillovers, such as:

- Agglomeration economies in production, which arise when firms have good access to labour supply, customers, and suppliers. Increased urban scale and/or density can enable firms to be more productive due to increasing returns to scale and specialisation in production and knowledge spillovers.
- Agglomeration economies in consumption, which arise when increased urban scale and/or density enables a greater range of consumer amenities, such as cultural facilities (e.g. museums, theatres, rock concerts), retail and food and beverage outlets, and non-market goods such as dating opportunities.
- Public goods and positive aesthetic externalities, which may arise when features such as public parks or attractive building frontages make an area more attractive for people other than the property owner. Public goods may benefit both users and non-users, including future generations and people who may simply appreciate their existence.<sup>1</sup>

Third, regulations may enable efficiencies in infrastructure and public service provision. Infrastructure and public services do not tend to be efficiently priced, meaning that users do

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<sup>1</sup> Strictly speaking, a public good is something that is neither rivalrous – i.e. many people can enjoy it without diminishing others' enjoyment – nor excludable – i.e. it is difficult to prevent people from enjoying it.



not necessarily bear the full costs of the infrastructure they are using. In this context, land use regulations can be used to help manage the costs associated with infrastructure provision. For example, planning regulations may enable development in areas with capacity in existing infrastructure networks while limiting development in areas that lack capacity. This may reduce the costs associated with providing infrastructure or better enable governments to stage the development of new infrastructure.

In addition to these categories of externalities, it is sometimes worth considering other potential market failures that could arise in the built environment. These could include, for example, information problems between buyers and sellers of buildings, in which one party lacks some relevant information for assessing the quality of a property.

### **Identifying the costs of planning regulations**

Planning regulations can also impose costs on individuals and society in general by making it difficult to develop land efficiently or supply new housing. To assist in analysing these costs, we suggest that the costs of planning regulations can be divided into three broad categories:

- Compliance costs: Planning policies and processes may impose a range of direct costs on individuals seeking to develop. These range from costs associated with preparing and processing resource consent applications (including the cost of additional delay in development) or complying with planning rules or consent conditions. These can also be described as added “resource costs” – i.e. they require people to expend additional resources, such as their time or construction costs, to obtain their desired outcomes.
- Deadweight costs: Planning regulations can also limit the amount of housing or business space that people can build on sites, or reduce the likelihood of development. This can result in a loss for both developers, who aren’t able to build their preferred projects, and their customers, such as households that may not be able to find housing in the places they would prefer to live. Deadweight costs may arise as a result of rules that limit the amount of housing or business space that can be developed in desirable areas, or that dissuade development due to higher cost and uncertainty of applying for resource consents.
- Indirect costs in imperfectly functioning related markets: Planning regulations can influence the cost of housing and the quantity of housing available. Consequently, they can also affect the choices that people make about where and how to live. This may result in some additional, indirect costs if there are imperfections in “related markets” such as transport, labour markets, public health, or urban land and development markets in general. Indirect costs tend to be borne by society rather than individuals – e.g. if somebody must drive longer distances on a congested road, it tends to have a negative effect on other road users.

In the aggregate, regulatory policies and processes can also influence the long-run dynamics of housing markets by slowing down the rate at which new housing or business space is built in response to increased demand. There is some evidence that cities with more restrictive planning regulations have less “elastic” housing supply. This reflects the fact that urban land and development markets are less competitive and responsive due to the aggregate impact of packages of regulations.

This is an important consideration when assessing the impact of overall “packages” of urban planning policies. However, it is not usually feasible to factor these effects in to evaluations of specific planning policies or regulations, as they tend to have an incremental effect on the overall urban development market.

### **Measuring the costs and benefits of planning regulations**

It is useful to estimate and compare the magnitude of costs and benefits associated with proposed planning regulations. To assist in doing so, we identify a number of methodologies that have been used to measure or estimate costs and benefits, including:

- General equilibrium models of land use and transport choices within cities or of the economy in general, such as the Alonso-Muth-Mills monocentric city model, transport modelling, and computable general equilibrium (CGE) models of regional and national economies.
- Simple micro-economic models of affected markets. Bespoke models can be developed to analyse key effects such as changes in consumer and producer surplus and increased/decreased externalities. These models typically attempt to approximate general equilibrium outcomes using ad-hoc assumptions about elasticities.
- Stated preference (SP) and revealed preference (RP) techniques. These are commonly used to value non-monetary benefits and costs, such as changes in environmental quality or public goods. SP studies survey people about their stated willingness to pay to obtain specific outcomes, or their willingness to accept losing those outcomes. RP studies use observed behaviours in “surrogate markets”, such as sale prices for houses or distance travelled to amenities, to estimate the value that people place on benefits.
- Hedonic analysis of property sales is a particularly important RP technique that is commonly used to identify both costs and benefits associated with land use regulations, by identifying the value of dwelling attributes that are restricted or enhanced by regulations and the value of amenities / public goods that are provided.
- Quantity surveyor (QS) cost estimates. These can be relevant for quantifying both costs and benefits. In some cases, regulations require people to incur additional costs, ranging from added construction costs to increased consenting costs. In

others, regulations allow people to avoid costs associated with mitigation of externalities (such as the installation of noise insulation to mitigate the effects of loud neighbours).

- Literature review or meta-analysis of previous studies. In cases where it is not feasible to conduct new research on benefits and costs, existing research may provide a basis for quantifying benefits and costs. In these cases, it can be useful to conduct a literature review and “transfer” previously observed values to the local context.

These methodologies can be flexibly applied in the context of policy evaluation. We discuss a number of examples where these methodologies have been applied to evaluate the costs and benefits of planning regulations.

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# 1.0 Purpose of this report

Urban planning involves regulating the use and development of land in and around cities. A range of plans, policies, and rules developed by local governments and legislation developed by central government seek to manage *where* residential and commercial activities can be located, or *how* development may occur. This may seem like a minor issue, but it is anything but. Planning policies directly or indirectly affect many important parts of society, such as urban labour markets, housing markets, and transport behaviours.

In the words of the Productivity Commission (2015):

“Cities are national assets. When cities function well, they provide greater choices of employment and more opportunities for specialisation, and they have higher incomes and productivity than other areas. This is because firms located in close proximity to each other can take advantage of having access to a wider pool of skilled labour, better links to markets for both inputs and outputs, and the ability to share knowledge. However, the concentration of people and businesses in cities also creates costs, such as pressure on infrastructure and on the availability of housing. This puts a premium on good city organisation and on the ability to plan for growth.”

The aim of urban planning policy is simple in principle but challenging in practice: it seeks to manage the good and bad sides of urban growth. In order to do so, it often must balance competing priorities. Policy must enable cities to grow upwards and outwards, enabling people to find homes and access employment opportunities, while managing ill effects on the environment and on existing residents. And, in cases where there are trade-offs, it is important to weigh up the costs and benefits of alternative policy options.

This report provides conceptual and methodological guidance to assist in understanding these trade-offs. It is aimed at analysts at the local and central government level who are seeking to apply cost benefit analysis techniques to planning regulations to understand the effects of existing and proposed policies in order to inform decision-making.

## 1.1 Context for this report

In order to provide context for the report, we begin by briefly reviewing some of the challenges and opportunities facing Auckland in particular and New Zealand cities in general.

### 1.1.1 Growth pressures

Auckland is New Zealand's largest city and among the fastest-growing places in the country. According to Statistics New Zealand's latest (2015) subnational population projections, the city is expected to grow at an average annual rate of 1.3% per annum from 2013 to 2043, compared with projected growth of 0.8% for New Zealand as a whole. Overall, Auckland is



expected to accommodate over 60% of national population growth in upcoming decades. Other urban areas, including Christchurch, Hamilton, Tauranga, and Queenstown, are also expected to grow rapidly.

The majority of Auckland’s population growth (62%) is projected to result from natural increase (i.e. an excess of births over deaths), while the remainder (38%) is expected to come from net migration.<sup>2</sup> This relatively rapid population growth means that it is necessary to plan for a significant increase in Auckland’s housing supply.

Figure 1: Projected average annual regional population change, 2013-2043 (Source: Statistics NZ, 2015)



### 1.1.2 The good and bad side of economic geography

New Zealand is small and distant from major markets, which makes it challenging to achieve good economic performance in today’s global economy. McCann (2009) describes this as a key cause of New Zealand’s “productivity paradox”, or the fact that its productivity and economic competitiveness lags behind most other OECD countries in spite of its good institutions, sound economic policies, an educated population, and a high level of entrepreneurialism and trust. He observes:

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<sup>2</sup> Historically, net migration to New Zealand has been quite volatile, with above-average net inflows in some years balanced out by smaller inflows or net outflows in others (Coleman and Landon-Lane, 2007; McDonald, 2013). A casual analysis of Statistics New Zealand’s regional net migration data suggests that net migration to Auckland may be somewhat less volatile than migration to other regions.

“Looking at New Zealand’s characteristics in the current phase of globalisation through the lens of economic geography, therefore suggests that the apparent productivity paradox of New Zealand is really a conundrum, a riddle, with a very simple solution. The major characteristics of the New Zealand economy, i.e. a small and extremely isolated economy, with small urban centres, and a low degree of export diversity, is a combination of structural characteristics that is not productivity-enhancing in the modern phase of globalisation, relative to other countries in other places.”

While New Zealand’s economy suffers from its geography, McCann (2009) argues that Auckland is best placed to emerge as a productive and innovative city with good international connections. A range of research shows that locating in Auckland offers advantages for households, who can access a larger labour market and more consumer amenities, and for businesses, who have better access to skilled labour, inputs, and markets for their products. Maré (2008) describes this as the “Auckland productivity premium”. As shown in Table 1, the Auckland urban area is 29% more productive than the rest of New Zealand even after adjusting for industry composition. The productivity premium is even larger in the city centre – 72%.

Table 1: Auckland’s productivity premium, 2006 (Source: Maré, 2008)

<b>Area</b>	<b>Value added per worker (VAPW)</b>	<b>Industry-adjusted VAPW</b>	<b>Productivity premium (industry-adjusted)</b>
New Zealand	\$52,037	-	-
New Zealand excluding Auckland	\$45,440	\$48,126	-
Auckland Urban Area	\$68,435	\$61,943	+29%
Former Auckland City Council area	\$76,930	\$66,836	+39%
Auckland city centre	\$106,873	\$81,638	+72%

According to Grimes et al (2014) and Donovan (2011), Auckland’s potential for agglomeration economies – the advantages of city size and density for producers and consumers – has been a fundamental driver of the city’s growth. In addition, the city benefits from good natural amenities, such as its climate and relatively high sunshine hours. We expect that Auckland’s geographic advantages within New Zealand and its comparatively high productivity means that it is likely to continue growing rapidly. Enabling urban growth

may assist in overcoming the New Zealand “productivity paradox” by strengthening urban agglomeration economies and international connections.<sup>3</sup>

### 1.1.3 Constrained geography

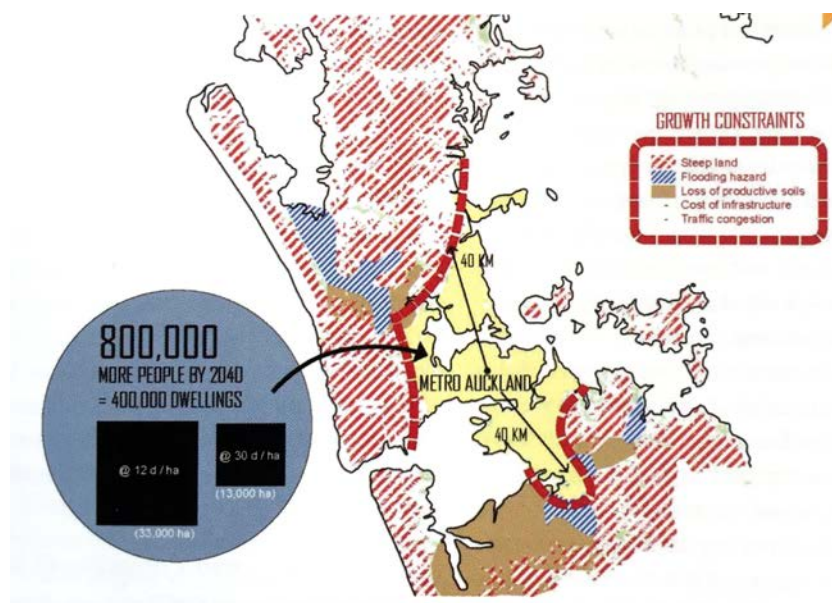
However, Auckland – like many other cities – faces some geographical constraints. Figure 2 presents a stylised view on the constraints on Auckland’s outward growth, which include two harbours and a significant amount of flood-prone or steep terrain on the fringes of the city.<sup>4</sup>

In a similar vein, Lees (2014) observes that Auckland’s harbours mean that it has significantly less land for development than comparably-sized Australian cities. He estimates only 32% of the area within 30 kilometres of the city centre is made up of developable land, compared with 48% of the area around the six major Australian cities, and concludes that:

“the impact of Auckland’s narrow geography is equivalent to adding about 900,000 residents or moving the city up to 2,200,000 residents – about the size of Brisbane.”

Geographical constraints reduce the amount of land available for new housing, which can reduce the flexibility and responsiveness of housing supply (Saiz, 2010). This in turn strengthens the need to use available land efficiently.

Figure 2: A stylised view of Auckland’s geographical constraints (Source: Falconer, 2015)



<sup>3</sup> As we discuss further in Appendix A there is stronger evidence for the impact of urban *scale* on agglomeration, as opposed to urban *form*.

<sup>4</sup> Of course, this map does not show which parts of the existing urbanised area are flood-prone or built on steep land. It is likely that similar geographical constraints have been overcome in the past, albeit at a cost.

## 1.2 Purpose of this report

The purpose of this report is to assist in understanding and evaluating the costs and benefits of urban planning policies, which include plans, policies, and rules developed by local governments and legislation developed by central government.

Planning regulations can have complex effects on the use and development of land in and around cities, and hence on the efficiency of local and regional economies, living standards for residents, and environmental quality. Understanding these effects – and the trade-offs between different values addressed by planning – can seem daunting.

Moreover, there are usually alternatives about whether and how to regulate. It is not always immediately apparent which approach is the most efficient – i.e. which delivers the greatest benefits relative to costs. Analysis is required in order to understand how best to regulate.

In this report, we review theory and evidence on the costs and benefits of planning regulations, and present a high-level framework for identifying and analysing their effects. In doing so, we draw upon relevant guidance on cost benefit analysis (CBA) and regulatory impact analysis (Resource Management Act 1991; Treasury, 2013, 2015; Auckland Council Chief Economists Unit, 2013; MfE, 2014).

We address the following issues:

- How to categorise the impacts of planning policies on the use and development of land – an important step in describing proposed policies and identifying how they may result in costs or benefits.
- How to identify an appropriate “counterfactual” scenario for proposed planning regulations, considering other central and local government regulations.
- Identification of market failures, such as externalities, public goods and inefficiently priced infrastructure networks, that may imply a case for planning regulations.
- A classification and analysis of the costs and benefits of planning regulations.
- A review of key methodologies for measuring and comparing the costs and benefits of planning regulations.

## 1.3 Intended users of this report

This report has been written with several audiences in mind.

First, it has been written as a guide for people who are analysing, evaluating, or researching the costs and benefits of planning regulations. We expect that these users will have some familiarity with cost benefit analysis frameworks and regulatory impact analysis, as well as underlying microeconomic concepts such as consumer and producer surplus and

externalities. If not, we recommend that they read this report in conjunction with other relevant guidance.

However, these users may be less familiar with the details of planning regulations, including how they affect the use and development of land, the mechanisms through which they can impose costs on individuals and on society, and how they can result in benefits by managing market failures associated with development and land uses.

We expect that this audience will benefit from the methodological sections of this report, as well as the Appendices summarising a range of relevant literature on measuring costs and benefits of planning regulations.

Second, this report has been written as a guide for planners and policymakers who are seeking to understand the value of proposed policy interventions. We expect that these users will be familiar with the nuances of the Resource Management Act 1991 (RMA) framework and the details of existing and proposed planning regulations.

However, these users may be less familiar with the economic concepts underlying cost benefit analysis and regulatory impact analysis. This may make it difficult to build a robust case for changes to planning regulations or identify the costs and benefits of planning regulations as required by section 32 of the RMA.

We expect that this audience will benefit from the conceptual discussion of how planning regulations can generate benefits and impose costs in section 5.0, as well as concluding sections identifying key areas where the evidence base for planning regulations could be improved.

Lastly, this report may also be of interest to laypeople who are interested in better understanding the effects of planning regulations. Planning policies are often of significant interest to the general public – after all, people have to live in the cities shaped by planning. While this report is technical in nature, we hope that it is nonetheless accessible to a wider audience.

## 2.0 The role of cost benefit analysis in planning policy

Planning policies often seek to manage trade-offs between competing social, economic, environmental, and cultural outcomes. Planners, economists, and policymakers are increasingly aware that there is a need for good analysis to ensure that policies strike an appropriate balance between competing outcomes.

Cost benefit analysis (CBA) is a widely-used framework for undertaking this analysis. CBA can be used to analyse the *efficiency* of proposed public policies. In doing so, it asks: are the benefits of this policy likely to exceed the costs?

Because CBA is a flexible framework rather than a single methodology, it is well suited for incorporating non-economic effects (such as environmental or health externalities) as well as economic effects. As discussed in following sections, a range of methods can be used to quantify different types of costs and benefits. The advantage of CBA is that it provides a framework for *integrating* the results of that analysis and reporting them in a consistent fashion.

### 2.1 Local governments have statutory obligations to evaluate proposed policies

Cost benefit analysis has historically been used to assess public investments, such as transport infrastructure projects. However, it is increasingly being applied in other areas of policy, including for assessing regulatory policies at the local and central government level.

CBA of planning policies should take into account the RMA, which establishes the framework under which local government planning policies are developed and implemented. The purpose of the RMA is to “promote the sustainable management of natural and physical resources”. In Section 5(2), it defines this aim as:

“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.”

A 2013 amendment to Section 32 of the RMA strengthened requirements for pre-implementation evaluation of proposed policy statements, plans, plan changes, regulations, or standards (MfE, 2013). Section 32, the relevant parts of which are excerpted in Table 2, now requires that the benefits and costs be assessed in terms of the environmental, economic, social and cultural effects that are anticipated from the implementation of the provisions. It also recommends quantifying costs and benefits, where practicable, to assist in understanding whether proposed policies are an efficient way of improving well-being.

Table 2: Section 32 of the RMA

**32 Requirements for preparing and publishing evaluation reports**

- (1) An evaluation report required under this Act must—
  - (a) examine the extent to which the objectives of the proposal being evaluated are the most appropriate way to achieve the purpose of this Act; and
  - (b) examine whether the provisions in the proposal are the most appropriate way to achieve the objectives by—
    - (i) identifying other reasonably practicable options for achieving the objectives; and
    - (ii) assessing the efficiency and effectiveness of the provisions in achieving the objectives; and
    - (iii) summarising the reasons for deciding on the provisions; and
  - (c) contain a level of detail that corresponds to the scale and significance of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the proposal.
- (2) An assessment under subsection (1)(b)(ii) must—
  - (a) identify and assess the benefits and costs of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the provisions, including the opportunities for—
    - (i) economic growth that are anticipated to be provided or reduced; and
    - (ii) employment that are anticipated to be provided or reduced; and
  - (b) if practicable, quantify the benefits and costs referred to in paragraph (a); and
  - (c) assess the risk of acting or not acting if there is uncertain or insufficient information about the subject matter of the provisions.

## 2.2 Key sources of guidance on CBA

Comprehensive guidance on CBA is available from a range of other sources, covering off issues such as comparison of options against “counterfactual” scenarios, discounting of future costs and benefits, and avoiding “double counting” costs and benefits. This report does not seek to duplicate that guidance – instead, it refers readers to those sources as relevant background material for the remaining sections of this report.

In addition to Section 32 of the RMA, which is summarised above, we recommend referring to the following sources of guidance:

- The Treasury's (2015) Guide to Social Cost-Benefit Analysis: Provides broad guidance on CBA, including the treatment of economic costs and discounting of future costs and benefits.<sup>5</sup>
- The Treasury's (2013) Regulatory Impact Analysis Handbook: Provides guidelines for conducting regulatory impact analysis (RIA), which can support or feed into a s32 analysis. In particular, these processes are valuable in establishing a robust “intervention logic” for proposed provisions.<sup>6</sup>
- The Auckland Council Chief Economist Unit's (2013) Cost-Benefit Primer: Provides supplemental guidance on CBA within a local government / urban context, including discounting future costs and benefits in the presence of long-lived assets.
- The Ministry for the Environment's (2014) Guide to section 32 of the Resource Management Act 1991.

In addition, it can be useful to refer to other sources of guidance, such as CBA textbooks. For example, we found Boardman et al's (2011) *Cost-Benefit Analysis: Concepts and Practice* particularly useful when considering how to account for indirect impacts of planning policies.

## 2.3 A roadmap for CBA of planning regulations

Based on Treasury's guidance, we have identified the following requirements for a good cost benefit analysis of proposed planning policies:

1. Describe the proposed policy and (if within scope of the assessment) other regulatory and non-regulatory options. Section 3.0 provides some guidance on categorising the impacts of planning policies on land use and development.
2. Identify the context and current state, including a counterfactual scenario that would occur in the absence of the proposed policies. Section 4.0 provides some background information that is useful for identifying a counterfactual.
3. Define the problem statement – in other words, what market failures (or government failures) would prevent a socially beneficial outcome from occurring in the absence of existing or proposed regulations? To this end, Section 5.0 contains a brief discussion of externalities and other market failures that may justify regulation.

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<sup>5</sup> Available online at <http://www.treasury.govt.nz/publications/guidance/planning/costbenefitanalysis/>

<sup>6</sup> Available online at <http://www.treasury.govt.nz/publications/guidance/regulatory/impactanalysis/>



4. Identify costs, benefits, and risks associated with options. This step follows on from the description of the policy and the problem statement. Section 5.0 defines how costs and benefits may arise from planning policies.
5. Quantify and compare costs and benefits (if practicable). In many (although not all) cases it is possible and desirable to quantify at least some costs and benefits. Section 6.0 describes a range of methods for doing so.

In many respects, Step 3 – defining a robust problem statement – is most important for ensuring good planning policy. In this step, analysts should investigate whether there is a rationale to regulate – i.e. whether there is reason to believe that people would be incapable of arriving at a socially beneficial outcome in the absence of regulations. In the absence of market failures, such as externalities, public goods, or information problems, there is no strong reason to expect regulations to improve well-being. This step aligns with the requirements of Section 32(1)(a), which asks whether regulation may be required in order to meet the purpose of the RMA.

In saying this, we note that even if there *are* market failures, it may be possible to address them through private arrangements between neighbouring property owners. This is commonly known as the Coase theorem, as it was originally described by economist Ronald Coase (1960). For example, a property owner seeking to preserve their own access to daylight and views may be able to bargain with neighbouring property owners to prevent them from erecting tall buildings on their site (Fischel, 2015). In these cases, planning regulations may not necessarily result in any additional benefits that would not have arisen from bargaining or contracts between property owners. It is therefore important to consider how these opportunities may arise, and how policy can respond to them.

Similarly, steps four and five – analysis and quantification of costs and benefits – are required by Section 32(2) of the RMA. These steps are important in establishing that a proposed policy is an *efficient* way of meeting the purpose of the RMA – i.e. that the benefits of the policy are likely to outweigh the costs. In other words, the *existence* of benefits from planning regulations is not necessarily sufficient to justify proposed rules. If the costs of regulating are higher than the benefits, it may be preferable to adopt a different approach.

## **3.0 Categorising impacts on the use and development of land**

Planning policies can have complex impacts on the use and development of land in a city. They can influence where people live and work, how intensely areas are developed for residential or business use, and the building and dwelling characteristics. These regulations can have cumulative or overlapping effects, as multiple rules may govern what can occur on a site.

Local governments write district plans, regional plans, and coastal plans that control a range of activities include the mix of land uses in an area, urban growth, and discharges into the air and water. The complexity of planning rules can make it difficult to assess their costs and benefits, as rules can have multiple effects or multiple interactions with other rules.

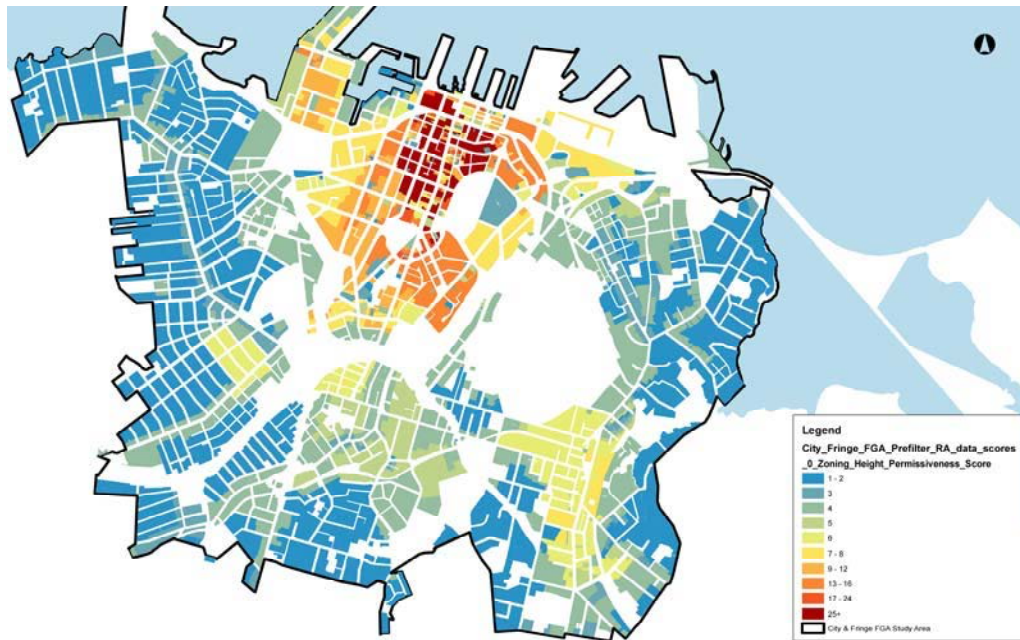
Consequently, this section sets out a high-level framework for identifying how planning regulations may affect development. It focuses on rules related to the urban environment, such as residential zoning controls, but contains some references to rules related to coastal policy and environmental protections.

### **3.1 Planning rules are inherently spatial**

Unlike most other regulatory policies, planning rules are spatial in nature. Regulations put in place by central government tend to apply equally throughout the country – for example, occupational safety and health rules apply equally to workplaces in Invercargill or Whangarei. Planning rules, on the other hand, can apply differently to different places within the same local government area. For example, a district plan may allow heavy industry to locate in one place but not another.

Similarly, planning rules often allow some areas to be more intensively developed than others. Figure 3 shows the variation of building height limits in and around Auckland's city centre, illustrating how fine-grained planning rules can be.

Figure 3: Building height limits in and around the Auckland city centre (Source: Lees, 2015a)

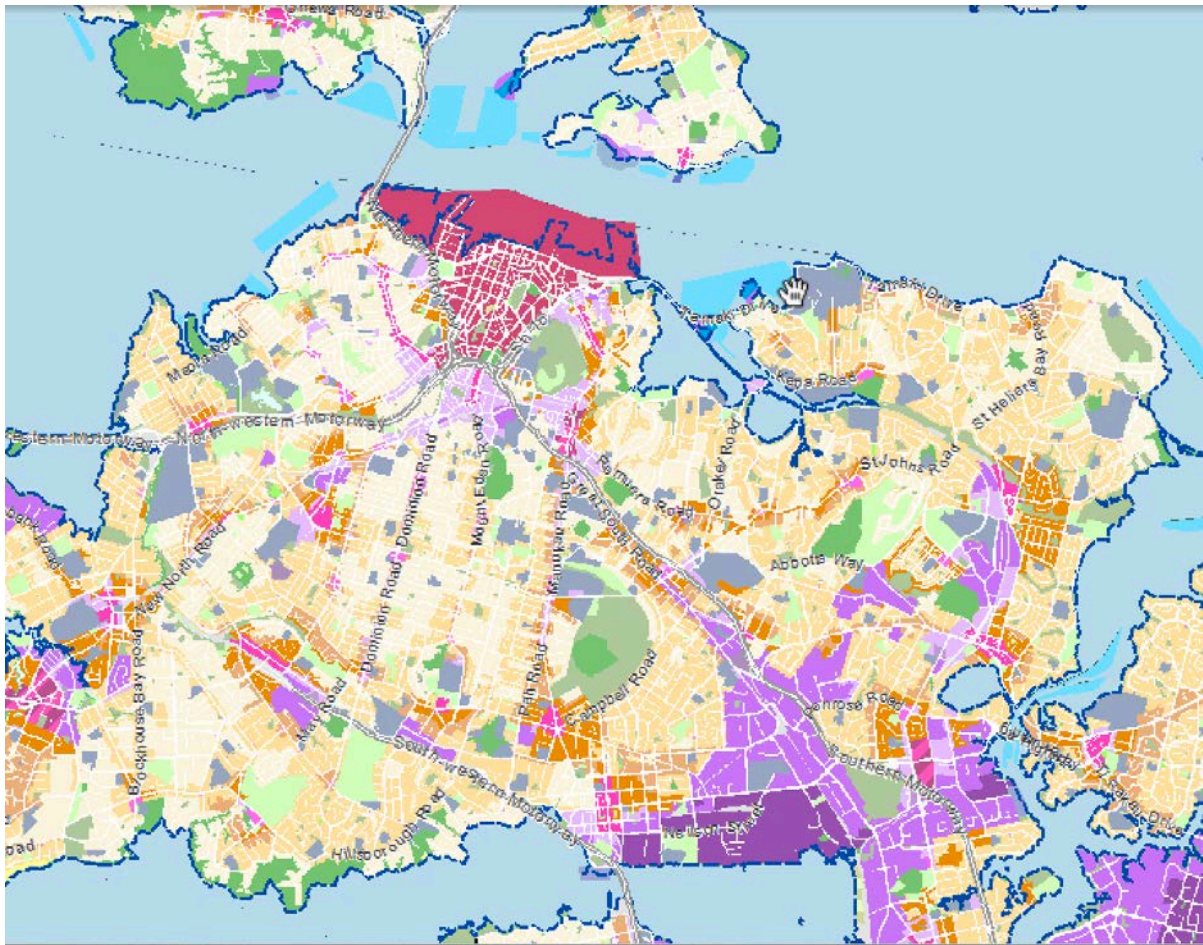


Location-specific planning rules are implemented in several different ways:

- First, region-wide policies are often applied to address regional resource management / environmental issues, such as air quality and freshwater quality. These policies are typically developed and implemented by regional councils (or district councils).
- Second, zoning policies are used to manage the types of activities that can occur in a given location (e.g. residential use versus business use) and the intensity of those activities (e.g. density of residential development). Zones are spatial areas where common land uses and activities are expected. All land and coastal water within Auckland, with the exception of some roads, is zoned. These policies are typically developed and implemented by district councils (or unitary councils) in district plans.
- Third, overlays and precincts (or other similar controls) may be used to modify underlying zoning rules or introduce additional controls on development or demolition of sites. In Auckland, these are used to raise or lower building height limits in specific areas, or introduce additional controls on the demolition of old buildings.

Figure 3 illustrates zoning controls on the Auckland isthmus under the Proposed Auckland Unitary Plan (PAUP), which was under review by an Independent Hearings Panel at the time we wrote this report. Zones are indicated by different colours on the map. Residential zones, which comprise the majority of the city, are coloured cream and orange colours, with darker shades indicating areas zoned for more intensive development. Business zones, some of which enable residential uses, are shown in violet and purple, while the city centre zone is shown in red. Open space zones are shown in shades of green.

Figure 4: Zoning controls under the Proposed Auckland Unitary Plan (Source: Auckland Council, 2013)



### 3.2 A taxonomy of planning regulations

Several economics papers have attempted to categorise planning regulations based on their impacts on the use and development of land. Quigley (2007) distinguishes five categories of planning regulations:

- Controls on the quantity and intensity of residential development
- Land planning controls focused on managing the availability of greenfield land
- Adequate public facilities requirements focused on ensuring that new subdivisions have a sufficient supply of transport facilities, water infrastructure, and social facilities
- Service capacity restrictions aimed at managing or limiting growth in infrastructure-constrained areas
- Development impact fees aimed at charging new developments for the supply of new infrastructure and social facilities.

In practice, there are often significant overlaps between these categories. For example, development impact fees (also called “development contributions” or “financial contributions” in New Zealand) can substitute for regulatory requirements. Shoup (2005) describes how impact fees have been substituted for minimum parking requirements in some jurisdictions. In San Jose, new office developments can choose whether to provide a regulated minimum amount of car parking on-site or pay impact fees to contribute to the provision of public parking garages.<sup>7</sup>

Brueckner (2009) presents an alternative classification based on the World Bank’s research into planning regulations in a number of jurisdictions. He distinguishes five categories of regulations, the first three of which are relevant to the case of New Zealand:

- Urban growth boundaries or “greenbelts” that attempt to limit the outward growth of cities
- Floor area ratio restrictions that set limits on the minimum amount of land per dwelling (“lot sizes”) or maximum building heights
- Regulations governing the design of buildings and neighbourhoods and consenting processes, which range from minimum street width requirements to design controls to consent requirements<sup>8</sup>
- Direct government involvement in development decisions, which was a common feature of mid-20<sup>th</sup>-century urban development in both communist-bloc countries and some urban renewal / public housing projects in the US and Europe (as critiqued by Jacobs, 1961) but which is less relevant for contemporary New Zealand
- Racially based exclusionary zoning, which is not relevant for New Zealand as it was principally found in apartheid South Africa.<sup>9</sup>

Brueckner’s classification also distinguishes between regulations affecting the supply of land and regulations affecting the density of development, as well as including a catch-all

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<sup>7</sup> Of course, as Shoup (2005) also notes, this is a case where new regulations have been devised to address the perverse consequences of existing regulations. Given the negative effects of minimum parking requirements on the efficiency of land development, the cost of housing, traffic congestion, and air quality, it would be better to simply repeal them.

<sup>8</sup> Brueckner describes these as “cost-increasing regulations”. We prefer to use a more neutral term.

<sup>9</sup> According to Fischel (2015), an early attempt to institute racially exclusive zoning in the “Jim Crow” American south was struck down in a 1917 Supreme Court case. However, Fischel argues that minimum lot size regulations, which potentially “exclude” low-income households that cannot purchase enough land, were later used as a substitute for racially exclusive zoning in the wake of federal and state housing laws that banned racial discrimination in the 1960s and 70s.

category for regulations affecting building and neighbourhood design and consenting processes.

Based on discussions with Auckland Council planners and a review of current planning documents, we propose a more detailed taxonomy of how planning regulations affect the use and development of land. Our classification is shown in Table 4.. It incorporates Quigley (2007) and Brueckner's (2009) distinction between regulations aimed at managing the supply of land for different types of activities and regulations aimed at managing the intensity of development but goes into further detail regarding *how* regulations may influence the development of land.

Unlike Quigley and Brueckner, we have included a category for regulations aimed at managing environmental quality, as this is an important aim of the RMA. In doing so, we note that planning regulations aimed at managing environmental quality could often fall into other categories on the table. For example, it is common to limit development in sensitive ecological areas, or require site design to respond to environmental issues (e.g. by fencing livestock off from streams).

Like Quigley (2007), we have included development and financial contributions in this table. In doing so, we note that these requirements are governed by the Local Government Act 2002<sup>10</sup>, rather than the RMA. However, they are highly relevant as they affect the mix of public and private costs to provide infrastructure and public services to new developments – i.e. if development contributions do not cover the full cost to supply infrastructure, ratepayer or taxpayer subsidies are required.

Table 3: Categories of planning regulations

Category	Examples of common regulations
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<sup>10</sup> Available online at <http://www.legislation.govt.nz/act/public/2002/0084/latest/DLM170873.html>.

Regulations controlling the location of urban activities (e.g. residential and business uses)	Zones, including residential, business, rural, and open space zones Urban growth boundaries Limits on development in / occupation of sensitive ecological areas Electricity transmission corridors
Regulations controlling floor area ratios (FARs) – i.e. the quantity of floorspace that can be developed per square metre of land	Building height limits Maximum impermeable surface / site coverage Height in relation to boundary controls Yard setbacks Viewshaft protection
Regulations controlling the density of dwellings or buildings – i.e. the quantity of land required per dwelling	Minimum lot sizes Density controls Subdivision controls
Regulations controlling the design of buildings, sites, and subdivisions	Minimum parking requirements Minimum dwelling size Outlook and daylight controls Landscaping requirements Street design rules <sup>11</sup>
Regulations controlling the demolition or alteration of buildings or sites	Heritage demolition controls Sites and places of significance to Mana Whenua Tree protection rules
Regulations controlling connections to public infrastructure networks	Vehicle access way rules Water and wastewater controls Stormwater management controls
Regulations managing environmental quality, including discharges into air or water	Significant ecological areas Air quality regulations Transport noise corridors Controls on discharges in the coastal marine area Earthworks controls
Development and financial contributions	Typically levied as a “lump sum” payment for new developers, to pay for some or all of the costs to provide transport infrastructure, water, wastewater and stormwater infrastructure, community facilities, and parks Alternative approaches may include targeted rates to recoup infrastructure costs over a period of time

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<sup>11</sup> Street design rules are not typically included within district plans but tend to be set separately by road controlling authorities.

## 4.0 Identifying a counterfactual for analysis

In order to analyse the costs and benefits of proposed planning policies, it is necessary to compare them against a “counterfactual” or “status quo” scenario that reflects a reasonable expectation for what would occur if the proposed rules were not implemented.<sup>12</sup> This does not necessarily mean that there are no regulations in the counterfactual scenario: it may still include national-level policies or regulations or other land use regulations that would apply in the absence of a proposed policy.

It is important to clearly establish a counterfactual for analysis, as the problems that may require regulatory intervention arise within the context of existing market and social arrangements and existing legislation and regulations. If market failures or government failures arise in the status quo scenario, they may create a situation in which individuals are unable to make decisions that result in an optimal outcome for society as a whole.<sup>13</sup> This may create a rationale to regulate. However, in the absence of specific market or government failures, there is unlikely to be a strong case to regulate (Treasury, 2013).

The counterfactual scenario should generally consider:

- Features of existing market and social arrangements, including information about trends, demands, and preferences in the affected markets; and
- Existing legislation and regulations, including information about the policies that would apply even in the absence of the proposed policy.

Establishing a robust counterfactual can be challenging for several reasons. First, there may be uncertainty or poor information regarding trends, demands, and preferences in affected markets. It may be difficult to determine the level of demand for building characteristics (or land uses) that a proposed policy will affect. In this case, it may be difficult to determine whether or not the policy is likely to be “binding” on development.<sup>14</sup>

Second, there are often multiple regulations or policies that need to be considered. Often, it is necessary to consider national-level policy guidance, as this may establish requirements for planning regulations, as well as other local government regulations that would apply even

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<sup>12</sup> See Step 1 in the Treasury’s (2015) *Guide to Social Cost-Benefit Analysis*.

<sup>13</sup> The terms “market failure” and “government failure” are explained by the Treasury (2013). In the following section, we provide a more specific discussion of market failures in the context of urban development.

<sup>14</sup> Rules are binding when they prevent or discourage people from doing something that they otherwise would have preferred to do. Conversely, a rule set at an extraordinary low level may not be binding. For example, a building height limit of 200 storeys would not be binding given that the world’s tallest building, the Buri Khalifa, is only 163 storeys high.



in the absence of a proposed policy. It may also be difficult to determine how regulations interact.

## 4.1 Existing market and social arrangements

Identifying a counterfactual or status quo scenario in the affected market requires an assessment of demands, trends, and preferences, as well as current land uses. The aim of this exercise is to determine:

- Whether proposed regulations are likely to be binding on development – i.e. are they likely to require people to change their behaviour?
- How much development is likely to be affected by policy changes – i.e. how large is the affected market?
- Are there any factors that would change demand or preferences in the future? For example, if a transport agency has committed to developing rapid transit infrastructure in part of the city, it may stimulate demand for intensive development in that area and hence change the cost of building height limits in that area.

Because different regulations affect different markets, in different ways, analysts must exercise judgment in deciding what information to gather. In our experience, it can be worthwhile to consider the following types of information when assessing the state of the market:

- Demographic data, including data on current residential population, households, and incomes. Statistics New Zealand publishes a wide range of demographic data, broken down at a detailed geographic level, from the New Zealand Census (most recently conducted in 2013).
- Economic data, including data on current employment and gross domestic product. Statistics New Zealand publishes employment data at a detailed industry and geographic level, as well as data on gross domestic product at a regional level.
- Projections of future population and economic growth. Statistics New Zealand (2015) publishes long-term population projections at a detailed geographic area, which Auckland Council uses to make estimates of future household formation. Auckland Council also produces long-run projections for future economic and employment growth at an industry level (Owen, 2012).
- Data on property markets, including current prices for land, dwellings, and business floorspace, and information on the spatial structure of demand. This data is not generally publicly available, but it can be sourced from councils, who collect it for updating their ratings databases, or property data companies such as CoreLogic (formerly QV) or REINZ. In addition, published hedonic price studies of property

sales (which are discussed below in Section 6.1) often provide relevant information on key aspects of property markets.

- Data on current resource and building consent applications, including the number of consents submitted and the number of dwellings consented. This data is available at an aggregate level from Statistics New Zealand, and potentially at a more detailed level from councils. It can be useful in understanding the quantity, composition, and scale of development that is currently occurring.
- Data from other, similar cities with different planning regulations. In many cases, the presence of existing planning regulations makes it difficult to determine the underlying level of demand for a given building attribute or land use. There may be latent demand that is going unmet as a result of existing rules. In these situations, data from other cities can be useful in understanding what might occur if regulations changed. MRCagney (2013) employs this approach to identify a counterfactual scenario for analysing the cost of Auckland's minimum parking requirements.

In addition to these sources, we recommend that analysts seek out other relevant sources of data, ranging from published research to interviews with market participants, where relevant.

## 4.2 Existing legislation and regulations

When identifying a counterfactual scenario for legislation and regulations, it is useful to consider the following sources:

- The Resource Management Act 1991, which in some cases specifies default requirements to obtain a resource consent for specific activities or land uses. For example, Section 12 of the RMA defines activities in the coastal marine area (e.g. recreational boating) as a permitted activity – something that people can do “by right” without the need for a resource consent. However, occupation of the coastal marine area (e.g. construction of a boat shed) is defined as a discretionary activity – i.e. something that requires a resource consent that can be granted (or declined) at council's discretion depending upon its alignment with the relevant Regional Policy Statement.
- The Building Act 2004 and the Building Code establish performance standards that new buildings must meet. The Code covers aspects such as structural stability, fire safety, access, moisture control, durability, services and facilities. Generally speaking, the Building Code takes a “performance based” rather than “prescriptive” approach – i.e. it seeks to define desired outcomes rather than specify specific methods of achieving outcomes. However, in some cases (e.g. regulation of exterior cladding to avoid leaky building problems) it has taken a more prescriptive approach (Marriage, 2010). In order to assist in achieving these performance standards, the Ministry of Business, Innovation and Employment (MBIE) publishes Compliance

Documents recommending Acceptable Solutions and Verification Methods.<sup>15</sup> MBIE's Compliance Documents are not mandatory – alternatives can be used provided these meet the required performance standards stipulated in the Building Code. However, they can provide a useful indication of the actions that may be required in order to comply with the Building Code.

- In some areas, National Policy Statements or National Environmental Standards establish targets or outcomes for land use regulations to achieve. These can guide the approach taken by local government regulations, although they do not necessarily limit councils to a single policy method. At the time of writing, there are four National Policy Statements in place (freshwater management, renewable electricity generation, electricity transmission, and coastal policy).<sup>16</sup> There are also five National Environmental Standards in place (air quality, drinking water, telecommunications facilities, electricity transmission activities, contaminants in soil) and several more under development.<sup>17</sup>
- Other planning regulations that would still apply even in the absence of any individual proposed rule. For example, if attempting to evaluate the impact of a proposed regulation to limit industrial emissions, it may be necessary to consider the location of industrial zones relative to residential or commercial zones.

While this list is a useful starting point, it is not exhaustive. In addition to these sources, it is useful to consider other legislation, council bylaws, etc, that may apply even in the absence of the proposed policy.

However, current regulations are not generally an appropriate counterfactual for an analysis of proposed changes to regulations under new (or significantly revised) district plans. Although we are not starting from a “blank slate” situation in which no planning policies apply, that does not imply that existing policies should simply be rolled over with no need for further analysis. In re-planning exercises, section 32 of the RMA applies equally to new rules and rules carried over from existing plans.

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<sup>15</sup> Available online at <http://www.building.govt.nz/compliance-documents>.

<sup>16</sup> Available online at <http://www.mfe.govt.nz/rma/rma-legislative-tools/national-policy-statements>.

<sup>17</sup> Available online at <http://www.mfe.govt.nz/rma/rma-legislative-tools/national-environmental-standards>.

## 5.0 Identifying costs and benefits

Well-designed planning regulations can play an important role in supporting higher well-being and improved social, economic, environmental, and cultural outcomes. However, planning regulations can also impose costs on individuals and society and create risks of unintended negative consequences.

As described in the Treasury's (2013) *Regulatory Impact Analysis Handbook*, regulations can improve outcomes in cases where market failures, such as externalities or information asymmetries between buyers or sellers, may prevent individuals from achieving a socially optimal outcome. Consequently, it is necessary to identify specific market failures that regulations seek to address in order to establish a case for regulation and enable the benefits of regulations to be identified and quantified.

To that end, the following sub-sections summarise the principal ways in which planning regulations may generate benefits or impose costs. Further detail, including references to the empirical and theoretical literature, is provided in Appendix A and Appendix B.

### 5.1 The impact of planning regulations on well-being

In principle, planning regulations can either improve or detract from well-being. If they manage market failures, such as externalities, at an acceptable cost, they are likely to raise well-being. However, if they are excessively restrictive or costly for development, or generate few benefits, they are likely to detract from well-being. In addition, even if there are market failures, it may be possible to address them through private arrangements between neighbouring property owners. Consequently, in some cases regulating may not be the only way to achieve social benefits.

#### 5.1.1 Planning in the context of externalities

Planning regulations are commonly seen as a mechanism for managing externalities and other market failures in the built and natural environment. Chung (1994) describes this as the "Pigovian paradigm" on planning, after the economist Arthur Pigou, who first described the concept of externalities. In this paradigm, planning regulations are a potentially efficient way of managing market failures.<sup>18</sup>

Figure 5 presents a stylised view of the potential positive and negative impacts of planning regulations on urban development markets. The left panel illustrates a case in which the supply of new housing in a given location (e.g. a sensitive ecological area) is associated with significant negative externalities. In this case, a restriction on supply (the vertical line on the

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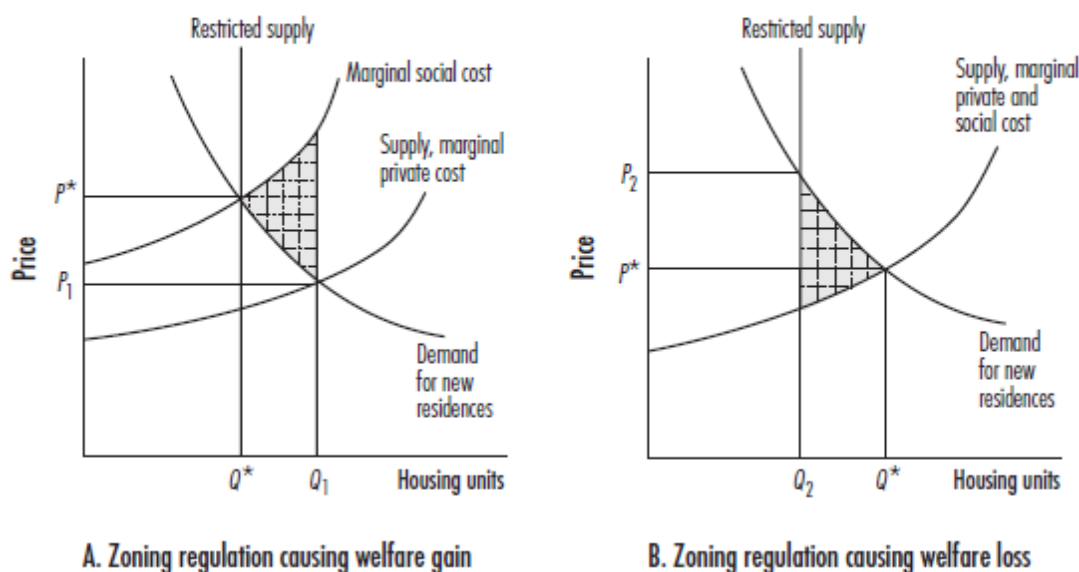
<sup>18</sup> However, it also bears mentioning that Pigou is *also* known for the argument that externalities can be "internalised" into individuals' decision-making by levying a tax on activities that harm others.

chart) can *raise* well-being by limiting these externalities. The magnitude of these benefits is shown in the shaded grey area.

The right panel shows a case in which a regulatory limit *reduces* well-being. In this case, the supply of new housing is not associated with any significant negative externalities.

Consequently, limiting supply simply raises the cost of housing – resulting in the economic losses shown in the shaded grey area.

Figure 5: Stylised model of how planning regulations can either increase or reduce well-being (Source: Quigley, 2007)



### 5.1.2 A Coasean perspective on planning regulations

However, some economists have argued that, even in the presence of externalities associated with urban development, there may not necessarily be a need to regulate (Chung, 1994). Following Coase (1960), they argue that private transactions between property owners can result in an optimal solution to externalities – at least under certain assumptions.

Coase (1960) begins with the observation that the decision to allow an externality to go uncorrected or to correct it through regulation has a *reciprocal* nature:

“The question is commonly thought of as one in which A inflicts harm on B and what has to be decided is: how should we restrain A? But this is wrong. We are dealing with a problem of a reciprocal nature. To avoid the harm to B would inflict harm on A. The real question that has to be decided is: should A be allowed to harm B or should B be allowed to harm A? The problem is to avoid the more serious harm.”

He goes on to argue that, regardless of the initial allocation of rights between A and B, it should be possible for the two parties to bargain with each other to achieve an optimal outcome. This is known as the “Coase theorem”. For example, a property owner seeking to

preserve their own access to daylight and views may be able to bargain with neighbouring property owners to prevent them from erecting tall buildings on their site. (See also Fischel, 2015, for a particularly useful discussion of the Coase theorem.)

The Coasean paradigm on planning implies that planning regulations may simply affect the initial allocation of rights – for example, by requiring property owners who seek to construct tall buildings to negotiate with neighbours or obtain a resource consent in order to secure the right to do so – without affecting the end outcomes.

However, as Coase acknowledges, “the situation is quite different when market transactions are so costly as to make it difficult to change the arrangement of rights established by the law”. Transaction costs may include the administrative costs of negotiating with neighbours, a lack of appropriate information about the effects of development, and the potential for “holdouts” who refuse to bargain (Fischel, 2015). If transaction costs are large, the Coase theorem may not hold true in practice.

A more subtle issue is that cognitive biases in decision-making can result in a situation in which the outcome from negotiations differ wildly depending upon the initial allocation of rights. Consider, for example, two alternative ways of asking survey participants how they value access to views:

*Approach 1: “How much would you be willing to pay (WTP) to obtain a sea view?”*

*Approach 2: “How much compensation would you be willing to accept (WTA) in exchange for giving up a sea view?”*

In theory, we would expect people to give the same answer to both questions. If somebody was willing to pay \$10 to obtain a view, it seems logical that they would also be willing to accept \$10 to give up that view. In practice, people give very different responses to these questions. As Kahneman et al (1990) document, measured WTA values are usually several times higher than WTP values – a finding they interpret as evidence for an “endowment effect” in decision-making that significantly affects the outcome of negotiations.<sup>19</sup>

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<sup>19</sup> See Kahneman (2011) for a broader discussion of cognitive biases in decision-making.

## 5.2 Identifying the benefits of regulations

Planning regulations can raise well-being by correcting for market failures that would have otherwise led to a poor outcome for society.<sup>20</sup> However, if market failures are not present, or if they are not large in magnitude, then it is unlikely that regulations will raise well-being. This is because regulations that require people to change their behaviours – e.g. by limiting their ability to find housing in the places that they want to live or requiring them to purchase dwelling features that they did not want – reduce individual well-being. If those people internalise all or most of the costs and benefits of their choices, this will *also* reduce social well-being.

Consequently, when seeking to identify and assess the benefits of regulations, it is necessary to begin with a robust assessment of potential market failures that may arise in the absence of rules. If it is not possible to identify any, or provide evidence for them, it is very difficult to claim that regulations will raise well-being. Even if it is possible to identify market failures, uncertainties about their magnitude and causal mechanisms may mean that “attempted cures may well do more harm than the disease” (Anas, Arnott and Small, 1998).

Table 4 defines five categories of market failures that should be considered in an analysis of residential zoning provisions. Each of these market failures can result in reduced social well-being, e.g. when:

- Individuals externalise some of the costs of their activities on society or the environment
- Individuals choose to under-provide public goods, such as parks, because they are unable to recover costs from people who enjoy them
- Individuals over-consume publicly provided infrastructure or amenities, such as transport networks.

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<sup>20</sup> They may also attempt to address government failures, which arise as a result of the perverse consequences of other policy interventions.

Table 4: Categories of market failures (Source: Treasury, 2013)

- Imperfect competition - where one or more party is able to control a market for their own benefit at the expense of consumers or other firms.
- Information problems - where one party to a transaction does not have the information needed to act in their best interests. In extreme circumstances this can lead to significant costs to many parties and the market being under-developed because of a lack of trust.
- Externalities (spill-overs) - where costs or benefits fall on people other than those who consume the good or service. This can lead to the over- or under-provision of the good or service, and
- Public and mixed goods - where a good or service is:
  - *under-supplied*, because it cannot be charged for
  - *under-consumed*, because consumers are being directly charged but their consumption is not incurring extra costs, (ie, it non-rivalrous), or
  - *over-consumed*, because there is free access to the resource but consumption still imposes costs.
- Lack of clear property rights - unclear, ill-defined, or poorly designed property rights can mean that parties do not bear the consequences or receive the rewards that result from their actions.

In addition, regulations may in some cases have some benefits that are fully captured by the owner or user of the affected property. Unless information problems or a lack of clear property rights would prevent them from achieving their preferred outcome, the existence of internalised benefits does not imply a case for regulation. For example, in the case of heritage protection, heritage buildings may be worth more than equivalent non-heritage buildings. However, this does not imply a case for heritage protection rules, as nothing is stopping individual property owners from preserving that value.<sup>21</sup>

### 5.2.1 Some relevant categories of market failures

Based on a review of the literature (see Appendix A) we identify three broad categories of market failures related to the use and development of land that planning regulations could in principle address.

First, regulations may manage negative externalities associated with new development. Important categories of negative externalities include:

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<sup>21</sup> However, heritage protection rules may still be justifiable based on the existence of positive externalities arising from aesthetically pleasing old buildings. Lazrak et al (2014) and Nunns et al (2015) provide some evidence of positive aesthetic externalities from old buildings.



- Externalities resulting from the collocation of incompatible land uses (e.g. excessive noise or poor air quality from industrial activities in residential areas) or building form or location (e.g. overshadowing or loss of views from tall buildings)
- Transport-related externalities, such as excessive vehicle congestion, vehicle noise and emissions, or crashes involving third parties or passengers
- Environmental externalities, such as negative effects on ecosystems from discharges to air and water (e.g. increased runoff from paved surfaces)
- Health and safety externalities resulting from factors such as poor air quality, neighbourhood designs that do not enable walking and as a result lead to public health costs from reduced physical activity, or neighbourhood designs that enable crime prevention through environmental design (CPTED). Health and safety costs are borne partly by individuals and partly by public health systems, law enforcement, and neighbours.

Second, regulations may facilitate positive externalities from new development or enable the provision of land uses with a “public good” character. Important categories of positive externalities include:

- Agglomeration economies in production, which arise when firms have good access to labour supply, customers, and suppliers. Increased urban scale and density can enable firms to be more productive due to increasing returns to scale and specialisation in production and knowledge spillovers.<sup>22</sup>
- Agglomeration economies in consumption, which arise when increased urban scale and density enables a greater range of consumer amenities, such as cultural facilities (e.g. museums, theatres, rock concerts), retail and food and beverage outlets, and non-market goods such as dating opportunities.
- Public goods and positive aesthetic externalities, which may arise when features such as public parks or attractive building frontages make an area more attractive for people other than the property owner. Public goods may benefit both users and non-users, including future generations and people who may simply appreciate their existence.<sup>23</sup>

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<sup>22</sup> In saying this, we note that there is stronger evidence for the impact of urban *scale* on agglomeration, as opposed to urban *form*. We discuss some relevant empirical literature in Appendix A.

<sup>23</sup> Strictly speaking, a public good is something that is neither rivalrous – i.e. many people can enjoy it without diminishing others’ enjoyment – nor excludable – i.e. it is difficult to prevent people from enjoying it.

Third, regulations may enable efficiencies in infrastructure and public service provision. Infrastructure and public services do not tend to be efficiently priced, meaning that users do not necessarily bear the full costs of the infrastructure they are using. In this context, land use regulations may be used as a “second best” method for managing the costs associated with infrastructure provision. For example, planning regulations may enable development in areas with capacity in existing infrastructure networks while limiting development in areas that lack capacity. This may reduce the costs associated with providing infrastructure or better enable governments to stage the development of new infrastructure. However, appropriately coordinating these decisions in the absence of comprehensive information about prices and demand for new infrastructure is very challenging.

Some important categories of infrastructure and public services to consider include:

- Transport infrastructure, which is funded both by local government (from general council revenues and development contributions) and central government (from the National Land Transport Fund), user charges for public transport and toll roads, and
- Water and wastewater infrastructure, which is funded by local government out of general council revenues, development contributions, and/or user charges
- Stormwater infrastructure, which is funded by local government out of general council revenues and development contributions
- Social facilities such as schools and hospitals (funded by central government) and libraries, sports fields, and parks (funded by local government)
- Electricity distribution and telecommunications infrastructure is privately provided and generally paid for out of user charges.

In addition to these categories of externalities, it is sometimes worth considering other potential market failures that could arise in the built environment. These could include, for example, information problems between buyers and sellers of buildings, in which one party lacks some relevant information for assessing the quality of a property. In these cases, the prices that people face may not accurately reflect quality. This is most likely to occur in cases where building attributes cannot be observed directly. For example, renters may not be able to fully assess how well insulated or weathertight a dwelling is prior to renting it, even though these features can negatively affect occupants’ well-being.

### **5.3 Identifying the costs of regulations**

Planning regulations can make it more difficult for people to develop land according to their personal preferences and budget constraints. (Or, in the case of developers, according to the expected preferences and budget constraints of their potential customers.)

Based on our review of theory and evidence (see Appendix B), we identify three ways in which planning regulations can impose costs on individuals and society in general:

- Compliance costs: Planning policies and processes may impose a range of direct costs on individuals seeking to develop. These range from costs associated with preparing and processing resource consent applications (including the cost of additional delay in development) or complying with planning rules or consent conditions. These can also be described as added “resource costs” – i.e. they require people to expend additional resources, such as their time or construction costs, to obtain their desired outcomes.
- Deadweight costs: Planning regulations can also limit the amount of housing or business space that people can built on sites, or reduce the likelihood of development. This can result in a loss for both developers, who aren’t able to build their preferred projects, and their customers, such as households who may not be able to find housing in the places they would prefer to live. Deadweight costs may arise as a result of rules that limit the amount of housing or business space that can be developed in desirable areas, or that dissuade development due to higher cost and uncertainty of applying for resource consents (Mayo and Sheppard, 2001).<sup>24</sup>
- Indirect costs in imperfectly functioning related markets: Planning regulations can influence the cost of housing and the quantity of housing available. Consequently, they can also affect the choices that people make about where and how to live. This may result in some additional, indirect costs if there are imperfections in “related markets” such as transport, labour markets, public health, or urban land and development markets in general. Indirect costs tend to be borne by society rather than individuals – e.g. if somebody must drive longer distances on a congested road, it tends to have a negative effect on other road users.

In the aggregate, regulatory policies and processes can also influence the long-run dynamics of housing markets by slowing down the rate at which new housing or business space is built in response to increased demand. There is some evidence that cities with more restrictive planning regulations have less “elastic” housing supply. This reflects the fact

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<sup>24</sup> However, as Grimes and Mitchell (2015) note, “planning and regulatory issues may rule out a developer’s ex ante preferred project but the same rules and processes do not necessarily rule out development of the same available land; an alternative project (either by the same or a different developer) may still proceed that has different consenting costs, probability of consenting success and/or different timeframes, building costs or expected revenues relative to the initially preferred project.” As a result, we suggest that deadweight costs are generally, although not always, smaller in magnitude than the compliance costs that would be required in order for the project to proceed.

that urban land and development markets are less competitive and responsive due to the aggregate impact of packages of regulations.

We provide a high-level discussion of this issue in Appendix B. It is an important consideration when assessing the impact of overall “packages” of urban planning policies. However, it is not usually feasible to factor these effects in to evaluations of specific planning policies or regulations, as they tend to have an incremental effect on the overall urban development market.

Table 5 illustrates how these costs can arise for individuals and for society as a whole. While these examples are hypothetical, they demonstrate how complex it can be to fully account for the cost of planning regulations. It is often necessary to consider the interaction between multiple markets, such as housing markets in adjacent suburbs, to fully understand how costs may arise and how they may be distributed between individuals.

Table 5: Examples of how planning regulations can impose costs

Type of cost	Hypothetical examples	Potential impacts
Compliance costs (added resource costs)	Obtaining a discretionary resource consent for a new development requires additional fees and consultant reports and results in delays to construction.	The development proceeds, but the cost per dwelling is higher than it otherwise would have been. These costs will tend to be passed on to households or land-owners. <sup>25</sup>
	Minimum parking rules require all developments to supply parking based on a “one-size-fits-all” rule that over-provides for some businesses and households.	The development proceeds, but the cost per dwelling is higher than it otherwise would have been. Some households (or businesses) are required to purchase car parks that they do not value.
Deadweight costs (opportunity costs)	Building height limits reduce the number of apartments constructed on a site.	<p>Because fewer dwellings are constructed in a desirable area, households that want to live in that area face a choice between, e.g.:</p> <ul style="list-style-type: none"> <li>• Competing with other people for the limited supply of apartments and thus paying higher prices for housing</li> <li>• Living in a less accessible location, which means spending more time and money on transport.</li> </ul>
Indirect costs in imperfectly functioning related markets (social costs)	Constraints on the development of apartments near a town centre mean that some people live further out than they would prefer. They must drive further to get to work.	<p>In addition to the impacts on individuals, which is already accounted for elsewhere, society bears some additional costs as a result of “market failures” in transport such as:</p> <ul style="list-style-type: none"> <li>• Congestion externalities, or increased delay for other road users</li> <li>• Vehicle emission externalities, which have health and environmental effects.</li> </ul>
	High costs for new housing as a result of planning rules means that some low-income households must live in crowded conditions or in excessively cold and damp dwellings.	In addition to their impact on individuals, which is already accounted for elsewhere, health problems such as respiratory diseases arising from poor quality dwellings increase public health costs. These are social costs.

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<sup>25</sup> As Evans (2004) observes, the incidence of these costs will depend upon the elasticity of supply in the affected market. In more “inelastic” or unresponsive markets, these costs will accrue more to land-owners.

Finally, we note that there are important interactions between regulatory policies, such as planning rules, and regulatory processes, such as the processes that councils follow in deciding whether to grant resource consents applications. There is often uncertainty about resource consent outcomes, as councils have some discretion over whether to grant consents, what information to require from applicants, or what conditions to place on consents.

In the context of uncertainty, it is possible for regulations to impose both compliance costs and deadweight costs. This is because developers may choose to apply for a consent (and bear compliance costs) that is subsequently turned down (resulting in a deadweight cost as the development does not proceed). By way of illustration, Table 6 summarises three potential outcomes for a development that would be required to obtain resource consent. It can often be difficult for developers to choose whether to apply for consent, as they may not have good information about how likely they are to receive it.<sup>26</sup>

Table 6: Potential outcomes from a requirement to obtain resource consent

	<b>Outcome</b>	<b>Compliance cost?</b>	<b>Deadweight cost?</b>
1	Development does not proceed to consent application	No	Yes
2	Developer applies for consent, which is subsequently granted	Yes	No (unless conditions are placed on consent to limit the amount of development)
3	Developer applies for consent but consent is not granted	Yes	Yes

Economists have used simple microeconomic models of developer behaviour to investigate the impact of uncertainty and delay on the development process. Mayo and Sheppard (2001) find that increased delays in obtaining consent tend to reduce the quantity of developments that apply for resource consent (leading to increased deadweight losses). In addition, increased *uncertainty* about the outcomes of consent applications (which they model as an increase in the variance of delays) also tends to reduce the quantity of development. Mayer and Somerville (2000) and Grimes and Mitchell (2015) obtain similar results, showing that increases in the cost of consent applications, delays during the consent process, and perceived uncertainty about consenting outcomes are likely to reduce the value of developments (and hence the likelihood of development).

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<sup>26</sup> In practice, there are ways to manage this uncertainty. For example, developers may use pre-application meetings to get an early indication of their probability of success. Likewise, developers with greater familiarity with regulatory processes and experience working with Council staff will often have a better understanding of their chances.

While these results are straightforward, applying them in a practical setting is not. It is usually possible to assess the impact of different outcomes – e.g. by measuring the cost of a successful resource consent application for the applicant, including the cost of preparing the consent application and consent application fees. However, understanding the relative likelihood of different outcomes is difficult without more in-depth information on resource consent applications. Detailed information about regulatory processes, and developers' perceptions of those processes, is therefore needed in order to assess the costs of a proposed planning policy.

## 6.0 Methods for measuring and comparing costs and benefits

In this section, we review a range of methodologies that can be used to measure the costs and benefits of planning regulations. As discussed in Section 2.0 above, estimates of costs and benefits derived using these methodologies can be incorporated and compared within a CBA framework. In doing so, we recommend referring to the Treasury's (2015) guidance on consistently comparing different streams of benefits (Step 5 of their guide).

Further detail on some of these methodologies, including examples of previous studies in which they have been used, is provided in Appendix A and Appendix B.

### 6.1 Summary of key methodologies

A review of the literature finds that a range of approaches have been used to quantify the costs and benefits of land use regulations. Relevant methodologies include:

- General equilibrium models of land use and transport choices within cities or of the economy in general. The Alonso-Muth-Mills monocentric city model is commonly used to obtain high-level estimates of the cost of regulations such as building height / floor area ratio limits or urban growth boundaries (see Glaeser, 2008 for an explanation of this model, and Lees, 2014, 2015a for an application in the Auckland context). In a similar vein, transport modelling can be used to analyse the impact of alternative development patterns on transport-related externalities. Computable general equilibrium (CGE) models of regional and national economies can also be used to model the flow-on effects of additional expenditure or increased construction costs throughout the economy.
- Simple micro-economic models of affected markets. Bespoke models can be developed to analyse key effects such as changes in consumer and producer surplus and increased/decreased externalities. These models typically attempt to approximate general equilibrium outcomes using ad-hoc assumptions about elasticities (see Donovan and Nunns, 2015 for a description of this approach and an application to multiple "markets" affected by minimum parking requirements).
- Stated preference (SP) and revealed preference (RP) techniques. These are commonly used to value non-monetary benefits and costs, such as changes in environmental quality or public goods. SP studies survey people about their stated willingness to pay to obtain specific outcomes, or their willingness to accept losing those outcomes. RP studies use observed behaviours in "surrogate markets", such as sale prices for houses or distance travelled to amenities, to estimate the value that people place on benefits.



- Hedonic analysis of property sales is a particularly important RP technique.<sup>27</sup> Hedonic analysis is commonly used to identify both costs and benefits associated with land use regulations, by identifying the value of dwelling attributes that are restricted by regulations and the value of amenities / public goods that are provided by them. The following section discusses several relevant evaluation methodologies based on hedonic analysis.
- Quantity surveyor (QS) cost estimates. These can be relevant for quantifying both costs and benefits. In some cases, regulations require people to incur additional costs, ranging from added construction costs to increased consenting costs. In others, regulations allow people to avoid costs associated with mitigation of externalities (such as the installation of noise insulation to mitigate the effects of loud neighbours).<sup>28</sup>
- Literature review or meta-analysis of previous studies. In some cases it may not be necessary (or feasible) to conduct new research on benefits and costs. Existing research may provide a basis for quantifying benefits and costs. In these cases, it can be useful to conduct a literature review and “transfer” previously observed values to the local context (see Rohani, 2013 for an application of this approach to valuing freshwater quality).

These methodologies are not mutually exclusive, as it is common to use different approaches to value different costs and benefits. For example, hedonic analysis could be used to estimate the benefits associated with providing more of a given building characteristic, while QS estimates could be used to estimate the cost of doing so.

## 6.2 Identifying and comparing costs and benefits with hedonic analysis

Here, we briefly discuss approaches to evaluating planning regulations using hedonic analysis of property sales. Hedonic price models can be used to estimate the implicit prices that people are willing to pay for various building and neighbourhood characteristics that are “bundled” together in individual houses (see Rosen, 1974). They have therefore played an important role in economists’ attempts to assess the costs and benefits of planning rules. According to Sheppard (1999):

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<sup>27</sup> Rohani (2012) provides an overview of hedonic analysis, which is derived from Lancaster’s (1966) consumer theory and Rosen’s (1974) model. This approach is commonly applied to understand the value that people place upon specific dwelling characteristics such as age, location, views, or qualities of neighbouring buildings.

<sup>28</sup> This can be described as the “replacement cost” approach to valuing benefits of regulations.

“A primary reason for undertaking hedonic analysis of housing markets is to understand the structure of demand for housing attributes and environmental amenities. Such understanding is essential for predicting the response to changes in the housing market and for providing welfare estimates of the costs and benefits associated with such changes.”

In other words, hedonic analysis can enable us to identify the value of both:

- Things that are potentially made scarce by planning rules, such as floorspace and appropriately zoned land, and
- Public amenities that are provided or preserved by planning rules, such as parks, heritage buildings, and attractive neighbourhood features.

Our review of the literature suggests that there are three broad approaches to assessing the existence and magnitude of costs and benefits using hedonic analysis. Appendix B discusses these methodologies, as well as key results, in further detail.

First, formal models of household housing demand and welfare can be estimated using the implicit prices from a hedonic analysis of house prices, plus survey data on household income and composition. These models can then be used to test more or less stringent restrictions on housing supply and the supply of amenities.

This approach has several advantages. As it formally models household demand functions and welfare, it avoids some of the estimation issues discussed by Sheppard (1999).<sup>29</sup> It also allows for an explicit quantification and comparison of both costs and benefits.

However, this approach has not been widely employed in the literature, due to its complexity and high data requirements. Implementing for survey data on household income and composition aligned to property sale data means that it is difficult to apply on a regular basis.

Cheshire and Sheppard (2002) provide the best example of this approach in their analysis of the welfare impacts of greenbelt and MUL policies in Reading (UK), which “faces some of the most restrictive land use planning in Britain”. They model the amenity that households derive from private living space and yards (which may be constrained by planning regulations) and public and private open spaces within and around the urban area (which are protected by planning regulations).

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<sup>29</sup> In particular, Sheppard argues that estimating attribute demand using linearised household budget functions derived from hedonic analysis can over-state the welfare losses associated with planning regulations that restrict the supply of desired attributes, as household budget functions are in fact *convex*.

Elsewhere, Brinkman (2013) employs a related approach to model the net welfare impacts of congestion pricing in the presence of a negative congestion externality and a positive agglomeration externality in Columbus (Ohio).

Second, hedonic analysis can be used to identify “boundary discontinuities” at the edges of zones (e.g. industrial and commercial zones) or at urban growth boundaries. These models can be used to identify situations in which overly restrictive zoning imposes costs by not allowing land to be used for its highest and best purpose (Cheshire and Sheppard, 2005). The intuition is that adjacent parcels of land should have a similar value unless other factors, such as regulations, artificially reduce the value of one parcel.

However, this approach has several limitations. The first is that it is only applicable in cases where planning regulations impose a measurable spatial limit on specific land uses. (Although Nunns, 2015 argues that it could in principle be generalised to address issues such as minimum lot sizes, which may result in a “discontinuity” in land prices for lots of a certain size.)

The second limitation is that this approach does not explicitly measure costs or compare them against benefits generated by planning rules. In fact, as McCann (2001) notes, the magnitude of boundary discontinuities may in fact be *increased* by localised amenities produced by planning rules.

Third, it is not necessarily possible to attribute discontinuities in land prices at zone boundaries to any single regulation, such as an urban growth boundary. Land prices are typically influenced by a wide range of planning regulations, each of which may contribute to discontinuities at zone boundaries. In addition, geographical features may also influence land prices at zone boundaries. For example, a low-lying area next to an existing residential subdivision may be flood-prone and hence difficult to develop. In this case, the flood-prone land may be kept in rural zoning – a case of zoning following the underlying value of the land rather than distorting its value.

Grimes and Liang (2007) and Zheng (2013) have used the boundary discontinuity approach to determine whether Auckland’s Metropolitan Urban Limit is likely to impose costs on development. More recently, Lees (2015b) has explored whether this approach can be generalised to identify discontinuities in land prices at zone boundaries.

Third, hedonic analysis can be used to implement “cost-benefit tests” to understand whether the amenities provided by planning rules are more or less valuable than the building floorspace foregone in the process. This is typically done by comparing the magnitude of the implicit prices for specific amenities or building attributes derived from hedonic models.

This approach can be applied flexibly to assess various different types of planning regulations, provided that appropriate data on building and neighbourhood attributes affected

by planning rules is available. In addition, it provides a balanced view of both costs and benefits.

In common with the “boundary discontinuity” method, this approach does not explicitly estimate and monetise the costs of planning regulations.<sup>30</sup> Rather, it can be used to identify cases in which planning regulations have resulted in the oversupply of building or neighbourhood characteristics. (Or, conversely, where these characteristics may be undersupplied due to an absence of regulations.) It is therefore a useful tool for identifying the direction in which planning regulations should change, but other information is needed in order to understand the degree to which this will result in improvements to well-being.

Rouwendal and van der Straaten (2008) use this approach to determine whether public parks and gardens are optimally supplied in three Dutch cities. Based on the value of building floorspace and proximity to park land measured using hedonic analysis, they estimate the optimal population density for the city and compare it to actual population density to determine whether open space is over- or under-supplied relative to housing. MRCagney (2012, 2013) use hedonic analysis of commercial property sales in three Auckland retail centres to determine that the value of additional floorspace significantly exceeds the value of additional car parks.<sup>31</sup> Nunns (2015) uses the results of a hedonic analysis of the value of proximity to old (pre-1940) buildings in Auckland to identify a cost-benefit test for the optimality of heritage demolition controls, which preserve positive spillovers from old buildings but also make it more difficult to develop new housing.

### **6.3 Comparing costs and benefits with incomplete data**

Incomplete data is a major challenge in analysing the costs and benefits of planning regulations. Although it is usually possible to identify and qualitatively assess most costs and benefits, it is not always feasible to quantify them.

Difficulties in quantification may arise for a number of reasons. For example:

- Planning regulations are not “binding” in all situations. For example, a building height limit may not restrict development in areas with low land values and little demand for tall buildings. This may make it challenging to determine the magnitude of both costs and benefits.

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<sup>30</sup> In addition, this approach does not necessarily address the estimation issues identified by Sheppard (1999).

<sup>31</sup> In fact, there was a negative (albeit statistically insignificant) association between more surface car parking and property sale prices. MRCagney (2013) interpret this as an indication that regulations have resulted in a significant over-supply of car parking.

- Planning regulations may in some cases have complex, site-specific and hard-to-quantify impacts on building design. For example, in some cases a minimum floor to ceiling height may simply require slightly higher stud heights, leading to marginally increased construction costs. But in other cases it may result in the loss of a storey of developable capacity, resulting in larger deadweight costs. (Grimes and Mitchell, 2015 and MRCagney, 2015 discuss floor to ceiling heights in further depth).
- Sufficient research into household preferences and perceptions of the value of different amenities may not have been conducted, meaning that there is little basis to value the benefits of amenities produced by planning regulations. In the long run, further research can be commissioned to overcome this information gap.
- Existing research or models may not enable us to accurately model behavioural or health responses to different building or neighbourhood characteristics. For example, it may be difficult to evaluate a regulation aimed at improving the ergonomic performance of dwellings without knowing the degree to which better ergonomics are likely to reduce accidents in the home.
- Beneficiaries of planning rules may be dispersed or may have poor information about relevant outcomes. This can make it challenging to measure benefits using SP or RP techniques.
- Existing data and methodologies may not be sufficiently fine-grained to distinguish between costs or benefits generated by different planning regulations (or non-regulatory factors). For example, it is possible to empirically estimate the relative desirability of different cities for residents or businesses (see Donovan, 2011 and Grimes et al, 2014). However, the existence of confounding factors such as geography and climate means that it is not possible to attribute all variations in amenity to planning regulations.

It is usually possible to undertake some degree of quantification and comparison of costs and benefits even if there are data gaps. In order to do so, we recommend beginning with a partial quantification of costs and benefits and then asking how large would unquantified costs/benefits have to be in order for the benefits of the regulation to exceed the costs. This is an indirect approach that enables analysts to determine whether or not it is plausible to expect unquantified benefits (or costs) to be large enough to justify regulation.

MRCagney (2014) illustrate this approach. They estimate the annual economic cost of minimum apartment sizes in Auckland's city centre to be roughly \$10.3 million per annum, in terms of higher housing costs and reduced supply of apartments. However, they find that it is not possible to quantify the benefits of minimum apartment sizes, as the literature identifies no clear, robust quantitative link between floor/balcony area and well-being.

Consequently, they ask whether minimum apartment size rules are likely to lead to a sufficient improvement in disability adjusted life years (DALYs) for apartment residents in order to justify the economic costs. Table 7 summarises estimates of the cost of DALYs sourced from several studies.

Table 7: Cost of disability adjusted life years for three diseases (Source: MRCagney, 2014)

<b>Illness / Risk factor</b>	<b>\$/DALY</b>
Arthritis	\$165,000
Dementia	\$398,000
Smoking	\$246,750
Average	\$264,000

As the average cost of a single DALY from these diseases is \$264,000, this implies that minimum apartment size rules would have to prevent at least 39 DALYs per annum in order to generate net benefits for society (i.e. \$10.3m costs / \$264,000 per DALY). MRCagney (2014) estimate that this would be equivalent to a 9% reduction in the burden of illness among city centre residents living in small apartments. They conclude that:

“A 9% reduction in the burden of illness is relatively high in the sense that many of these diseases will be either untreatable or unaffected by general well-being. Put simply, it seems implausible to suggest that the PAUP rules on minimum floor/balcony areas will deliver such a large reduction in the burden of disease.”

In our experience, this type of approach can also be used to address a range of other issues.

## 7.0 Opportunities for further analysis

In light of the importance of planning policies to housing affordability, urban amenity, and the efficiency of New Zealand's economy, there is a strong case for ongoing research into the costs and benefits of individual planning policies.

We identify four key priorities for further analysis in the near to medium term.

First, the Proposed Auckland Unitary Plan is currently under review by an Independent Hearings Panel appointed by central government and Auckland Council. In the course of these hearings, Auckland Council and other submitters have presented a significant body of evidence on the costs and benefits of a wide range of provisions. Once hearings have been completed, we recommend reviewing and consolidating this evidence to make it accessible for future evaluations of proposed policies in Auckland and other jurisdictions.

Second, some types of planning regulations have received more research attention to others. Economists studying the topic have generally focused on planning regulations that control urban land supply and that limit the height of buildings, as well as regulations like minimum parking requirements and minimum apartment sizes that have significant impacts on building and site design. Regulations related to connections with infrastructure networks and environmental quality have received less attention from economists, although they also have important costs and benefits. Interestingly, there is little New Zealand-specific analysis of the impact of minimum lot sizes / density controls – in spite of the fact that the PAUP proposes significant changes to density controls.

In a similar vein, economists have often placed more focus on the costs of planning policies than on the benefits. This does not imply that existing research can be discounted – as we discuss in Section 6.3, it does provide us with a basis to ask some intelligent questions about the required magnitude of benefits. Nonetheless, it does mean that some further work may be required in order to understand the degree to which changing rules would affect well-being.

The studies summarised in Appendix A and Appendix B provide a reasonable summary of the existing literature, and of gaps in that literature. We suggest that targeted, New Zealand specific research should be undertaken to fill these gaps.

Third, economists have tended to treat planning regulations as fixed limits on the use and development of land. While this approach has led to some useful insights, it does not take into account the fact that regulations are often “negotiable”. That is, in urban plans developed under the RMA framework, it is possible to obtain a resource consent to exceed the limits set by regulations for developments with minor adverse effects.

This has some potentially important implications for assessing the costs of planning regulations. On the one hand, it may mean that rules are not always firmly binding. On the

other hand, as economists have observed, the uncertainty involved in resource consent applications can also deter development (Mayer and Somerville, 2000; Mayo and Sheppard, 2001; Grimes and Mitchell, 2015). Some empirical research has recently been undertaken on the likelihood of obtaining resource consents in Auckland (see Parker, 2015 for a summary). Further empirical and theoretical work in this vein would be useful.

Fourth, we note that it is common for analysis of the costs and benefits of proposed planning regulations to compare only two scenarios – one with the proposed rule, and one without. However, there are usual multiple options about how to design planning regulations, taking into account the level they are set at, the locations where they apply, and the ease of obtaining resource consent to get around them.

In the future, planners and economists who are analysing the costs and benefits of planning regulations may seek to identify and compare a wider range of policy options. This is likely to be an important step in improving policymaking, as the choice about *how* to regulate is in many respects as important as the choice about *whether* to regulate.



## 8.0 References and further sources

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## 9.0 Appendix A: Evidence on the benefits of planning regulations

This appendix reviews theory and evidence on the role that planning regulations may have in responding to a range of market failures that may arise as a result of new development. It is intended to provide further detail for an assessment of positive and negative externalities related to the built environment, as well as other market failures such as information problems.

### Planning regulations can manage negative externalities

We identify a number of types of negative externalities that may arise from new development and which could potentially be controlled through appropriate planning regulation.

#### Externalities related to incompatible land uses

Anas, Arnott, and Small (1998) observe that “cities are awash in very localized externalities, from the smells from a fish shop to the blockage of ocean views by neighbors' [sic] houses.” It is often challenging for individuals to negotiate or “contract” with each other to manage these externalities. If regulations are able to manage these externalities, they can result in social or environmental benefits that would not otherwise have occurred.<sup>32</sup>

Industrial activities and infrastructure networks (e.g. high-traffic roads or electricity lines) may generate negative externalities for neighbouring residential or commercial uses, such as noise and emission effects. On the other hand, industrial activities may also experience “reverse sensitivity” effects from adjacent residential uses who may complain about their operations.

Planning regulations can manage these externalities by separating incompatible land uses or requiring barriers. This can be captured in property values (Gislain-Létrémy and Katosky, 2014). McMillen and McDonald (2002) find evidence that the introduction of Chicago's first zoning code in 1923 resulted in faster increases in property values in areas newly zoned for residential use only. As the zoning code did not remove existing commercial and industrial activities from residential areas, McDonald and McMillen (2003) interpreted

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<sup>32</sup> As Coase (1960) observes, regulations are not the only way to manage localised externalities. For example, Bertaud (2014b) describes several examples where “spontaneous settlements” in developing-world cities have successfully established “good neighbour norms” that govern the form of development.

this effect as the value of an “insurance policy against the invasion of commercial or industrial activity that would create strongly negative effects”.<sup>33</sup>

### **Externalities related to building form or location**

New development can generate some localised negative externalities by overshadowing neighbouring properties, blocking existing views, or creating other highly localised nuisances.

Hedonic analysis can provide some evidence on the existence and magnitude of these effects. For example, several studies in Auckland have found a positive association between views of water (and sometimes views of land) and house sale prices (Bourassa et al, 2003; Rohani, 2012; Nunns et al, 2015). Bourassa et al. (2003) also survey a range of studies on the value of views across a number of other jurisdictions. In some cases, some or all of this value may be lost if a newly constructed building blocks the view.<sup>34</sup> (However, in doing so they would also be *creating* new views for occupants of the new building.)

Likewise, there are several “channels” in which adverse effects of overshadowing from tall buildings can be detected and measured:

- reduced access to daylight could reduce health and well-being for neighbours;
- reduced access to daylight could increase heating costs in neighbouring buildings, as darker buildings tend to be colder. Increased expenditures on heating would tend to offset some negative health effects by preventing buildings from becoming too cold or damp; or
- reduced access to daylight could reduce the value of neighbouring properties by making them less desirable for residents. Reduced property values would reflect both negative health and amenity effects as well as higher expected heating bills.

There is some evidence of a link between natural light and reduced incidence of depression, which mean that reducing the sunlight received by neighbouring buildings may have adverse (if difficult-to-quantify) effects on health (Chism, 1988; Brown and Jacobs, 2011). In addition, Yeoman and Akehurst (2015) report survey evidence suggesting that natural light is one of the most highly rated features influencing Aucklanders’ housing choices. 77% of

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<sup>33</sup> However, Cheshire and Sheppard (2005) also observe that industrial zoning can become sub-optimal over time if demand for industrial land rises more slowly than demand for residential land. In such a case, zoning may prevent land from being re-purposed to its highest and best use.

<sup>34</sup> Glaeser et al (2005b) use this fact to compare the magnitude of costs and benefits arising from limits on the construction of new tall buildings in Manhattan. Their estimates imply that the cost of restrictions is at least eight times higher than the benefits of preserved views.

respondents rate it as ‘very important’ and only 2% rate it as ‘not important’ in determining housing choice.

The evidence on the other two “channels” is more tenuous. There are only a small number of studies that addressed the relationship between overshadowing and power bills, and no studies that identified a link between overshadowing and property values.<sup>35</sup> In part, this is due to the difficulty of modelling shading in an urban environment (see e.g. Jones et al., 2004; Fung and Lee, 2012).

However, existing papers suggest that the impact of overshadowing on power bills is ambiguous. Strømman-Andersen and Sattrup (2011) find that narrow “urban canyons” in a northern European climate raise modelled residential energy consumption by approximately 19% relative to dwellings with open horizons. Donovan and Butry (2009) found that shading from street trees in Sacramento, California tended to *lower* summer cooling costs. Kolokotroni et al (2006) observe a “heat island” effect in intensely developed areas such as central London, which raises summer cooling costs while *lowering* winter heating costs.

### **Transport-related externalities**

Transport behaviours are associated with a number of externalities, including:

- Congestion, which refers to the delays incurred by existing road users when traffic volumes increase
- Vehicle noise and emissions, which may reduce the amenity of streets and adjacent property values, impose health costs (principally through fine particulate emissions) and impose global environmental costs (e.g. from carbon dioxide emissions)
- Crash costs, which may arise due to increased traffic volumes on local streets or the design of vehicle access to properties
- Reduced public health costs from increased walking and cycling activities.

The NZ Transport Agency’s (2013) *Economic Evaluation Manual* provides standard guidance for identifying, modelling, and quantifying transport-related externalities. We recommend referring to their guidance if assessing planning rules that may affect transport behaviours.

Urban form can influence transport behaviour both at a fine-grained and aggregate level. Ewing and Cervero (2010) undertake a comprehensive meta-analysis of research into the impact of the built environment on transport behaviour. They conclude that there are “five D’s” that influence people’s travel behaviour: density, diversity, the design of street networks,

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<sup>35</sup> We searched for studies in Google Scholar, searching for various permutations of the phrases {overshadowing, daylight, shading, sunlight} and {heating costs, electricity costs, property prices, property values, sale prices, hedonic price}.

destination accessibility, and distance to public transport. These variables are associated with lower rates of vehicle use and higher rates of non-car modes such as walking, cycling, and public transport. Some studies have shown these effects to be causal – i.e. higher rates of public and active transport use in more walkable neighbourhoods are not simply the result of self-selection on the part of residents (see e.g. Frank et al, 2014).

More broadly, long-term transport modelling conducted for the Auckland Plan has shown that a compact urban form results in lower levels of congestion and improved accessibility to employment (Auckland Council, 2011). Figure 6 summarises the four alternative scenarios for accommodating Auckland's future population and employment growth that were analysed in this report. These scenarios varied in terms of the density of development – i.e. the degree to which growth was concentrated in and around specific centres – and in terms of the compactness of development – i.e. the degree to which growth spilled out into greenfield areas.

Figure 6: Four future land use scenarios analysed for the Auckland Plan (Source: Auckland Council, 2011)

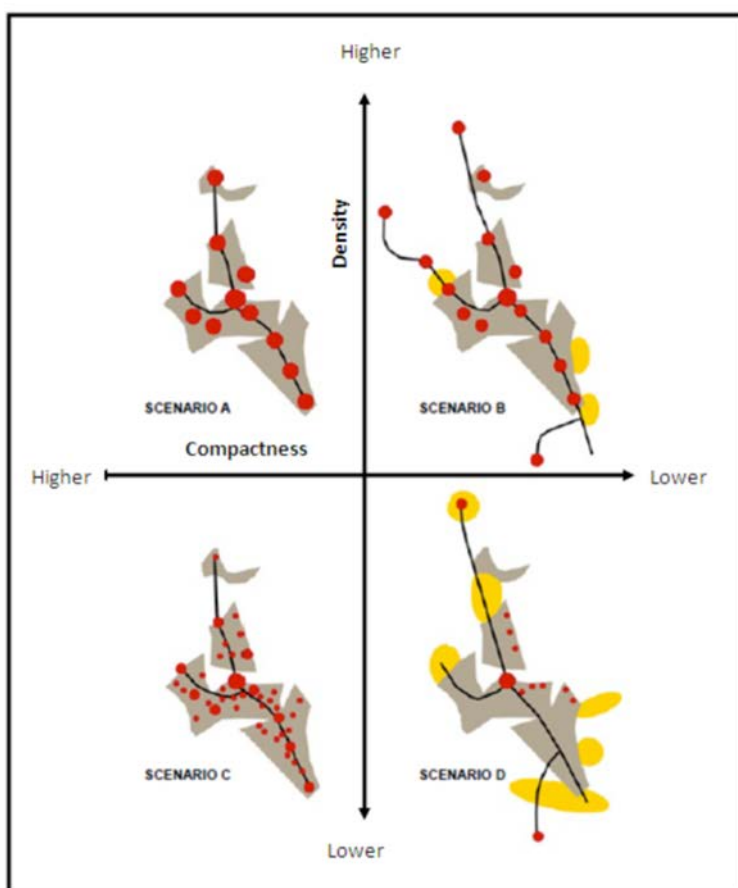
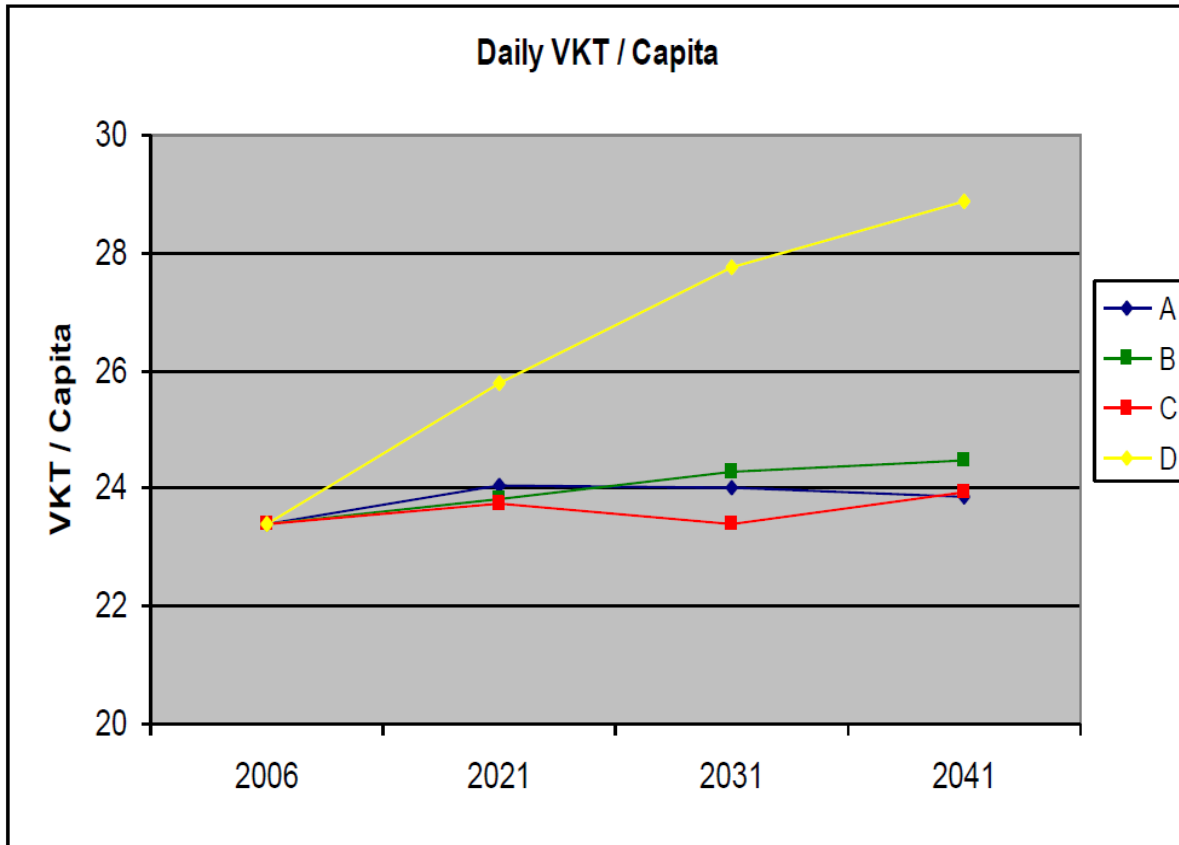


Figure 7 reports the results of transport modelling conducted for the four scenarios defined in Figure 6. It shows daily vehicle kilometres traveller (VKT) per capita, a measure that is



strongly related to overall congestion and emissions. Scenario D requires a significantly greater amount of travel to be undertaken, due to its more dispersed and expansive urban form. By comparison, increases to VKT per capita (and hence congestion and emissions) are considerably smaller under more compact or denser development scenarios.

Figure 7: Daily vehicle kilometres travelled per capita under four land use scenarios (Source: Auckland Council, 2011)



### Environmental externalities

The use and development of land can result in a range of environmental externalities, either in the development process or due to ongoing activities with a negative impact on the environment.

These impacts may arise as a result of, for example:

- Earthworks undertaken for development, which may discharge sediment into water bodies
- Occupation or displacement of natural habitats – for example, removals of native vegetation and development in sensitive ecological areas – or agricultural land (Curran-Courane et al, 2014)

- Ongoing discharges of contaminants into the land, air, or water associated with land uses, leading to reduced environmental quality and potential negative impacts on human health (e.g. from poor air quality). In urban areas, runoff from roads and buildings can have a significant effect on water quality.

Auckland Council monitors and reports on the quality of freshwater, marine, air and land environments in the Auckland region. The most recent report (Auckland Council, 2015) presents several case studies showing how urban design can affect environmental quality either positively or adversely.

However, it can be more challenging to understand how environmental effects compare to monetary costs. Some of the benefits of improved environmental quality accrue directly or indirectly to humans, like increased recreational opportunities, improved opportunities for primary production, or reduced infrastructure costs (e.g. flood control).<sup>36</sup> However, other benefits, such as the intrinsic value of biological diversity, may not accrue to humans.

In response to this, a number of papers have identified approaches to accounting for the overall value of environmental quality and ecosystem services (see e.g. de Groot et al, 2002; Rohani, 2013). These papers describe a “total economic value” (TEV) approach that attempts to account for all values associated with environmental outcomes, whether or not they accrue to humans.

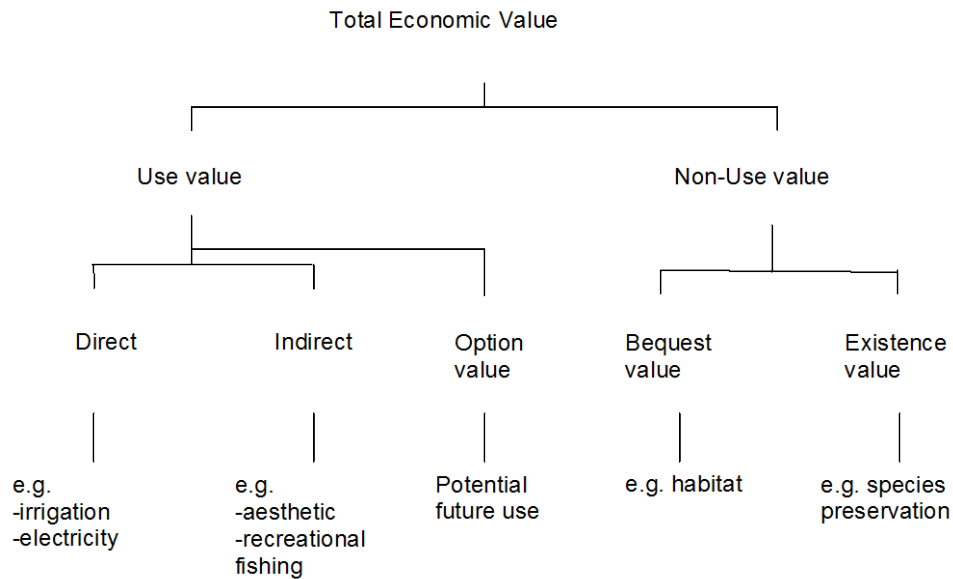
Figure 8 illustrates the components of a TEV assessment of freshwater quality. These frameworks typically encompass direct and indirect use value, option value, and non-use values such as bequest value and existence value. Typically, various approaches are used in order to account for different components of TEV, ranging from analysis of market values (e.g. tourism expenditures or primary production), estimates of replacement cost for ecosystem services, stated preference and revealed preference techniques to account for values experienced or perceived by humans, and “transferring” values from previous studies.<sup>37</sup>

Figure 8: Components of a total economic value assessment (Source: Rohani, 2013)

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<sup>36</sup> Benedict and McMahon (2002) suggest that conserving green infrastructure can decrease the costs of public infrastructure and services such as flood control, water treatment systems and storm water management. Based on their findings during the 1990s, New York City saved spending \$4-6 billion on new water filtration and treatment plants by purchasing and protecting watershed land in the Catskill Mountains at a cost of \$1.5 billion. In other words, some environmental benefits are related to efficiencies in infrastructure provision.

<sup>37</sup> However, as Brander, Florax and Vermaat (2006) observe in a meta-analysis of the literature on the value of wetlands, different methods can result in significantly different estimates of the value of ecosystem services, which may challenge attempts to transfer values between contexts.



TEV frameworks have been applied to account for the value of environmental quality and ecosystems in a range of contexts, including an assessment of the value of New Zealand's land-based ecosystems (Patterson and Cole, 2013).

### Health and safety externalities

The design of buildings and neighbourhoods can influence health and safety outcomes for residents and users in general. While some of these costs are “internalised” by individual property owners or tenants, others are borne by other parties. For example, many of the costs of poor health from damp or uninsulated buildings are externalised on the public health system. In such cases, planning regulation may result in economic or social benefits that would not otherwise have occurred.

Health and safety externalities may arise in a number of ways.

First, building characteristics may affect residents' health, resulting in higher public health costs and other external costs. A number of recent studies in New Zealand have found that a significant proportion of the housing stock is in poor condition and that badly insulated, heated, and weatherproofed dwellings contribute to high rates of preventable diseases and hospitalisation, especially among the young. Importantly, the impact on hospitalisation rates suggests that many health impacts are externalised – that is, although the worst effects are experienced by residents, the public health system also pays many costs.

Two alternative measures of housing quality show that a large share of New Zealand's housing stock is in poor condition:

- The Healthy Housing Index measures houses' performance on five key measures: structural soundness, adequate services, warmth and dryness, safety, and protection from external hazards.<sup>38</sup> This measure was recently used in an assessment of several thousand houses, which found issues across the board but especially in private rental accommodation (Howden-Chapman, Baker, and Bierre, 2013).
- The Building Research Association of New Zealand (BRANZ) also conducts a House Condition Survey every five years.<sup>39</sup> The most recent publicly-available survey, conducted in 2010, found that only 42% of owner-occupied houses and 22% of rental properties were in good or excellent condition (Buckett, Jones and Marston, 2012).

The poor quality of New Zealand houses creates significant health issues for occupants.<sup>40</sup> Public health studies have found that poor quality rental accommodation and poverty are associated with greater rates of hospitalisation (Howden-Chapman, Baker and Bierre, 2013). A similar study of HNZC applicants and tenants found that they were more likely to be hospitalised than the general population (Baker, Zhang and Howden-Chapman, 2010). Even after adjusting for age and ethnicity, hospitalisation rates were still 47.4% higher for tenants and 60.3% higher for applicants than for other New Zealanders. Infectious and respiratory diseases were also more common.

Evaluations of central government's *Warm Up New Zealand* programme and Auckland Council's *Retrofit Your Home* programme, which offer subsidies or low-interest loans to install insulation and heat pumps, have found that the benefits of these programmes are significantly greater than their costs (Grimes et al, 2012; Rohani et al, 2014). In principle, regulating to require similar performance from buildings can offer similar benefits, although planning regulations only apply to new dwellings.

Second, neighbourhood design and location can affect transport behaviour and hence health outcomes. As discussed above, characteristics of neighbourhoods can influence people's travel behaviour and level of physical activity.

A range of studies suggest that neighbourhoods which enable higher rates of walking and cycling produce better health outcomes for their residents. Several recent studies from the US suggest that higher rates of walking and cycling are associated with lower rates of obesity (Brown et al, 2013) and that neighbourhoods with more connected street grids are associated with lower rates of obesity, diabetes, high blood pressure, and heart disease

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<sup>38</sup> See also <http://www.healthyhousing.org.nz/research/current-research/healthy-housing-index/>

<sup>39</sup> The 2010 BRANZ survey covered 491 houses – defined as standalone houses, townhouses, and terraced houses but excluding flats and apartments. Both rental and owner-occupied accommodation was included.

<sup>40</sup> See Health Housing / He Kainga Oranga's publications online at <http://www.healthyhousing.org.nz/publications/>

(Marshall et al, 2014). Similar research in two large Chinese cities also shows that walkable neighbourhoods have lower rates of obesity, suggesting that these findings are not peculiar to US cities (Alfonzo et al, 2014).

Planning regulations can either help or hinder these health benefits, depending upon what requirements they impose for the separation of uses, density of development, and other factors related to the design of buildings and vehicle access ways.

Third, the design of buildings and neighbourhoods can affect the perceived safety and likelihood of crime within the area. According to the McIndoe et al (2005), street connectivity and the design of buildings can influence the likelihood of crime. In particular:

- Areas with well-connected and visible streets have a reduced risk of burglary, while complex cul-de-sac arrangements are associated with increased crime
- Building designs (and park and public space designs) that enable natural surveillance – “eyes on the street” – as a result of entrances and windows facing the street are associated with lower crime rates
- More vegetation in inner-city areas may be associated with fewer reported crimes (Kane and Kirwan, 2009).

Planning regulations related to the design of buildings and neighbourhoods can in principle contribute to crime prevention through environmental design (CPTED).

Lastly, planning regulations may be able to manage exposure to externalities with a negative impact on health, such as poor air quality. Preventing people from locating near sources of contaminants, such as major transport corridors or industrial facilities, may improve health outcomes by reducing rates of mortality and morbidity. The Health and Air Pollution in New Zealand study provides estimates of concentrations of small particulates and health costs at a detailed geographic level (Kuschel et al, 2012). As discussed in further detail below, poor air quality is one of the most significant negative externalities in New Zealand cities.

## **Planning regulations can facilitate positive externalities and public goods**

Planning regulations can also produce benefits by facilitating positive externalities that may be associated with new development and enabling provision of land uses with “public good” characteristics. For example, they may facilitate or encourage agglomeration economies, which are the benefits of increased scale for consumers and producers. They can also preserve or provide public goods (e.g. public space, parks) and “aesthetic externalities” related to land uses and building design.

### **Agglomeration economies in production**

Agglomeration economies exist in both production and consumption. They arise as a result of fixed costs in production, which mean that it is cheaper or more efficient to serve a larger number of users, or positive spillovers between firms, workers, or residents located close to each other. In this context, increased proximity between firms, employees, and customers can result in higher productivity or improved consumption opportunities.

Agglomeration in production arises from fixed costs in production / increasing returns to scale at the firm level (Fujita, Krugman and Venables, 2001) or knowledge spillovers or improved potential for specialisation between firms and workers (Glaeser, 2008). This enables businesses located in larger or denser areas to be more productive. Following Alfred Marshall, there are three main “micro-foundations” for agglomeration:

- Geographically concentrated industries can support a wider and more specialised range of local providers of inputs and better supply-chain linkages
- Increased accessibility between firms and workers can support labour market pooling, which increases productivity by better matching workers to jobs and enabling firms to better adjust their labour input in response to demand shocks
- Geographic proximity facilitates knowledge spillovers between firms and between workers.

Formalising and modelling these interactions at a detailed level is challenging, although Glaeser (2008, chapter 4) presents some partial models that demonstrate how each of the three effects can endogenously result in city formation or the formation of concentrated business areas.

In theory, both urban scale (i.e. total size of labour market area) and density (i.e. proximity to surrounding firms) can in principle lead to higher productivity. However, the empirical literature has generally focused on measures of city-wide agglomeration, such as distance-weighted proximity to all other firms (or workers) within a region.<sup>41</sup> Some economists (e.g. Cheshire et al, 2014) argue that scale, not density, is the primary driver of agglomeration economies. However, there is some evidence that close physical proximity can foster increased productivity by increasing the potential for knowledge spillovers – for example, Arzaghi and Henderson’s (2008) study of the Manhattan advertising industry.<sup>42</sup>

The empirical literature also suggests that:

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<sup>41</sup> See Melo, Graham and Noland (2009) for a useful meta-analysis of empirical studies.

<sup>42</sup> In a similar vein, Rawnsley (2014) finds a positive correlation between productivity and walking accessibility at a fine geographic scale within the Melbourne city centre. On the whole, the link between urban scale, urban density, and productivity remains an area in need of further research.

- There is endogeneity between scale / density and productivity – in simple terms, increased density of firms leads to increased productivity, and productivity leads to greater density (Graham et al, 2010).
- Agglomeration elasticities vary between industry sectors – they are consistently highest in knowledge-intensive service sectors such as finance and professional services, and lowest in manufacturing and transport and logistics.
- Maré (2008) and Maré and Graham (2009) provide New Zealand-specific evidence on agglomeration, finding evidence for an “Auckland productivity premium” and for a positive relationship between employment density and productivity.
- There is also some evidence that both physical proximity and accessibility via transport can result in agglomeration economies (e.g. Ahlfeldt and Wendland, 2013); however, these effects have not been extensively studied in New Zealand.

### **Agglomeration economies in consumption**

Agglomeration in consumption arises from increasing returns to scale in the production of consumer amenities or the “public good” character of some consumer amenities (Glaeser et al, 2001). Consumer amenities include both market goods (e.g. retail and dining opportunities, museums, live music) and non-market goods (e.g. public parks, romantic relationships / dating). Larger or denser places tend to provide a better variety of services and consumer goods, which can enhance choice for all residents (Donovan and Munro, 2013). McCann (2009) comments, in a similar vein, that “urban scale and density also allows for consumption opportunities that are not possible in other locations. While the availability of many consumption goods such as television and beer is largely independent of location, the availability of certain consumption possibilities such as high quality restaurants, theatre and boutique shops, do vary with location.”

Because agglomeration economies exist in both production and consumption, it is not possible to assume that the net *direction* of the externalities associated with increased density of population or dwellings in existing neighbourhoods is negative. The literature on agglomeration suggests that the benefits of increased scale and density consistently outweigh the dis-benefits, at least at a city level. According to McCann (2009) and Glaeser et al (2001), relatively rapid increases in urban rents suggest that people increasingly value the amenities offered by urban areas as opposed to natural amenities that are more abundant in non-urban areas. Empirical evidence suggests that this is also true in Auckland:

- Global and New Zealand-specific trends towards urbanisation provide some circumstantial evidence that the positive externalities of density outweigh the negative ones. For example, Auckland’s population-weighted density (roughly equivalent to the density of the neighbourhood where the average Aucklander lives) rose by 33% from 2001 to 2013 (Nunns, 2014). This has not coincided with a reduction in Auckland’s projected population growth rate, which suggests that people

still see the benefit in locating in Auckland in spite of (or even because of) higher densities.

- Torshizian and Grimes (2014) use data from the New Zealand General Social Survey to study the relationship between population density and life satisfaction. He finds that after controlling for income, ethnicity, and people's underlying optimism, there is no positive or negative relationship between density and life satisfaction. This suggests that the range of densities experienced in Auckland are compatible with good life satisfaction.

### **Provision of public goods and aesthetic externalities**

In addition to the benefits of agglomeration economies, urban planning regulations can also produce positive externalities associated with provision of public goods:

Chung (1994) notes that planning rules have a role in preserving or providing "public goods" such as open space and attractive external built form that provide amenity for neighbours or passers-by. In a similar vein, Bourassa et al (2003) notes that features of buildings and yards can provide "aesthetic externalities" that are captured by neighbouring properties. Because it is not generally possible to exclude people from enjoying parks, landscaping, or the exteriors of buildings, these may be underprovided by individual decision-makers.

- Hedonic price studies provide some evidence of aesthetic externalities in Auckland. Bourassa et al (2003) find that "attractive immediate surroundings" and "good landscaping" are associated with higher sale prices. Nunns et al (2015) find that the presence of pre-1940 buildings in a neighbourhood is associated with higher sale prices.<sup>43</sup>
- Built heritage can be thought of as a type of public good due to the fact that neighbours, users of a heritage area, and city residents in general may benefit from it. Licciardi and Amirtahmasebi (2012) summarise a range of hedonic price studies on cultural heritage that show that heritage properties tend to be more valuable than non-heritage properties, although these findings do not necessarily indicate the presence of a positive externality. However, Lazrak et al (2014) finds that heritage houses have a modest positive effect (0.24-0.28%) on the value of properties within a 50-metre radius.
- Studies from other cities have found evidence of aesthetic externalities or public amenity effects arising from public and private open space in cities (Cheshire and

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<sup>43</sup> This may reflect an aesthetic externality arising from attractive built form among pre-1940 buildings, or, alternatively, the impact of an omitted variable such as street network layout that is correlated with the date when a neighbourhood was built.



Sheppard, 2002; Rouwendal and van der Straaten, 2008) as well as features such as street trees (Sanders et al, 2010; Donovan and Butry, 2010). The benefit of open space preservation tends to be a function of the number of residents within the neighbouring area, their preferences, and the relative scarcity of open space in the region (e.g. Geoghegan, Lynch and Bucholtz, 2003; Cho, Poudyal and Roberts, 2007).

In addition, some public goods may provide benefits for entire regions. If this is the case, it may be difficult to measure their value using hedonic pricing methods, as all households (or all visitors to a city) are expected to benefit from their presence. There is some circumstantial evidence for this in the empirical literature on location preferences. For example, Grimes et al (2014) finds that local environmental characteristics, such as annual sunlight hours, are correlated with population growth in New Zealand towns (another measure of revealed preference). Other public goods, such as regional parks or preservation of significant areas of built heritage, may also have a comparable effect (see Licciardi and Amirtahmasebi, 2012).

Lastly, future generations may also benefit from the retention of the “option value” associated with some public goods. Nijkamp (2012, included in Licciardi and Amirtahmasebi, 2012) argues that heritage dwellings (and other public goods) may benefit non-users who “attach a high value to the fact that the scarce socio-cultural asset is maintained, even when they do not plan to visit it”.

Boardman et al (2011) review the theoretical and empirical literature on the subject of option values and tentatively conclude that:

“with risk-averse individuals and normal (inferior) goods, treat option value as negative (positive) for income uncertainty, positive (negative) for other demand-side uncertainties, and generally positive (negative) for supply-side uncertainties.”

This implies that the option value associated with the provision of many public goods is likely to be positive.

Planning regulations can enable efficiencies in infrastructure and public service provision

Alternative development patterns may result in efficiencies (or inefficiencies) in the provision of public services and infrastructure. As with consumption and production, we would also expect increasing returns to scale in the provision of public services or some “public good” aspects of infrastructure or parks (Glaeser et al, 2001). This would imply that denser places tend to be more cost-effective to serve with infrastructure and public services like hospitals and schools, as the fixed costs associated with providing them can be spread over a larger

number of people. If population growth occurs in denser places, it may reduce the cost to government of providing new infrastructure and public services.<sup>44</sup> (Or, similarly, provide a funding source for the provision of more public goods for existing residents.) Interestingly, Cho, Wu and Boggess (2003) find that US cities with more restrictive land use regulations tend to have lower public service costs over time – although they do not compare the magnitude of infrastructure cost savings with the cost of regulatory restrictions.

Efficiencies in infrastructure provision have long been a consideration in planning. For example, Hill (2008) suggests that they provided the original rationale for Auckland’s Metropolitan Urban Limit (MUL) policy. He notes that a 1975 study found that “there was a 10% cost margin in favour of the 1.5 million consolidated scenario over the 1.5 million peripheral scenario”, driven primarily by reductions in transport infrastructure costs.

Local and central government provide a range of infrastructure to residents, including:

- Transport infrastructure and services, including state highways (100% funded by the National Land Transport Fund), local roads (jointly funded by the NLTF and local government), and public transport services (jointly funded by the NLTF, local government, and users through fares)
- Water and wastewater infrastructure (funded by local government and users)
- Stormwater infrastructure (funded by local government)
- Social facilities, such as libraries (funded by local government), schools (central government), and hospitals (central government).

Externalities related to infrastructure provision can arise because public infrastructure is not typically priced efficiently – i.e. users do not necessarily bear the full costs of the infrastructure serving their location. This can result in over-consumption of public infrastructure, which results in congestion or overflow from networks in the short term and requirements to upgrade or expand networks in the long run.<sup>45</sup>

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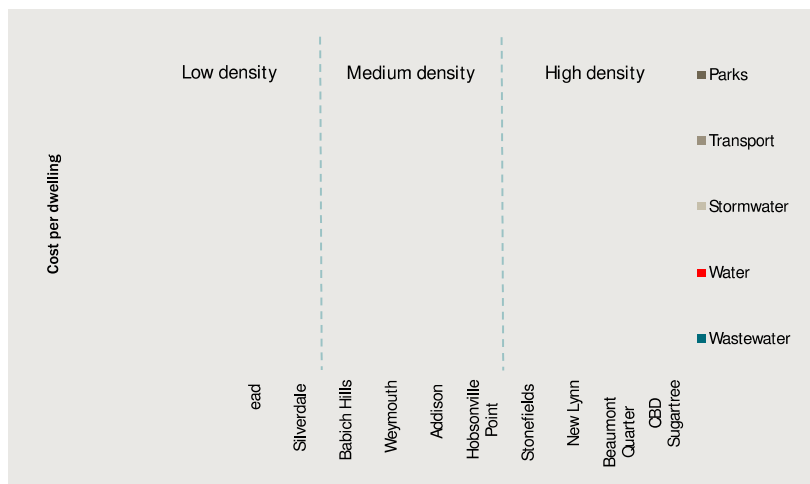
<sup>44</sup> In principle, development contributions enable local governments to charge developers for the full cost of new infrastructure that they require. For example, Auckland Council’s *Draft Contributions Policy 2015* specifies a generally lower rate of contributions for smaller dwellings, to reflect lower occupancies and impacts on infrastructure networks. It also varies contribution rates between different areas of the city. However, in practice it may be difficult to robustly estimate variations in infrastructure costs between different locations. In addition, development contributions are not collected for infrastructure directly funded by central government, including state highways and other transport infrastructure.

<sup>45</sup> Wallis and Lupton (2013) observe that congestion can be thought of as the short-run cost of added demand for roads, while infrastructure costs are the long-run cost. They find that the short-run cost of

Previous studies have found that new developments in greenfield areas on the urban fringe tend to incur higher infrastructure costs than infill or brownfield development (Trubka et al, 2008; CIE and Arup, 2012; CIE and Arup, 2015). However, this research also indicates that infrastructure costs can be extremely site-specific and depend upon the existence of capacity constraints within transport or water infrastructure. For example, adding new dwellings in an existing urbanised area may require the duplication of at-capacity water mains or the construction of new schools.

CIE and Arup (2015) study the cost of servicing residential growth at 12 sites in Auckland. They find evidence that infrastructure costs are, on average, lower in high density developments than low density developments, although outcomes vary considerably between sites.

Figure 9: Summary of infrastructure costs by development density (Source: CIE and Arup, 2015)



The following table summarises the average infrastructure costs in each density category, weighted by number of dwellings, as well as the highest and lowest value in each category. There is a difference in average costs per dwelling between the categories. However, there

congestion (delays for other road users) are similar to the long-run cost of congestion (cost to expand peak road capacity):

“The provision of infrastructure is economically optimal when the short run marginal cost (SRMC), which is the cost imposed by the marginal user without adjusting capacity, is equal the long run marginal cost (LRMC), which is the cost of adjusting capacity for the marginal user. We were able to use the property of networks operating at capacity to calculate the SRMC. We estimated that the SRMC for the Auckland network in peak periods was \$7.86 for an average peak trip.

The LRMC can be estimated from the costs of constructing or expanding the motorway system. Based on recent Auckland projects, we estimate that the LRMC averages about \$8.35 per peak trip. Currently then, the capacity of the Auckland network is thus not far from being optimal.”

is also a reasonable degree of overlap between case studies in each category, which suggests that the difference in means may not be statistically significant:

- The highest cost case study in the high density category had costs similar to the average cost in the medium density category. Conversely, the lowest cost case study in the medium density category was *below* the average in the high density category.
- There was similar overlap between the medium density and high density categories.
- There was little or no overlap between the high density and low density categories.

Table 8: Range of infrastructure costs per dwelling for 12 case studies (Source: CIE and Arup, 2015)

Density	Average cost / dwelling	Lowest cost (approx)	Highest cost (approx)
High	\$28,077	\$25,000	\$34,000
Medium	\$33,890	\$25,000	\$42,000
Low	\$41,633	\$35,000	\$50,000

Several of the medium density case studies were in fact located in greenfield areas (e.g. Weymouth, Addison). Consistent with the discussion of economies of scale in infrastructure provision above, this suggests that the location of developments in greenfield or brownfield areas may matter less than the density of development.

## Planning regulations may address information problems

Planning regulations can also produce benefits by addressing market failures associated with information problems. When buyers and sellers do not have access to the same information, it may make it difficult for them to reach an optimal outcome through market transactions. Consider a case in which a home buyer (or potential renter) is not able to directly or indirectly observe some dwelling quality features. It may be difficult for those buyers to know how much they should pay for a given dwelling. In some cases, buyers may be willing to pay too much for dwellings that do not, in fact, have the features that they are seeking.

If buyers (or sellers) are systematically ill-informed about the quality of dwellings, this information asymmetry can be thought of as a “tax” on buyers (or sellers). This “information tax” will have two primary impacts:

- First, it represents a transfer of money (or well-being) from buyers to sellers. While this does not necessarily represent a net loss to society – the buyer’s loss is the seller’s gain – it may be perceived as unfair or inequitable.

- Second, it may impose a “deadweight loss” on people who decide not to buy (or rent) due to the fact that information asymmetries have inflated prices. This represents a net loss to society as it reflects some opportunities that people have foregone.

That being said, theory and evidence is ambiguous about whether and how information problems may affect housing markets. Coleman and Landon-Lane (2007) note that it may be difficult to determine how much to pay for housing, due to the fact that dwellings bundle together a complex variety of attributes such as location, size, quality, and neighbourhood characteristics:

“...unless a problem is reasonably easy to formulate and solve, the cost of making a well-informed prediction about the future path of prices will be excessive for most agents. These difficulties are likely to be more pronounced when the commodity in question has many different quality levels, for then it is difficult for agents to distinguish between factors that affect the price of a particular quality level and those that affect the price of all quality levels.”

Coleman and Landon-Lane (2007) also note that “search costs” – i.e. the time and difficulty required to find and view residential properties for sale – also make it difficult for buyers to gather accurate information. If this is the case, buyers may decide what to pay based on a more limited range of factors they *can* observe, such as visible attributes and prices recently paid for similar properties. This may mean that they exclude some other important factors.

The empirical evidence on information problems in housing market is mixed. In practice, home buyers seem to be able to access information about the quality and condition of buildings, either directly or indirectly.

For example, it is common practice to order a builder’s report prior to completing a property sale. This may reduce or eliminate information problems for buyers and sellers as builder’s reports are intended to inform prospective buyers of any potential issues with properties. However, building reports may measure physical building attributes rather than environmental quality/amenity features such as indoor temperature.

Hedonic price studies provide evidence that dwelling quality features, including some relatively complex or hard-to-measure attributes, are factored into house prices.

- Auckland-specific studies have shown that prices are highly responsive to visible dwelling features, such as lot size, dwelling size, the condition of exterior walls and roofs, and views of land and water (see Nunns et al, 2015 for a review of findings from key studies). Consequently, it is unlikely that there are significant information problems related to visible dwelling features.
- Rehm (2009) finds some evidence that the risk of leaky buildings has been factored into prices in the Auckland market. He finds that properties with monolithic cladding – a feature associated with leaky buildings – sold at a discount relative to similar

houses with different exteriors.<sup>46</sup> Monolithic cladding was associated with a 5% reduction in sale price for single-family homes and a 10% reduction in sale price for multi-family dwellings.

It is possible that information problems may be more pervasive in the rental market. Renters do not typically obtain builder's reports prior to signing leases, and may have less bargaining power relative to landlords. On the other hand, they may be more mobile than home-buyers due to the short-term nature of leases and thus may not be as exposed to information problems.

In their analysis of 2010 BRANZ House Condition Survey data, Buckett et al (2012) find that renters were more likely to over-estimate the condition of their housing than owner-occupiers: "approximately 80% of [tenants] considered the property in good condition and only 2% believed their home to be in poor condition. This is a remarkable contrast to the assessments made by BRANZ surveyors, who considered that only 22% of rental properties were in good condition and 44% in poor condition." However, this disparity may simply arise as a result of differences in what residents and BRANZ assessors consider to be "good condition". For example, residents may focus on environmental quality, e.g. internal temperatures/dampness, while BRANZ assessments focus on the physical attributes that may not directly affect environmental quality.

## **How large are negative externalities?**

We do not always have robust information on the magnitude (or, in some cases, the direction) of all market failures that may arise as a result of new developments.

Consequently, it can be useful to examine the magnitude of other social or environmental externalities to provide context for an assessment of benefits. Table 9 summarises data on three important externalities associated with Auckland's urban footprint and transport system (discussed in more depth in MRCagney, 2015) as well as estimates of the social cost of burglaries and the benefits from improving home insulation and heating.

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<sup>46</sup> In other words, buyers have looked for a visible building attribute – the materials used in exterior walls – to serve as a proxy for leakiness, which is an "invisible" attribute. However, this does not necessarily mean that markets are pricing in the true negative effects of leaky buildings, as some non-leaky buildings with monolithic cladding may also suffer a loss in value.

Table 9: Annual and present value cost of negative externalities in Auckland

<b>Externality</b>	<b>Annual cost to Auckland</b>	<b>Annual cost per Aucklander</b>	<b>Present value per Aucklander (30 years; 8% discount rate)</b>
Poor air quality from anthropogenic PM <sub>10</sub> pollution (Kuschel et al, 2012)	\$1.07 billion (2010 NZD)	\$820 <sup>47</sup>	Approximately \$10,000
Average annual social cost of road crashes, 2009-2013 (Ministry of Transport, 2014)	\$677 million (2013 NZD) <sup>48</sup>	\$480 <sup>49</sup>	Slightly less than \$6,000
Social cost of congestion (Wallis and Lupton, 2013)	\$250 million (2013 NZD) <sup>50</sup>	\$190 <sup>51</sup>	Slightly less than \$2,400
Social cost of burglaries (Treasury, 2006)	\$120 million (2004 NZD) <sup>52</sup>	\$90 <sup>53</sup>	Slightly less than \$1,100
Benefits of the Warm Up New Zealand home insulation and clean heating programme (Grimes et al, 2012)	Present value benefits of \$510 million (2012 NZD) across approximately 178,000 homes	N/A	Slightly less than \$1,100 <sup>54</sup>

These figures can help to establish a rough order of magnitude for negative externalities associated with developments. Poor air quality, road crashes, congestion, crime, and poor health from uninsulated or poorly heated dwellings are among the most significant public

<sup>47</sup> Based on the 2006 Census population of 1.3 million.

<http://nzdotstat.stats.govt.nz/wbos/Index.aspx?DataSetCode=TABLECODE8001>

<sup>48</sup> This reflects the social cost of roughly 3,000 road crashes per annum that result in an average of 52 road deaths, 10 pedestrian deaths, and 1 cyclist death per annum plus a large number of injuries.

<sup>49</sup> Based on the 2013 Census population of 1.4 million reported by Statistics New Zealand (2013).

<sup>50</sup> Wallis and Lupton (2013) report a range between \$250 million to \$1.25 billion per annum, in terms of extra time spent travelling and additional vehicle operating costs. The lower figure is a more realistic estimate, as it compared travel times against a scenario in which roads operated at their optimal capacity, rather than free-flowing.

<sup>51</sup> Based on the 2006 Census population of 1.3 million reported by Statistics New Zealand (2013).

<sup>52</sup> Based on Treasury (2004) estimate of a social cost of \$7,060 per burglary (2004 NZD) multiplied by 17,100 reported burglaries in Auckland in 2013.

<sup>53</sup> Based on the 2013 Census population of 1.4 million reported by Statistics New Zealand (2013).

<sup>54</sup> Calculated as gross benefits of \$510 million divided by 178,000 homes divided by average occupancy of 2.7 from the 2013 Census.

health challenges facing Auckland. The attention that researchers and policymakers have devoted to the externalities listed in Table 9 reflects their significant magnitude.

For additional context, we note that NZIER (2013) provides data on central government spending broken down by portfolio area and region. This provides an indication of the per-capita public costs associated with health care and other social services. These values, which are summarised in Table 10, should be considered in cases where there are potential public health costs associated with poor dwelling quality or public safety externalities related to passive surveillance of street environments.

Table 10: Annual and present value cost of central government spending in Auckland (Source: NZIER, 2013)

<b>Spending category</b>	<b>Annual spending in Auckland</b>	<b>Annual spending per Aucklander</b>	<b>Present value per Aucklander (30 years; 8% discount rate)</b>
Health	\$4.5 billion	\$3,000	\$36,000
Law and order	\$1.2 billion	\$780	\$9,400

These regional averages conceal significant variations in spending on individual people. For example, healthy individuals tend to incur fewer public health costs than chronically ill or aged people. However, a regional average does provide a rough “order of magnitude” estimate of public service costs.



## 10.0 Appendix B: Evidence on the costs of land use regulations

Planning regulations can make it more difficult for people to develop land according to their personal preferences and budget constraints. (Or, in the case of developers, according to the expected preferences and budget constraints of their potential customers.) This can reduce people's well-being by:

- Increasing the cost or time required to construct new housing (which will tend to push up house prices)
- Discouraging people from constructing new housing in desirable areas (which will tend to push up house prices and require some people to relocate to other, less desirable locations)
- Imposing wider costs in related markets (e.g. transport markets, housing markets in adjacent suburbs) as a result of market imperfections in these markets. For example, a rule that makes it difficult to develop housing near a commercial centre will push up prices for buyers, but it may also impose additional congestion costs as a result of longer commute distances for people who choose to relocate to outlying suburbs.

Furthermore, regulations can have unintended consequences – for example, rules that limit building size and density in desirable areas may cause unmet demand to “spill over” into neighbouring suburbs, raising density in those areas.

### How can we think about the costs of regulations for individual developments?

Based on our review of theory and evidence, we identify three ways in which planning regulations can impose costs on individuals and society in general:

- Compliance costs: Planning policies and processes may impose a range of financial costs on individuals seeking to build new housing. These range from costs associated with preparing and processing resource consent applications, paying development contributions for infrastructure costs, or complying with planning rules or consent conditions. These can also be described as added “resource costs” – i.e. they require people to expend additional resources, such as their time or construction costs, to obtain their desired outcomes.
- Deadweight costs: Planning regulations can also limit the amount of housing that people can built on sites, or reduce the likelihood that new housing is developed. This can result in a loss for both developers, who aren't able to build their preferred projects, and households, who may not be able to find housing in the places they

would prefer to live. Deadweight costs may arise as a result of rules that limit the amount of housing that can be developed in desirable areas, or that increase the cost and uncertainty of applying for resource consents (Grimes and Mitchell, 2015).<sup>55</sup>

- **Indirect costs in imperfectly functioning related markets:** Planning regulations can influence the cost of housing and the quantity of housing available. Consequently, they can also affect the choices that people make about where and how to live. According to Boardman et al (2011), this may result in some additional, indirect costs if there are imperfections in “related markets” such as transport, labour markets, or public health. We discuss a range of potentially relevant market imperfections, or “market failures”, in more detail in Appendix A above. Indirect costs tend to be borne by society rather than individuals – e.g. if somebody must drive longer distances on a congested road, it tends to have a negative effect on other road users.

## **Who bears the costs of planning regulations?**

Some previous research has focused, somewhat narrowly, on the costs that planning regulations impose on developers and the impacts that they have on the viability of new developments (Grimes and Mitchell, 2015). For a more comprehensive analysis, it is necessary to consider how these costs may flow through to households – who are seeking to buy dwellings from developers.

Following Boardman et al’s (2011) analysis of costs and benefits in multiple markets, we suggest that costs that are imposed on developers are ultimately passed on to the people who buy or rent dwellings. This is intuitively sensible – why would a developer choose to build a house if they could not sell it for a price that covered their costs, including their financing costs and profits?

Furthermore, as Glaeser et al (2005a) observe, planning regulations that significantly increase the cost or difficulty of constructing new housing can push up prices throughout the market, rather than just for new dwellings. Once again, this makes intuitive sense. If, for example, the total cost (including compliance costs) of constructing a new house is \$400,000, why would somebody choose to pay a higher price for a similar, but older, house?

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<sup>55</sup> However, as Grimes and Mitchell (2015) note, “planning and regulatory issues may rule out a developer’s ex ante preferred project but the same rules and processes do not necessarily rule out development of the same available land; an alternative project (either by the same or a different developer) may still proceed that has different consenting costs, probability of consenting success and/or different timeframes, building costs or expected revenues relative to the initially preferred project.” As a result, we suggest that deadweight costs are generally smaller in magnitude than the compliance costs that would be required in order for the project to proceed.

Conversely, why would somebody choose to sell an existing house for less than \$400,000 when they know that buyers can't find a new house for a cheaper price?<sup>56</sup>

All in all, Glaeser et al (2005b) conclude that:

“the social costs of binding development restrictions lie in the misallocation of consumers, and having them live in less productive, less attractive places.”

The outcome is that planning regulations may reduce people's well-being in a range of ways, as they may have to pay more for housing (which reduces the amount that they can spend on other goods and services), spend more time and money on transport costs, or choose a dwelling or location that doesn't fully meet their needs.

## Some approaches to measuring the cost of regulations

Here, we review some relevant empirical evidence and modelling on the costs of regulation internationally and in Auckland.

### The “regulatory tax” measure

Glaeser and Gyourko (2002) and Glaeser et al (2005a,b) present an influential view on planning regulations, arguing that rules that make it more costly or difficult to build new housing can push up the price of housing. They describe this as a “regulatory tax”:

“One of the strongest implications of free markets is that in an open, competitive, unregulated market, the price of a commodity will not be greater than the marginal cost of producing that good... Free competition among these suppliers should ensure that prices are pushed down to marginal cost, so the presence of a large gap between market values and marginal production costs indicates the presence of supply-side restrictions. If we are confident that we are not missing any technological barriers to construction, then the gap between market value and the cost of supply must reflect the impact of government regulation.”

Equation 1 formalises this observation, showing how the regulatory tax is equal to the observed sale price for dwelling minus the estimated marginal cost to produce a new dwelling.

Equation 1: The “regulatory tax” on new housing supply

$$\text{Regulatory tax} = \text{Market price of a dwelling} - \text{Marginal cost to produce that dwelling}$$

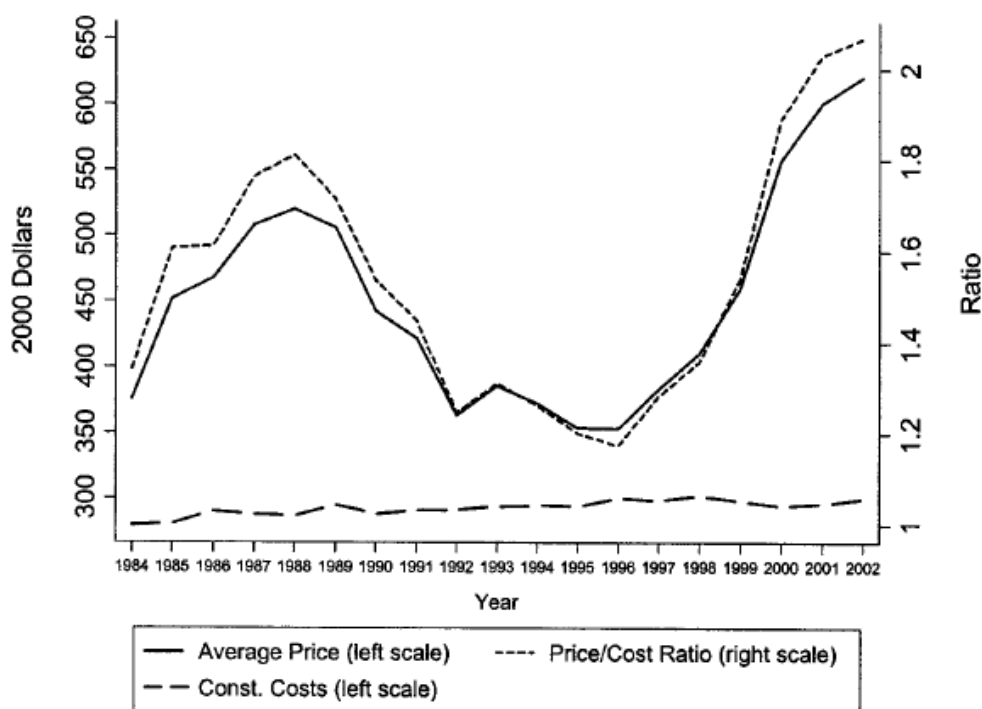
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<sup>56</sup> If regulatory constraints push up the price of existing houses, it is best seen as a transfer rather than a net cost to society. People trying to buy existing homes bear some additional costs, as they must pay more, but the people selling those homes benefit by the same amount. Consequently, regulations' net cost to society relate principally to the supply of new dwellings.

Glaeser et al's (2005a) approach effectively “bundles” together the aggregate impact of all regulatory policies and processes. It does not distinguish between the marginal impact of individual rules. While it provides an indication of the aggregate impact of regulations, it is less relevant for assessments of specific planning regulations.

The regulatory tax approach has been applied to understand the costs of regulations in a number of US cities. Figure 10, for example, summarises Glaeser et al's (2005b) estimates of the regulatory tax in the Manhattan high-rise apartment market, where attempts to “build up” are often limited by building heights, viewsheds, and heritage protection rules. It shows the ratio of the average sale price of a high-rise apartment to the cost to construct such an apartment – numbers above one indicate that there is potentially a regulatory tax. While the authors find evidence that these rules raise the cost of apartments, it is worth noting that the magnitude of the regulatory tax varies considerably between years, possibly indicating that the estimates are influenced by other factors that influence prices in the short run, such as interest rates.

Figure 10: Estimated price to construction cost ratio for Manhattan apartments (Source: Glaeser et al, 2005b)



Other research has identified variations in the cost of regulations between cities. Glaeser and Gyourko (2002) find that “there is a huge gap between the price of land implied by the gap between home prices and construction costs and the price of land implied by the price differences between homes on 10,000 square feet and homes on 15,000 square feet. Measures of zoning strictness are highly correlated with high prices.” Other researchers

have applied similar concepts to investigate the housing market in US cities (Albouy and Ehrlich, 2012) and the office market in UK and European cities (Cheshire and Hilber, 2008).

However, these methods may be difficult to apply in New Zealand due to the lack of a well-developed apartment market (outside the Auckland and Wellington city centres) that would enable us to apply the approach from Glaeser et al (2005b) and the lack of sufficient comparator cities for Auckland to enable us to compare regulatory taxes. Luen (2014) attempts to implement a similar approach to understand the costs of building height limits in Auckland. While there are limitations to this analysis as a result of the fact that Auckland's apartment market is smaller, she finds some evidence of a similar regulatory tax for Auckland apartments.

### **Modelling household welfare using general equilibrium models**

The Alonso-Mills-Muth model, a standard urban economics model, is commonly used to estimate the impact of urban growth boundaries and building height limits (and other rules, such as site cover ratios, that also limit building size). This is a simple general equilibrium model of households' location choices within cities. Glaeser (2008) describes the specifications for several useful permutations of this model.<sup>57</sup>

Although this model makes a number of simplifying assumptions – most notably the assumption that cities are “monocentric”, with all employment concentrated in the centre and people commuting in from the outskirts – it is nonetheless useful for evaluating regulations. The Alonso-Mills-Muth model is widely understood and commonly used in urban economics, and relatively easy to calibrate to local conditions using observed data on incomes, transport costs, and housing costs. It also accounts for both housing and transport costs as drivers of household location decisions. This makes it easy to understand the broader indirect effects of land use regulations, including the fact that limits on development in some areas displace some households to more outlying areas with higher transport costs.

The Alonso-Mills-Muth model has been applied to analyse building height limits in Australian cities (Kulish et al, 2011), Indian cities (Bertaud and Brueckner, 2003; Brueckner and Sridhar, 2012), and Auckland (Lees, 2015a). These studies have found that these cities' limits on building size impose costs ranging from 0.7% to 3% of household incomes.<sup>58</sup>

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<sup>57</sup> The Alonso-Mills-Muth model is also frequently used to motivate empirical research into the determinants of population distribution, house prices, and housing supply. For example, Saiz (2010) employs a variant of this model to motivate his analysis of the impact of geographic constraints on house price and supply dynamics in US cities.

<sup>58</sup> These costs include both increased housing costs and the added time and monetary costs of transport that arise from people having to move further out to find housing.

The Alonso-Mills-Muth model can be used to understand some of the indirect or flow-on effects of planning regulations. This can lead to some broader insights about how urban development patterns and prices are affected by planning regulations. For example, this model provides the paradoxical insight that planning regulations that enable greater housing choice allows for *both* high-density and medium-density living options *and* more low-density suburban living.

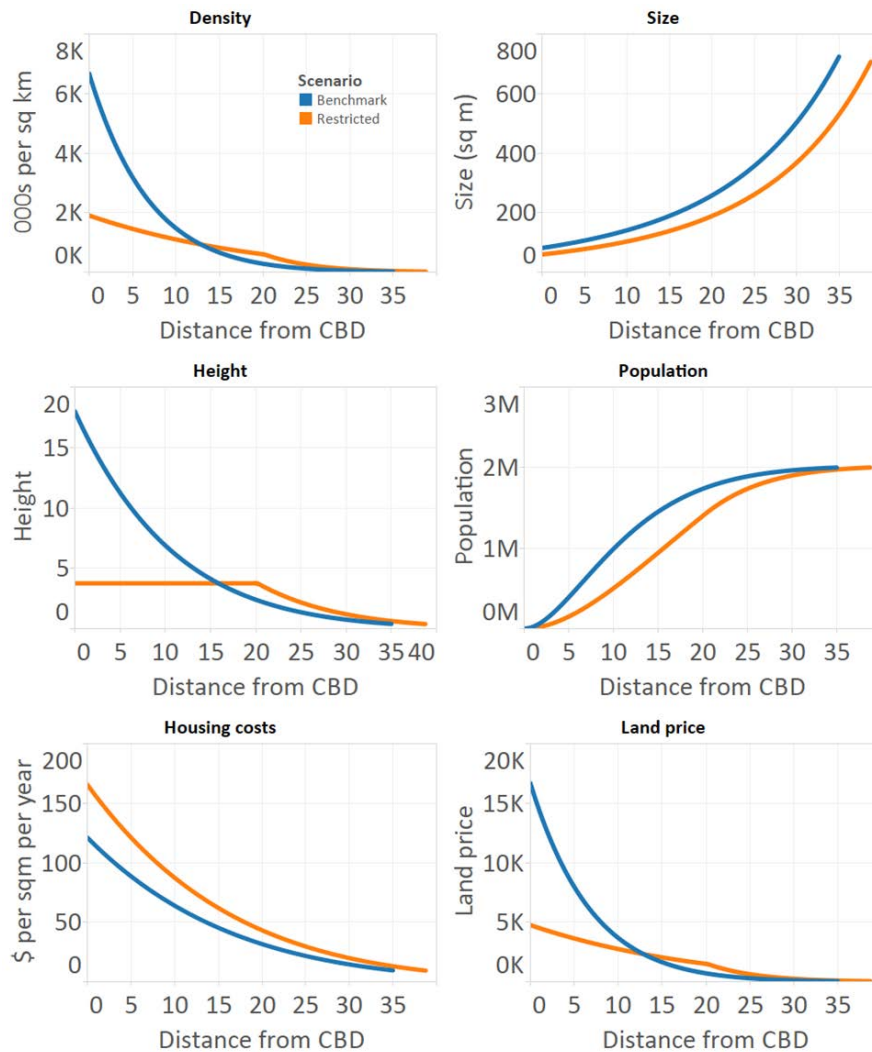
Figure 11 presents the outputs of from the model in graphical form, including impacts of density limits on key variables such as population density (top left panel), city size (top right panel), building heights (middle left panel), population location (middle right panel), housing costs (bottom left panel), and land prices (bottom right panel).

The “benchmark”, or unconstrained, scenario is shown using blue lines, while the “restricted” scenario is illustrated in orange. We note three key findings from the model:

- First, in the benchmark scenario, building heights and population densities are highest near the centre – or, in more general terms, in the areas that are most accessible to employment and amenities.
- Second, as shown in the middle left panel, regulations that limit the size and density of buildings are expected to reduce population densities in inner-city areas. However, they also increase population densities further out, as people who are unable to find housing in their preferred location move further out. This also increases the spatial extent of the city (top right panel).
- Third, these regulations are expected to raise housing costs throughout the city, as shown in the bottom left panel.

In short, a city that constrains medium to high density development doesn’t just fail to provide options for people who want to live in apartments. It also fails to provide good options for people who want quarter acre sections or lifestyle blocks. Furthermore, these rules raise the cost of housing throughout the city – which means that limiting housing choice in cities requires everyone pays too much for housing that does not really suit their preferences.

Figure 11: Modelled effects of a building height regulation in Auckland (Source: Lees, 2015a)



Other types of general equilibrium models, such as computable general equilibrium (CGE) models of spending flows between industry sectors and regions, may also be useful. For example, CGE models may assist in determining the net economic costs associated with a restriction on industrial land in one region.

### Simple microeconomic models of costs in multiple markets

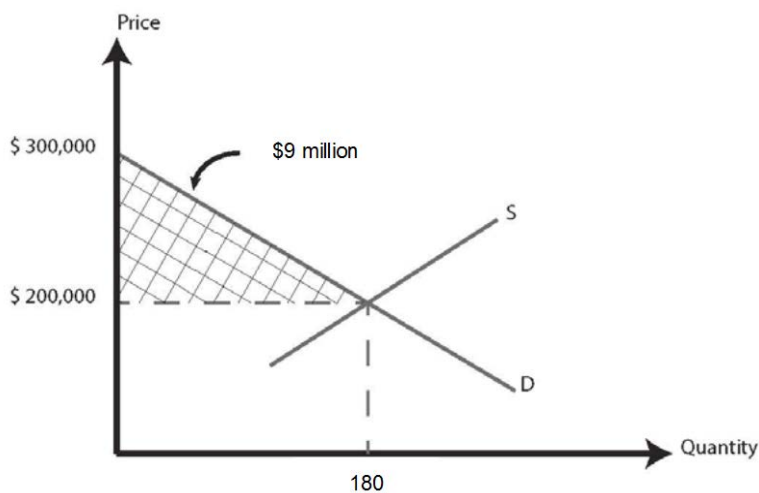
However, general equilibrium models are not necessarily available or relevant in all cases. Consequently, it can be useful to develop simple micro-economic models to estimate how costs and benefits may arise across multiple “markets” affected by planning regulations. These models typically attempt to approximate general equilibrium outcomes using ad-hoc assumptions about elasticities, often drawn from the literature.

Developing and using these models requires basic familiarity with key microeconomic concepts, such as consumer and producer surplus and externalities. Boardman et al (2011) and the Treasury (2013, 2015) provide a useful introduction to these concepts.

This approach can enable analysts to make an estimate of costs and benefits to various parties in situations where there is limited data or a lack of formal models. Simple microeconomic models can be flexibly applied to address a range of different types of regulations. However, they are typically based on assumptions that may be difficult to verify, e.g. about the shape of supply and demand curves or about the interactions between markets. These limitations can be partly addressed by drawing upon observed outcomes (e.g. demand for building attributes observed in un-regulated contexts) or published literature on relevant elasticities.

MRCagney (2014) use this approach to estimate the economic costs of minimum apartment size regulations in Auckland. They develop a simple microeconomic model to estimate the foregone consumer surplus (i.e. the benefits that occupants derive from small dwellings) arising from a restriction on the supply of small apartments. Figure 12 illustrates their simple model, which is calibrated based on observed outcomes for small apartment demand and prices prior to the implementation of a 2007 rule restricting their development.

Figure 12: Economic costs associated with not building small apartments (Source: MRCagney, 2014)



Donovan and Nunns (2015) use a similar approach to estimate the economic costs and benefits associated with minimum parking requirements (MPRs) in a medium sized city. They model the interactions between one primary market (land use development) and four transport “markets” where flow-on effects occur (parking, vehicle travel / congestion, public transport, and walking and cycling). They use this model to estimate the magnitude of costs/benefits and increased externalities arising from the imposition of an MPR in a representative mid-sized New Zealand city (population ~100,000).



Table 11 summarises their estimates of costs and benefits. These results suggest that the additional consumer surplus in the parking market, which arises due to the lower cost and increased convenience from increased supply of parking, is considerably lower than the costs, including foregone consumer surplus in the land use market and increased externalities in transport markets. Moreover, the costs associated with reduced efficiency of land use are considerably larger than the costs associated with increased transport-related externalities.

Table 11: Modelled costs and benefits of MPRs (Source: Donovan and Nunns, 2015)

<b>Market</b>	<b>Costs / benefits</b>
Land use	-\$95.6 million
Parking	+\$10.9 million
Vehicle travel (added congestion)	-\$4.4 million
Public transport (increased subsidy requirements)	-\$1.8 million
Walking/cycling (reduced health benefits)	-\$2.9 million
<i>Net costs</i>	<i>-\$93.7 million</i>

The wider economics literature provides a number of cases where simple microeconomic models have been used to compare the impact of alternative policies. For example, Coleman and Scobie (2009) use a conceptually similar, but more sophisticated, approach to modelling interaction between housing rental and ownership markets. They use their model to test the impact of five policy changes on rents, house prices, and the home ownership rate.<sup>59</sup>

### **Modelling household welfare based on hedonic analysis**

Cheshire and Sheppard (2002) develop an approach to formally modelling the costs and benefits of planning regulations using a household demand function estimated using the implicit prices from a hedonic analysis of house prices, plus survey data on household income and composition. They employ this approach to analyse the welfare impacts of greenbelt and MUL policies in Reading (UK), which “faces some of the most restrictive land use planning in Britain”. They model the amenity that households derive from private living space and yards (which may be constrained by planning regulations) and public and private open spaces within and around the urban area (which are protected by planning regulations).

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<sup>59</sup> Modelled policy changes are an increase in the supply of state houses, an increase in the tax concession for landlords, an increase in implicit subsidies for home ownership, an increase in housing development costs (e.g. land and construction costs), and an increase in the mortgage interest rate.

First, the authors look at the gross benefit of three “planning amenities”. Their results, which are summarised in Table 12, suggest that the average household derives substantial gross benefits from Reading’s planning regulations, although the effects vary significantly between households (as demonstrated by the large standard deviations). As one would expect, the value of accessible open space (e.g. public parks) is greater than the value of inaccessible open space (e.g. farmland), as it offers better recreational opportunities.

Table 12: Gross value of benefits from planning amenities (Source: Cheshire and Sheppard, 2002)

<b>Amenity</b>	<b>Amount available in the absence of planning</b>	<b>Average annual value per household (£)</b>	<b>Standard deviation (£)</b>
Accessible open space	Zero accessible open space in urban area	2424.45	1745.05
Inaccessible open space	Zero inaccessible open space in urban area	1029.65	1223.90
Industrial land use	47% of land in every part of the city is in industrial use	1092.00	600.96

Second, the authors calculate the net costs associated with planning amenities. In order to do so, they model three scenarios in which Reading’s greenbelt and MUL policies are relaxed, leading to lower housing costs (or increased housing consumption) as well as a reduction in the amenity value of open space. Their results, which are summarised in Table 13, suggest that relaxing planning regulations would improve well-being for the average household (i.e. reduce net costs to welfare) even after accounting for the loss of amenity from reduced open space. As above, these effects vary significantly between households, as demonstrated by the large standard deviations.

However, it is instructive to compare the *magnitude* of Cheshire and Sheppard’s (2002) estimates of the net costs of planning regulations with their estimate of the gross benefits of those regulations. Their estimated net costs are significantly smaller than gross benefits – in the range of £45-407 per household per year compared with £1000-2400. This suggests that analyses that disregard amenities produced or preserved by planning regulations may overstate the true costs of those regulations.

Table 13: Net costs of planning amenities compared to several scenarios for relaxing rules (Source: Cheshire and Sheppard, 2002)

Scenario for relaxing rules	Description of scenario	Average annual net cost per household (£)	Standard deviation (£)
Reduced internal open space	17.23% reduction in open space within Reading's MUL – i.e. enabling development on some greenbelt sites	45.55	61.20
Modest relaxation of MUL and greenbelt policies	46.9% increase in urbanised land area as a result of a 17.23% reduction in internal open space and a relaxation of the MUL	210.94	376.68
Significant relaxation of MUL and greenbelt policies	70.7% increase in urbanised land area as a result of a 17.23% reduction in internal open space and a more significant relaxation of the MUL	407.44	335.40

Finally, Cheshire and Sheppard (2002) consider the distributional impact of changes to planning rules. They conclude that:

“Provision of open space that is generally accessible to the public generates benefits that are significant and tend to reduce inequality. Provision of open space that is inaccessible to the public (largely located at the urban periphery) generates benefits that are very unequally distributed, and tend to increase inequality.

Overall, the benefits produced by the planning system appear to be distributed in a way that favours those who are already favoured with high incomes.”

Cheshire and Sheppard's approach has a number of advantages. As it formally models household demand functions and welfare, it avoids some of the estimation issues discussed by Sheppard (1999). Furthermore, unlike some other approaches, it allows for an explicit quantification and comparison of both costs and benefits.

However, this approach has not been widely employed in the literature, due to its complexity and high data requirements.<sup>60</sup> In particular, the requirement for survey data on household income and composition aligned to property sale data means that it is difficult to apply on a regular basis.

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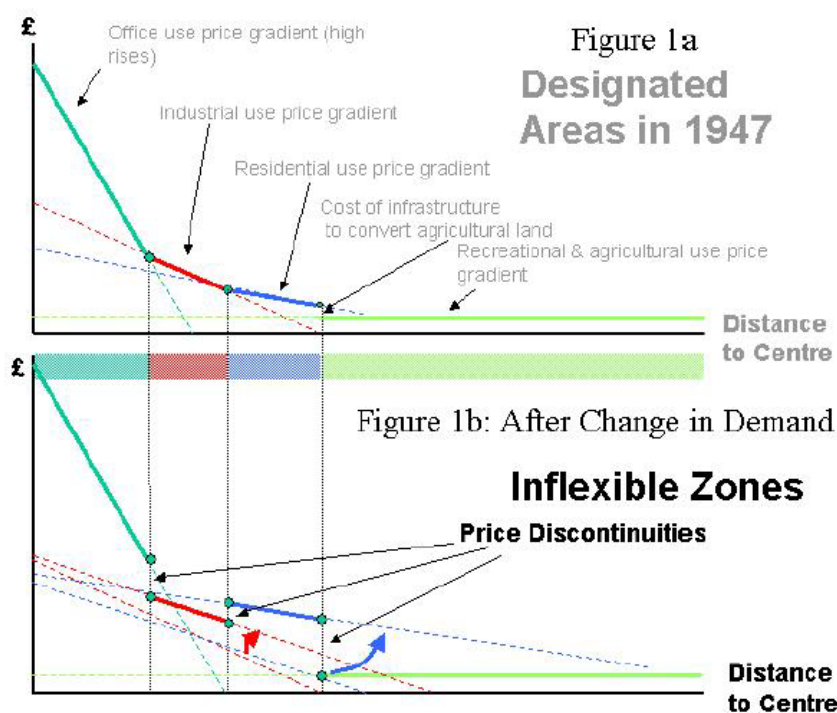
<sup>60</sup> Brinkman (2013) employs a somewhat similar approach to model the net welfare impacts of congestion pricing in the presence of a negative congestion externality and a positive agglomeration externality.

## Identifying boundary discontinuities using hedonic analysis

Cheshire and Sheppard (2005) present another approach that is commonly used to analyse constraints imposed by planning regulations. They argue that observed discontinuities in land values should be seen as a “market signal” that land should be rezoned to a higher-value use. Figure 13 depicts how a combination of fixed zoning and changing urban land values can result in differences in land prices between adjacent areas.

While discontinuities in land prices are most commonly observed at the urban fringe, where MULs may pose barriers to urban growth, they can *also* arise within the urban area if zoning varies significantly between adjacent areas. For example, Kulish et al (2012) present some modelling results that indicate that if planning regulations limit the density of development within cities, large “windfall gains” in land prices will arise if density controls are relaxed for some sites but not others.

Figure 13: The emergence of land price discontinuities under fixed zoning (Source: Cheshire and Sheppard, 2005)

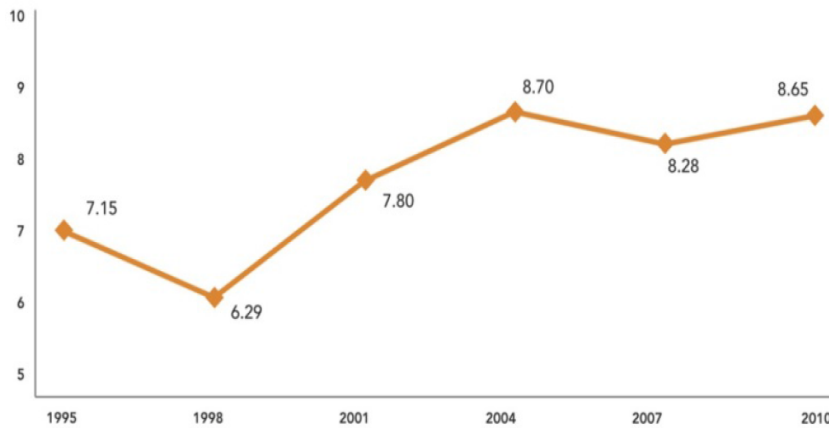


Several papers have used hedonic analysis to search for boundary discontinuities around Auckland’s MUL. Grimes and Liang (2007) use a hedonic price model to study determinants of land prices in Auckland, concluding that land just inside the MUL boundary is around 12 times more expensive per hectare than is land situated just outside the MUL.

In a similar vein, Zheng (2013) employs a quantile regression approach to identify the magnitude of the boundary discontinuity. His estimates are summarised in Figure 14. Zheng (2013) also notes that “the impact of the MUL on housing affordability is most pronounced

for those at the lower end of the housing market. One reason for this is that lower priced land is more often found further out on the fringes of cities.”

Figure 14: Estimated boundary discontinuity in land prices near the Auckland MUL (Source: Zheng, 2013)



Source: *Housing affordability report from New Zealand Productivity Commission*  
Note: The price multiple of land 2km within the MUL to land 2km outside the MUL

However, this discontinuity cannot necessarily be attributed solely to the MUL. First, other planning regulations may limit the supply of dwellings in areas that are more accessible to employment and urban amenities. Economic modelling suggests that this can artificially inflate demand for land at the urban fringe and thus push up the size of the discontinuity (see Kulish et al, 2012; Lees, 2015a).

Second, planning regulation is not the only factor that can result in land price discontinuities. In some cases, low-value land is simply ill-suited for development for reasons that have nothing to do with its zoning. For example, a low-lying area next to an existing residential subdivision may be flood-prone and hence difficult to develop. In this case, the flood-prone land may be kept in rural zoning – a case of zoning following the underlying value of the land rather than distorting its value.

Third, as McCann (2001) notes, zoning may result in localised amenities that push up house prices on one side of the zoning boundary: “If environmental amenities are relatively localized and it is perceived that the greenbelt policy will be maintained in the long term, this implies that the persons who are resident on the urban fringes will always enjoy superior environmental amenities in comparison to those who are resident closer to the city centre.” Failing to explicitly account for these effects, as Cheshire and Sheppard (2002) do, may result in too high an estimate of the cost of the boundary discontinuity.<sup>61</sup>

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<sup>61</sup> It is worth noting, however, that Grimes and Liang (2007) do not find strong evidence of this effect in Auckland. In their analysis of Auckland’s MUL, they conclude that “distance variables are capturing the values of land just inside the MUL boundary, implying that there is no extra amenity value placed

Notwithstanding these challenges, hedonic analysis of boundary discontinuities in land prices is a valuable tool for understanding the costs of planning regulations. Nunns (2015) suggests that it could be adapted to address issues such as minimum section size rules and mixed-use versus single-use zoning. (See also Cho and Roberts, 2007.)

### **Cost-benefit tests based on hedonic analysis**

Rouwendal and van der Straaten (2008) present a third approach to comparing the costs and benefits of planning regulations using the outputs from a hedonic price model. Following Cheshire and Sheppard (2002), they observe that providing public parks and gardens results in positive amenity spillovers for nearby properties, while also constraining the supply of private living space and yards. Consequently, they propose the following cost-benefit test:

“Open space should be provided until the sum of the marginal willingness to pay of all the inhabitants in of a neighbourhood is equal to the market value of residential land in the neighbourhood.”

Rouwendal and van der Straaten use house sales data to estimate the value of public and private space to households in the Netherlands’ three largest cities. They use the outputs from a hedonic price model to calculate the marginal price of open space and the marginal price of floor area in each city – i.e. the amount of money that a new household could be expected to pay for each amenity. By dividing the marginal price of floor area into the marginal price of open space, they obtain an estimate of the population densities that would be required to obtain an optimal balance of public parks and housing.

Table 14 summarises the results of their analysis. They interpret these results as results as follows:

- Amsterdam is over-supplied with open space –actual population densities of 72 households per hectare are considerably lower than the optimal density of 201 households per hectare implied by the cost-benefit test
- The Hague is under-supplied with open space – actual population densities of 59 households per hectare are considerably higher than the estimated optimal density of 42 households per hectare
- Rotterdam is about right – actual population densities of 42 households per hectare are similar to the estimated optimal density of 43 households per hectare.

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on this land. Second, even if there were such higher amenity value, it is likely that higher income (and less deprived) households will move into the sought-after area. Our extended model controls for these household characteristics and hence indirectly controls for such amenity values.”

Table 14: Willingness to pay for open space and housing in three Dutch cities (Source: Rouwendal and van der Straaten, 2008)

City	Marginal price of open space (€/ m2 / hectare / household)	Marginal price of floor area (€/ m2 / household)	Optimal number of households per hectare	Actual number of households per hectare
Amsterdam	4.01 (1.38) <sup>62</sup>	806 (42)	201	72
The Hague	14.55 (1.04)	606 (38)	42	59
Rotterdam	9.87 (1.79)	429 (47)	43	42

MRCagney (2012, 2013) employ a similar cost-benefit test in their analysis of minimum parking requirements (MPRs) in Auckland. As their name implies, MPRs define the minimum amount of parking that developers are allowed to supply with commercial and residential buildings. In many cases, the ratios applied are significantly in excess of actual parking demand (see Donovan, 2015 for a discussion of the lack of scientific rigour in parking policies).

MRCagney (2013) suggest that MPRs have resulted in an oversupply of parking if the following cost-benefit test holds true:

“An additional square metre of floor area is worth more than an additional square metre of parking.”

In order to implement this test, they use a hedonic analysis of 219 commercial property sales in three Auckland retail centres (Takapuna, Dominion Road, and Onehunga). Table 15 summarises the results of this analysis, which shows that:

- The elasticity of price with respect to commercial floorspace [i.e. the coefficient on  $\ln(F)$ ] is positive and statistically significant at the 1% level
- The elasticity of price with respect to surface parking area [i.e. the coefficient on  $\ln(P)$ ] is negative, albeit statistically insignificant.

In other words, additional floorspace is associated with higher property values, while additional parking spaces have no positive effect on property values. This can be interpreted as evidence that MPRs have required businesses to over-supply car parking.<sup>63</sup> MRCagney

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<sup>62</sup> Standard errors are given in parentheses to provide an indication of the potential uncertainty in these estimates. All coefficients are highly statistically significant.

<sup>63</sup> These results are supported by a number of studies that employ different approaches to identify parking oversupply, including comparison of parking supply outcomes before and after the removal of MPRs (Guo and Ren, 2013) and analysis of actual parking demand in commercial centres (Hulme-Moir, 2010; Weinberger and Karlin-Resnick, 2015).

(2013) then extend this analysis further, estimating the costs of MPRs in terms of the net reduction in the value of commercial developments and comparing this cost against the benefits associated with reduced on-street parking management costs. Overall, they conclude that the costs of MPRs are 6 to 11 times higher than the benefits.

Table 15: The value of commercial floorspace and parking in three Auckland retail centres (Source: MRCagney, 2013)

There are both advantages and disadvantages to employing hedonic analysis to implement cost-benefit tests for planning regulations. As these examples show, this approach can be applied flexibly to assess various different types of planning regulations. Depending upon the specification of the model and the availability of data on building and neighbourhood attributes affected by planning rules, it can be generalised to address a range of issues. For example, Nunns (2015) implements a simple cost-benefit test for heritage preservation policies.

In common with the “boundary discontinuity” method, this approach does not explicitly estimate and monetise the costs of planning regulations.<sup>64</sup> Rather, it can be used to identify cases in which planning regulations have resulted in the over-supply of building or neighbourhood characteristics. (Or, conversely, where these characteristics may be undersupplied due to an absence of regulations.) It is therefore a useful tool for identifying the *direction* in which planning regulations should change, but other information is needed in order to understand the *degree* to which this will result in improvements to welfare.

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<sup>64</sup> In addition, this approach does not necessarily address the estimation issues identified by Sheppard (1999).



## Estimating the marginal increase in costs associated with planning regulations

A number of other approaches have been used to measure or estimate the cost of specific planning regulations. Bespoke approaches are often required to quantify the costs associated with various rules controlling the bulk and form of buildings, the density of neighbourhoods, and building characteristics such as car parking, balconies, or dwelling size.

A common approach to quantifying these costs is to estimate the marginal increase in land costs or construction costs associated with regulatory requirements. The advantage of this approach is that it is straightforward to implement and communicate. For example, an analyst could easily estimate the costs associated with a rule that required new apartments to have balconies by estimating what it would cost to construct balconies.

The main disadvantage of this approach is that it is a “partial equilibrium” approach that does not consider the flow-on effects of regulations on supply, demand, and prices for land and construction. In the case of balcony requirements, this approach would not account for any changes in the desirability of apartments for residents or, conversely, reductions in demand for apartments driven by higher costs.<sup>65</sup> These issues become more problematic when dealing with regulations such as minimum lot sizes that may have a significant impact on the spatial structure of cities and on the cost of land.

There are several good examples of this approach in the literature. Bertaud and Malpezzi (2001) compare the cost of developing housing under alternative scenarios for neighbourhood and dwelling design, including road width, infrastructure standards, minimum lot sizes, yard setbacks, and controls on building height and site coverage. Based on data on land prices and construction costs, they estimate the impact of alternative rules on housing costs in Malaysian cities.

Figure 15 summarises the development scenarios that the authors compared. The right hand panel contains narrower roads, fewer back alleys, and smaller building setbacks. As a result, it provides a significantly greater amount of saleable land and a larger amount of dwelling floorspace.

Figure 15: Alternative development scenarios for Malaysia (Source: Bertaud and Malpezzi, 2001)

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<sup>65</sup> Which may in turn lead to flow-on effects in other parts of the housing market.

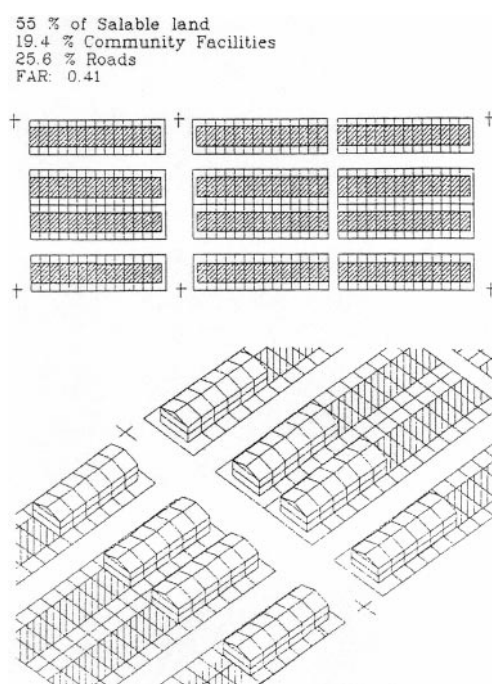
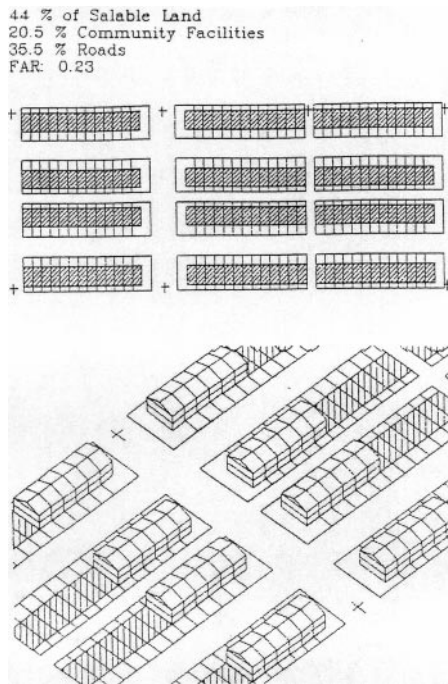


FIG. 3. Site plan corresponding to SLCHP guidelines. FIG. 4. Site plan corresponding to a conservative baseline.

The Portland Bureau of Planning and Sustainability (2012) adopted a similar approach to study the impact of minimum parking requirements on the supply of new midrise apartments and rents charged to tenants. Their results, which are summarized in Table 16, show that requiring on-site parking will raise the cost of apartments by 19-63%, depending upon how car parks are constructed, and reduce the number of apartments supplied by 12-40%.

Table 16: The impact of MPRs on housing costs (Adapted from Portland Bureau of Planning and Sustainability, 2012)

Building and car park design	# of units	# of car parks	Reduction in units (%)	Increase in rents (%)
Four storey building with no parking	50	0	-	-
Surface parking on site	30	19	-40%	50%
Parking on ground floor with apartments on a podium above	42	22	-16%	19%
Underground parking	44	33	-12%	63%

Grimes and Mitchell (2015) adopt a variant of this approach in their analysis of the impact of sixteen historical or proposed planning rules on the cost to develop apartments and standalone houses in Auckland. They survey 16 developers on their expectations for how the regulations would change the cost or value of new housing.<sup>66</sup> Developers' responses

<sup>66</sup> In some cases, Grimes and Mitchell (2015) found that regulatory requirements entailed the "substitution" of one dwelling attribute for another, less valued dwelling attribute. For example, they

were implicitly based on models of development costs and sale revenues similar to those developed by Bertaud and Malpezzi (2001) and the Portland Bureau of Planning and Sustainability (2012).

## **Estimates of the cost of planning regulations in Auckland**

Table 17 summarises and compares the findings from five recent studies that estimate the cost that regulations impose on new housing supply in Auckland. We note three key findings:

- Lees (2014, 2015a) find that the cost of regulations that limit building size and density are slightly larger than the costs of Auckland's MUL
- Grimes and Mitchell (2015) find that regulations impose much greater costs on apartments than on standalone dwellings. These findings are reinforced by MRCagney (2014), who look at the impact of minimum dwelling size rules on city centre apartments.
- The costs of planning regulations are significant. It is estimated that planning regulations may impose costs of up to \$100,000 on some types of dwellings. This suggests that it is necessary to have a robust intervention logic for proposed planning rules to ensure that regulations provide sufficient benefits to society.

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found that requiring a higher floor-to-ceiling height for high-rise apartment developments would interact with building height limits to limit the number of storeys that could be built. As a result, this regulation requires developer to substitute higher ceilings for more storeys.

Table 17: Overview of recent findings on the cost of legacy zoning provisions in Auckland

Study	Dwelling type / regulation type	Estimated cost
MRCagney (2013)	Impact of minimum parking rules on the value of retail development in town centres	\$19,000 per excess parking space Based on an estimated oversupply of 25-50%, this suggests that MPRs reduce the value of three retail centres by a total of \$75.7m to \$157.5m, plus added congestion costs of \$12.3m.
MRCagney (2014)	Impact of minimum dwelling size rules on the cost of small (city centre) apartments	\$50,000 to \$100,000 per apartment
Lees (2014)	Impact of MUL on Auckland households' housing and transport costs	Relaxing the MUL would reduce costs by \$860 per household This equates to a total cost of \$10,500 per household in present value terms (30 years; 8% discount rate)
Lees (2015)	Impact of building height limits (and other limits on density) on Auckland households' housing and transport costs	Annual cost of \$933 per household This equates to a total cost of \$11,300 per household in present value terms (30 years; 8% discount rate)
Grimes and Mitchell (2015)	Impact of provisions governing building heights, floor to ceiling heights, dwelling mix, and other design features on the cost of apartments	\$65,000 to \$110,000 per apartment
	Impact of provisions governing section size, dwelling density, site coverage, and other design features on the cost of standalone houses	\$32,500 to \$60,000 per house

## The impact of regulation on housing supply

There are several ways to think about how planning regulations affect development outcomes and/or limit the supply of floorspace. Figure 16 displays and compares three perspectives on how planning can affect property markets using a stylised analysis of supply and demand for housing.

Panels 1a and 1b presents one common way of thinking about planning regulations. This perspective views rules as hard limits that effectively “cap” the amount of development that can occur in an area (symbolised by the vertical red line). Initially, this has no effect, as shown in Panel 1a. But if demand for housing or business floorspace increases enough, as illustrated in Panel 1b, regulations restrict development to a fixed quantity ( $Q_R$ ). Over time, this results in higher and higher prices and an increasing deadweight cost (shown in the blue shaded triangle).

Auckland Council’s Capacity for Growth Study 2013 implicitly adopts this perspective in its analysis of the amount of development capacity enabled by the PAUP. It models development capacity under the assumption that developers will never seek to build anything that is not strictly enabled by the plan (Balderston and Fredrickson, 2014).

Panels 2a and 2b present a second common view on planning regulations: that they increase the cost of development but do not necessarily prevent it from occurring. This is

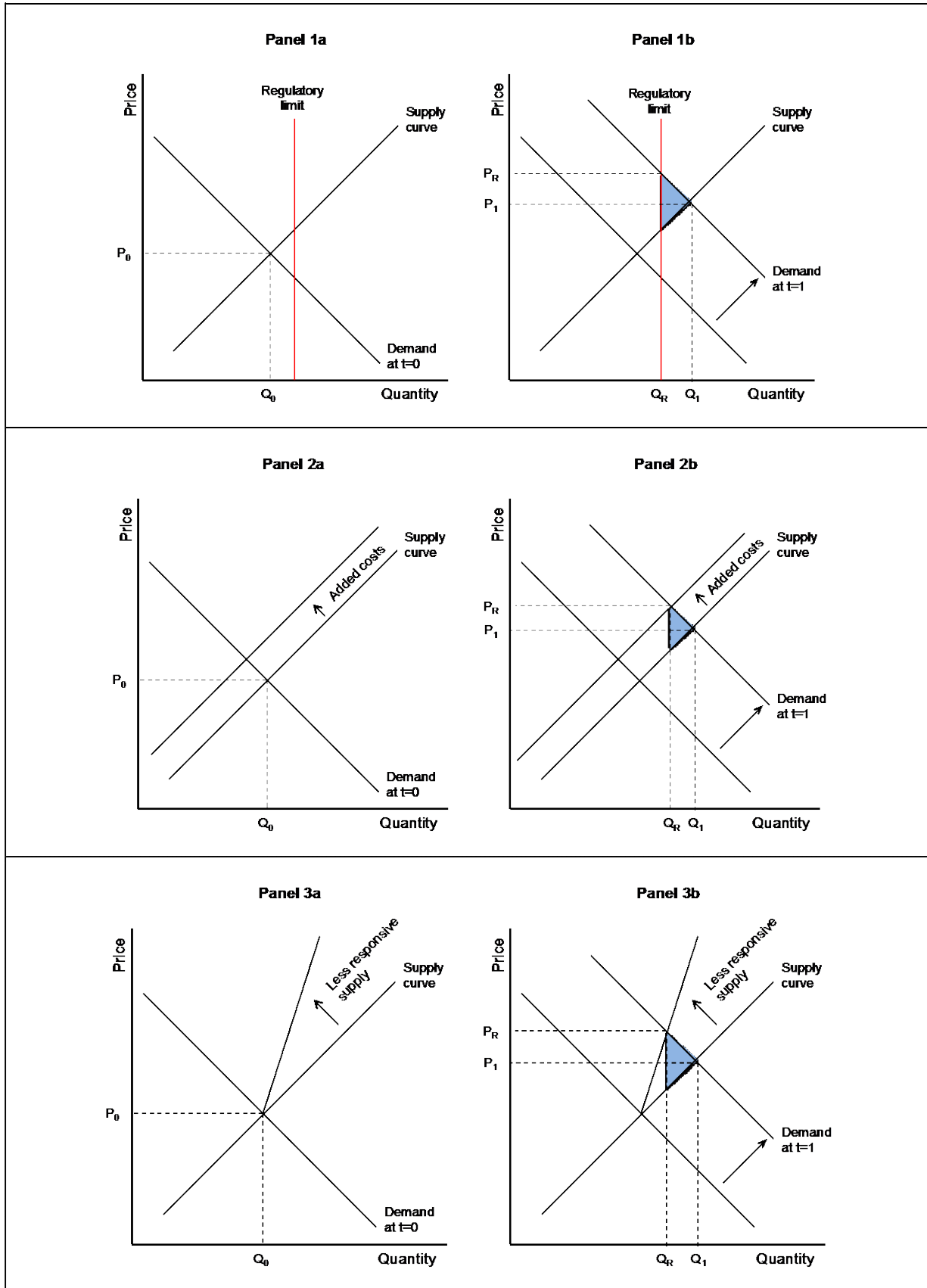
illustrated as an upward shift in the supply curve. This perspective sees regulations simply as a “tax” placed on development. This “tax” may arise as a result of either regulatory processes, including the cost and time required to apply for resource consents, as well as regulatory policies that influence what ultimately gets built.

As demand for housing or business floorspace increases, as illustrated in Panel 2b, it will tend to occur at a slightly higher cost than it otherwise would have done (i.e.  $P_R$  rather than  $P_1$ ). This, again, results in a deadweight cost shown in the blue shaded triangle. However, the magnitude of this cost is relatively *predictable* over time, regardless of how much new development occurs.

Panels 3a and 3b present a third perspective: that planning regulations reduce the flexibility of the development market in response to increased demands. Evans (2004) provides a theoretical underpinning for this perspective; we note that regulatory processes that result in uncertainty about consent application outcomes can also reduce responsiveness. This is shown as a change in the *slope* of the supply curve – in economic terms, a reduction in the price elasticity of housing supply.

This may have relatively modest impacts in the short term, but over time, the cost of regulations will tend to increase as new construction fails to keep up with rising demand for housing and business floorspace. As shown in Panel 3b, this will tend to result in higher prices and an increasing deadweight cost (shown in the blue shaded triangle).

Figure 16: Three ways of thinking about the effects of land use regulations



There is some evidence that the perspective in Panel 3 is most accurate, at least in the aggregate. Mayer and Somerville (2000), McLaughlin (2011), and Quigley and Raphael (2005) find evidence that more restrictive regulations reduce the supply elasticity in US, Australian, and Californian cities, respectively. However, in a more comprehensive review of the literature, Gyourko and Molloy (2014) conclude that there is a need for a stronger evidence base on elasticity of supply:

“In summary, most models predict that regulation should reduce the elasticity of housing supply, resulting in a smaller stock of housing, higher house prices, greater volatility of house prices, and less volatility of new construction. Although many empirical studies do find evidence of these relationships, they are mainly cross-sectional studies and consequently are potentially biased by omitted variables and reverse causality. A few studies have use panel data or community characteristics in order to mitigate these issues, but much more should be done along these lines.”

Planning regulations are not the only factor that can affect the elasticity of housing supply. Technical constraints in the building sector – i.e. a shortage of skilled labour or capital – can also slow down the supply response (Parker, 2015). Geographic constraints such as harbours, lakes, and steep hillsides can also play an important role. Saiz (2010) models the effect of these constraints on housing supply and prices in US cities, finding that geographic constraints have a strong negative impact on supply elasticities. This is an important finding given the impact of geography on urban form in New Zealand.

Lastly, there is some evidence that inflexible housing supply may increase the impact of economic “shocks”, such as increases in net migration or changes in interest rates, on house prices. In their review of OECD housing market policies, Andrews, Caldera Sanchez and Johansson (2011) note that:

“Low supply responsiveness of new housing has tended to exacerbate the price effect of changes in housing demand (e.g. caused by financial and labour market or demographic shocks)... Thus, in rigid supply environments, increases in housing demand are much more likely to be capitalised into house prices than to spur increases in the quantity of housing, at least over the medium-term horizon covered by OECD analysis.”

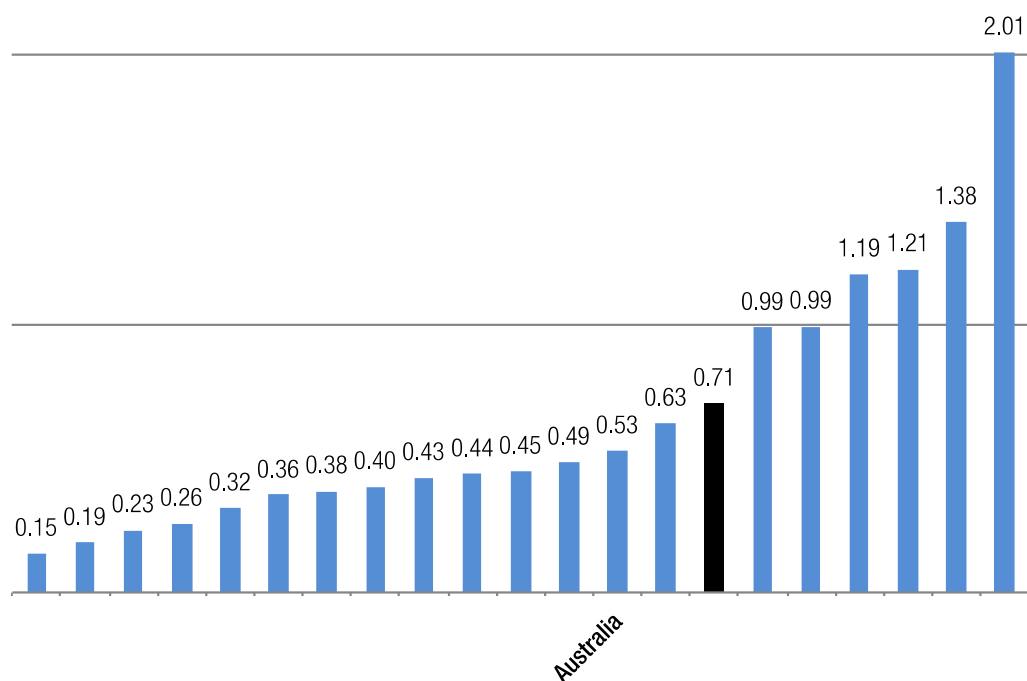
### **How responsive is housing supply in New Zealand?**

We now review the available empirical evidence on the responsiveness of New Zealand (and Auckland) housing supply in response to changes in price or changes in demand. Overall, we do not find evidence that housing supply is particularly inflexible in New Zealand relative to most other OECD countries. Nor is there strong evidence that Auckland’s housing supply is especially unresponsive to increased demand.

Caldera Sanchez and Johannson (2011) estimate the long-run price elasticity of supply (i.e. the degree to which price increases cause people to build more housing) for 21 OECD countries, including New Zealand. Their results, summarised in Figure 17, suggest that New Zealand's housing supply is more flexible than many other OECD countries, including Australia and the UK. They also find that new housing tends to be constructed relatively rapidly in response to shortfalls in supply.

However, New Zealand's housing supply is still inelastic, as the coefficient of 0.71 indicates that if house prices rose by 10% at a national level, we would expect housing supply to increase by only 7.1% in the long run. This finding is consistent with Grimes (2007), which estimates that New Zealand's elasticity of housing supply is between 0.5 and 1.1.

Figure 17: Long-run price elasticity of supply for housing in 21 OECD countries (Source: Caldera Sanchez and Johannson, 2011; Table 3)



Several recent papers have investigated the relationship between changes in net migration, which increases demand for housing, house prices, and new construction. Based on data from 1962-2006, Coleman and Landon-Lane (2007) estimate that “a net migrant inflow equal to one per cent of the population causes real house prices to increase by 11-13 per cent after a year... Moreover, the impact on house prices is not substantially unwound after a year, as might be expected from the delayed response of house construction activity.” McDonald (2013) provides a slightly lower estimate of the impact of migration – finding that a net migrant inflow equal to one per cent of the population causes real house prices to rise by 8%.



However, the papers' findings on housing supply responses are slightly more ambiguous. McDonald (2013) finds that over a three year period "an additional house is built for around every six migrants. This is materially more than the existing number of people per household in New Zealand (around 2.5)." This may suggest that housing supply is slow to respond. However, Coleman and Landon-Lane (2007) suggest that even a rapid increase in housing supply may not be sufficient to mitigate the impact of migration on house prices:

"In the five years to March 2006, the New Zealand population increased by 257 thousand or 6.6 percent, partly because of net immigration of 115 thousand people (433 thousand immigrants and 318 thousand emigrants.) During this time, 137 thousand building permits were issued, or 0.53 permits per new person. This rate of construction was sufficiently rapid that the ratio of houses to people increased from 0.35 in 2001 to 0.36. Many of these houses were very large: 20 per cent exceeded 300m<sup>2</sup> in size, while a further 40 per cent were between 200 and 299 m<sup>2</sup>. Yet despite this construction boom, real house prices increased by 67 percent, or by 10 times as much as the population increase and 22 times the population increase due to net immigration."

Finally, Grimes and Aitken (2010) provide some evidence on the flexibility of housing supply in response to increased demand at a territorial local authority (TLA) level, based on data from 1992 to 2004. They find that:

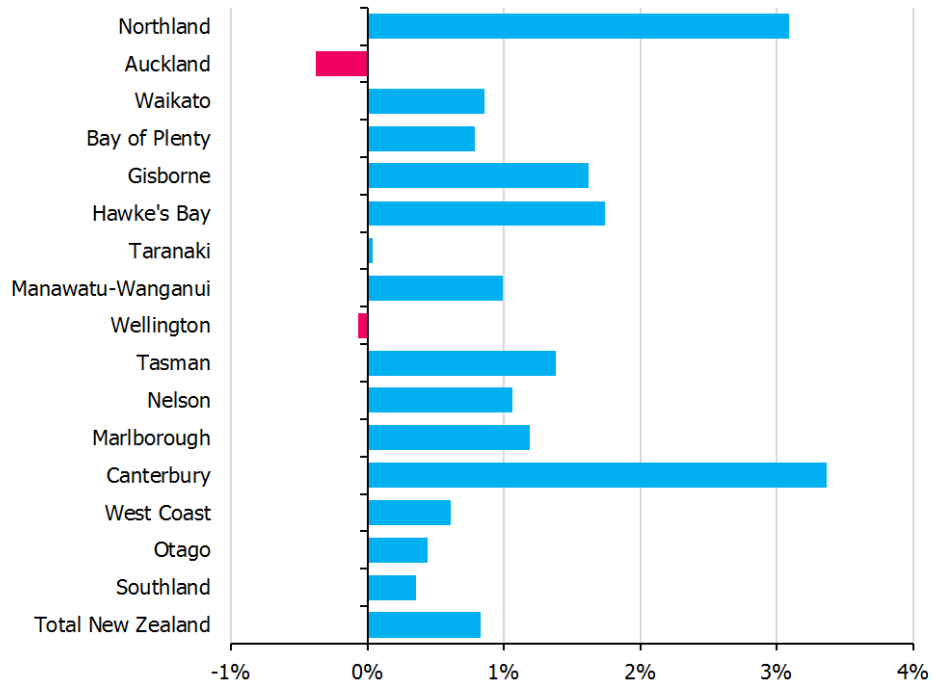
"If we divide regions into urban and rural, we find faster adjustment in urban areas (average  $\gamma_{ji} = 0.0093$ )<sup>67</sup> than in rural areas (average  $\gamma_{ji} = 0.0064$ ). This result is consistent with an active development industry, based principally in cities, facilitating new construction."

Their coefficient for urban areas (0.0093) indicates that housing supply is expected to increase by 9.3% in response to a 10% increase in prices. Based on correspondence with the author, we understand that Auckland's elasticity of supply is slightly higher than the average for all urban areas. That being said, Eqaub (2014) presents some more recent data that Auckland's recent housing supply outcomes have lagged behind demographic growth when compared with other regions. It is difficult to draw robust conclusions from this data due to the fact that it does not necessarily control for exogenous income and demographic trends.

Figure 18: Housing supply growth relative to demographic demand, 2006-2013 (Source: Eqaub, 2014)

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<sup>67</sup>  $\gamma_{ji}$  is a parameter estimating the responsiveness of new housing supply to demand shocks / price increases.



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