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# UP OR OUT?:

## *Examining the Trade-offs of Urban Form*

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### ABSTRACT

Co-authored by Jason Krupp and Khyaati Acharya, *Up or Out? Examining the Trade-offs of Urban Form* analyses the assumption that in order to accommodate an ever-growing population, cities need to build up, not out. The idea behind this suggestion is that denser, more compact cities achieve higher levels of productivity, greater housing affordability, better health outcomes and less traffic congestion. But do they really?

Research into the historical trends and academic literature on the subject finds the argument for compact cities is far from clear cut. In many cases this urban ideology exacerbates the very problems it looks to solve. Quantitative research reveals US investment in trains has not alleviated traffic congestion, compact cities often have the least affordable housing markets, and urban form changes only have a marginal influence on obesity.

The aim of this report is not to say that rail is not an important part of the urban transport mix, or that suburban housing is preferable to apartments. Rather, the goal is to lay bare the trade-offs that urban residents will have to live with when choosing to adopt a compact city development plan.

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## CHAPTER 1: INTRODUCTION

Urban residents in much of the developed world should be familiar with the term ‘compact city’. If they are not, it is probably because the term has been disguised under different names such as smart growth, neo-urbanism or some other euphemism. Either way, names matter little because the form is almost always the same: a long-term policy framework that aims to restrict the outward growth of car-dominated cities that have sprung up in much of the Western world since World War II. In its stead, proponents of compact cities want to create more efficient, egalitarian and sustainable cities in the face of rising population levels, depletion of scarce energy resources, and growing concerns for the environment. The utopian compact city is dominated by walking, cycling and public transit use, with the populace housed in high-rise apartments situated close to places of work. The urban footprint of these cities is small, and clearly separate from the rural farmland and countryside that surround it. In short, the focus is to build up instead of out.

Many of New Zealand’s cities are going the compact city route by restricting land supply, and stipulating urban densities through building permits and zoning regulations. Auckland is the most obvious example, but Wellington, Christchurch and regional centres like Tauranga have all pursued, or are pursuing, compact policies. Given the clean, green and economically vibrant vision compact cities promise, it is hard for many voters to oppose a compact city plan, especially when it is set against traffic jams, steeply rising house prices, increased costs of living, and high rates bills outpacing inflation. Compact cities seem like a turnkey solution to everything that is wrong with the modern urban environment.

The difficulty with the major challenges facing society today is there is almost never a silver bullet solution, and if there is, it has been fired long ago – and more complex problems have since arisen. This is certainly the case with compact cities.

Some of the very obvious costs associated with the standard urban model, such as traffic jams, have become worse even after significant investments in transit networks. Steeply rising property prices, in Auckland and other parts of New Zealand, are not only made worse by artificial restrictions on land supply, but in many cases have been the direct result of such policies. Yet when voters are asked to decide on the future shape of the

cities they live in, these trade-offs are seldom explored. Instead, officials often choose to use platitudes to sell their development frameworks. Tauranga’s Smart Growth Strategy, for instance, carries the banner of ‘Live, Learn, Work, Play’, and its regional business growth strategy is titled ‘SmartEconomy’ (who wants a ‘DumbEconomy’ in the first place?). A more candid slogan might be ‘Unaffordable housing, high cost of living, low rates increases’.

We suggest that this communication mismatch is not out of some cynical disregard for voters but the highly complicated nature of urban development issues that often stray beyond urban development. For example, numerous major infrastructure projects have been deferred in New Zealand because the mechanism for local government finance – property rates – does not allow councils to participate in the economic benefits of these investments. In addition, urban form changes are highly technical, and require the input of economists, planners, water and roading engineers, geologists, lawyers, accountants and others. The unintended consequence of this is that any material debate about compact development can only be had among the professional elite who are paid to work on these issues. It also makes the documents nearly inscrutable to the general public. The Auckland Unitary Plan, for example, is being planned as a rulebook of the radical changes the city will undergo by 2040. But at 7,000-plus pages, it is not an easy document for the general public to digest. The ObamaCare health legislation, by comparison, is only 2,500 pages long.

This report will discuss these complex issues at a level that the educated layperson can understand without diluting their essence. The aim is not to dictate what sort of development city councils should pursue, but to ensure that councils and planners are transparent about the trade-offs they are asking urban residents to accept.

In light of this, this report will examine the concept of agglomeration in detail. This economic term refers to the notion that the economic output of cities is always greater than the sum of the parts, and that the higher the density of a city, the more productive these urban areas will be. City officials and planners often use agglomeration to justify steering future urban development along the compact city route. But research



clearly shows there is no linear relationship between density and economic growth. Agglomeration benefits only occur where the advantages of working and living in greater proximity outweigh the negatives such as high land prices, congestion and impacts on human health. It is a delicately struck balance, and as we show in this report, many of changes to urban form proposed by the compact cities movement make it much harder to maintain this equilibrium. These trade-offs and their consequences to urban form need to be discussed transparently – and with the benefit of international comparison. ‘Trust us’ does not cut it anymore.

## CHAPTER 2: WHAT IS A COMPACT CITY?

Green Growth or Urban Sustainability, Smart Growth or New Urbanism. Whatever you choose to call it, these terms are all synonymous with a compact city – a planning concept that endorses a more intensive use of urban buildings, sub-divisions and the efficient re-use of brownfield land.<sup>1</sup>

The compact city is a widely discussed and highly contested topic in contemporary urban planning that has dominated the conversation on how cities should grow and develop. In a rapidly urbanising world, with an ever-growing population, the compact city concept is gaining increased traction. Densification, intensification and promoting a more efficient use of resources within our urban areas are being touted as the most viable methods of enhancing the environmental sustainability of cities in a world of finite resources.<sup>2</sup>

The absence of a single compact city model makes definition a difficult task. In addition, the concept has, over its long history, evolved and enlarged both in scope and policy objectives.<sup>3</sup> What originated as an urban planning and design concept to promote high residential density with mixed land uses has expanded to become a policy framework with which to address population pressures, global warming, environmental concerns, and fears of energy resource and land depletion.<sup>4</sup> Furthermore, compact cities are not just a means of environmental protection but also

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<sup>1</sup> Elizabeth Burton, “The Compact City: Just or Just Compact? A Preliminary Analysis,” *Journal of Urban Studies* 37, no. 11 (2000): 1969.

<sup>2</sup> Organisation for Economic Co-operation and Development (OECD), *Compact City Policies: A Comparative Assessment* (Paris: OECD, 2012), 19.

<sup>3</sup> *Ibid.*

<sup>4</sup> *Ibid.*

an avenue through which economic growth can be facilitated (see Chapter 3 of this report).<sup>5</sup>

Given the broad definition of a compact city, how do we define a compact city for the purposes of this report? The many essential characteristics of a compact city, according to Elizabeth Burton in *The Compact City: Just or Just Compact? A Preliminary Analysis*, include:<sup>6</sup>

- Relatively high-density living and employment
- Mixed-use
- Contiguous development
- Efficient public transport
- Intensification, consolidation and densification of infrastructure
- Dimensions that encourage walking and cycling.

Population density and the constraint of urban expansion unite or enable all the above characteristics. As Michael Breheny said, the term compact city is now synonymous with a “variety of approaches to the planning of towns and cities which stress the merits of urban containment”.<sup>7</sup> Indeed, researchers tend to use density alone as the main independent variable (while designers and planners tend to use physical characteristics such as street widths, lot size, sidewalks, etc.).

Perhaps as useful for this argument is a definition of what a compact city is not, namely the dispersed urban environments that characterise many metropolitan areas in the Western world. No doubt, New Zealand readers of this report will be familiar with these dispersed urban environments because they live in them. These dispersed areas are better known as suburbia, and are characterised by low-density areas that surround the urban core, typically consisting of a single dwelling per lot of land, often surrounded by a garden, with transport options dominated by private motor vehicle use. In this report, we refer to these areas as dispersed areas, not sprawl, which has been pejoratively used to describe suburbia. Sprawl is, in fact, a term used to describe two types of inefficient land use: a) ribbon strip development

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<sup>5</sup> *Ibid.*, 20.

<sup>6</sup> Elizabeth Burton, “The Compact City: Just or Just Compact? A Preliminary Analysis,” 1969.

<sup>7</sup> Michael Breheny, “The Compact City and Transport Energy Consumption,” *Transactions of the Institute of British Geographers* 20, no. 1 (1995): 82.



where housing and commercial buildings only occupy the main transport corridors, with empty land behind, and b) leapfrog developments, where developers produce housing in non-contiguous patterns, leaving tracts of open land. Both represent inefficient use of land in the short to medium term, particularly from an infrastructure perspective. Dispersed urban development is exactly that – a perfectly valid choice to contiguously develop out instead of up. These distinctions are important because by critically examining the factual evidence and foundations for sustainability, we can more accurately analyse whether dense urban cities are more sustainable than dispersed suburban areas.

## CHAPTER 3: AGGLOMERATION

When examining how modern cities grow, it is worthwhile to consider the benefits of cities to residents. Cities have not only existed for millennia but have also expanded to the point where more than half the world's population live in one. This is explained in history by the primary need for defence – and also trade and knowledge sharing. It is no coincidence that writing was invented in the ancient Sumerian city-states, an urban form that drove innovation and trade for many centuries. In European history, Athens, Rome and Venice all stand as excellent examples of specialist city-states. However, since the widespread use of gunpowder in the West, the need for the cities as defence structures has diminished. Yet, proximity has continued to deliver benefits to businesses and residents. That was true 500 years ago, and it is true today. Otherwise, as economist Edward Glaeser has noted, why would financial services professionals choose to work shoulder-to-shoulder on a crowded trading floor when their wealth could afford them the privacy and luxury of an office?<sup>8</sup>

Economists call these positive externalities but in the interests of simplicity we will call them agglomeration benefits. For businesses, these advantages stem from four primary sources: proximity to suppliers, proximity to markets, ability to specialise, and access to a deep labour pool. These positive externalities extend down to the individual level. People living in cities are exposed to a far bigger labour market into which to sell their skills; by positioning themselves close to markets for the goods and services they need, city residents receive the benefit of lower

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<sup>8</sup> Edward Glaeser, *Triumph of the City: How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier, and Happier* (New York: The Penguin Press, 2011), 57.

costs due to reduced transport costs and economies of scale. Urban economists also note that individuals maximise their human capital by living in cities, allowing for the efficient sharing of ideas.

### 3.1 BALANCING URBAN COSTS AND BENEFITS

It is also well recognised that agglomeration is a net benefit to society only when it exceeds the costs associated with increasing density. In economic terms, these costs come in the form of congestion and high land prices. This is logical because if congestion adds to the time it takes for a firm to access its suppliers and markets, then productivity will inevitably suffer. It's similar with land and property prices. Companies and workers will have to recoup these costs through higher wages and prices, ultimately affecting productivity. For economists, the study of agglomeration involves weighing the positive and negative spill over effects of urban density against each other.

This balance has been well established and quantified on a firm level, but a real quantification of agglomeration benefits on a wider scale began in earnest only two decades ago. Still, a significant amount of work has been done to show that on a per capita basis, urban centres are more productive than suburban or rural areas. And all things being equal, in terms of employment density and productivity, urban areas with more working-age inhabitants are more productive than those with a shallower labour pool. Edward Glaeser and Joshua Gottlieb have conducted research on this relationship in the United States.<sup>9</sup> This research has been repeated in many developed world economies, adding to the growing body of work establishing the elasticities between employment density and productivity, or assessing how the first factor influences the latter.

Motu Economic and Public Policy Research too recently produced several research reports quantifying the effects of agglomeration in New Zealand. In a project sponsored by the New Zealand Transport Agency (NZTA) to estimate agglomeration elasticities to evaluate transport projects, economists David Maré and Daniel Graham found that New Zealand firms located in areas with

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<sup>9</sup> Edward L. Glaeser and Joshua D. Gottlieb, "The Wealth of Cities: Agglomeration Economies and Spatial Equilibrium in the United States," *Journal of Economic Literature* 47, no. 4 (2009): 23.



a 10% higher effective density were 0.69% more productive.<sup>10</sup> Maré and Graham further estimated an aggregate pooled cross-sectional agglomeration elasticity for New Zealand of 0.048 using Statistics New Zealand’s Longitudinal Business Database (LBD) information. That is to say, controlling for regional variations, a 10% increase in density should lift a firm’s multi-factor productivity by 0.48%.<sup>11</sup> Additional research by David Maré and Richard Fabling found evidence of agglomeration effects in New Zealand’s labour markets, noting productive “spillovers from operating in areas with high-skilled workers, and with high population density”.<sup>12</sup>

These arguments seem to support compact cities, in that housing people closer to places of work and in higher densities will increase the productivity of urban economies. Indeed, these perceived gains are already being factored into the business case for major infrastructure projects, such the Auckland City Rail Link (see Table 1). The project to build a rail tunnel from Mount Eden to the CBD for \$1.7 billion (in 2010 dollars) is estimated

Table 1: Auckland City Rail Link - Wider Economics Benefits Analysis  
AUCKLAND CITY RAIL LINK: UPDATED ECONOMIC EVALUATION (2011): 14

	UPDATED BUSINESS CASE		
	Benefits \$m NPV	Costs \$m NPV	Benefit to cost ratio
Transport benefits	1,192 to 1,379		
Bus cost savings	43		
Agglomeration benefits	393 to 455		
<b>Combined total (consistent with EEM and comparable with other transport projects)</b>	1,628 to 1877	1,699	1.0 to 1.1
Imperfect competition	30 to 34		
Labour supply	57 to 66		
Productivity gains from job relocation	147 to 591		
<b>Total including wider economic benefits outside the EEM</b>	1,862 to 2,568	1,699	1.1 to 1.5
Increase in the size of the regional economy	0 to 1,300		
<b>Total including regional growth</b>	1,862 to 3,868	1,699	1.1 to 2.3

\*ALL FIGURES IN NET PRESENT VALUE (2010 DOLLARS) APPLYING AN 8% DISCOUNT RATE FOR 30 YEARS.

10 David C. Maré and Daniel J. Graham, “Agglomeration Elasticities in New Zealand,” NZ Transport Agency Research Report 376 (2009): 21, accessed March, 2014, <http://210.48.109.218/resources/research/reports/376/docs/376.pdf>.

11 David C. Maré and Daniel J. Graham, “Agglomeration Elasticities and Firm Heterogeneity,” Spatial Economics Research Centre Discussion Paper 43, (2010): 11, accessed March, 2014, <http://ideas.repec.org/p/cep/sercdp/0043.html>.

12 David C. Maré and Richard Fabling, “Productivity and Local Workforce Composition,” Motu Working Paper 11-10. Motu Economic and Public Policy Research (2011).

to produce agglomeration benefits of between \$393 million and \$455 million. This is on top of \$1.19 billion in transport benefits and \$43 million in bus cost savings, to produce a cost-benefit ratio range of between 1:1.0 to 1:1.1 (excluding wider economic benefits (WEBs) and increased size of the regional economy).<sup>13</sup>

### 3.2 AGGLOMERATION UNCERTAINTIES

However, agglomeration elasticities should be treated with a high degree of caution when factored into the compact cities debate. First, despite the correlation between employment density and productivity, urban economists are still debating the extent to which one causes the other. As Maré and Graham state in their NZTA-sponsored study:

It is clear that denser areas are more productive but this may reflect other factors that are positively associated with both density and productivity. It is more difficult to establish that an increase in density would necessarily lead to an increase in productivity.<sup>14</sup>

In fact, Maré and Graham say their cross-sectional analysis of firm micro data in New Zealand may:

... overstate the true impact of agglomeration on productivity ... if the estimated agglomeration effects reflect sorting rather than a causal effect, increases in density as may result from investments in transport infrastructure will not necessarily result in net increases in production.<sup>15</sup>

Sorting, or clustering, is a process whereby some firms choose to situate themselves in close proximity to avail the specific benefits available. If sorting is responsible for higher productivity in urban areas rather than

13 Auckland Transport, “Auckland City Rail Link: Updated Economic Evaluation” (20 May 2011).

14 Maré and Graham, “Agglomeration Elasticities in New Zealand,” 11.

15 Maré and Graham, “Agglomeration Elasticities and Firm Heterogeneity,” 19.



agglomeration, then increasing business density is unlikely to yield any economic gains. For instance, technology firms may gain a productivity advantage from locating in Silicon Valley, but it does not mean a greengrocer can expect the same boost by relocating there.

Daniel Graham, in quantitative research with Kurt van Dender, assessed the agglomeration benefits of transport investments but was unable to:

... distinguish the role of accessibility from other potential explanations for productivity increases. For transport appraisal, this implies that the use of conventional point elasticity estimates could be highly misleading.<sup>16</sup>

Second, agglomeration benefits have been spun out into WEBs, which have since been factored into a number of infrastructure projects. However, some economists question whether these benefits are already captured in the initial cost-benefit analysis, and to what extent this amounts to double counting. SAHA International, the management consulting firm hired by the NZTA to assess the WEBs from the Roads of National Significance project, raised just such a point. SAHA looked at Australian examples of large, interlinked infrastructure projects, and found no simple or widely used method to quantitatively determine interdependencies between projects.<sup>17</sup>

[The] approach used to estimate WEBs is relatively new and as such it produces results which vary considerably – it is likely the approach will be subject to ongoing refinement for some time.<sup>18</sup>

Despite this uncertainty, WEBs were included in the final evaluation of the Australian projects, and lifted the economic benefits by between 20% and 30% over and above what a conventional transport estimate would have produced. Similarly

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<sup>16</sup> Daniel J. Graham and Kurt Van Dender, "Estimating the Agglomeration Benefits of Transport Investments: Some Tests for Stability," *Joint Transport Research Centre of the OECD and the International Transport Forum* (2010).

<sup>17</sup> SAHA International, *Roads of National Significance: Economic Assessments Review* (Wellington: New Zealand Transport Agency, 2009), 17

<sup>18</sup> *Ibid.*, 41.

in New Zealand, Auckland Transport included WEBs in its assessment of the City Rail Link project, resulting in more than double the upper estimate of the cost-benefit ratio from 1.1 to 2.3 once benefits to the regional economy were factored (see Table 1). That is not to say agglomeration benefits, or indeed WEBs, do not exist – only that they are imperfectly understood and likely to be misapplied.

Third, agglomeration benefits are subject to the law of diminishing returns. As a city grows in size and density, the benefits from agglomeration will shrink as the urban costs in the form of congestion and land prices increase. This has been observed in France, where the pace of wage growth in urban areas outpaced the costs (specifically rent) to a point.<sup>19</sup> However, once the cities passed a certain population threshold, competition for scarce resources like housing meant urban costs outstripped the benefits from agglomeration. In the Netherlands, researchers Lourens Broersma and Jouke van Dijk found that multifactor productivity growth was slower in the core urban regions than in surrounding regions partly due to the effects of higher levels of congestion on the labour market.<sup>20</sup> This finding is notable because the main Dutch metropolitan areas are textbook compact cities, with high levels of transit, pedestrian and cycling access, and dense mixed used urban developments.

Maré and Graham too acknowledge diminishing returns in their estimates on agglomeration elasticities in New Zealand.<sup>21</sup> Cognisant of the limitations in establishing the relationship between urban density and productivity discussed above, they found that out of Auckland's seven sub-regions, four (Rodney, Manukau, Papakura and Franklin) had higher agglomeration elasticities (ranging from 0.099 to 0.145) than the city's main CBD (0.071). Despite this, the Auckland Unitary Plan proposes to continue developing the city along a monocentric model, with the CBD acting as a centralised hub, serviced by transport corridors acting like spokes. So why haven't Auckland Council policymakers considered a polycentric model in such

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<sup>19</sup> Pierre-Philippe Combes, et al., "The Productivity Advantages of Large Cities: Distinguishing Agglomeration from Firm Selection," *Econometrica* 80, no. 6 (2012): 2544.

<sup>20</sup> Lourens Broersma and Jouke van Dijk, "The Effect of Congestion and Agglomeration on Multifactor Productivity Growth in Dutch Regions," *Journal of Economic Geography* 8, no. 2 (2008): 204.

<sup>21</sup> Maré and Graham, "Agglomeration Elasticities in New Zealand," 30.



detail, despite public feedback from the draft Unitary Plan. Agglomeration benefits do not function as a one-size-fits-all arrangement.

### 3.1 CONCLUSION

Clearly, agglomeration is an important consideration to be factored into the economic analysis of how cities develop, and in the investments that need to be made to make these urban areas economically sustainable. Given the limited investment resources at any one time, a tool that allows policymakers to make a more informed choice about where to allocate funds to generate the biggest bang for buck should be welcomed. But equally it should be recognised that this branch of spatial economics is an evolving field, with significant work still to be done to emphatically demonstrate that pulling policy lever X leads to outcome Y. The emerging literature on the topic only agrees that they occur, not why they occur. This matters in the compact city debate because agglomeration benefits are often simply presumed to occur when the population density of a city is increased. Yet as any urban dweller knows, living in a city increases the exposure to negative forces that decrease quality of life (such as air pollution, crime, congestion and a higher cost of living) as well as offering positive benefits. An informed debate on changes to urban form needs a greater emphasis on these urban costs. It is clearly beyond the scope of this report, which is essentially a literature review, to emphatically prove (or disprove) the calculus of agglomeration, particularly when the field is undergoing rapid change at an academic level. However, we can hold up the urban costs against the record of compact cities, with a view to generate a more informed discussion around the trade-offs that will have to be accepted whether cities choose to expand upwards, outwards, both or neither.

## CHAPTER 4: TRANSPORT

Transport is an integral component of any major urban development plan, and given its significance, it is no surprise that it is a major concern to planners, residents and businesses. But why does transport matter in the compact city debate? The ability to get goods, services and labour to and from the market efficiently is primarily why cities are more productive and pay higher wages than less populated regions (see Chapter 3). These agglomeration benefits only arise if they are greater than the urban costs of living in high population densities. When it comes

to urban transport, that cost is congestion, and it is one of the most contested elements in the urban form debate.

The proponents of compact cities argue that dense urban environments, with their presumed rates of high public transit usage, offer greater transport efficiency than car-dominated cities. By providing an alternative to private transport and the right incentives to make transport users shift to mass transit, compact cities reduce the need for burdensome spending on roading infrastructure and maintenance, and reduce congestion and air pollution in the process. Public transport systems also play a key role in fostering equality by serving lower-income populations.

Those against compact cities, and in favour of private transport, argue that even though cars cause congestion, they are the most efficient and low-cost means of moving an urban population from residences to workplaces. That is because it is the private citizen, not the taxpayer, who takes on the capital and running costs of the car, and in New Zealand at least, a significant portion of roading investment and maintenance costs is borne by the users of this infrastructure. Transit systems though are often faced with funding pressures due to their high labour intensity and dispersed trip patterns.<sup>22</sup> In the United States, transit usage has declined steadily since the end of World War II.<sup>23</sup>

The question for New Zealanders, particularly those being asked to choose what development path their cities should pursue, is which type of city is more effective at reducing congestion, compact or the existing dispersed model?

Before we review the literature on this debate, it is important to note that public transit in this report predominantly refers to rail investments – not bus networks – because buses are distinct from trains from an investment perspective. Buses do not require a significant upfront capital investment in land and track equipment, and are lower risk because services can be adjusted to match user demand patterns. On the other hand, buses can be regarded as contributors to congestion because they use

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<sup>22</sup> Kenneth E. Small, "Transportation: Urban Transportation Policy," In *Making Cities Work: Prospects and Policies for Urban America*, Robert P. Inman (ed.) (New Jersey: Princeton University Press, 2009), 63.

<sup>23</sup> *Ibid.*, 79.



existing road infrastructure to transport passengers. After all, any infrastructure investment aimed at improving the efficiency of a bus service is also likely to benefit private car users, and hence, should be regarded as distinct from light rail, rail and tram projects.

#### 4.1 INTERNATIONAL CONGESTION FIGURES

Which urban form is more effective at eliminating congestion in New Zealand is a complicated question. The size of the country relative to its population meant such prohibitive costs of investing in passenger rail infrastructure that only two cities (Wellington and Auckland) offer rail services as a means of daily transit. Auckland is characterised by a notable underinvestment in rail infrastructure, with city officials relying disproportionately on private vehicle use rather than public transport to move the city's goods, services and people.<sup>24</sup> The rail network only services a narrow corridor, and has been slow in modernising, only recently shifting to electricity-powered locomotives. Instead, we have to look at other parts of the developed world, particularly the United States, which has a richer transport history, to show how the different transit investments affect congestion levels. The United States was also chosen because its transport network most resembles that of New Zealand's cities, as opposed to Europe, which had naturally formed into compact and transit intensive cities as late as the 1920s. In this broader context, it is possible to

Table 2: Most Congested Metropolitan Areas, September 2013  
SOURCE: "INRIX TRAFFIC SCORECARD," INRIX INC., ACCESSED JANUARY 15, 2014, [HTTP://SCORECARD.INRIX.COM/SCORECARD/DEFAULT.ASP](http://scorecard.inrix.com/scorecard/default.asp)

RANK	US CITIES	TRAILING 12 MONTHS	SEPT. 2013	SEPT. 2012	POPULATION DENSITY/SQ MILES*
1	Los Angeles	30.7	33.4	31.2	8,092.3
2	Honolulu	27.6	41.2	30.1	5,572.6
3	San Francisco	25.9	30.1	27	7,004
4	Austin	22.1	24.9	23	2,653.2
5	New York	20.9	20.1	20.6	27,012.4
6	Bridgeport	20.9	20.1	18.5	9,029
7	San Jose	19.4	22.8	20.9	6,370.9
8	Seattle	18.7	20.8	18.3	7,250.9
9	Boston	17.1	18.4	17.2	12,792.7
10	Washington D.C.	16.3	16	17.6	9,856.5

\*"POPULATION DENSITY FOR U.S. CITIES MAP," GOVERNING: THE STATES AND LOCALITIES, ACCESSED JANUARY 15, 2014, [WWW.GOVERNING.COM/GOV-DATA/POPULATION-DENSITY-LAND-AREA-CITIES-MAP.HTML](http://WWW.GOVERNING.COM/GOV-DATA/POPULATION-DENSITY-LAND-AREA-CITIES-MAP.HTML)

<sup>24</sup> Auckland Regional Transport Authority, *A Step-change for Auckland. Rail Development Plan 2006* (Auckland: ARTA, 2006), 2.

analyse urban form against congestion. The annual INRIX Traffic Scorecard, which compares the stated speed of urban roads in the United States, Canada and Europe against the actual speed during peak times, was chosen as a measure of congestion, and cross-referenced against population density (Table 2).

Two things are evident from Table 2: the high levels of congestion and high population densities across these cities, ranging between 6,000 and 27,000 people per square mile. Auckland has an urban population density of 7,600 people per square mile (or 2,900 per square kilometre).<sup>25</sup>

What is less obvious is that 9 of the 10 cities in the table have pursued a compact development model for many years, and in many cases, decades (San Francisco, for example). Austin, Texas, is an exception, but officials there are increasingly steering development along the compact city model through their Comprehensive Plan, a framework that will dictate public policy on transportation and land use.<sup>26</sup> Compare that to Houston, Texas, where land use is largely determined by market forces rather than central planners, resulting in the city's urban footprint expanding outwards as opposed to upwards. The INRIX scorecard ranks Houston 14th on the congestion scorecard, less than half that of Los Angeles, Honolulu and San Francisco – three cities touted as models of compact development.

What the table suggests is that compact cities, far from being urban forms that reduce congestion, appear to be associated with congestion.

#### 4.2 TRANSIT NO CURE FOR CONGESTION

It may seem counterintuitive that compact cities, characterised by high transit market penetration, experience higher congestion levels than dispersed cities, but this stands to reason for two factors. First, urban centres can only handle a set amount of traffic throughput at any one time: Increasing population density decreases this flow rate, even when accounting for increased transit use because more goods, services and private vehicles will be competing for limited space. Second, cities only

<sup>25</sup> Statistics New Zealand, "Subnational Population Estimates: At 30 June 2013 (provisional)."

<sup>26</sup> City of Austin, "Imagine Austin: The Way Forward."





have limited resources to invest in their transport networks. Where new transit investments are required, such as on light rail and trams, these funds are often diverted from traditional transportation spending areas such as road building and maintenance, hence increasing congestion if the private vehicle fleet continues to grow.

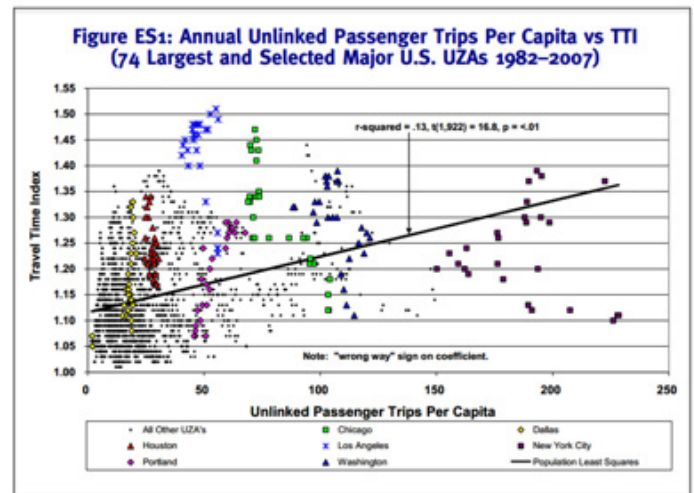
This was seen in Portland, Oregon, in the late 1970s, when city officials stopped building new freeway lanes and instead allocated funds to the construction of a light rail network to reduce the number of cars using the city's road network.<sup>27</sup> This would have been a non-issue had the transfer from private to public transport been entirely efficient. However, the light rail line failed to achieve its stated goal of carrying 42,000 passengers per weekday after the first full year of operation, transporting less than half at 19,500 per weekday. Furthermore three out of four light rail users had previously used bus services, not cars. Ten years after Portland introduced light rail in 1987, total rail ridership had increased by just 10,000 riders per weekday. At the same time, private passenger vehicle use exploded, with the city's highways servicing 55,000 vehicles per weekday, carrying more than 88,000 passengers than in the previous 10 years.<sup>28</sup> Since then, no major upgrades have been made to the road network, thereby intensifying congestion instead of reducing it. Additional light rail lines have had little effect on the trends behind transit and private car usage. Portland is now ranked as the 16th most congested city in North America on the INRIX scorecard, just behind Chicago but ahead of the major metropolitan areas of Philadelphia, San Diego and Minneapolis. The INRIX numbers need to be approached with caution though, because Portland's city planners have embraced high levels of road traffic congestion as a tool to force residents out of their cars and onto public transit instead. The rationale is the higher the penetration of public transport, the more efficient, and ultimately less congested, the city will be in the long term. The question for Portland, and compact cities in general (plus those considering the urban form), remains whether the strategy will pay off by reducing the number of cars on the road? The fact that less than 7% of the city's population rely on public transport despite 27 years of intensive transit investments, to say nothing of the

<sup>27</sup> Randal O'Toole, *The Vanishing Automobile and Other Urban Myths* (Bandon, Oregon: Thoreau Institute, 2001), 44.  
<sup>28</sup> *Ibid.*, 101.

budget shortfalls and heavy subsidies, suggests the strategy is not paying off.<sup>29</sup>

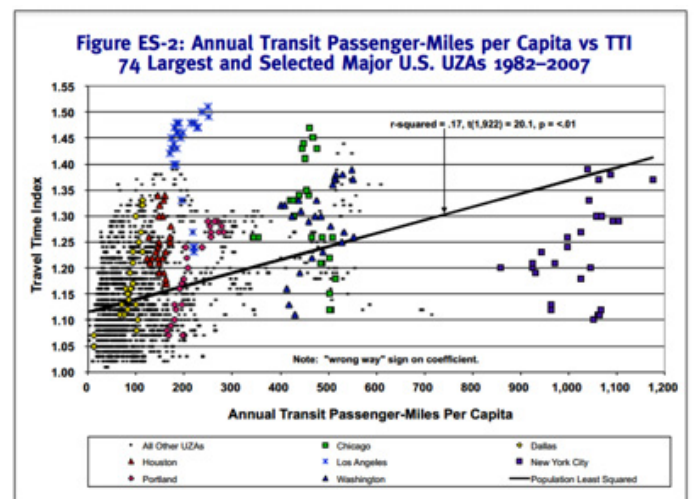
For instance, Reason Foundation research analysing 74 of the largest metropolitan areas in the United States over 26 years found no statistically significant link between transit investments and congestion.<sup>30</sup> This can be seen in figures 1 and 2, where the data points for the respective cities show no relationship between the independent variables (unlinked transit trips and passenger miles per capita) and dependent variables (Travel Time Index).

Chart 1: Annual Unlinked Passenger Trips Per Capita versus Travel Time Index



SOURCE: "TRANSIT UTILIZATION AND TRAFFIC CONGESTION: IS THERE A CONNECTION?" (REASON FOUNDATION)

Chart 2: Annual Transit Passenger-Miles per Capita versus Time Travel Index



SOURCE: "TRANSIT UTILIZATION AND TRAFFIC CONGESTION: IS THERE A CONNECTION?" (REASON FOUNDATION)

<sup>29</sup> Ryan Holeywell, "Portland Struggles to Remain a Leader in Public Transit," *Governing* (March 2012) [www.governing.com/topics/transportation-infrastructure/gov-portland-oregon-struggles-to-remain-leader-in-public-transit.html](http://www.governing.com/topics/transportation-infrastructure/gov-portland-oregon-struggles-to-remain-leader-in-public-transit.html).

<sup>30</sup> Thomas A. Rubin and Fatma Mansour, "Transit Utilization and Traffic Congestion: Is There a Connection?" Policy Case Study 427 (Reason Foundation, 2013): 9.



If such a relationship existed, it would be reflected in the charts by the data points clustering along the trend line. The research also looked for a relationship between the transit passenger miles and congestion, and again found no meaningful correlation (see Figure 2). What the research appears to suggest is that investments in additional forms of transit are unlikely to lure enough commuters out of their cars to make a dent in road traffic congestion.

There are several explanations for this, but they all stem from one source: Commuters for the most part prefer the point-to-point utility of a private motor vehicle over public transit (including buses), which are restrictive and slow due to their routes and scheduling.<sup>31</sup> Even the world's most impressive public transport systems are slower, more infrequent, and reach fewer destinations than private cars, and arguably always will be.<sup>32</sup> Pro-transit advocates may be quick to attack the 'preference' part of this equation, but the choice is not always that simple. Wayne Stewart notes that one of the most dramatic social changes of the last 50 years has been the proportion of women, specifically women with children, in paid employment, which in New Zealand has risen from 26% in 1936 to 47% by 2001.<sup>33</sup> Many of these women have retained their domestic responsibilities, and combine trips for childcare and household shopping with the work commute. These trips can often only be efficiently accomplished with a private car, as these facilities are often attached to transport corridors, severely limiting the appeal of other forms of transit. This corridor linkage problem is not limited to working mothers, and includes workers who are employed or live in places not directly serviced by public transport.

Furthermore, private motor vehicles are not just used for the commute to work. According to the latest annual travel survey, New Zealanders spent a total of 206 million hours travelling for social, entertainment, recreational or shopping activities compared to 161 million hours spent travelling for their main

jobs or work (including the self-employed).<sup>34</sup> This suggests that efforts to increase transit usage are unlikely to reduce the preference for cars because it cannot match the utility that private cars offer in non-work activities. Quite simply, rail transit, and public transport in general, is simply not an adequate substitute for private motor vehicles on a level playing field, which explains why investments in public transit have failed to tackle congestion.<sup>35</sup>

### 4.3 CARS AND CONGESTION

As we have seen so far, public transit investments are not a silver bullet solution to one of the most obvious urban costs associated with cities, namely traffic congestion. Housing people in more compact urban forms with high levels of public transport does not make the road network any more efficient, even where congestion is adopted as a tool to encourage more transit use. Public spending on transit in Portland, Oregon, for example, has increased over a 27-year period, but the city remains a highly congested metro with 87% of its residents commuting by cars.

If public transport is not the solution to congestion, should planners accept that cars are a feature of modern cities and adopt a civil engineering approach to reduce congestion, namely adding more road capacity? First, as discussed above, cars offer a level of point-to-point utility that public transport cannot easily match. The preference for cars is reflected in the growth of the light fleet in New Zealand, which accounts for 9 out of every 10 vehicles on the country's roads. Between December 2000 and December 2006, the number of cars, vans, utes, four-wheel drives, sports utility vehicles, buses and motor caravans under 3.5 tonnes increased by 19%.<sup>36</sup> That far exceeds the 5% rate of population growth over the same period.<sup>37</sup>

But just because the public prefers a mode of transport does not necessarily mean infrastructure budgets can, or should, keep pace with the growing fleet. Indeed, research by the Reason Foundation suggests that budgets could never keep pace with demand for road space even if vehicle fleet numbers grew at a more modest pace. Regression modelling of the 74 biggest

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<sup>31</sup> Randal O'Toole, "The Myth of the Compact City: Why Compact Development Is Not the Way to Reduce Carbon Dioxide Emissions," Policy Analysis 653 (Washington, DC: Cato Institute, 2009).

<sup>32</sup> Ibid.

<sup>33</sup> Wayne Stewart, "The Growing Transportation Challenge," Paper presented at the INGENIUM Conference, Nelson (26–30 June, 2005).

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<sup>34</sup> Ministry of Transport "New Zealand Household Travel Survey 2009–2012."

<sup>35</sup> O'Toole, "The Myth of the Compact City,"

<sup>36</sup> Ministry of Transport, "The New Zealand Vehicle Fleet: Annual Statistics."

<sup>37</sup> Statistics New Zealand, "National Population Estimates: At 30 June 2013 (provisional)."



urbanised areas in the United States over 26 years showed a strong statistical relationship between increased vehicle miles travelled per freeway lane mile and increased traffic congestion. The researchers also found a relationship between vehicle miles travelled per arterial (non-free) lane mile and traffic congestion, albeit less strong than with the analysis of freeway.<sup>38</sup> That is to say the more highway and arterial road capacity is available to a city, the more congestion it will experience. As new road capacity comes on line and initially lowers congestion, more people will be incentivised to use cars until congestion rises to the equilibrium point, where it is less onerous for people at the margin to use public transport. The relationship between cars and congestion also works in reverse, where less road capacity reduced congestion for the same reasons discussed above. One planner informally likened it to a bar offering free beer, in that more and more patrons will continue to arrive so long as the bartender keeps pouring. But should it be impossible to get a drink – due to too many people standing at the bar – some patrons are likely to choose alternative establishments, even if the terms are not as favourable as the bar offering free beer.

This was demonstrated not only in the Reason Foundation's macro analysis but also in case studies of Houston and Los Angeles. In Houston, a clear pattern emerged between 1982 and 2007, where spending on roads would increase dramatically to address a congestion problem. Once the investment was complete, congestion would fall for some time until the number of passenger miles travelled on the freeway system increased to reach the congestion equilibrium point.<sup>39</sup>

Of the case studies, Los Angeles showed the strongest relationship between vehicle miles travelled per freeway lane mile and traffic congestion over the 26-year study period, in that as more road capacity was added, so total congestion levels rose. However, when vehicle miles travelled per freeway lane mile fell between 1990 and 1994, so too did total congestion.<sup>40</sup>

#### 4.4 LESSONS FOR NEW ZEALAND

The compact city model, which relies heavily on transit, only increases congestion, thereby slowing any positive spill over

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<sup>38</sup> Rubin and Mansour, "Transit Utilisation and Traffic Congestion: Is There a Connection?" 69.

<sup>39</sup> *Ibid.*, 26–33.

<sup>40</sup> *Ibid.*, 34–43.

benefits gained from higher densities. Using land planning regulations too to tackle congestion is a high-risk activity. Stewart showed how increasingly difficult it was to influence travel behaviour patterns in the Netherlands due to the cultural factors that have skewed transport behaviours towards private modes of travel.<sup>41</sup>

Building more road capacity too is only a temporary reprieve, as the Reason Foundation exhaustively showed. Like most of the challenges facing the developed world, the answer is in achieving marginal improvements that collectively add up to bigger gains.

Auckland has seen a noted under-investment in transit compared to urban centres in other parts of the developed world, such that only 5 million people used the rail system in 2006, roughly translating to 3.4 trips per capita.<sup>42</sup> That has improved significantly as new rail lines, such as the Western Line, were opened – the city's rail system carried 11 million passengers in the year ending February 2014.<sup>43</sup> This pace of patronage growth is expected to continue to 2016 when the project to replace diesel locomotives with electric stock is expected to be completed, but it has come at a cost of \$1.14 billion.<sup>44</sup> However, that pace of growth cannot be sustained indefinitely (see Chapter 3). Additionally, the walkable catchment area of a train station along the rail line is limited in Auckland, with an estimated radius of 800 to 1,200 meters.<sup>45</sup> Those who live within this catchment are likely to walk or drive the short distance to the 'park and ride' facilities. However, those who live beyond the average catchment area are more likely to choose private cars as their travel means since the distance to 'park and ride' is too far to incentivise them to walk or drive, and any private car travel will likely be faster. This is an obvious limitation given that within greater Auckland (land area of 4,894 square kilometres), there are only approximately 130 kilometres of tracks consisting of just three major lines. There are less than 40 stops along these rail lines, which means a total catchment area of 520 square kilometres. Only 10.8% of greater Auckland falls within the catchment area.

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<sup>41</sup> Stewart, "The Growing Transportation Challenge," 7.

<sup>42</sup> Auckland Regional Transport Authority, *A Step-change for Auckland*, 8.

<sup>43</sup> Auckland Transport, "Statistics Report February 2014."

<sup>44</sup> Mathew Dearnaley, "\$1.1b electric rail upgrade on track," *New Zealand Herald* (3 January 2013).

<sup>45</sup> Auckland Council, "Walkable Catchments Analysis at Auckland Train Stations: New Lynn, Glenn Innes and Mt Albert – 2012" (Auckland: Auckland Council, 2012), 5.



The nature of the network is further likely to cap rail patronage growth. Auckland's rail system is designed to service a mono-centric city, with the CBD acting as a hub, and the rail transit corridors like spokes, transporting people to and from the suburbs to the urban core. Yet only 13% of the city's working population are employed in the city, with numerous polycentric urban nodes, such as Manukau, acting as de facto town centres in their own right. This severely limits the practicality of using the rail system for people travelling between spokes, who are more likely to use private cars. While Auckland's ongoing investments in its transit system will bring some agglomeration benefits, the rail link by itself will not overcome urban costs in the form of congestion.

The same applies to Auckland's roading network, with the city ranked as one of the top 10 most congested urban metros in the developed world, according to the TomTom Traffic Index.<sup>46</sup> Christchurch and Wellington do not fare much better, coming in 12th and 24th respectively, notable for a country that has a much smaller population and is less developed than its European and North American peers. This may seem odd for a country that has favoured the private motor vehicle as the predominant means of transportation, with 80% of all trips completed by private motor vehicle between 2006 and 2009.<sup>47</sup> However, that investment has not always been made as efficiently as possible, especially to reduce congestion. For example, Christchurch, and its population of 366,000 people, is only serviced by one highway linking the southern suburbs.

In Auckland, it was recognised as far back as the 1960s that one of the city's main transportation challenges was to get people from the suburbs through the CBD to the non-central areas of employment. At the time, it was envisaged that two additional highway bypasses would be needed to achieve this. Plans to develop an Eastern transport corridor were scrapped in the early 2000s, and the Western bypass, State Highway 20, is only now being constructed. This under-investment in high capacity roading has failed to keep pace with the growth of the population or economy. Paradoxically, particularly in light of the findings from the Reason Foundation, further investments in key roading

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<sup>46</sup> TomTom Traffic Index. "TomTom Australia & New Zealand Traffic Index."

<sup>47</sup> Ministry of Transport, "New Zealand Household Travel Survey 2009–2012: "Driver Travel," 2.

infrastructure appear necessary in Auckland, specifically to improve congestion on routes that are underserved by existing transport corridors, such as links between the transport corridors that connect the suburbs to the CBD hub. Under the current local government arrangement, councils and the NZTA carry these capital projects on their balance sheets, which can act as an impediment because of pressure to keep local property tax increases in line with inflation. Similarly, in central government, competition for funding may see local transport projects delayed in favour of politically backed projects, such as the Roads of National Significance. But other avenues exist to fund these road investments, such as engaging with private investors to build and operate the infrastructure. Privatising road networks works particularly well with travel demand management schemes such as hot lanes (high occupancy toll), where private users pay a premium to use an express lane. Kenneth Small says these partnership arrangements offer several advantages:<sup>48</sup>

- Private investors and their financial backers have a strong incentive to accurately forecast demand on a road
- Private firms are experienced in price setting, particularly in price sensitivity, marketing and product differentiation
- Private road operators have a strong financial incentive to manage congestion via price differentiation.

Beyond such a public-private partnership arrangement, urban planners can still implement traffic demand management schemes – as they do in London. However, road pricing is only likely to improve congestion at the margin under the London model. The scheme has been in place since 2003, but has only reduced traffic levels by 10.2% and travel times have remained stable since 2007.

#### 4.5 CONCLUSION

Transportation is without doubt an issue of vital importance in the future development of modern cities, and can rightly be seen as the conduit of economic growth. However, too often decisions on the topic become polarised by the compact versus dispersed development debate. The research reviewed in this chapter shows

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<sup>48</sup> Small, "Transportation: Urban Transportation Policy," 68.



that neither the car-dependent status quo, nor high transit urban environments, is likely to address congestion in a meaningful manner. These reasons include:

- an obvious correlation between population density and congestion regardless of urban form
- contrary to the perception, US cities that have chosen to pursue compact development strategies tend to be more congested than dispersed urban environments
- some compact cities, like Portland, Oregon, have chosen to use congestion as an urban tool to encourage transit use. However, only 7% of the city's population rely public transport
- research conducted by the Reason Foundation, which quantitatively analysed 74 US metros over a 26-year period, found investments in transit systems had little long-term impact on traffic congestion
- the public's preference for point-to-point transport, and that private motor vehicles cater for transport niches which transit cannot match, such a working mothers
- the same research showed investments in highway and arterial land miles had no material impact on traffic congestion in the long term.

If New Zealand wants to increase the agglomeration benefits within its cities while reducing the urban cost of congestions, the following factors should be considered:

- New Zealand has underinvested in transit, with Auckland and Wellington the only cities that offer daily rail transit services. Investments to modernise the transit network are likely to lift transit use, but are unlikely to significantly alleviate congestion.
- More road capacity needs to be added to the urban network, particularly to laterally connect the transit corridors.
- City authorities need to explore appropriate road pricing schemes to fund investments in roading infrastructure and reflect the scarcity value of free

flowing traffic.

- Local governments, faced with pressure to keep rates increases in line with inflation, should explore the option of private-public partnership and long-term lease options.

There is no obvious instant fix to traffic woes. Yet there is a clear imperative to get the balance between the various modes right if we are to enhance the economic benefits and output of the country urban centres. Cities need to thoroughly examine all transport options open to them and remain cognisant of the societal impacts which shape transport choice, not just select the modes favoured by the respective urban ideologies. As Small states:

A healthy economy requires a transport system that includes both private and public modes, since neither alone can possibly accommodate the enormous variety of trips that such an economy generates.<sup>49</sup>

Striking a balance between mobility and liveability is fundamental in any urban area, especially one that strives to be sustainable.

## CHAPTER 5: INFRASTRUCTURE AND LAND

Urban infrastructure and land are two discrete elements of the debate around compact cities, but it is important to examine them as interrelated items when examining urban development. This is because changes to either of these elements have been shown to have dramatic effects on the other, but this relationship is almost never discussed in any detail. For example, no one disputes that the smaller a city's footprint, the less it will have to spend on urban infrastructure. It also stands that the bigger the urban area, the bigger the utility and social infrastructure networks will have to be to service it. Indeed, this is often used as a bulletproof justification for why cities should pursue compact development, particularly as it is taxpayers and homeowners who foot the bill for these networks in the end. But although limiting the urban footprint might lower property rates bills, these policies have been consistently shown to dramatically increase house prices and reduce the economic competitiveness

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<sup>49</sup> *Ibid.*, 63.



of cities. By the same token, though, land use restrictions and zoning aimed at ensuring minimum lot sizes to propagate low density have the same effect. Clearly, there is a trade-off between infrastructure and land, but one that is little discussed either in the media or when residents are asked for their input on city development.<sup>50</sup> In this chapter, we will shed some light on what price urban residents will pay as a result of the urban development choices they make.

## 5.1 INFRASTRUCTURE

Infrastructure is a necessary but complex component in any development, be it in dense compact cities, dispersed outer suburbia or isolated rural farmland and towns. It can have a notable benefit on liveability in urban dwellings, contributing to efficiency, affordability and access to goods and services. These large physical networks, which typically consist of road, water, gas, electricity and telecommunication networks, are necessary for the functioning of a modern nation like New Zealand. However, weighing up the agglomeration benefits that may be accrued from infrastructure investment in a dense urban environment is a difficult task. That is because urban centres, as an area of study, are continually changing and evolving, making the job of measuring and modelling the citywide, or indeed region-wide, impacts of infrastructure projects difficult to grasp, particularly when the substantial timelines are taken into account on such projects.<sup>51</sup> This is a significant hurdle in weighing up the true value of both compact and dispersed growth patterns. The Organisation for Economic Co-operation and Development (OECD) acknowledges that there is little research on the actual economic impacts of compact city policies – and whether they lower or increase the costs of urban infrastructure.<sup>52</sup>

But while the debate surrounding the interplay of infrastructure investment and agglomeration is still evolving, one area where it is all but settled is at the local government level, where authorities have to balance new infrastructure versus the cost of maintaining existing stock.<sup>53</sup> From this perspective, compact cities are a desirable urban form because they reduce the size of the overall infrastructure network. According to the OECD,

<sup>50</sup> "The case for small homes," *New Zealand Herald* (19 January 2014).

<sup>51</sup> Patricia Gordon, "Infrastructure Costs and Urban Growth Management," *Siemens and Canadian International Development Agency (Canada: Siemens, 2012)*, 2.

<sup>52</sup> OECD, *Compact City Policies: A Comparative Assessment*, 63.

<sup>53</sup> Patricia Gordon, *Infrastructure Costs and Urban Growth Management*, 1.

local government bodies reduce their infrastructure costs by building up instead of out as they are required to provide fewer roads, water and sewer systems, schools and privately owned utility systems that would otherwise be required under a dispersed urban model.<sup>54</sup> Second, compact infrastructure development models allow local authorities to spread the costs of new or existing infrastructure across a bigger taxpayer base. For example, consider the construction of 100 meters of road for residential purposes. Under a dispersed city model, the costs would be spread across the 10 households that would share it on their side of the road. However, under a compact model, where these standalone houses are replaced by two apartment blocks consisting of 40 individual properties each, the cost of this road would be significantly smaller for each resident. Similarly, the city would benefit from 30 additional taxpayers under the compact model as opposed to the dispersed model. The economy of scale applies to both the capital and maintenance costs associated with the road, and to other infrastructure such as fresh water and waste water pipes. Granted, this example is overly simplistic. In real life, a larger road and water mains connection would be required to service the increased traffic and water needs of the 40 households in the apartments. Maintenance could, and would, also be higher in the compact development scenario outlined above. According to Auckland City Council, the annual maintenance costs for a kilometre of roading in a suburban area is approximately \$5,800, while in a dense urban area, the cost is around \$23,200.<sup>55</sup> In addition, not all utilities are advantaged by compact development, such as electricity and telecommunications lines, with providers incurring significantly higher costs from brownfield rather than greenfield development.

Even with these higher costs, the financial incentives are still stacked in favour of compact development for local government bodies. This was clearly shown in a paper presented by Martin Nichols to the 2013 State of Australian Cities National Conference, where he broke down the road infrastructure costs associated with various forms of urban development in Sydney.<sup>56</sup> His research looked at a sample of 16 recent and

<sup>54</sup> OECD, *Compact City Policies: A Comparative Assessment*, 63.

<sup>55</sup> Auckland City Council. Telephone interview with Siri Rangamuwa, Regional Asset Planning and Policy Manager at Auckland Transport, March 25, 2014.

<sup>56</sup> Martin Nichols, "Road Costs Associated with Differing Forms of Urban Development" (Sydney: University of Sydney, 2013), 1.



projected developments within the Greater Metropolitan Region of New South Wales, and by-and-large demonstrated that both cost per housing unit and total cost per kilometre of roading (maintenance costs plus initial installation costs) tended to be more expensive in low density than in high density suburban areas: “Low density contiguous greenfield developments appear to generate significantly higher road capital costs, varying from AU\$106,000 to AU\$143,000 per household”.<sup>57</sup>

High-density developments, on the other hand, generate costs of around AU\$28,000 to AU\$53,000 per household. Nichols found some variation within already developed areas, where the disruptive nature of infrastructure projects in highly dense inner city locations means that costs were higher than in already developed areas outside the CBD. However, costs increase almost exponentially in greenfield developments, where the low population density of fringe areas do not support the capital expenditure required for such infrastructure.<sup>58</sup> So from a local government perspective, compact cities appear to be a more desirable urban form because they reduce the rates burden on residents. This has increasingly become an issue as New Zealand’s population ages, and becomes more reliant on fixed incomes.

## 5.2 LAND COSTS

However, although a smaller urban footprint may be appealing from an infrastructure provision and local government balance sheet perspective, there is a trade-off in the form of higher land prices, and hence, housing affordability. As discussed in Chapter 2, to limit the outward spread of the physical urban environment, either for infrastructure provision efficiency or sustainability reasons, planners have to determine where developers can build and where they cannot. This is done through urban growth limits and zoning laws, which narrowly constrain development to meet a predetermined vision for an urban community many decades in the future.<sup>59</sup>

Yet the combination of urban growth boundaries and zoning has been widely shown to have a direct influence on the final asking

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<sup>57</sup> *Ibid.*, 7.

<sup>58</sup> *Ibid.*

<sup>59</sup> Samuel R. Staley, “Reforming Zoning Laws,” *In A Guide to Smart Growth*, Jane S. Shaw and Ronald D. Utt (eds) (Washington, DC: The Heritage Foundation, 2000), 61–62.

price of housing. Quantitative research conducted by prominent urban economists Edward Glaeser and Joseph Gyourko showed that the cities in the United States most afflicted by housing affordability issues, particularly New York and urban areas in California, were the ones with the most rigorous building restrictions.

The bulk of the evidence marshalled ... suggest that zoning, and other land-use controls, are more responsible for high prices ... [and] measures of zoning strictness are highly correlated with high prices.<sup>60</sup>

The findings are not limited to North America. Policy Exchange researchers Alan Evans and Oliver Hartwich found that the restrictiveness and selectivity of the British planning system (introduced in 1947 under the Town and Country Planning Act) were a direct contributor to the housing affordability crisis that still has much of the country in its grip.<sup>61</sup>

Similarly, Australia and New Zealand’s major cities are also gripped by housing affordability issues. Demographia’s median multiple is a useful gauge for international housing affordability. This measure is worked out by calculating how many multiples of the median annual salary are required to pay off the median house price in respective areas, with 3.0 being the upper threshold for affordability. Restrictive planning and zoning regulations have pushed house prices in both countries into the severely unaffordable territory, exceeding even that of the United Kingdom (Table 3).

Drilling below the headline numbers shows that the biggest cities in all three countries are afflicted with similar affordability issues. The Greater London Area has a median multiple of 7.3, Auckland 8, and Sydney (the least affordable of the three) 9.<sup>62</sup> Notably, Auckland’s median multiple was 6.6 in 2006, with the increase in house prices outstripping wage growth in the city

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<sup>60</sup> Edward L. Glaeser and Joseph Gyourko, “The Impact of Building Restriction on Housing Affordability,” *Federal Reserve Bank of New York: Economic Policy Review (New York: June 2003)*, 23–35.

<sup>61</sup> Alan W. Evans and Oliver M. Hartwich, “Unaffordable Housing: Fables and Myths” (London: Policy Exchange, 2005), 17.

<sup>62</sup> Demographia, *10th Annual Demographia International Housing Affordability Survey 2014: Ratings for Metropolitan Markets*.



Table 3: Housing Affordability Ratings by Nation: Major Markets (Over 1,000,000 Population)

SOURCE: DEMOGRAPHIA

	AFFORDABLE (3.0 AND UNDER)	MODERATELY UNAFFORDABLE (3.1 TO 4.0)	SERIOUSLY UNAFFORDABLE (4.1 TO 5.0)	SEVERELY UNAFFORDABLE (5.1 +)	TOTAL OBSERVATIONS	MEDIAN MARKET
<b>Australia</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>5</b>	<b>6.3</b>
Canada	0	2	2	2	6	4.5
China (Hong Kong)	0	0	0	1	1	14.9
Ireland	0	1	0	0	1	3.7
Japan	0	1	1	0	2	4
<b>New Zealand</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>8</b>
Singapore	0	0	0	1	1	5.1
United Kingdom	0	1	9	6	16	4.7
United States	14	24	6	8	52	3.5
<b>TOTAL</b>	<b>14</b>	<b>29</b>	<b>18</b>	<b>24</b>	<b>85</b>	<b>4</b>

over seven years.<sup>63</sup> This is suggestive of urban costs eclipsing the benefits of agglomeration. This is not limited to Auckland – Wellington’s median multiple in 2013 was 5.4, Christchurch’s 5.8 and Palmerston North’s at 4.5.

New Zealand’s cities compare poorly to places like Houston, Texas, which has a median multiple of 3.3 and where authorities have adopted a market-based approach to planning. This is not limited to Houston. In Germany and Switzerland, where there is a presumed right to build, and local government funding is linked to population size, house prices have remained nearly static in real terms for decades as planners sought to actively match land supply with housing demand.<sup>64</sup> So why is housing so unaffordable in New Zealand, specifically in its biggest urban centre, Auckland?

The answer appears to be overly restrictive planning restrictions and zoning controls. Michael Basset and Luke Malpass showed that a confluence of a slowing economy after 1974, a fear of urban sprawl, urban growth limits, and environmental sustainability concerns steadily tightened supply relative to demand in Auckland over a few decades.<sup>65</sup>

The city’s housing supply constraints appear to have become particularly acute since 2000, which Motu Economic and Public Policy Research has examined in detail. Arthur Grimes, et al.

63 Demographia, 2nd Annual Demographia International Housing Affordability Survey 2006: Ratings for All Major Urban Markets.

64 Michael Bassett and Luke Malpass, “Priced Out: How New Zealand Lost Its Housing Affordability” (Wellington: The New Zealand Initiative, 2013), 8.

65 Ibid.

found that while house prices in the city had been steadily rising for decades, the increase in dwelling stock largely increased at a marginally faster pace than population growth. However, this reversed in the five years to 2006, with population growth expanding by 11.6% while dwelling stock increased by 10.9%. This period coincided with Auckland’s Regional Growth Strategy (RGS), adopted by the Auckland Regional Council and all seven territorial local authorities (now unified into

one body, Auckland Council), which promoted urban development along a compact form.<sup>66</sup> This involved a focus on intensification of dwellings and population around growth nodes surrounding town centres and transport links. However, this intensification did not occur outside the CBD because of existing building height limits. This, in conjunction with Auckland’s self-imposed Metropolitan Urban Limit (MUL), created a shortage of greenfield land suitable for development at scale. Attempts to develop properties were also frustrated by what developers perceived to be extended delays in the consent process and the rollout of infrastructure. Between 2000 and 2005, vacant section prices doubled in Auckland City, Waitakere and Franklin. Over the same period, the median house sales price rose by as much as 60% in some areas of the city.<sup>67</sup> While other factors like the cost of building materials also contributed to the problem, Grimes, et al. clearly see council regulation and zoning as the root cause of Auckland’s housing affordability crisis. Furthermore, while local councils may be under pressure to keep rates bills low due to the growing number of voters reliant on fixed incomes, high house prices are in fact having the opposite effect, as rates bills in New Zealand are calculated on property value. This was noted recently by Local Government New Zealand (LGNZ), which observed that many regions in the country are seeing household income decline due to falling populations, and as such have limited ability to cope with property tax increases.<sup>68</sup>

66 Arthur Grimes, et al., “Housing Supply in the Auckland Region 2000–2005” (Auckland: Motu Economic and Public Policy Research, 2007), 103.

67 Ibid., 104–105.

68 Local Government New Zealand (LGNZ), “LGNZ reviewing local government funding.” Media release (9 April 2014).



However, before we risk jumping to an over-simplistic conclusion that the key to Auckland's housing affordability crisis is to simply increase the land supply, it must be recognised that the city's zoning laws are not confined to limiting the spread of the suburbs. Across much of the city, various binding height restrictions have been put in place to preserve the city's suburban character. This is so notable that the dramatic transition from suburbia to the CBD often surprises foreign visitors who are more familiar with a gradual increase in population density towards the city centre. The effect of these restrictions has been to restrict what the market produces and steer development towards standalone suburban homes even where some demand for apartments exists. This would not necessarily be a problem for housing affordability if the market could continue expanding outwards, but the MUL prevents this.

This phenomenon is not limited to Auckland. Edward Glaeser and Bryce Ward looked at how low-density zoning regulations in Boston achieved much the same market outcome as in Auckland. In Boston, a city with a population of around 600,000 people, the effect was to suppress the build rate and increase house prices, which echoes the situation in Auckland since the early 2000s.<sup>69</sup> The impact of low-density zoning has been shown to not only increase the price of land but building costs as well, according to economist Keith Ihlanfeldt. His work in the United States showed that the more restrictive the land use and zoning rules, the more expensive it is to build a house, and that the end buyer will disproportionately bear the bulk of these costs.

Where costs are shifted forward, the results suggest a serious erosion of housing affordability ... moreover, the size of the house will also increase, which will further increase the average house price by 1.8%.<sup>70</sup>

### 5.3 LAND PRICE AS A WIDER COST

So far the obvious impact of higher land and housing prices has been assumed to be on buyers, or renters. From the perspective of sellers, however, higher land prices are seen as a positive.

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<sup>69</sup> Edward L. Glaeser and Bryce Ward, "The Causes and Consequences of Land Use Regulation: Evidence from Greater Boston," *National Bureau of Economic Research Working Paper 12601* (2006), 19.

<sup>70</sup> Keith R. Ihlanfeldt, "The Effect of Land Use Regulation on Housing and Land Prices," *Journal of Urban Economics* 61, no. 3 (2007), 430-435.

Indeed, this uplift in the value of land and property is often touted as a major benefit by proponents of compact cities because it is seen as a proxy for agglomeration benefits. This point was recently made by the Ministry for the Environment in a document on the benefits of compact city design, which included enhanced land values.<sup>71</sup> The rationale was that only wealthy people will be able to afford these higher land values, and they are wealthy because they have highly desirable skills. This logic stacks up, but at some point the competition for limited housing stock sees the rise in property costs outpace the wage increases that skilled individuals can expect from living in a city. This was demonstrated by Joseph Gyourko, et al. in 2006, when they looked at the correlation between US superstar cities and house prices. Their definition of a superstar city was an urban environment characterised by high house price growth relative to housing unit growth. To qualify as a supercity, these locations had to have some inelasticity to the supply of housing and also excess demand.<sup>72</sup> In short, these cities are perceived as scarce luxury goods (a distinction to which Auckland, with its high levels of inward migration, certainly qualifies). Gyourko, et al. also found that:

- High house prices in superstar cities tend to push lower-income individuals and families out of these urban centres, concentrating the number of middle- to high-income earners in an area. The pattern also emerges when a location achieves superstar status.
- Superstar cities trade at higher price-to-rent ratios, which increases as these cities fill up.
- Superstar cities see disproportionately high house-price growth when the number of high-income families increases above the national average.
- People moving to established superstar cities are more likely to be rich than movers to cities without superstar status.

In short, the desirability of a city disproportionately attracts

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<sup>71</sup> Ministry for the Environment, New Zealand Government, *The Value of Urban Design: The Economic, Environmental, and Social Benefits of Urban Design* (2005).

<sup>72</sup> Joseph Gyourko, Christopher Mayer, and Todd Sinai, "Superstar Cities," *National Bureau of Economic Research Working Paper 12355* (2006), 168.

the wealthy, who drive up house prices and crowd out lower-income households. More to the point, many of the perceived benefits that appear to be generated by superstar cities are partially explained by a higher concentration of rich residents. Therefore, using high house prices as a measure of the benefits from agglomeration can be misleading. Gyourko, et al. make this point more firmly, stating that “house prices do not rise in superstar cities because there is increasing value from amenities or productivity benefits. Instead, the composition of families living in superstar cities shifts to those who are willing to pay more as high-income families become more numerous”.<sup>73</sup>

While Gyourko, et al. limited their analysis to house prices and concentrations of the wealthy, further research has shown that higher land prices are borne by all residents within a city, not just property owners. This is reflected in the wages that inner city employees demand, but also as a premium on the goods and services consumed. This was demonstrated by Evans and Hartwich in 2007, when they analysed how high land prices in the United Kingdom fed through to consumer goods. They did this by comparing the price of six standardised items from furniture available from Ikea across 11 European countries. The United Kingdom topped the list with a total price of £1,483 (2007 value) (see Table 4). The country is also noted for having one of the most restrictive planning regimes in Europe. In Germany, a country with a dramatically less restrictive approach to planning and development, the price for the six items was £1,229. That is just over 20% lower than in the United Kingdom, even though shipping costs and sales tax rates were broadly comparable.<sup>74</sup>

The Ikea example may sound obtuse, but it reflects the economic reality that businesses have to pass on costs to customers through prices of goods and services if they are to make a profit. And if residents and businesses are finding it disadvantageous to stay in a city because of high direct or indirect costs, they will move elsewhere. Grimes observed this in his report on land prices in Auckland in 2007:

<sup>73</sup> *Ibid.*, 33.

<sup>74</sup> Alan W. Evans and Oliver M. Hartwich, “The Best Laid Plans: How Planning Prevents Economic Growth” (London: Policy Exchange, 2007), 26.

Table 4: Ikea Product Pricing Around Europe  
SOURCE: POLICY EXCHANGE

RANK	COUNTRY	COST OF GOODS
1	United Kingdom	£1,483
2	France	£1,453
3	Italy	£1,450
4	Norway	£1,380
5	Spain/Portugal	£1,358
6	Austria	£1,338
7	Finland	£1,328
8	Denmark	£1,316
9	Belgium	£1,290
10	Holland	£1,249
11	Germany	£1,229

House prices and costs cannot keep rising in an unchecked fashion. As well as macroeconomic forces acting on the market (e.g. through interest rates) another major influence is migration. If, after accounting for income differentials, housing is overly expensive in Auckland relative to other competing centres, people will emigrate from Auckland and inwards migration will be curtailed.<sup>75</sup>

Due to the impact of the global financial crisis and the exodus out of Christchurch after the 2011 earthquake, creating a significant amount of turbulence in traditional population movement patterns, it is too early to tell whether the effects on migration predicted by Grimes have materialised. However, his prediction seems prescient, as other indicators suggest rising urban costs are starting to outpace the benefits of being located in Auckland. For example, recent media reports claim more businesses are setting up shop in Hamilton, a city 125 kilometres south of Auckland, due to its lower property costs.<sup>76</sup> Furthermore, in a period where central government tabling legislation to reduce their turnaround time on large-scale residential developments from three years to six months,<sup>77</sup> Hamilton was signing off on \$20 million worth of land use and building consents a week. A major driver of this was access to the Waikato Expressway and the

<sup>75</sup> Grimes, et al., “Housing Supply in the Auckland Region 2000–2005,” 109.

<sup>76</sup> Jamie Small and Aaron Leaman, “Hamilton Attracting Auckland Business,” *Stuff.co.nz* (31 March 2014).

<sup>77</sup> New Zealand Government, “Housing Accords and Special Housing Areas Bill 2013.”

city's proximity to Auckland, which was "bursting at the seams".<sup>78</sup> Thus, by restricting building outwards as well as upwards, Auckland has wedged the city between a rock and a hard place.

Some may argue that Auckland Council's Unitary Plan seeks to extricate the city from this regulatory bind as it prepares to house a million additional residents over the next 20 years. The plan seeks to do this by releasing large blocks of land for housing outside the city in satellite towns like Pukekohe, as well as relaxing development height restrictions in the suburbs. However, there are several reasons to suspect this will fail. First, they are predictive in nature, making guesses about how a whole range of social, economic and demographic factors will turn out in the future. As Samuel Staley succinctly puts it:

Planners seek to attempt to use the planning process to achieve an ideal vision of the community 20–30 years in the future. As a practical matter, this is impossible, given the dynamic nature of the [economy].<sup>79</sup>

This presumption limits the ability of communities to efficiently choose their own course, and produces unintended consequences such as Auckland's height restrictions. Second, Staley notes that these master plans are rarely updated. For example, Columbus, Ohio, adopted its first zoning code in 1923 but did not comprehensively update it until the 1950s, and then not again until 1992. Similarly, Auckland's Regional Growth Strategy, adopted in 1999, is set to be replaced by the Auckland Unity Plan, a 7,000-plus page document that exhaustively maps out the city's development framework until 2050. The plan, which is still in the submission stage, is not expected to come into force until several years yet.<sup>80</sup> In the meantime, house prices continue to spiral upwards due to the shortage, increasing by 16.9% in the year ending February 2014.<sup>81</sup> This outpaced growth in the average weekly wage in the city, which rose at a more tepid pace of 1.3% in the year ending June 2013.<sup>82</sup>

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<sup>78</sup> Daniel Adams, "Welcome to Hamilton, City of the Billion Dollar Developments," *Stuff.co.nz* (15 April 2013).

<sup>79</sup> Staley, "Reforming Zoning Laws," 61–62.

<sup>80</sup> Auckland Council, "The Proposed Auckland Unitary Plan."

<sup>81</sup> Real Estate Institute of New Zealand (REINZ). "New Zealand Residential House Sales – February 2014: Easing Tone to Sales Volumes, Although Prices Firming in February Market."

<sup>82</sup> Statistics New Zealand, "New Zealand Income Survey: June 2013 quarter."

Furthermore, Auckland Council has expressed concern about the influence NIMBY-ism (Not In My Back Yard) will have on the ability to free up land and height restrictions to encourage development; yet the local government body increased the number of channels through which objections to large-scale developments can take place. One example of this is the Cultural Impact Assessment, which calls for one or more of the 19 Māori tribes to be consulted on any infrastructure development to determine if there is any impact on sites with a potential of archaeological value. This plan was slammed by former Labour Party Māori Affairs and Building and Construction spokesman Shane Jones, who said the rule gave local Māori tribes over-representation in the approvals process, and could potentially add significantly to the cost of development.<sup>83</sup>

## 5.4 CONCLUSION

Limiting infrastructure spending may be desirable from a rates burden perspective, particularly as:

- local government bodies reduce their infrastructure costs by building up instead out, as they are required to provide fewer utility and social networks
- compact infrastructure development models allow local authorities to spread the costs of new or existing infrastructure across a bigger taxpayer base
- lower infrastructure costs are desirable for many local governments due to demographic changes, with an increasing number of ratepayers on fixed incomes.

To achieve a smaller infrastructure, local councils have to implement land use and zoning restrictions. These restrictions come with trade-offs, which are already seen in many of New Zealand's cities:

- Zoning restrictions, such as urban limits, have been shown internationally to increase land supply shortages and reduce housing affordability.

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<sup>83</sup> Bernard Orsman, "Shane Jones slams new iwi approval rule," *New Zealand Herald* (28 February 2014).

- Less restrictive planning regimes in the United States and Europe have consistently nurtured affordable housing markets for decades.
- New Zealand's main cities are characterised by severely unaffordable housing markets.
- Auckland is particularly unaffordable due to urban growth constraints and inner-city height limits, according to two influential reports.
- High land costs in desirable cities or 'superstar cities' are creating a property inflation cycle where prices exceed gains in productivity and increasingly force lower income residents from cities to the suburbs.
- All urban residents share the cost of land prices in more than rent and mortgage costs, as businesses have to pass on higher operating expenses to customers.
- High property costs in Auckland are starting to prompt more firms to look for cheaper locations elsewhere, with Hamilton an increasingly popular option.

Urban infrastructure and land are inherently linked, and changes to one generates both intended and unintended consequences for the other. For compact cities, these trade-offs are rarely discussed in detail when changes to the urban form are being mooted. It is not surprising then, that the urban status quo in New Zealand has broadly remained in place, even though housing prices have become increasingly unaffordable, and have started to show signs of slowing some regional economies. We can only speculate how residents' decisions would change if these trade-offs were made more explicit, but it is fairly safe to presume that people locked out of the housing market by high prices would begin laying responsibility for the problem at the feet of the planning system.

## CHAPTER 6: HEALTH AND THE CITY

One of the core arguments made in support of compact cities is that dense urban agglomerations is beneficial to the health of the people living in them. The logic stems from the assumption that by housing people in greater densities situated closer to places of work, recreation and shopping, residents of compact cities will opt to walk or cycle rather than travel by car for their daily

transportation needs. Where distance or climate makes walking or cycling impractical, it is assumed that residents of compact cities will use public transport, such as buses, light rail and trains, which still achieves a higher level of physical activity than the point-to-point nature of private vehicle use. The upside from this added activity for urban populations is lower obesity rates (and associated health benefits), as well as decreased exposure to airborne pollutants since there will be fewer cars on the road. Meanwhile, the people living in suburbia and dependent on private automobiles as their primary means of transport, expose themselves to significant health risks by sitting in traffic, breathing exhaust fumes for hours every day, while getting fatter due to a lack of physical activity. Pitched this way, it makes for a compelling narrative: Living in dense modern cities is good for health while living in the suburbs slowly kills you. So it makes sense to encourage greater density in major cities.

However, a closer examination of the extensive research into compact cities shows that the case for densification on the grounds of health and social welfare is far from clear cut. Residents moving from suburbia to dense inner city accommodation are faced with a number of trade-offs, not all of them to their benefit as we will discuss.

Dense cities, as shown elsewhere in this report, are more often than not associated with more traffic congestion, not less. Similarly, when gauging Western preferences for housing, there is clear demand for the suburban single-family dwelling, as judged by the high prices these homes fetch and the long commutes that people are prepared to undertake to live in them.

That is because, according to Michael Neuman, at the heart of the densification debate is a paradox, specifically in the drive to becoming more sustainable, and hence denser, urban settings sacrifice their liveability.<sup>84</sup> That may seem out of kilter with images of Parisian boulevards, Singapore's modern public spaces, and the brownstone neighbourhoods of New York – urban forms lauded for their liveability. And yet they are countered by experiences of living in London, Hong Kong and Tokyo – hyper dense cities characterised by high levels of congestion, pollution and a low level of liveability. This chapter seeks to explore this

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<sup>84</sup> Michael Neuman, "The Compact City Fallacy," *Journal of Planning Education and Research* 25 (2005), 15.

paradox, and list some of the factors New Zealanders need to consider when deciding how their cities should develop, and the lifestyle choices they will face when living in them.

## 6.1 OBESITY AND URBANISM

When examining healthy lifestyles, one of the main arguments for compact cities is that living in dense urban environments is good for encouraging inhabitants to be more active. The theory is that by building up instead of out, residents of compact cities will be more likely to walk or cycle to their homes, workplaces, recreational centres and shopping districts as opposed to driving, as their suburban counterparts do. This increased level of activity is believed to lead to a lower level of obesity within compact cities, which in turn lowers the risk of a number of serious diseases. These obesity-linked illnesses include coronary heart disease, type II diabetes, various cancers, hypertension, dyslipidaemia, stroke, liver and gallbladder disease, sleep apnoea and osteoarthritis.<sup>85</sup> Preventing these diseases represents a real saving to the health sector, and for a public funded medical system, the taxpayer. But can changes to the urban form, as advocated by proponents of compact cities, deliver on their promises of improving activity levels, and hence, the rate of obesity?

This is a question that successive studies have sought to answer. Indeed, many early studies found just such a link, but the research was marked by an arm's-length approach to the problem, only examining broad sets of data for concurrent trends. Now, thanks to improvements in technology that have made modelling and quantitative data collection easier, research has relooked at the problem in recent years and begun to question the strength of the correlation. For example, modelling conducted by Stone, et al. (2007) in the United States found that a 10% increase in the total population density of a city reduced household vehicle travel by 3.5%.<sup>86</sup> The flow-on effects from this reduction are increased walking, cycling and transit use, and hence, low obesity rates. On first examination this may seem significant, but the population density of a city would need to be doubled to reduce traffic volumes by just over a third, a density target hardly worth the infrastructure and development costs.

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<sup>85</sup> Centres for Disease Control and Prevention, "The Health Effects of Overweight and Obesity."

<sup>86</sup> Brian Stone Jr, et al., "Is Compact Growth Good for Air Quality?" *Journal of the American Planning Association* 73, no. 4 (2007), 416.

The model of Stone, et al. actually makes the case for leaving suburban density unchanged, finding that it is more efficient to increase densities of already urbanised city centres, with a 10% increase in inner city population reducing driving by 4.3%. That suggests that tearing up the suburbs and replacing them with high-density housing is less efficient by a factor of 2.3 than increasing the density of already urbanised areas.<sup>87</sup> However, these gains still fall victim to the same inefficiencies discussed above. Furthermore, if city planners were to increase urban density to achieve these gains, what would be the consequences for congestion levels? As we discussed earlier, the data suggests it will increase congestion.

The National Bureau of Economic Research (NBER) reached just this conclusion. Researchers Zhenxiang Zhao and Robert Kaestner found that a 13% increase in obesity can be attributed to living in suburban environments highly dependent on private automobiles.<sup>88</sup> However, they noted that while urban sprawl did indeed appear to "... cause an increase in obesity, its effect was relatively modest". Put plainly, the NBER's research found that the case for reshaping existing cities into compact ones because it combats obesity is just too weak to justify when weighed against the costs of the process.

Why is it that the conclusions seem to run counter to common sense? Russ Lopez, a researcher at the Boston University School of Public Health, provides some answers. He too found a link between density and obesity as part of a multi-level study, such that the risk of being overweight and obese in the United States increased by 0.2% and 0.5% respectively for each 1 point rise in the urban sprawl index (a measure of urban sprawl in metropolitan areas was derived from the US census in 2000), after factoring in various socioeconomic, education and race factors previously associated with obesity.<sup>89</sup> However, Lopez notes that his findings need to be interpreted with caution, with a tendency for self-selection (where overweight and obese people move to the suburbs due to ease of vehicular access while more active people move to the areas where they can walk or cycle) muddying

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<sup>87</sup> R. Lopez, "Urban Sprawl and Risk for Being Overweight or Obese," *American Journal of Public Health* 94, no. 9 (2004), 1575.

<sup>88</sup> Zhenxiang Zhao and Robert Kaestner, "Effects of Urban Sprawl on Obesity." NBER Working Paper 15436 (2009), 24.

<sup>89</sup> Lopez, "Urban Sprawl and the Risk for Being Overweight or Obese," 1576.

attempts to forge a clear causal link.<sup>90</sup> He also attributes low-density neighbourhoods as one factor among many that may contribute to the incidence of obesity – not the main cause. Obesity, he suggests, is in need of a multi-pronged approach.

For example, Hong Kong, characterised by extreme density, high use of pedestrian networks, and extensive public transport infrastructure, is wrestling with its own obesity explosion. Almost 37% of the population is considered overweight (body mass index score of over 23), and rising.<sup>91</sup> Hong Kong's health statistics show that 60% of the population do not undertake the minimum physical activity recommended by the World Health Organization (WHO) (150 minutes of moderate-intensity aerobic physical activity throughout the week or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week). Similarly, in Singapore, another extremely dense city-state with low levels of private vehicle ownership due to government restrictions and an absence of suburban development, is concerned about the incidence of obesity among its population.<sup>92</sup> Although the prevalence of obesity among Singaporeans is not as high as in Western countries (11% in 2010) it has almost doubled since 1998 (6%).<sup>93</sup>

But why are populations in dense cities becoming more obese when the urban form is geared to encourage physical activity? Research published in the *American Journal of Public Health* suggests the link between urban design and physical activity is far weaker than has been previously claimed. Data sourced from the (San Francisco) Bay Area Travel Survey (2000) show the modes of transport residents were likely to select for a variety of activities such as visiting friends, light shopping, and so on. Activities considered unsuitable to walking or cycling (such as a monthly grocery shopping trip) were excluded. Once the preference was established, the researchers queried why a particular transport mode had been selected. The research revealed that many people living in the Bay Area chose to travel by private motor vehicles over walking or cycling due to weather and topography even though the urban environment had been designed to encourage non-car transport choices.

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90 *Ibid.*, 1577.

91 Hong Kong Department of Health, "Health Facts of Hong Kong, 2013 Edition."

92 Jeremy Grant, "Singapore Cracks Down on Obesity," *Financial Times* (29 October 2012).

93 Singapore Ministry of Health, "Disease Burden."

Urban landscapes in the San Francisco Bay area generally have a modest and sometimes statistically insignificant effect on walking and bicycling. Although well-connected streets, small city blocks, mixed land use, and close proximity to retail activities were shown to induce non-motorised transport, various exogenous factors, such as topography, darkness, and rainfall, had far stronger influences.<sup>94</sup>

Certainly, that seems to be the case in Sydney, which after making a significant investment in cycle lanes by repurposing areas of the street previously reserved for parking, found the number of bike trips had fallen almost 6% over a decade, while use of transit, private car, and walking networks all increased over the same period.<sup>95</sup> Applying the findings from this research to New Zealand, it is clear that expecting a significant portion of the population to walk or cycle through the wet and cold winters, regardless of the urban form, is unrealistic. Common sense may hold that 'if you build it, they will come', but that doesn't always pan out in reality.

Another explanation for the weak positive correlation between obesity and low density neighbourhoods is it may have a reverse effect: Living in compact cities exposes residents to factors that in fact increase obesity. This appears to be the case in Asia. Singaporean Prime Minister Lee Hsien Loong attributed the increasing incidence of obesity to access to fast food and sedentary occupations, coupled with falling rates of general physical activity. This matches the observation that people living in highly dense urban environments have less access to healthy food due to a lack of shelf space than their suburban counterparts, who can drive to a large supermarket with more capacity to stock fruit and vegetables and other healthy foods. Furthermore, urban areas tend to have a greater number of fast food outlets per capita than the suburbs. The combination results in what is commonly referred to as a nutritional 'food desert'.

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94 Robert Cervero and Michael Duncan, "Walking, bicycling, and Urban Landscapes: Evidence from the San Francisco Bay Area," *American Journal of Public Health* 93, no. 9 (2013), 1478.

95 Vikki Campion, "Sydney's message to Lord Mayor Clover Moore – we're over your bikes," *The Telegraph* (18 September 2013).

The picture that emerges from the research is far muddier than the link put forward by proponents of compact cities. The slam-dunk case that low-density suburbs cause obesity only stacks up at an extreme arm's-length view of population data. Obesity is caused and influenced by multiple factors such as socioeconomic standing, race and genetics, as is demonstrated by Hong Kong and Singapore. It cannot be denied that urban design plays a factor, but only a small one.

## 6.2 AIR QUALITY AND URBAN FORM

If compact cities and greater urban density do not significantly reduce obesity, at least the argument can be made that they reduce exposure to airborne pollutants. By requiring people to walk, cycle or use public transport, either through direct restrictions on private motor vehicle usage, or indirectly through space constraints, New Urbanists postulate that fewer harmful pollutants will be produced, and hence, living in dense cities will be beneficial to the health of the inhabitants of these urban environments. This is counter to the perceived status quo of the suburbs, where residents are seen to be highly exposed to vehicle emissions as they undertake long commutes and often remain stationary in traffic jams for long periods of time.

The rationale behind this thinking is based on well-established scientific fact. The burning of coal, wood and light fuel for domestic heating, transportation and industrial processes is the primary source of fine particle matter (sized 10 microns across or smaller), which is easily breathed into the lungs.<sup>96</sup> Human activity in urban environments also produces a number of other pollutants such as dioxins, carbon monoxide, nitrogen dioxide, sulphur dioxide and ozone, all of which have a demonstrated severe impact on human health in the form of cardiovascular and respiratory diseases as well as lung cancer, according to the WHO.<sup>97</sup> But, as with obesity, research shows the link is far less clear than common sense would suggest.

When examining urban form and airborne pollution, one has to investigate road traffic congestion, a common source of smog or the cloud of pollutants that often hovers over cities and highways in major metropolitan areas. Indeed, smog is a common feature in many New Zealand cities in winter.

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<sup>96</sup> Ministry for the Environment, "Hazardous Air Pollutants."

<sup>97</sup> World Health Organization, "Ambient (Outdoor) Air quality and health."

Congestion is important in the urban form debate because proponents of compact cities argue that by increasing the number of people living in mixed-use urban dwellings, the need for cars will be reduced, and hence, total congestion and the amount of airborne pollution will be reduced. This, in turn, will cause a lower incidence of pollution-related diseases, and ease the burden on the health system. On the surface this logic stacks up, but as we showed in Chapter 2, compact cities are associated with more traffic congestion, and hence smog, not less.

The observable relationship between density, congestion and pollution is borne out by data compiled by the Environmental Protection Agency (EPA) in the United States showing a strong association between higher population densities and traffic and pollution concentrations (with a statistically significant 99% level of confidence).<sup>98</sup> That is further corroborated by quantitative research conducted in Vancouver (a city often referred to as a model compact city), which measured concentrations of nitric oxide and ozone in urban and suburban areas. People living in urban centres with high walkability were exposed to much higher concentrations of nitric oxide than their suburban counterparts. The reverse was true for ozone, with people in the suburbs with low walkability exposed to higher concentrations of the pollutant than their urban peers. But it should be noted that ozone is produced from the breakdown of primary pollutants such as nitric oxide, which is predominantly produced by traffic in dense urban areas. The study did, however, find a low pollution sweet-spot in Vancouver where the residents were exposed to the least nitric oxide and ozone concentrations. This was located just outside the urban core but before the commencement of suburban development. Yet, this area accounted for less than 2% of the city's postal codes, and was inhabited exclusively by high-income earners.<sup>99</sup>

The picture that emerges from this research shows that restructuring the urban form along the compact city mould does not reduce the production and exposure to airborne pollutants; in fact, it's quite the opposite. Compact development with

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<sup>98</sup> Wendell Cox, "Population Density, Traffic Density and Nitrogen Oxides (NOx) Emission Air Pollution Density in Major Metropolitan Areas of the United States," *Demographia*.

<sup>99</sup> Julian D. Marshall, Michael Brauer, and Lawrence D. Frank, "Healthy Neighborhoods: Walkability and Air Pollution," *National Center for Biotechnology Information* (2009), 1759.

high population densities increases congestion, which in turn generates more pollution. Even if changes to the urban form did yield improvements in air quality, would the costs involved justify the investment? If you consider that vehicle technology has steadily reduced the amount of pollution produced by motor vehicles (promoted by regulatory pressure, particularly in the European Union), then the answer steers towards 'no'. Economist Randall O'Toole found that air pollutants declined more than two-thirds between 1970 and 2007 despite urban driving increasing by 250%.<sup>100</sup> This is due to ongoing improvements in vehicle technology. European Emission Standards, for example, were introduced in the early 1990s, placing controls on the concentrations of carbon monoxide, hydrocarbons, volatile organic compounds, nitric oxide, and particle matter that can be released into the atmosphere from vehicle exhausts. This has been steadily tightened to the extent that allowable carbon monoxide emissions are now five times lower than in 1992.<sup>101</sup> Similar reductions were also seen on the other forms of air pollution over the same period, with even further improvements likely as new standards are implemented.

From the research quoted above, it is evident that cities, regardless of whether they are compact or dispersed, are environments that expose their inhabitants to air pollution. But counter to the commonly held perception that dense urban environments reduce exposure to airborne toxins, the evidence shows they in fact increase it. As such, arguments for reshaping the urban form along a compact model that uses pollution exposure as the sole justification do not hold much water.

### 6.3 MENTAL HEALTH

As discussed earlier, compact cities present us with a paradox in that what makes them desirable from a planner's perspective makes them less appealing to the inhabitants. This may seem counter logical, but can be easily proved by looking at the high prices people pay for a suburban house with a garden, and the daily commute these people are willing to undertake to live in such a house. So why are people attracted to suburban houses over more centrally located accommodation in the city?

Clearly, there are multiple factors that appeal variously to

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<sup>100</sup> O'Toole, "The Myth of the Compact City," 2.

<sup>101</sup> European Union, "Emissions from diesel and gas engines (up until 2013)."

individuals, but one possible explanation is that the suburbs offer exposure to greenery and open space not available on the same scale to inhabitants of dense urban centres. Research into this area shows that this sort of exposure to greenery has positive benefits to human well-being. Velarde, et al. conducted a literature review of the major ecology, health and psychology journals, and found a common thread running through them – both short- and long-term exposure to natural landscapes (non-urban) yielded positive health benefits for humans. These included "reduced stress, improved attention capacity, facilitating recovery from illness, ameliorating physical well-being in elderly people, and behavioural changes that improve mood and general well-being".<sup>102</sup> In short, just looking at trees is good for you, but long-term exposure is even better.

Suburbs certainly do not have a monopoly on green space, with many good examples of leafy cities, but it is obvious that the concrete dominated urban form cannot host the same variety of flora (and fauna) as the low-density city fringes. Yet, that ratio of green space to head of population is likely to decline as population densities increase, according to research by Richard Fuller and Kevin Gaston. Using regression modelling to map the relationship between urban green space coverage, city area and population size across almost 400 European cities, the pair found "a dramatic drop in per capita green space provision in cities with greater population densities".<sup>103</sup> Moreover, that amount of green space was likely to decline rapidly as cities grow, "increasing the geographical isolation of people from opportunities to experience nature", and hence, the positive effects this would have on human health, as discussed earlier. That has been the experience in places like the United Kingdom, where the development focus has almost exclusively fallen on brownfield development, and has resulted in the practice of 'garden grabbing' or urban in-fill. The same trend can be seen in New Zealand and Australia, with the trend towards subdividing traditional one-family properties into multi-family units on the same footprint is common throughout the suburbs. The practice was so ubiquitous in the United Kingdom that local councils were given powers by central

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<sup>102</sup> M. D. Velarde, G. Fry and M Tveit, "Health Effects of Viewing Landscapes – Landscape Types in Environmental Psychology," *Urban Forestry & Urban Greening* 6 (2007), 209–210.

<sup>103</sup> Richard A. Fuller and Kevin J. Gaston, "The Scaling of Green Space Coverage in European Cities," *Biology Letters* 61, no. 5 (2009), 354.



government in 2010 to stop it.<sup>104</sup> In Australia, a report into the effects of greenery found that many cities in the country were losing their foliage due to urban in-fill as population densities increased.<sup>105</sup> This not only affected human well-being, as discussed above, but also negatively affected heat management and energy use in cities like Perth, with trees providing shade and acting as a wind break, playing a vital role in heat, pollution and storm water absorption.<sup>106</sup> Furthermore, studies have found that the loss of green space is not limited to private gardens and street verges, but inner-city parks and playgrounds as well, as developers and city councils seek low-cost brownfield land to develop.<sup>107</sup>

This raises an important question: What effect is the dense urban environment, characterised by little green space and large tracts of concrete infrastructure, likely to have on human well-being? It is a question researchers have sought to answer for much of the 20th century, as the global population shifted to a predominantly urban existence, with more than half of the people living in cities. Extensive studies have shown that the answer can be severely negative. As early as the late 1930s, researchers in the United States found a greater prevalence of schizophrenia in urban areas. This was corroborated by a literature review in 1974, showing that the majority of studies found an increased prevalence of mental health disorders among urban residents compared to their rural equivalents.<sup>108</sup> Emily Goldmann and Sandro Galea, who explored mental health and cities, concluded:

Urbanisation can also increase population density, producing crowded and congested living environments, which could cause social strain or facilitate the spread of certain behaviours or psychological symptoms.<sup>109</sup>

Further research found a link between population density and

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<sup>104</sup> “‘Garden grabbing’ to be curbed,” *The Telegraph* (9 June 2010).

<sup>105</sup> Helen Brown, et al., “Cool Communities: Urban Trees, Climate and Health,” *Curtin University* (2013), 10.

<sup>106</sup> *Ibid.*, 7.

<sup>107</sup> Amberol, “The Disappearance of Our Urban Green Spaces.”

<sup>108</sup> Emily Goldmann and Sandro Galea, “Social and Environmental Influences on Population Mental Health,” in *Population Mental Health: Evidence, Policy, and Public Health Practice*, *Routledge Studies in Public Health*, Neal Cohen and Sandro Galea (eds) (Oxo: Routledge, 2011), 58.

<sup>109</sup> *Ibid.*

hospitalisation rates of people with serious mental illnesses, with the authors concluding that the link between disorders and illnesses such as schizophrenia and cities is more important than previously thought, with the urban environment providing more stimuli likely to trigger a mental episode requiring treatment.<sup>110</sup> That is not to say living in suburbia comes without its own mental health baggage, but it is less stressful than the inner city.

## 6.4 CONCLUSION

While compact cities may be considered a desirable urban form from a planners’ perspective, living in cities with higher densities has an adverse impact on the health of the people living there.

- There is a weak relationship between high population densities and low obesity rates.
- Some of the world’s most dense and compact cities are struggling with obesity epidemics similar to that of their Western counterparts.
- Landscape and climate have a bigger influence over walking and cycling than urban form.
- US data show compact cities increase traffic congestion rather than decrease it, thereby increasing airborne pollution.
- Quantitative studies in Vancouver, a compact city, show urban areas with high walkability are exposed to significantly higher primary pollutants than suburban areas.
- Improvements in vehicle technology have led to a greater reduction in pollution emissions than changes to urban form and programmes that encourage the use of public transport.
- Green spaces and vegetation within cities (particularly gardens, parks and playgrounds) – proven to provide health benefits – are likely to decline as population densities increase.
- The stress associated with living in urban centres with high population densities has been linked to higher rates of mental illnesses, including schizophrenia.
- People afflicted with mental health problems are

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<sup>110</sup> John Husted and Amber Jorgens, “Population Density as a Factor in the Rehospitalization of Persons with Serious and Persistent Mental Illness,” *Psychiatric Services*, 51 no. 5 (2000): 605.

more like to be hospitalised (and for longer) than those in rural areas.

In short, while the suburbs are often demonised as an urban form that leads to poor health outcomes, the dense urban forms favoured by proponents of compact cities appear to have as many, if not more, adverse effects on human health.

## CHAPTER 7: CONCLUSION

New Zealand's cities, like many in the developed world, are beset by a number of challenges. The status quo of congested highways, skyrocketing house prices, and bureaucratic gridlock are as unpalatable here as elsewhere. That each of these problems needs to be addressed if New Zealand is to maintain and enhance its economic prosperity is without question.

What is questionable, however, is whether reshaping our urban areas along the compact city mould will rightly address these problems.

Part of this debate has centred on the agglomeration benefits that come from urban proximity. This is an important discussion point because agglomeration is often cited by planners as the clincher in their argument for compact cities. We do not reject the economic advantages to situating businesses and consumers closer to one other. After all, people and firms in urban areas tend to be more productive than their counterparts in less well-populated areas. However, these advantages are only detectable as agglomeration benefits when the positives of proximity outweigh the costs of density. This is a balance that any city, regardless of urban form, has to strike if it is to survive. And yet this report shows that the restrictive planning regulations required to deliver the utopian vision of a compact city often tips the balance towards the cost side of the urban ledger.

Congestion is one of these costs. Traffic congestion data from the United States shows that the most congested metropolitan areas are often the ones that have chosen to pursue compact development. Additionally, quantitative research into transit investments over a 26-year period using data from 74 US metros shows public transport had no long-term impact on road congestion. This stands at odds with the perception that high transit penetration is the solution, not an aggravator of gridlock.

Another cost is land. From the perspective of local government in New Zealand, compact cities are desirable because they limit the amount of roading, water and social infrastructure that will need to be provided. Yet by limiting the supply of land, city officials are inadvertently putting a scarcity value on housing in this country, which ranks among some of the least affordable in the world. Equally, the onerous regulations and zoning restrictions required to steer development along the compact model add to the scarcity value of housing. This scarcity value is not limited to housing, and businesses facing higher property costs will pass these on to customers in the form of higher prices, and where they cannot, firms will look to relocate to cheaper areas – a process that is already happening in Hamilton, a beneficiary of fleeing Auckland firms.

Lastly, the urban environment is a cost in itself. Proponents of compact cities portray them as healthy alternatives to the pollution-choked suburbs, populated by car-bound obese, but this is not always the case. Research shows that dense urban cores can increase exposure to harmful pollutants, and factors such as topography and climate play a greater role in determining whether people will use transport options, like cycling, than whether the infrastructure exists in the first place. Furthermore, urban residents are likely to increase their exposure to fast food outlets and diminish their access to health foods, typically stocked by retailers in suburban locations. Indeed, the mental stress of living in urban environments was one of the factors that caused people to flee cities in the 20th century once cars became readily available.

We have shown through academic research and the historic record that compact cities are not a panacea for the social, financial and infrastructural problems gripping modern cities today. There is no 'one size fits all' solution to urban costs, and the sooner we abandon ideology, the sooner we can start developing nuanced solutions to issues like congestion and skyrocketing property prices. The aim of this report was not to generate specific policy recommendations but to unpack the highly technical argument surrounding urban form changes for the average citizen to participate in the discussion. Still, it is evident at a high level that overly centralised planning and decision-making structures are one of the major contributing factors driving urban costs in New Zealand and further afield. We encourage a far more market-centric approach to the development

and evolution of urban areas, which have been proven to work in various parts of the world. This would represent a radical change of policy direction for New Zealand, involving a regulatory overhaul of a number of pieces of legislation, including the Resource Management Act, various parts of local government legislation, and the Building Act. This is clearly a long-term reform project, but that does not mean city officials are unable to act until these reforms have been completed. Council officials could explore more innovative forms of funding to ring fence the infrastructure costs of opening new land from general ratepayers. We are encouraged to see LGNZ investigating measures for local councils to participate in the economic growth happening in their region. And there are certainly economies of scale that can be achieved on infrastructure provision by amalgamating some of the utility services that New Zealand's 78 regional and territorial councils provide. The New Zealand Initiative proposed three ways to achieve this in its series on housing affordability, which are still applicable:

- **Community Development Districts (CDDs):** Create development structures that can privately finance debt to build new infrastructure by issuing bonds and charging residents a mandatory levy to repay the debt. These could be used by developers, landowners or councils to spur large-scale developments beyond town boundaries aimed at first-home buyers.
- **Financial Incentives for local councils:** Local government needs a structure to share in the proceeds of population and housing growth that are almost exclusively paid to central government. Councils must be entitled to a Housing Encouragement Grant for every new house built in their area, provided the house meets minimum delivery deadlines from application to completion, benchmarked on the GST levied on the house.
- **Reform water provision:** Encourage local councils cede control of their water networks to regional monopoly water providers, with ownership still held by participating local government bodies. These water companies can use network pricing to create quality water infrastructure and make long-term infrastructure decisions free from political or electoral considerations.

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