Report ER17

Land value capture to fund transport investments in cities

Malcolm Campbell, Joshua Neville,
Ria Dionisio and Simon Kingham
Project LR0482
The University of Canterbury, funded by the
Building Research Levy

Preface:

This report is part of the BRANZ 2015/16 Building a Better New Zealand – Industry Research Strategy. This comes under the Building better cities and communities stream of work, which focuses on the need to have high preforming urban environments reflecting their importance as the main habitat of our society and economy.

To build the cities that New Zealanders have come to expect and have as their aspiration there requires a step change in the delivery of key components that make up a city. To deliver the vision of denser but more liveable urban places we will need to find methods to enable development through greater transportation capacity, and enable this capacity to be built through innovative funding mechanism. New funding mechanism will be the start of a much larger puzzle of creating density in our cities; land value capture is one purported solution and this report seeks to enlighten as to international implementation to date.

Intended Audience:

The intended audience for this report is those interested in ways in which New Zealand could begin to unlock density in our urban centres through building transport infrastructure, and who wish to learn from international examples in doing so.

Title:

Land value capture to fund transport investments in cities: international implementation case studies and the lessons that can be learned from these.

Authors:

Neville, Joshua – University of Canterbury, Department of Geography
Campbell, Malcolm – University of Canterbury, Department of Geography
Dionisio, Rita – University of Canterbury, Department of Geography
Kingham, Simon – University of Canterbury, Department of Geography

Abstract:

Cities need new solutions if they are to carry on growing whilst also improving their liveability. A large part of this is the provision of transportation capacity within a city, without spare capacity growth cannot occur. In current economic and political times funding expensive transport projects can be difficult and cities are increasingly looking for more ways in which they can fund the much needed infrastructure for growth. Land value capture is a method that has been studied and discussed a lot in recent years but there remains few examples of implementation.

This short report covers international exemplars, carefully selected from around the world to demonstrate how value capture has been applied to various different projects. It gives a brief overview of what Value Capture is as well as lessons learned, the advantages and disadvantages of different approaches. The report concludes with some salient points to consider for New Zealand.

Graphic work:

Hrubosova, Iva

Contents

Land value capture to fund transport investments in cities

international implementation case studies and lessons that can be learned.

Introduction

Transportation is a unique feature of urban environments. It has the power to shape and define cities becoming increasingly important as population grows. Growing cities need increasing and continued investment in transportation, but this is expensive. Consequently, value capture is a funding mechanism that has been getting significant attention. Though not unique to the urban context, it is being looked at as a modern market led solution to both build sustainable communities and meet the transportation needs of the future.

Value Creation

Core to value capture is the premise that transport is one of the most powerful catalysts of urban land value increase, and when new infrastructure is built, land prices can rise rapidly; even before projects are completed. A 2006 report by Smith and Gihring looked at over 85 international studies that examined the impact of transportation investment to adjacent property prices, finding comprehensive support that this phenomenon occurs. This is explained by location theory in that, transportation creates access and that people and businesses are willing to pay commodity premium for this. Access allows people to be closer to jobs and social amenities, as well as allowing businesses to have greater access to markets. Having greater access creates more opportunities to generate wealth and opportunities; and given that there is a willingness to invest in such opportunities, land prices can increase in areas where transport access is improved [1].

Conversely, when urban areas grow and capacity fills on transportation networks, access decreases. To counter this, cities need to build new infrastructure and increase transportation capacity. This is often reached through a number of means that can range from the introduction of new modes of transport; creating more routes, or enabling faster travel on additional transport solutions. On the ground this could be the construction of a new train station, a new bus rapid transit, a road way, or could be a whole new metro system; even an airport or a port. If infrastructure is built at a location that enables improved access in cities, it generates opportunities for uplift of land value. When new development occurs close to new transport infrastructure this value uplift is realised but perhaps not captured.

Value Realisation and the unearned increment

When value uplift is created following a transport project being completed, the land owner or holder of the development rights experiences a windfall gain in the value of their asset; an unearned increment. International experience has shown that good transport access being created can generate value gains of up to 30%. Land value gains are generally a gradient that are highest closest to the transport service, and decreasing as properties get further away from the transport. These gains are very rarely the result of active participation or action on the part of the windfall recipient. The transportation projects are often solely constructed by public authorities, and very commonly funded through their funds. There is an inequality in the cost sharing of implementation, the public authorities or providers bearing the cost; and the land owner or holder of development rights being the beneficiary that received all the value gains. This increased value is realised when land owners sell or develop land, capitalising the gains that the transportation infrastructure and access has generated [2].

Value Capture

Value capture is the process of capturing some of this land value increase and this value that is captured is then used to finance transportation projects, sharing the cost burden of transportation infrastructure. Unlike the concepts of value creation and value realisation, value capture is a poorly defined concept and can mean a number of different things depending on situation. Experiences in value capture can vary from place to place and there are as many similarities as there are differences. Loosely it is the process of capturing whole or part of the value realisation that occurs when transportation access increases the value or development capability of land. Broadly, value capture is able to be achieved through direct taxation as one off fees, levies or ongoing special taxation; developer extraction, or through land asset management. This can be broad reaching and district wide or can be land parcel specific. As such there is a myriad of different application methods and approaches, and this is where complexities about defining value capture stem from. In some cases, value capture methods and approaches are able to generate significant funds that contribute towards project costs; others can even go above and beyond the costs of projects and be recycled back into funding pools to create further infrastructure and subsequent value uplift.

Approaches to value capture

Passive value capture methods

Passive value capture occurs when a transport authority recovers the value that the transport accessibility creates. A simple example is the application of a tax on the sale of land, as a percentage of the additional value. Others include: sales tax, special taxation applied to certain districts, tax increment financing, development levies, development rights, or even the application on tolling.

Active value capture methods

Active approaches to value capture generally correspond to cases in which authorities are the main developers. This is well illustrated when agencies implement a land plus rail model, selling public lands following transportation improvement or to build greater density of housing on a site. These approaches led to higher risk exposure for authorities as they become market developers, but they are also capturing 100% of the value gain that the transportation has generated.

International experience and case studies

Whilst New Zealand has few contemporary examples of value capture application, there are a number of international examples of successful implementation of value capture. In some cases, value capture is quite innovative, and in others is implemented through agencies extending existing transportation funding. There is a need to review these international cases, to extract lessons relevant to New Zealand to enable efficient value capture mechanisms in this context. This paper sets out 7 international examples of value capture being utilised in various contexts, with different modes, and capture methods. The lessons we have summarised from each case study are designed to be lessons from which New Zealand could learn and then build cases for implementation, if desired.

Rapid Transport System

Green Line
Linha Verde

Case Study 1:

Linha Verde, Curitiba, Brazil — Highway Conversion to BRT

Project Context:

Authority:	Urbanização de Curitiba (URBS, Urbanization of Curitiba)
Area:	Curitiba, State of Paraná, Brazil
Project:	9.4km Freeway to BRT (Bus Rapid Transit) conversion, Stage 1
Mode:	Bus (Rapid transit development)
Cost:	60 Million USD (2009)
Value Capture:	Certificates of Additional Development Potential

Overview

The 9.4km first stage of Curitiba's green line is the start of an 18km Bus rapid transit axis connecting 23 districts of the metropolitan region and over 280,000 residents. Included in this development is a 20,000m² linear park, 6km of cycleway, and a redeveloped road system [3]. The area where the line is being developed was a former roadway, wide enough to accommodate 8-10 lanes of traffic [4]. Worldwide, Curitiba's bus rapid transit system is held up as a model example of an effective as well as a cost efficient alternative to a subway system. It currently operates free of any subsidy. The network was initially developed in the 1970's and is the backbone of Curitiba's transportation system, carrying the majority of daily commuters. Low fares mean citizens use less than 10% of their income on travel [5].

Impacts of development

The green line is expected to have a capacity of 32,000 passenger journeys per day. Since the line was developed, nearby land has seen substantial value increases along the corridor. This increase in land value helped promoting the development of multiple low density industrial sites, described by commentators as an urban renovation [6].

The network as a whole has recently transitioned to operating solely bio-fuelled buses, resulting in 30% less CO_2 and 70% less smoke; reducing many negative impacts of the bus system [7].

Value Capture Mechanism

Funding for the development of the line was expected to come from the sale of additional development rights. The city of Curitiba closely controls land use and allows for additional development only through the purchase of development certificates. These CEPAC, (certificate of additional development potential) are auctioned off as a tradable credit within specified areas along the route [8].

Lessons learned

The auctions for the CEPACs occurred at a time when the property market was severely depressed. Yields were only slightly over minimum prices and less than 60% of the anticipated funds were raised [9]. Since this time, property has recovered strongly and these CEPACs have increased in value meaning this project missed out on value gains that could have gone into the development of the line.

Hong Kong SAR – China
MTR System

Kwun Tong Line
Extension
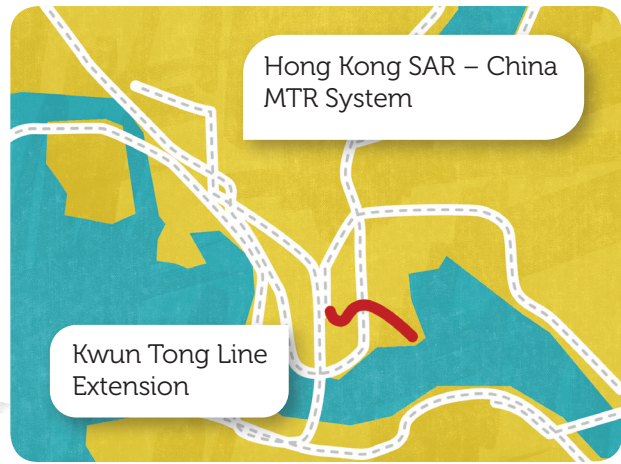
Case Study 2:

Kwun Tong Line Extension, Hong Kong

Project Context:

Authority:	MTR Corporation Limited
Area:	Kowloon City District, Hong Kong, SAR, China
Project:	2.6km Extension of the Existing Kwun Tong Line
Mode:	Underground Rail
Cost:	5.3 Billion HKD (2009)
Value Capture:	Rail plus property

Overview

The Kwun Tong Line extension is adding an additional 2.6km of underground rail line, connecting the existing line from Yau Ma Tei station to the newly developed Whampoa station. The Ho Man Tin interchange will also be developed and improve connections to the central island. This development will offer reliable, convenient and fast transportation to these areas served predominantly at present by motor vehicles [10]. Whilst a short section of track, it has substantial impacts on travel times, from 25mins by car to 5mins on the proposed line. 146,000 residents will be serviced by the line once complete [11].

Impacts of development

Significant travel time reduction and the anticipated mode shift from vehicles to train that will happen once the development is complete, gives the line a very high economic rate of return (8% annually). The high economic gains come from direct travel time reductions to users of this service, as well as road network capacity improvement resulting from the predicted reduction of cars originating from a central and strategic location, increasing flow rates across the transport network [12].

Value Capture Mechanism

Despite the high economic rate of return, a poor financial rate of return leaves a funding gap of $3.5 billion HK (2009). To plug this funding gap and enable the development, the Hong Kong government gave special concession to the MTR Corporation to develop the Ex-Valley Road Estate Site near the proposed Ho Man Tin interchange. A 5 tower, 1800 apartment complex is proposed for the site. Developing this site leverages the increased value of this real estate and its proximity to transport, enabling the use of profits for rail development; a model the MTR is very experienced in using [13].

Lessons learned

Despite some government owned shares, the MTR is a listed company and as such is profit motivated. This motivation means it will seek good financial rate of returns. In this case the government was criticized by some for gifting the MTR a very valuable strategic site that had been earmarked for social housing, with suggestions the profit that the MTR will receive from the development of the site is disproportionate to the funding required by the MTR to build the line [14].

Gold Coast Light Rail – Stage 1.

Gold Coast – Australia
G:Link – Light Rail

Case Study 3:

Gold Coast Rapid Transit: Light Rail

Project Context:

Authority:	Gold Coast City Council
Area:	Gold Coast City, QLD, Australia
Project:	13km 16 Station light rail
Mode:	Light Rail, dedicated corridor
Cost:	949 Million AUS (2011)
Value Capture:	Global metropolitan wide levy

Overview

The Gold Coast rapid transit is a 13km light rail with 16 stations, and supporting east/west feeder buses. This is the initial stage of a planned eventual 40 km network of rail which has been marked for completion over the next 25 years [15]. Once complete the entire network will service just short of a Million residents, reach most of the business activity centres, and link tourist hot spots [16]. The light rail will be a city shaping project, and is seen as key to meet and support the growth demands in one of Australia's fastest growing areas [17].

Impacts of development

The stage 1 route targeted key institutions including Griffith University, the University Hospital, 20% of regional employment, and several tourist centres. The light rail opened in July 2014 and has experienced better than expected uptake, with passenger numbers continuing to grow. Part of the success has been attributed to the speed due to the dedicated light rail corridor, attractive and well located stations, and comfortable carriages, which also have the capacity to carry surfboards. Enabling the train to carry surfboards was done to deter residents from vehicle ownership and to maximise the project benefits by have people use the train for both commuting and recreation; surfing is the most popular recreational activity in the region [18].
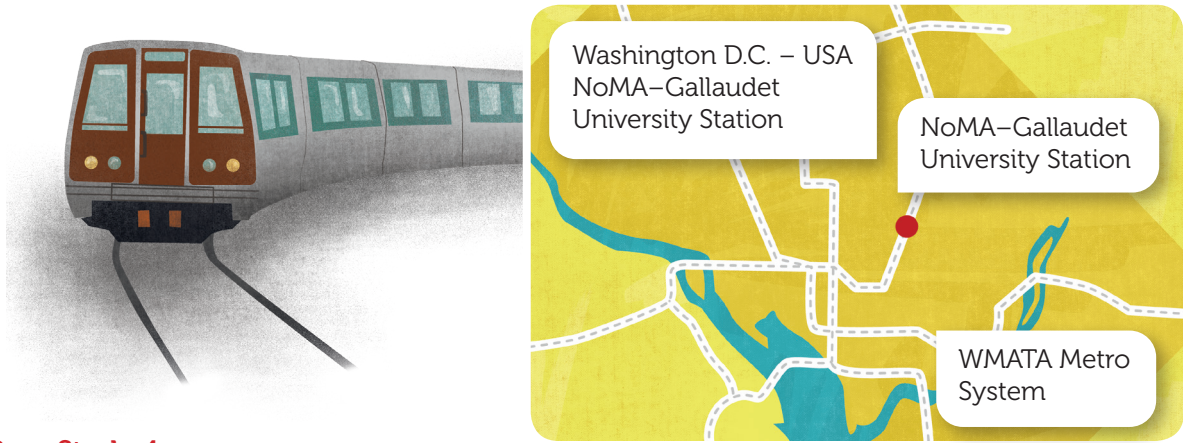
Value Capture Mechanism

The project is a public private partnership, with a build and operate contract being awarded to GoldLinQ a consortium. Funding for the project was provided by three levels of government, the Federal government $365m, the QLD state $464m, and the Gold Coast council $120; the latter's commitment being partly funded by a metropolitan wide levy. This levy is an attempt to capture the private benefits of the project and use these for financing; a form of value capture [19].

Lessons learned

The levy was deeply politicised and was not well explained through the consultation and development process. The levy is also not ring-fenced and there is no commitment in using it to fund future stages of light rail [20]. The levy's link to actual increases in property value is poor, and with low buy-in for the levy, future transit development in the region has been jeopardised and the full benefits of the light rail may not be realised.

Washington D.C. – USA
NoMA–Gallaudet
University Station

NoMA–Gallaudet
University Station

WMATA Metro
System

Case Study 4:

NoMA Gallaudet University Infill Station development

Project Context:

Authority:	Washington Metropolitan Area transit authority
Area:	District of Columbia, Washington D.C., USA
Project:	Area redevelopment & Infill station development
Mode:	Rail (Existing network/New station)
Cost:	103.7 Million USD (2004)
Value Capture:	Active part contribution, special taxation district

Overview

The NoMA – Gallaudet University Station was constructed by the Washington Metro Authority as an infill station on their existing Metrorail system. The system was developed in the 1960's-70s and this station is first infill station built since. This station was also the first time WMATA used a mix of public and private funds to contribute to the costs of development [21].

Development of an infill station in this area had often been disregarded due to the area's historic underdevelopment and high car ownership. This changed in 1998, when consultation was initiated to evaluate station suitability and demand by the community; this cumulated in a station being built, opening in 2004 [22].

Impacts of development

The station was a success for reasons including urban regeneration, increasing the local tax base, greater community led decision-making, increasing network ridership and revenues, reducing car ownership, and increasing the value of WMATA assets nearby [23]. Prior to the station, the area was well connected by roads, but congestion and a lack of transport alternatives was stymieing development. By improving transport access, the station was able to unlock development potential, with 3 billion dollars of construction occurring since the station was built [24]. Land values have also increased 6.8 – 9.4% over and above regional increase [25].

Value Capture Mechanism

With community support the Washington Metro authority created a special tax assessment district. Owners agreed on an 800m catchment for 30 years to service $25 million in bonds. Further to the contribution of the community, the federal government gave $25 million with a further$53.7 million from the District of Columbia. This ability to utilise private funds enabled the development to go ahead [26].

Lessons learned

Key learnings were from the community engagement processes. Initial feasibility studies were useful in generating buy in from the communities who would later form crucial partners in enabling development to occur. To get political support for the special tax district to go ahead, the authority found that they needed to go beyond consultation alone and have full inclusionary planning [27].

Cross Rail

London – United Kingdom
London Underground
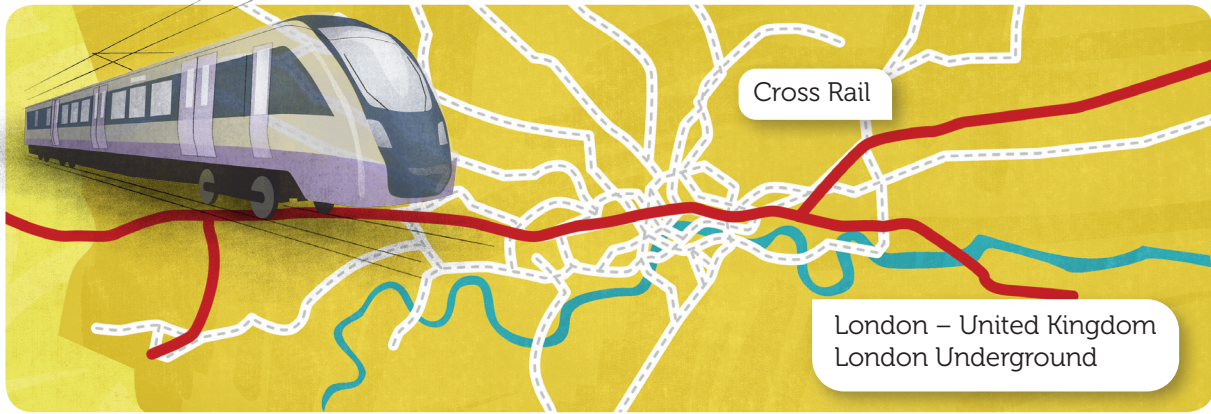
London Cross Rail

Project Context:

| Authority:	Greater London Authority
Area:	London, East West through the City
Project:	100km rail project, 42km of tunnels, 40 stations
Mode:	High Frequency/Capacity Rail
Cost:	14.8 Billion GBP (2009)
Value Capture:	Business Sales Tax and property development

Overview

Crossrail is Europe's largest construction project, it started in 2009 and is expected to be completed in 2017. The route is a dual track 100km line, 42km of which tunnelling is being completed for. The will be 40 Crossrail stations, including 10 new stations that are being constructed as part of the project. The route goes from Reading and Heathrow in the West and through to Shenfield and Abbey in the East. On route it passes through London's key business, employment, and entertainment districts, including Heathrow, West End, the city, and Docklands. Once complete, it enables an additional 1.5 million residents to be within 45 minutes travel time of central London, as well as providing significant service improvements to an additional 750,000 exiting service users. It is expected annual travel on the Crossrail to exceed 200 Million passenger Journeys [28].

Impacts of development

Given the size of the project, coupled with the additional 10% capacity increase on the public transport network, it is expected to generate significe economic gains. Early estimation has suggested it is in the regions of nearly £50Billion, generated through, travel time savings, increased economic activity, gains in land values, and decreased greenhouse gas emissions, innovation in rail sector development, and greater access to marketplaces both domestically and internationally [29]. The project also employs 8,700 people. The expanded capacity in the network is also enabling substantial increases in the housing stock nearby [30].

Value Capture Mechanism

The Greater London authority is seeking to capture part of the economic gains realised to help fund development. Likewise the project also seeks to benefit from the large increases in property value caused by Crossrail. It has twelve major developments along the route with an expected income of £500 million [31]. Businesses in the London area have also had a number of levy and tax mechanisms introduced and this will result in the direct business contribution to the project totalling more than £4.1 Billion. Additionally, a few large institutional organisations and businesses will direct contribute almost £1Billion for investments in station and network infrastructure. The total funding raised through direct value capture totalling more than £5.6 Billion [32]. Significant attention will be paid to the success of Cross Rail.

Ørestad Metro Line

Copenhagen – Denmark
Copenhagen Metro System

Ørestad development area
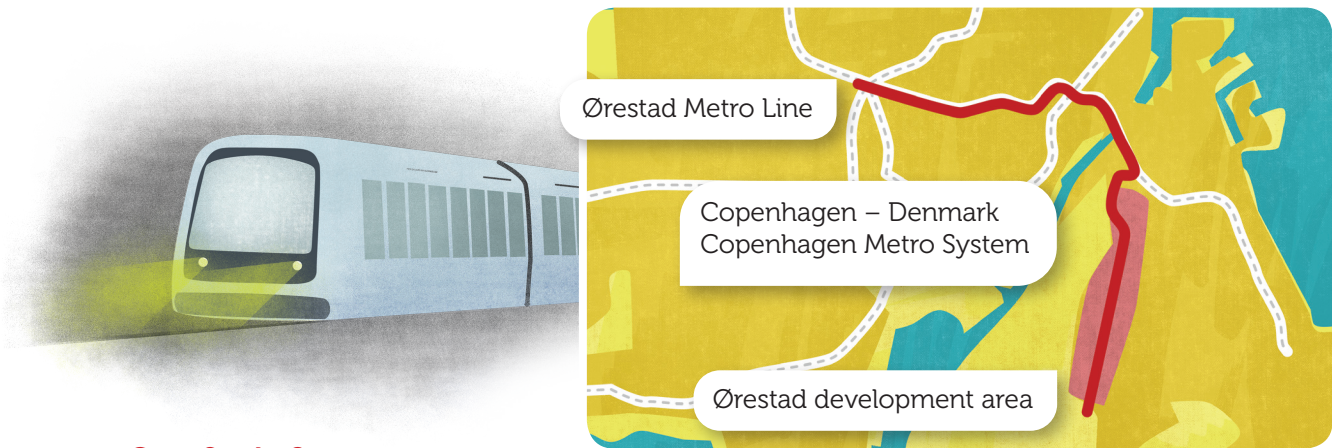
Case Study 6:

Ørestad Development Scheme, Copenhagen Metro, Denmark

Project Context:

Authority:	Ørestad Development Corporation
Area:	Copenhagen, Denmark
Project:	21km metro link to central Copenhagen
Mode:	Light Metro Line
Cost:	1.6 Billion EUR (2004)
Value Capture:	Direct payment, Land Sales, and Real Estate Taxes

Overview

In 1992, the City of Copenhagen and Ministry of Commerce formed the Ørestad Development Corporation (ORC). The ORC was empowered to develop 310ha of vacant land within 10 km of Copenhagen City Centre. The area is very narrow, and forms part of the link to Malmo, Sweden. A core part of this land development was the construction of a 3 stage mini metro system, 21 km in length, with 22 stations [33]. The ORC was also responsible for the construction of all public spaces.

Impacts of development

Regulations enabled up to 3.1 million m2 of floor space to be built. The mix of development was planned as: 60% commercial, 20% residential, and 20% dedicated to cultural facilities, retail, and educational institutions [34]. To date, just over half of all available land for sale has been sold. Initial sale of land was strong, but building development has been slow [35]. Some of the early buildings have been heavily criticised and still only 8,000 people live there and relatively few jobs have eventuated. Over time, it is expected that construction will increase and the number of residents should rise to 20,000, and the number of jobs to 80,000 [36].

Value Capture Mechanism

To fund the construction of the public spaces and the metro, the ODC used government backed loans. These debts were repaid through the money raised from the sale of land and subsequent development rights. These sales leveraged the value gain that occurred through the development process, and the rise in value that the metro connection to central Copenhagen created. 55% of the initial investment of land came from the city of Copenhagen, with the remaining 45% from the state of Denmark. No further public funds were used aside from sovereign backing of debts.

Lessons learned

Several slowdowns in the property market affected the project, with the GFC having a severe impact. The crisis that ensued resulted in land devaluation of 30%, slow land sales for four years, and the disestablishment of the ODC. The remaining land, debt, and assets were transferred into a new agency more able to negotiate additional lending. The payback period for debt changed from a planned 15 years, to an expected 76. The key failing was a lack of good risk management, with poor foresight of market realities [37, 38].

Cascades Development Area

MAX Red Line

Portland – USA MAX Light Area

Case Study 7:

MAX: Red Line Airport Light Rail, Portland, Oregon, USA

Project Context:

Authority:	(TriMet) / City of Portland
Area:	Portland International Airport, Oregon, USA
Project:	8.9km Train to plane light rail link
Mode:	Light Rail Transit
Cost:	125.8 Million USD (2001)
Value Capture:	Joint Development, Tax Increment Financing (TIF)

Overview

The Portland MAX: Red line light rail extension is an 8.9km link that connects the MAX transit system to the Portland international airport. The development included 4 new stations, a large park and ride, and the private partner was given 120 acres of land which was zoned as mixed use. The light rail had been designed many years earlier with the redevelopment of the Interstate 205. This meant the project had an already dedicated right of way set aside, however the light rail was delivered 10 years prior to plan due to the availability of private equity. It was the first light rail project in the USA to receive no federal funding, state general funds, or tax increases. Annual ridership exceeds one million passengers [39].

Impacts of development

Originally the private partner Bechtel had envisioned using development rights they were allocated to create a commercial centre and a hospitality district both with dense levels of employment. The 9/11, 2001 events meant the economy and airport travel cooled, forcing Bechtel to sell their interests to new developers Trammel Crow. They repositioned the development as a retail centre with a few flagship big box retailers. This ultimately reduced the demand on the light rail services as the anticipated commuters didn't eventuate. Port of Portland is however still developing commercial land nearby the Light rail as demand facilitates [40].

Value Capture Mechanism

The MAX: Red Line was funded through a unique mix of value capture mechanisms. The first was tax increment financing through the Airport Way Urban Renewal area, which used some debt funds to support the light rail project, the second was the commercial arrangement with Bechtel, where in exchange for contributing a third of development cost they were given the development rights to an 120 Acre land parcel along the light rail route, the last was the arrival levy charged on each passenger coming into Portland International Airport.

Lessons learned

Despite the success of using value capture mechanisms to fund the light rail, the complex arrangements meant substantial approvals, negotiations, and time. Cascade station also yielded suboptimal development due forces of market pressure and the commercial realities Bechtel faced [41].

Key Lessons Learned from International Experiences

The key conclusion that can be drawn through the review of international experiences with implementation of value capture strategies is that, in practise, many elements need to be right in order to implement a successful strategy. The international examples show that some failures can jeopardise entire projects, and even small errors over long periods of time can substantially decrease the value that is returned to the funding pool, greatly impacting the long term outcomes of a project. For projects to be successful there appear to be six key factors that contribute to positive results:

› Localised strategies that take into account specific spatial and local contexts;
› A clear link in value capture and value being created;
› The ring fencing of value captured funds for explicit and specific purposes;
› An adaptive strategy that responds to market situations;
› Correctly setting the amount of value to be captured;
› Sound project risk management and leadership.

1 / Localised strategies that take into account specific spatial and local contexts

In each jurisdiction, there are differing legislative environments that can enable or restrict certain value capture strategies and mechanisms. Some liberal planning environments enable transportation development to occur concurrently; the case with Hong Kong, and Curitiba. For other locations the planning environment is restrictive and rules enable only selected practises to take place, such was the case with Portland where, as a result, innovative solutions were required. Reviewing the legislative environment, assessing the limitations and opportunities it poses is a key first step; enabling a guide for future work to take place.

Following this, further understanding the proposed implementation area's willingness to pay for transportation will provide clues of the demand for travel alternatives. In some places, transportation usage and reliance is much higher than in others, having a distinct impact on the value created by projects, and the potential amount able to be captured.

Existing development in an area will determine success, as value can really only be meaningfully created in situations where there is additional development capacity. This was the case in NoMA Gaudete station development, where congestion and the lack of transport system capacity had limited development opportunity. In Ørestad the opposite was true; excessive development capacity subdued the land price and the value creation opportunities. By taking these exploratory steps the right strategy can be chosen that best fits the local and spatial context.

2 / A clear link in value capture and value being created

In a situation where a value capture strategy is being enacted, authorising agencies need to ensure that the affected area of implementation is clearly experiencing a value gain as a result of the project. In situations where the market or developers fail to see the cost of a value capture approach being absorbed by the value gain being created in an area, the perspectives towards the use of value capture will be negative. Situations where this commonly occurs is when the value capture method being used is applied over a too broad of a spatial area, this results in properties at the periphery experiencing little to no value gains but having to pay taxes or levies regardless. When such instances occur, the negative perspectives of these property owners can be toxic for the use of value capture as a funding strategy and risk jeopardising future implementation of value capture tools and consequently future projects.

In the case of the Gold Coast and in London, both adopted jurisdiction-wide taxation, imposed even in the areas not adjacent or proximate to transportation projects. These areas that are taxed, but not adjacent to transportation improvements are unlikely to see significant changes in land values or development increasing. In these two cities there has been significant negative press about the taxation and equity of its application. This becomes a risk when being implemented by authorities governed by elected officials as short political cycles can result in projects being cancelled, funding being scaled back, and even politicians being elected due to their opposition stance with regard to value capture approaches.

A juxtaposition of sorts, was the case of NoMA – Gallaudet University infill station. A strong business influence lobbied hard in initial negotiations and succeeded in minimising the value that was captured, leaving the Washington Metro Area Transport Authority with a much larger share of costs, and land owners with greater gain from the value created by the station. The additional value that would have been captured, had the WMATA been stronger in negotiations, could have been used to reduce the share of the project costs incurred by the agency, pay back debt faster, or even used to fund future transportation improvements.

3 / The ring fencing of value captured funds for specific purposes

When value capture tools are used the funds raised should be ring-fenced and used for specific purposes and projects rather than form part of a general budget. The best example of funds not being ring fenced is the Gold Coast metro. In this case a transportation levy was charged on all properties in the district, rather than just being used for transportation and ring fencing it for this purpose, the money has been used as part of the overall regional authority's budget. This has created an environment where it is not clear whether the levy is being fully used for transportation or not; this has given voice to critics of high taxation to speak out in opposition to the levy.

As the Gold Coast light rail is only the first stage of a much larger regional transportation improvement project, significant funding is required in the future. Opponents to light rail have been calling to axe the levy, which would render the authority unlikely to be able to source funding for the wider project. If the levy had been initially ring fenced and clear funding pools allowed to develop, future stages may have received wider support, and had funding pools they could draw from. The discussion for the future of the Gold Coast light rail has now revolved around funding. The debate and growing opposition now jeopardises future development from occurring and, ultimately, the success of wider transportation and development goals.

As a comparison to the Gold Coast, Hong Kong has managed to create one of the best metro systems in the world, through the use of the MTA; a completely independent entity with its property plus rail development method. Excess value captured from each project is used to help fund future projects and thus enhance the entire network's efficiency and capabilities, further encouraging the use of the metro.

4 / An adaptive strategy that responds to market situations

Value capture strategies need to be implemented with the market in mind. Not taking into account the context of a particular market situation when implementing a value capture strategy can create significant risk for a project success or can mean otherwise significant value gains will be uncaptured. In Curitiba the CEPAC certificates were sold at auction during a period where the property market was declining. The auctions failed to generate significant interest from developers who were struggling to sell existing developments and, as such, the CEPAC sale prices were low and in some cases barely met the legal minimum reserve price. When the property market recovered a short time after the auctions and development rebounded rapidly, the authority was left having already sold a significant share of the total available development rights, and with it the chance for much larger value gains. Given the deflated prices of the CEPACs sold at auction, many private resales of the development rights occurred, and initial buyers earned large profits.

In the Ørestad case, the scheme began at a time when land price and demand was at a very high point historically. Shortly after completion of the Ørestad metro, the market retracted and demand for new development land subsidised. Prices stabilised downwards from their historic high and the ODC failed to sell almost any land for four years due to the high prices being asked. The agency, faced with debt repayments to service, had to severely compromise on the permitted development outcomes, leading to some poor and heavily criticised development. It was only once a devaluation of land asking prices by 30% occurred that sales began again and development reignited. The debt in the interim period had ballooned and success of the scheme has now become dependent on utilising equity in other land development schemes to enable continued borrowing. Whilst market predictions are difficult, implementation strategies need to be adaptive and responsive so extreme high and low land values can be factored into the value capture approach and not create risk for schemes.

5 / Setting the amount and timing of value capture

Capturing the value that is created by a transportation project or improvement is a balance between enabling development and discouraging it. To achieve this balance, value capture strategies need to be designed to capture the right amount of value at the right time. This process can be very difficult to get right and is why many agencies choose broader rather than more specific methods. This relates back to method selection and designing strategies that fit within a local context.

To help get this right there needs to be a good understanding that different methods will capture value at different stages of the development cycle; some capture the value through the sale of land, some through business taxes following development completion, through property taxes, or development costs being imposed on additional development rights. Dependent to whom and when the value capture is applied, a risk exists in that too much value will be captured and that development will be discourage or suppressed; eroding the value created in the first place. Conversely, capturing the value too late in the development cycle imposes costs on parties that have not been party to the value realisation and, as such, become an additional cost to the end user increasing the cost of development. Accurate modelling is needed to help mitigate the risks, but it is very difficult to fully control for and a process for ongoing review needs to developed to support value capture approaches and to ensure the right value is being captured at the right time.

6 / Sound project risk management and leadership

With the added complexities in adopting a value capture strategy as part of funding a transportation project, competent project and risk management is essential. The poorest example that has been studied as part of these international examples is Ørestad. Poor risk management and lacking response to issues undermined the project and a complete restructuring was required of the agency responsible to remedy these failures. The best example, perhaps owing to the massive size and overwhelming complexity is the London Cross rail project. Cross rail is the largest infrastructure project in Europe, and constant review and management has kept the project on task and also made sure the value capture strategy is the right fit for the project. With any large project, controlling risk through all stages is important but with value capture approaches there is also increased need to manage risk prior to and post implementation to ensure the strategy corresponds into development and value being created adjacent to transportation projects. To achieve this, a mix of integrated planning, modelling, risk management, and economic forecasting is required. The more comprehensive mandate that the authority has who is organising a project the greater the chance for success. When different organisations are responsible for different components of implementation, strategies and projects can quickly fall apart.

Considerations for New Zealand

These case studies provide important considerations for local implementation. New Zealand planning authorities need to understand how different economic and funding instruments could be used to help fund future transportation projects. The current legislative context in New Zealand does not allow for truly pure value capture strategies to be implemented and local governments must rely on general rates, and government on income and sales taxes for the funding of transportation projects [42]. Recent interest however has been to explore options looking at how New Zealand might be able to diversify funding sources to enable larger ticket transportation projects to proceed. At present, however there are few examples of different funding models being used and if alternatives are sought it will be important to look and learn from the experience of other countries.

If we were to look at the six discussed lessons above, the task to develop a coherent strategy is neither small nor simple. Some early points to consider as we look for options would be:

Localised strategies that take into account specific spatial and local contexts

› *How does regional and urban New Zealand vary in the way methods would work?*

› *Does inflated housing pressure in urban centres preclude suitability for certain methods?*

› *What influence do high levels of speculative land investment have on value gain and realisation potential in New Zealand?*

› *Following transportation improvements, does the resource management act and district planning regime in New Zealand provide enough support for development to occur, creating sufficient value gains for value capture to occur?*

A clear link in value capture and value being created

› *Does New Zealand have the legislative appetite to develop a framework that would enable targeted rates?*

› *Is the current access to the required data such as land price, sales data, and well put together geospatial systems, in place to enable a fair test of this?*

› *Would the models used to asses this value gain stand legal test if they were to undergo legal review in the courts system?*

The ring fencing of value captured funds for explicit and specific purposes

› *As most New Zealand taxation and levies are used as part of general budgets, is there sufficient maturity and capability in treasury and local government accounting to enable this to occur?*

› *Would the pooling of funds be politically able to occur when other government spending such as social welfare or environmental protection remain low or poorly funded? Could the public culturally be able to differentiate the funding sources from the spending?*

› *An adaptive strategy that responds to market situations*

› *With the inflated property price in Auckland, is implementation of a value capture method even possible and would transportation improvements increase land values sufficiently to provide a gain able to be partially captured?*

Correctly setting the amount of value to be captured

› *As discussed prior, does the limited availability of sales data due to privatisation and a poor geospatial data framework create a barrier to being able to set the value capture amount correctly?*

› *As the public consultation framework in New Zealand creates anticipatory value gains, does this pose a barrier to suitability of certain value capture methods?*

Sound project risk management and leadership

› *Does New Zealand have the required project management and leadership capabilities to enable value capture to form part of projects or is there a need to build this capacity?*

New Zealand is likely to continue with a programme focused on improving the transportation access throughout its urban and regional areas as a continued tool to support growth and achieve economic prosperity. However, we also need to find ways to bridge funding gaps to enable these projects to go ahead. Value capture methods are worth exploring as a number of opportunities are likely to exist for implementation but, as this research hints at, there is a need to develop strategies and approaches that are the right fit for New Zealand. New Zealand will need further, but prompt, research to help guide and enable funding sources for the next generation of transportation projects throughout the country.

References:

Introduction:

1. Smith, J., & Gihring, T. (2006). Financing Transit Systems Through Value Capture. *American Journal of Economics and Sociology, 65*: 751–786.
2. Ingram, G., & Hong, Y. (2012). Land value capture: types and outcomes. In Value Capture and Land Policies. Cambridge, Massachusetts: Lincoln Institute of Land Policy.

Curitibas BRT

3. Lindau, L., Hidalgo, D., & Facchini, D. (2010). Curitiba, the Cradle of Bus Rapid Transit. *Built Environment, 36*(3), 274-282.
4. De Almeida, C. (n.d.). *Energy Efficiency in Cities: Curitiba's Green Line*. Lecture presented at World Bank's Energy Week April 2009.
5. Goodman, J., Laube, M., & Schwenk, J. (n.d.). *ISSUES IN BUS RAPID TRANSIT*. Washington, DC: Federal Transit Administration.
6. Lindau, L., Hidalgo, D., & Facchini, D. (2010). Curitiba, the Cradle of Bus Rapid Transit. *Built Environment, 36*(3), 274-282.
7. Lindau, L., Hidalgo, D., & Facchini, D. (2010). Curitiba, the Cradle of Bus Rapid Transit. *Built Environment, 36*(3), 274-282.
8. Neto, P., & Moreira, T. (2012). Urban policy in Brazil: Mismatches in the social management of land appreciation. *Spatial, 28*, 1-6.
9. Smolka, M. (2015). Value capture a land based tool to finance urban development [PDF]. Retrieved from *http://munkschool.utoronto.ca/imfg/uploads/306/mos_vc_toronto_feb_15.pdf*

Hong Kong, Kwun Tong Line Extension

10. Kwun Tong Line Extension - Background. (n.d.). Retrieved August 13, 2015.
11. Transport and Housing Bureau. 2014. *Progress update of the South Island Line (East) and Kwun Tong Line Extension*. Retrieved from *http://www.legco.gov.hk/yr14-15/english/panels/tp/tp_rdp/papers/tp_rdp20150102cb4-287-3-e.pdf*
12. MTR Corporation Limited. (2008). *Legislative Council Brief: Shatin to central link and MTR Kwun Tong Line Extension*. Retrieved from *http://www.mtr-shatincentrallink.hk/pdf/public-consultation/consultation-meeting/legislative-council/27032008_1_e.pdf*
13. MTR Corporation Limited. (2011). *Legislative Council Brief: Kwun Tong Line Extension Funding Arrangement*. Retrieved from *http://www.mtr-kwuntonglineextension.hk/en/pdf/public-consultation/consultation-meeting/legislative-council/tp_rdp-thb201105-e.pdf*
14. Yuanhua, K., (2012) *The Government should retrieve property ownership from MTR and provide affordable units*. Retrieved August 11, 2015, from *http://tsuiyuenwa.blogspot.co.nz/*

Gold Coast, Light Rail

15. Railway-Technology. (N.D.) *Gold Coast Rapid Transit System, Australia*. Retrieved from *http://www.railway-technology.com/projects/goldcoastrapidtransp/*.
16. Gold Coast City Council. (2013) *Gold Coast City Transport Strategy 2031: Technical Report*. Gold Coast, Australia: Gold Coast City Council.
17. Mepham, D., & Grennan, P. (2012). *City Building. In Gold Coast Rapid Transit: Lessons learned*. Gold Coast, QLD: Queensland Government.
18. Stay, P., & Griffin, M. (2015). *Are we Witnessing Light Rail Establishing a New Form of Linear Transit Oriented Development for Australian Cities?* 2015 AITPM National Conference Paper and Presentation.
19. Gold Coast City Council. (N.D.) *http://www.goldcoast.qld.gov.au/thegoldcoast/g-link-light-rail-22700.html*. Gold Coast, Australia: Gold Coast City Council.
20. McIntosh, J., (2012). *Presentation of Australian and international projects as case studies to the Doncaster Rail Project*. Perth, Australia: Curtin University.

NoMA Gallaudet, Infill Station

21. Schlickman, S., Snow, J., Smith, J., Zelalem, Y., & Bothen, T. (2015). *Transit Value Capture Coordination: Case Studies, Best Practices, and Recommendations.* NU Rail & Centre for Urban Transportation. Chicago, Il. United States.

22. WMATA. (2010). *New York Avenue- Florida Avenue- Gallaudet University- Station Access Improvement study Report.* Washington D.C.: WMATA.

23. MacCleery,R., & Tarr, J. (2012). *NOMA: The Neighbourhood that transit built.* Urban Land Magazine. Washington D.C.: Urban Land Institute.

24. Parsons Brinckerhoff Consultants. (2011). *New York avenue-Florida avenue- Gallaudet university metro station: A case study.* Washington, D.C

25. Aecom, Smart Growth America. (2011). *WMATA Regional Benefits of Transit, Executive Summary.* Washington D.C., United States of America: WMATA.

26. Mathur, S. (2011). Special Assessment district. In *Innovation in public transport finance: Property value capture* (p. 98). Burlington, VT: Ash gate.

27. WMATA. (2010). *New York Avenue- Florida Avenue- Gallaudet University- Station Access Improvement study Report.* Washington D.C.: WMATA.

London, Cross-Rail

28. Crossrail in numbers. (2015, September 1). Retrieved November 14, 2015, from *http://www.crossrail.co.uk/news/crossrail-in-numbers*

29. Colin Buchanan and Partners Ltd. (2007). *The Economic benefits of Crossrail.* London, UK: Crossrail Ltd.

30. City of London Corporation. (2015). *The Impacts of Crossrail: Secondary research briefing paper.* London, United Kingdom: City of London Corporation

31. Crossrail Limited. (2015). *Places & Spaces: Property Development on the Crossrail route.* London, UK: Crossrail Ltd.

32. Greater London Authority. (2009). The Crossrail Business Rate Supplement: Summary of initial prospectus. London, United Kingdom: Greater London Authority.

Ørestad Development

33. Stevens, B., & Schieb, P. (2007). *Infrastructure to 2030 volume 2: Mapping policy for electricity, water and transport.* OECD.

34. Stevens, B., & Schieb, P. (2007). *Infrastructure to 2030 volume 2: Mapping policy for electricity, water and transport.* OECD.

35. Ten Group. (2010). Learnings from Copenhagen and Malmö. London, United Kingdom: URBED/TEN Group 2010.

36. By & Havn. (N.D.). Orestad. *http://www.byoghavn.dk/english/development/districts-uk/district-orestad-uk.aspx*

37. Majoor, S. (2005). Contested governance innovation: the case of Orestad. Vienna, Austria: Aesop.

38. Flyvbjerg, B. (2007) Cost Overruns and Demand Shortfalls in Urban Rail and Other Infrastructure. *Transportation Planning and Technology*, *30.*1, pp. 9-30.

Portland MAX Airport Light Rail

39. TriMet. (2012). Airport MAX Tour Fact Sheet. Retrieved from: *https://trimet.org/pdfs/history/railfactsheetairport.pdf*

40. Gosling, G., & Freeman, D. (2012). *Case Study Report: Portland Max Airport Extension.* San Jose, California: Mineta Transportation Institute.

41. Gosling, G., & Freeman, D. (2012). *Case Study Report: Portland Max Airport Extension.* San Jose, California: Mineta Transportation Institute.

Considerations for New Zealand

42. Productivity Commission. (2015). Using Land For housing. Wellington, New Zealand

Opportunities for Residential Development

Developing an intensification index for use in urban areas of New Zealand.

BRANZ

UC UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
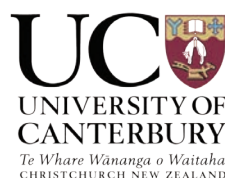CHRISTCHURCH NEW ZEALAND

Opportunities for Residential Development. Developing an intensification index for use in urban areas of New Zealand.

Preface:

This report is part of the BRANZ 2015/16 Building a Better New Zealand – Industry Research Strategy. This comes under the Building better cities and communities stream of work, which focuses on the need to have high performing urban environments reflecting their importance as the main habitat of our society and economy.

To build the cities that New Zealanders have come to expect and have as their aspiration there requires a step change in the delivery of key components that make up a city. To deliver the vision of denser but more liveable urban places we will need to find methods to enable development within our existing urban environments at a greater intensity. New development needs to be part of a much larger puzzle of creating density in our cities that includes transport provision, accessibility, and cohesive urban forms. This intensification index is being proposed as a solution to highlight as an initial step, areas that are suitable for denser development to occur.

Intended Audience:

The intended audience for this report is those interested in ways in which New Zealand could begin to unlock density in our urban centres. Local Authorities, Central Government Departments, Transport Planners, Developers and Construction Industry Professionals.

Title:

Opportunities for Residential Development: Developing an intensification index for use in existing urban areas of New Zealand.

Authors:

Neville, Joshua - University of Canterbury, Department of Geography

Campbell, Malcolm – University of Canterbury, Department of Geography

Dionisio, Rita – University of Canterbury, Department of Geography

Abstract:

Cities need new solutions if they are to carry on growing whilst improving their liveability. A large part of this is the provision of capacity for increased intensification, without spare capacity growth cannot occur. Cities are often faced with difficulties in deciding if they grow outwards, upwards, or a mixture of both. This report examines intensification suitability and aims to inform readers of the factors influencing this suitability. Presented is an index of densification suitability. This index - with Christchurch being used as an example, has been designed to be replicated with data from each of the urban areas around New Zealand. The report concludes with some salient points to consider for New Zealand.

Key Words:

Transportation, Density, Land Value, Urban, intensification, in-fill, infill, accessibility, densification

0.1 Background

The objective of most strategic planning attempts in New Zealand cities is to balance housing affordability, neighbourhood amenity, and to minimise negative environmental effects. Increasingly the focus of new housing supply is for intensification within existing urban areas. Whilst peripheral growth continues, and is an important source of new housing growth, the associated infrastructure costs, congestion, and current preferences toward locations closer to employment centres and walkable amenities, has resulted in demand for building and intensification within existing built-up urban areas. Currently, New Zealand cities are not very successful in delivering increased density in urban centres. Consequences of this lack of success has been rapid increase in house prices and continuing negative outcomes associated with sprawl.

The imperative to assist in achieving intensification has generated demand for the development of a methodology to recognise areas that are most suited for intensification. In this paper a number of different considerations are discussed as factors that are relevant for assessing the suitability of intensification. An argument is introduced as to the most important factors and this index has been developed from these research conclusions.

0.2 Objectives

The key outputs of this report:

› Identify urban factors that contribute to and promote high quality residential intensification
› Distil the most important factors for selecting areas for intensification
› Apply this methodology across Christchurch Urban Area to provide a mesh block level score.
› Provide basemap of densification index online (www.valueuplift.org.nz).

0.3 Approach

The research team identified a number of considerations that would be important for developing the densification index. This included the limitations of time and availability of data that the project team could access as well as consideration of transferability to other urban areas with different data regimes. The approach was then as follows:

› A survey of relevant Australasian studies on infill residential development.
› An in-depth review of the impact that transport, property and parcel level, and market or socio-demographic factors have on influencing development of densification.
› Modelling of the index on available Christchurch datasets.
› Production of a repeatable mesh block index.
› Identification of useful factors not supported by the index.

0.4 Contributing Factors for Residential intensification

Research has suggested that the most important factor for achieving intensification and urban infill is to reduce the risk faced by developers and increasing reward for quality developments (Scrafton & Bredemeijer, 2013). Developers are charged interest rates which are correlated to the level of risk that projects are exposed to. Developers then pass this cost onto consumers of housing, through increased sale prices. Part of the problem of this is that it can increase the cost of intensified development beyond what the market will support, and therefore increases the risk faced by the housing developer. This process of increased risk and higher prices creates a cyclic feedback loop, resulting in less than socially desirable intensification occurring. This problem can however be overcome by governments who introduce supportive measures that can help to reduce developer risk and reduce the costs of intensification (Hayek, Arku, & Gilliland, 2010). These measures can be prioritised so that the best and most suitable areas are the recipient of such investment (Gray, 2009).

New Zealand struggles to achieve high quality intensification outcomes. Most existing examples of intensification in New Zealand has been in two forms: either development of large brownfield sites in which developers can build in a similar model to new greenfield subdivisions, or the developments of individual parcels of land by opportunistic market actors (Sharpin, 2006, Dunbar & McDermott, 2011). Intensification targets are often missed when relying primarily on these two methods, which is an issue when strategically thinking about urban areas and the objectives set out in planning documents. New Zealand has multiple factors working against increasing the desirability of residential intensification, including socio-demographic factors such as cultural attitude not supportive of intensification, a fragmented urban real estate market with multiple owners, lacking developer capacity and experience, inadequate skills in professional industries of real estate, planning, and architecture, affordable and accessible transport, and perhaps the hardest to address – a cultural aspiration for detached housing on a large section (Auckland City Council, 2016. "Intensive Urban Development", 2010. Maré, Coleman, & Pinkerton, 2011). The corollary of all these factors means that a focus on the attributes that make an area more possible or likely for density to occur is needed.

To locate areas that density is most likely or desirable the project identified factors that influences the location of residential infill development. The project team reviewed several studies from across Australasia to identify factors and from this evidence, formed a significant argument to base area wide desirability of density on; socio-demographic factors, transport accessibility factors, and parcel level redevelopment indicators. These were found to be the optimal measures to base the assessment of the likelihood and suitability of locations for intensification within existing urban areas on. There are a number of other considerations that also could be made but due to the limitations of timing and data availability these were not suitable to be included in the index; these are discussed later in this report. A table showing the review and the key findings are included below, further into the report is a breakdown of how each factor is included in the index is included.

Table 1: Studies Reviewed – Residential intensification in Australasia

Study	Location	Key Finding
Pinnegar, S. & Randolph, B. (2012). *Renewing the West: Prospects for urban regeneration in Sydney's western suburbs.* City futures research paper no.13. UNSW, Sydney.	Sydney, Australia	**Influencers on infill locations:** › 400m from Transport › low improvements / unimproved land value ratio › Increased or amalgamated parcel sizes **Other findings:** › A need for public intervention to overcome fiscal implementation gap for infill development
Maré, D., Coleman, A., & Pinkerton, R. (2011). *Patterns of population location in Auckland. Moto working paper 11-06.* Moto Economic & Public Policy Research, Wellington.	Auckland, New Zealand	› Only 30% of growth occurring in built up areas › Higher density is located in areas with High Land Prices **Socio-Demographic findings:** › Clustering of age groups (18-29) and (65+) › Certain Ethnicities cluster › Maori and Polynesian/Pacific Island ethnicity exhibit significant clustering but only in Low density areas. › Higher number of renters in High Price locations › Asian ethnicities, Highly educated, returning New Zealanders, and recent immigrants (Excl. Pacific Islanders) tend to cluster in Higher priced High density areas.
Social & economic research team. (2014). *Auckland dwelling and households: initial results from 2013 census.* Auckland council, Auckland.	Auckland, New Zealand	› 24.8% homes are attached units but only 14.4% of these are apartments. › Most housing is still stand alone. › Home ownership rates are static and now ⅓ now rent, with 80% from private landlords.
Wildish, B. (2015). *Housing choice and preference: A review of the literature. Technical report 2015/19.* Auckland City Council. Auckland.	Auckland, New Zealand	› Housing choice is a process involving: Preferences, market conditions, availability, government regulation, real estate agent influences, peer/social pressures, lifestyle, and socio-economic status. › Historic preferences are overstated as proxy for future development. › Actual preferences matter less as these are modified to fit reality and possibility. › Maori and Pacific people have culturally specific requirements in housing design resulting in strong cultural bias towards standalone dwellings. › Most new homes are only built to the current planning regime rather than to aspirational development aims.

Johnson, A. (2015). *Housing briefing paper.* Child poverty action group. Wellington.	Wellington, New Zealand	› About 1.1 million dwellings in New Zealand › 640,000 (36%) rented, of which 80,000 (12%) are Social Housing › Growth of 18,000 (1.1%) per annum, but 21,000 dwellings consented › 2.6 people per house average throughout NZ, 3.0 people per household in Auckland › $196 Billion (2014) in housing related debt › $768 Billion (2014) market valuation of housing › $1.9 Billion in housing subsidies annually › 80% of new dwellings are detached › Average size 215m^2 › Average construction price of $1,700 per Sqm › Affordability will be the biggest issue in low income tenanted housing, of which there is a significant shortage of high quality low priced housing. › The debate about housing affordability is driven however with discussions of the difficulties in young middle class households gaining home ownership in locations they expect
Joiner, D. (2010) *Sustainable urban behaviour.* Department of Building and Housing. Wellington.	Wellington, New Zealand	› Behaviour modification of developers, architects, planners, and residents is key to achieving density. › Density is related with a reduced energy consumption, with regard to transport and heating › Affordable housing built at the edges exacerbates the problems associated with poverty, increases social exclusion, and reduces social mobility. › Medium density is defined as household density of 30 households per Hectare › Most new density is expensive, targeted at higher end consumers › Difficulties to achieve density are: Acquiring sites of a suitable size, integrating infrastructure delivery with development, regulation costs and timeframes, upfront costs with redeveloping sites, and banking /financial constraints

Newton, P. (2010). *Beyond Greenfields and Brownfields: the challenge of regenerating Australia's Greyfield suburbs*. Built environment.	Melbourne, Australia	› Redevelopment areas require 20 or more contiguous residential parcels with high levels of redevelopment potential. **Density is not occurring due to:** › Lack of exemplars, Lack of regulations and economic incentives for infill development, fragmented and adverse to density built environment industries; who are risk averse and slow responders to market change. › Current infrastructure pricing favours non-renewable energy use › Focus within building research industry on building code, assessment of buildings, and ratings systems – little research into new models and retrofits. › Strata title creates a barrier for redevelopment › NIMBYism is strong in existing suburbs. **Sites with a high redevelopment potential are seen as:** › 0.7–1 land value/capital value ratio › Investments into existing properties continue to be the dominant change in existing suburbs which is a barrier to intensification and results in property owners having an inflated view of value. › Also some properties have preservation values that create a barrier to redevelopment **Opportunities for redevelopment:** › Include public owned property › Planning work occurring › Supportive socio-demographic groups existing Older households present an opportunity for density as their demand is not being well met by supply but there is difficulty in delivery at an affordable price as many new homes are smaller but cost more than existing residences.
Glackin, S. (2013). *Redeveloping the Greyfields with Envision: Using participatory support systems to reduce urban sprawl in Australia.* European Journal of Geography. 3,3. Pp6 – 22.	Melbourne, Australia	› A platform of tools are needed to help bring together community and developers to achieve density › Development is currently failing to be achieved at activity centres and along transport corridors, but is rather occurring sporadically in the Greyfields at a suboptimal level. › Integration of stakeholders could help to achieve land amalgamation, zoning, and to allay community concerns. Redevelopment occurs when there is a: High development potential, when dwellings are over 45 years, area of site is large, or there has been a significant number of nearby demolitions.

| Marrondah City Council. (2016). *Opportunities for residential development: Developing a new housing strategy for Maroondah.* | Maroondah, Australia. | Redevelopment occurring when land value/capital improved value ratio is above 0.7, lots are larger than 700Sqm, housing is > 20 years, but only 30% of parcels meeting this criteria are being developed.
 › To achieve required density optimised layout is needed, as well as additional interventions in neighbouring area
 › More work needs to be done to define what character protection entails
 › 70%/ 30% infill/greenfield is needed
 › Policy often inhibits higher density
 › Existing Dwelling/site size ratios of redeveloped parcels is a good guide for potential of future sites. |

0.4-A Factors influencing intensification

Socio-demographic factors:

When looking at an area wide assessment of the best location for intensification one of the easiest and fastest ways to narrow down on the best locations is to uses socio-demographic indicators. From research a number of elements of densification ready populations have been found. This includes a high number of people in professional employment, these are people generally found seeking an efficiency in their living circumstances to advance their career development coupled with good access to high quality cultural amenities. Another broad group are people aged 50 years and older. As a gross simplification this group of the population are generally looking to downsize existing residential housing to something smaller, easier to manage, and closer to social infrastructure. This group generally has previously had children living at home and find they now need less space and are looking for more housing choice that is easier to maintain and of a higher quality. This group is the largest market in NZ, (making up almost one-third of the population, author's analysis) for high and medium density units for owner occupation within New Zealand (Dunbar & McDermott, 2011). Other groups are also more likely to be good host populations, or groups that generally seek out higher density living scenarios, these tend to be recently returned citizens or newly arrived non-Polynesian ethnicities. These groups have a different expectation in their housing preferences and have been influenced towards higher density living due to international trends and pop-cultural references (Maré, Coleman, & Pinkerton, 2011. Wildish, 2015). Whilst some other factors are worth including such as higher income, there are also factors that are worthy to avoid when seeking locations for density.

Certain ethnic groups are less likely to live in higher density housing due to cultural expectation and requirements that are unsuitable for higher density. Areas with higher levels of Māori or Polynesian populations are less likely to seek higher density housing options. This is generally due to cultural practises that are more suitable for lower density detached housing. For this reason, areas that have higher representation of these ethnic groups need to be assessed in more substantial and meaningful ways to ensure density is a good fit (Maré, Coleman, & Pinkerton, 2011). Care need to be taken to ensure social exclusion does not occur in these circumstances however.

Higher density housing options are generally more accepted and demanded in areas that have higher levels of rental tenure. Areas that have less than 50% owner occupier residential units are more likely to be accepting of residential intensification (Maré, Coleman, & Pinkerton, 2011). This is likely due to the cost reduction and location advantages of more dense urban areas being appealing to those who rent. Another component of this is related to non-owner occupiers being less likely to oppose new development nearby (Maré, Coleman, & Pinkerton, 2011). These groups have a general misconception that they have a lower ability to resist new development. Owners of rental units are also seldom interested in the area that their rental housing is located in aside from when situations occur that are likely to affect their rental or capital returns. This situation is

not ideal but does present an opportunity for more intense development that should be explored by cities struggling with intensification. Areas with high levels of rental tenure are also generally better serviced by neighbourhood amenities, transportation services, and public infrastructure (Johnson, 2015).

Proximity and Neighbourhood Amenity factors.

Most assessments of suitable places for intensification, use measures that assess possible locations in relation to their surrounding environment. Intensification it is seen is best suited to locations that have existing neighbourhood amenity and services. Short distances to major employment centres is desirable. Demand for housing in these areas is likely to be high and these areas often create opportunity for new housing to maximise on the access of existing transit services; which are commonly located nearby. Locations close to employment centres also have been shown to result in higher economic productivity for businesses and higher wages for employees (Pinnegar & Randolph, 2012. Newton, 2010). These factors drive residential demand from people choosing to live in areas that maximise employment opportunities.

For a location to be suitable for intensification it should be in close proximity to four elements. A close proximity of less than 400m of a park - this provides opportunities for residents to exercise and enjoy nearby open space. Within 800m of a local centre - this means that there is neighbourhood services, shopping and facilities within a walkable distance, creating less reliance on motor vehicles. Within 800m of a high frequency bus route - this means that there are travel choice options for future residents. The last factor is to be within 15 to 30mins travel time of a major business centre - this is a key factor, as this will drive demand and has a number of positive outcomes for local economies. These criteria have also been used historically in assessments of where transport orientated development should be located and is the background to land value uplift research (Khor, Et al. 2011. Newton, 2010).

In many cases it may be appropriate for physical and social improvements to be made to an area so it can be made suitable for intensification. Modelling can show which areas would result in the most productive investment by government bodies that would result in increasing the uptake of intensification opportunities and maximising these opportunities that are available. These investments are often made in the hopes that intensification will likely follow, however it needs coupling with supportive land use zoning, and in nearly all cases demonstration projects (Maroondah City Council, 2016).

Parcel level Redevelopment likelihood indicators

Three core indicators can explain the likelihood of an individual property to being redeveloped: the size of the land parcel, the ownership structure, and the ratio of capital investment compared with the land value. These measures can be used in a predictive setting to infer how likely a series of parcels are to being redeveloped. These scenarios can help inform decision makers of the areas to focus on delivering outcomes for intensification (Newton, 2010).

The size of the land parcel is a key factor is the likelihood of a parcel being redeveloped. A study by Newton, (2010) found that parcels that were greater than 2000sqm that had previously had development, were most likely to be redeveloped. The size of land parcel impacts on redevelopment in most cases due to the zoning rules which apply. These zoning rules limit the development area of smaller sites, through application of recession planes, setbacks, and plot ratios. With larger sites the ability to maximise site output is greatly increased due to simplified ownership and approval structures. Larger sites as a result are more likely to have comprehensive, higher density development. Brownfield redevelopment to comprehensive high density residential is common for old industrial sites and the developer risk, and cost scenarios are similar to Greenfield developments.

To expand redevelopment in existing urban areas to areas aside from brownfield sites some innovative thinkers in the urban redevelopment have proposed models for producing development on smaller parcels through the amalgamation of contiguous land parcels. This type of development is increasingly being known as Greyfield development and is in its infancy but, with further research on amalgamation, zoning, regulatory tools, and developer incentives, this may prove to be one of the largest sources of housing intensification for Australasian cities. To do this there is a need to identify areas with high levels land value that have low levels of

capital improvement investment. These areas exist in most cities on the edge of central cities, in the typology of post war suburbs. The land value to capital value ratio can be a very good indicator in the likelihood of a property in being redeveloped to a more intense use. In the research about Greyfield redevelopment this ratio has become known as the property redevelopment indicator (RPI). This measures the value of land as a ratio of the total improved capital value. As this ratio gets closer towards 1, and the value of the land makes up an ever more greater portion of the total capital improved value the more likely it is that a property will undergo redevelopment. Unlike land, capital values seldom appreciate and as buildings become older they are worth less (Khor, et al. 2011. Newton, 2010).

Considerable under investment occurs in Greyfield housing. Therefore land parcels that have a RPI of 0.7 or greater should be the focus of those interested in intensification. These are likely to be properties that the land is valuable enough that the existing development could be demolished and more intense development be built. This building typology typifies the current medium density zoned areas of New Zealand. Whilst current examples of these housing typologies are generally poor, with many built in what is colloquially known as a "gun-barrel style" single parcel, rows of houses, if multiple parcels are amalgamated these sites can become high quality comprehensive development. For New Zealand it is important to find areas that have large numbers of parcels that are ready for redevelopment and work to amalgamate these land parcels. If this can occur the prospects for improved intensification in cities will increase (Glauckin, 2013).

The ownership of properties is an important consideration when assessing the suitability for intensification. Properties that are owned by government agencies, both local and central can almost always form part of a comprehensive medium density development. Most governments at a central or local level hold large land holdings. These government land holdings are now assets that should be exploited for the purposes of building more dense urban development in high growth areas (Glauckin, 2013).

Strata and Unit titles can be a complex factor in redevelopment. The rules that apply to strata titles are complex and make it difficult to redevelop these property types. Some developers are successful in managing to combine the unit titles and redevelop the properties, but this is not common. In some cases there is considerable numbers of owners and a requirement for the 100% agreement of all owners, these situations can add significant risk to developments proposals (Newton, 2010. Intensive Urban Development, 2010).

Densification impediments. Things to avoid:

Unique factors of certain parcels mean redevelopment should be avoided in these parcels. This includes: schools, areas zoned open space, areas zoned heritage, or with heritage elements, and parcels with homes built in the last 25 years on them. All of these are unlikely to be redeveloped for more intense housing and research exists to show that each of these are barriers to a parcel level more intense redevelopment (Newton, 2010).

0.5 Factors included in intensification location index

In the index that has been developed for this project three core factors:

The first is the **accessibility** of an area. This is defined by the level of access to the urban transportation network, and the accessibility to local amenities.

The second factor is the area **redevelopment potential**. This is defined by the amount of redevelopment ready parcels clustered in an area that would allow for higher quality and more comprehensive redevelopment.

The third factor is supportive **socio-demographic** demand elements. These are census based measures that indicate an increase in a population more likely to demand properties that are good examples of higher and denser living. This factor however was not included in the final index due to repeatability issues with data quality. The meshblock data contained much confidentialised or data which is rounded (less than a count of 3), meaning proportions cannot be accurately computed.

The measure of accessibility:

Location is the key choice when choosing where to build or buy housing. We are interested in the proximity of the housing to nearby facilities, to nearby transport, and to local employment opportunities. A consumer in a housing market will locate where their transportation needs and their access to services they use, are best met, and at a price in which they can afford. For this reason the land that is situated in the best locations; the most accessible, is the land that is most expensive. As a consumer usually has limited cash resources, so they will maximise their choice in where they live by reducing their demand for the size of the land that they purchase. As we get closer to the most accessible points in cities the area of land that is used for each purpose gets smaller and smaller. To understand the theoretical basis from which the concept and modelling of has been derived, it is worth considering the spatial equilibrium framework developed through the work of Alonso (1964), Muth (1969), and Mills (1972). This body of work looks at the bid-rent attributes of urban economies and has been termed the AMM model; Alonso, Muth, and Mills model (Higgins & Kanaroglou, 2016).

The perfect model rarely exists in cities and as a result urban areas are a mosaic of densities and land prices. This leaves opportunities that need to be recognised as room for upwards growth in New Zealand cities.

To develop the index, the final choice of a simple accessibility indicator was to use the network distance to nearby district centre from each eligible parcel. Within 200m were given a very high score, 400m were given a high score, within 800m a medium score, and beyond 800m a low score. This measure was averaged based on the mean scores of all parcels within a mesh block. Each meshblock was then had a score of 1 (low) – 4 (very High), which helped form part of the index. Other measures of accessibility it is assumed are taken into account with the price of land, this assumption is not dissimilar to research on accessibility.

A measure of redevelopment potential of an area.

Unlike 'greenfield' or new suburban development, residential intensification rarely occurs in areas where there is vacant or unused land. Whilst some old industrial or commercial 'brownfield' sites are available to developers these represent a small portion of the land required for urban intensification in New Zealand. Most intensification and new residential growth needs to come from existing residential areas known in academic research as 'Greyfield' sites. These sites form the bulk of urban form in New Zealand, representing middle suburbs that were built in the boom years of New Zealand Urban growth following WW2 (Johnson, 2014). These sites have been since the 1990's steadily intensifying as opportunistic builders, developers, and home owners have transformed large standalone family homes on big lots into smaller houses, subdivided sections, cross leases, strata titles, and gun-barrel town houses. Few examples in New Zealand exist of good amalgamated development where redevelopment has occurred comprehensively; in contrast most development is piecemeal and occurs at a parcel by parcel scale. Whilst this provides a number of housing opportunities, there remains a need to identify sites suitable for intensification in a comprehensive and amalgamated manner (Joiner, 2015). This would allow higher levels of density to be achieved, greater economic returns for developers, and better urban design and liveability outcomes for residents of these areas, as well as the surrounding neighbourhoods. Most if not, all the fears that contribute to resistance to residential up zoning come from existing resident's concerns about a loss of neighbourhood amenity and subsequent property price impacts of poorly executed density

To develop the index, four indicators were used to assess the best location for intensification.

The first was the **redevelopment potential indicator (RPI)**. This indicator is the ratio of the land value compared to the capital improved value of land parcels. Mesh blocks where the mean is above 0.7 are considered high and given a score of 2, above 0.6 is considered medium and given a score of 1, and below 0.6 considered low and given a score of 0. The reason that these scores are smaller is due to testing showing this measure over-estimates the redevelopment potential of an area in conjunction with other measures.

The next measure is the amount of **nearby redevelopment**. Suburban areas that are already experiencing the impacts of change are more likely to be anticipating, and supportive of further change. For this measure the each parcel had a recorded figure for the number of properties redeveloped in the last 10 years within 200m Euclidean distance of it. Parcels across the city were then ranked in quartiles, 4 being high levels of nearby development, 1 being the lowest. These scores were aggregated to a mean for a mesh block average

score. These two normalisation techniques smoothed over the effect of outliers.

The next indicator was related to the **dwelling age**. It is assumed that dwelling under 25 years, and over 85 years are in most cases unlikely to be redeveloped and subject to intensification. From properties under 25 years old this is due to capital improvement value, as well as perceived owner value being too high to make economic sense. Dwellings over 85 years also are unlikely to be redeveloped – in some cases due to heritage protection, but in most cases this is due to cultural value being given to these buildings. The scores for each were 1 for under 25 years, 2 for dwellings over 85 years, 3 for over 25 years but under 35 years, and finally 4 for dwellings between 35 years old and 85 years old. Parcels with no buildings were also given a score of 4. These scores were then aggregated to a mesh block level average.

The final parcel level redevelopment indicator was the amount of **remaining developable land** each parcel contained. To calculate this, all parcels were assigned a zoning code and associated plot ratio permissible. The buildings were then subtracted for the parcel area, and then the remaining developable land based on the plot ratio calculated. Scores were allocated per quarters with the top quarter of sections awarded a score of 4, and the lowest quarter a score of 1. This normalisation was carried out to remove any effect of outliers. A mesh block average mean score was calculated.

Socio-Demographic influences:

It was intended at the start of the process of developing an intensification suitability index that socio-demographic scores could be created by using indicators from the census. Indicators that research suggested included, high levels of professional occupations in an area, populations with high proportions aged 55 and over, populations with high proportions of population aged 35 and younger, and higher proportions of new (non-Pacifica) residents, and high proportions of recently returned citizens. These indicators are able to be measured from the census data, however these can only be aggregated at an Area Unit size, with gaps in the Meshblock data meaning consistency was unattainable. This spatial scale is not fine enough to provide meaningful insight as to the most suitable places are for intensified development, smoothing and hiding the smaller areas rather than highlighting and focusing. For this reason it was decided to exclude these measures. Further research is needed in this area as a census based measure would be the most suitable and accessible. A prototype was produced by the authors, but is not made public.

0.6 Combining the factors to create the index

The final stage of creating an index to highlight the best locations for residential intensification involves combining the mesh block area scores for each of the indicators, the one accessibility indicator, and the four redevelopment indicator. Before this step could be carried out or any of the normalisation steps a number of parcels were removed from the analysis due to being unsuitable for intensification. These included heritage protected structures and areas, open space zones, school zones, and other community facilities. These are not considered available or in most cases desirable to redevelop. Each mesh block following the calculation of the scores had a number between 4 and 18. Scores closest to 18 were considered the most suitable for intensification. Scores closest to 4 were considered the least suitable for intensification.

> **The intensification index as such is: ISS = DIST + RDPI + Age_Built + Spr_Land + Nrby_Redev**

Intensification suitability score = Nearby Dist Centre Score + RDPI Score + built age Score + spare land score + nearby development score

When assessing mesh blocks for an urban area the research team found that any mesh block with an ISS (Intensification Suitability Score) of over 14 warranted further investigation. At this point it was worth once again assessing the area based on individual parcel redevelopment potential indicator (RDPI) to try and locate multiple parcels with high redevelopment potential scores. These areas should be the focus of urban regeneration planners and also the development industry when looking for the best places for intensification. The biggest barrier to overcome is then the amalgamation of land parcels, this topic is one that is now being explored in depth to see what the best routes of achieving this are.

0.7 The index as applied to Christchurch

The index was applied to Christchurch data. This data was kindly provided by Christchurch City Council (CCC) who were able to provide parcel level information such as Capital improved values and land values. With this data the number of normalisation steps as discussed above were undertaken. These then were aggregated to a mesh block level. Each of the scores began then to paint a picture as to where the focus for intensification should be in Christchurch City. In Figure One, is an example diagram of the city showing mesh blocks, and highlighted in blue, the ones most suitable for intensification.
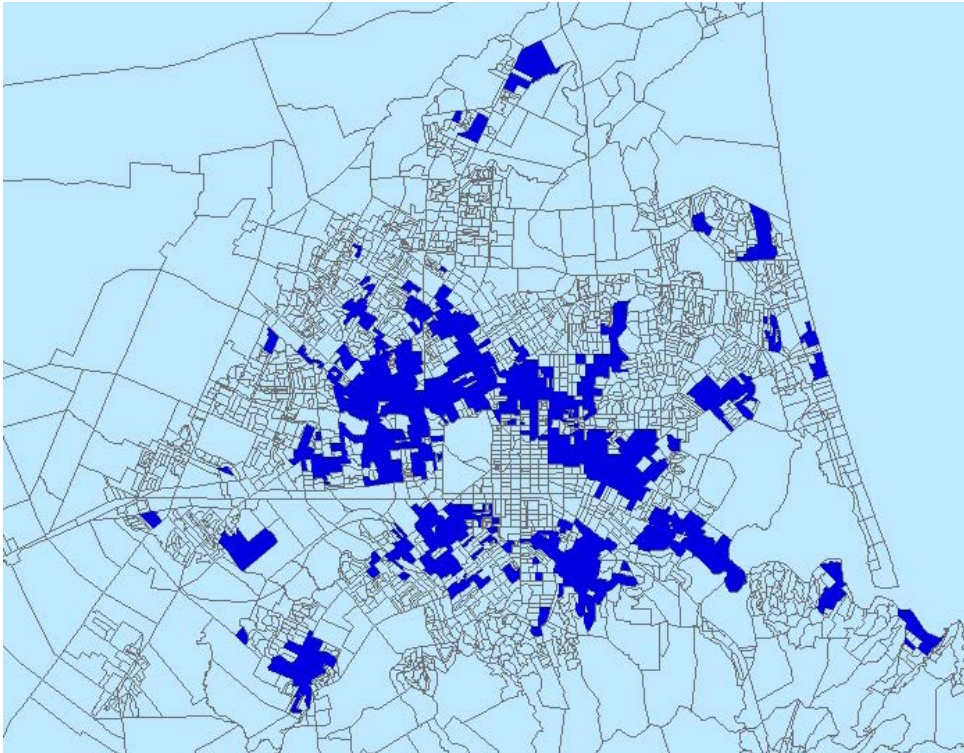

Figure 1- Diagram of Christchurch Mesh block, where areas with high Intensification suitability scores are shown in blue

In Figure One it is easy to see that the areas that are closest to the central city are indicated as suitable, other notable areas are Riccarton, Addington, Shirley, Linwood, New Brighton, and Sumner. In these areas it is most often that there are large villas, and detached housing on larger parcels of land. These parcels have also had significant dwelling increase nearby. The land values are often high in these areas where the building values are low. The only issue with this is that a number of mesh blocks in the wealthier areas of the city in Fendalton, Ilam, Bryndwr are also indicated with high levels of intensification suitability. To generalise, it is due to the fact these homes are often on large sections, of very expensive land. Further work on the indicators would need to be done to remove this anomaly.

When focusing on particular areas you can begin to see how these are able to be redeveloped comprehensively. By redeveloping comprehensively as opposed to piecemeal infill, you are able to create better outcomes: more amenity, more efficient and cheaper developments, and higher density. In the Addington area, where mesh block ISS were high, we can see there is a number of high redevelopment potential scores for individual parcels. This is shown in figure 2. If several properties in this area were to be amalgamated it would be possible to achieve higher density outcomes. We can see along Dickens Street a row of parcels all ready for redevelopment. If a land banker was to purchase these, and was to amalgamate them into a single title and single development, a developer could achieve the high level outcomes that New Zealand planning documents aim for.
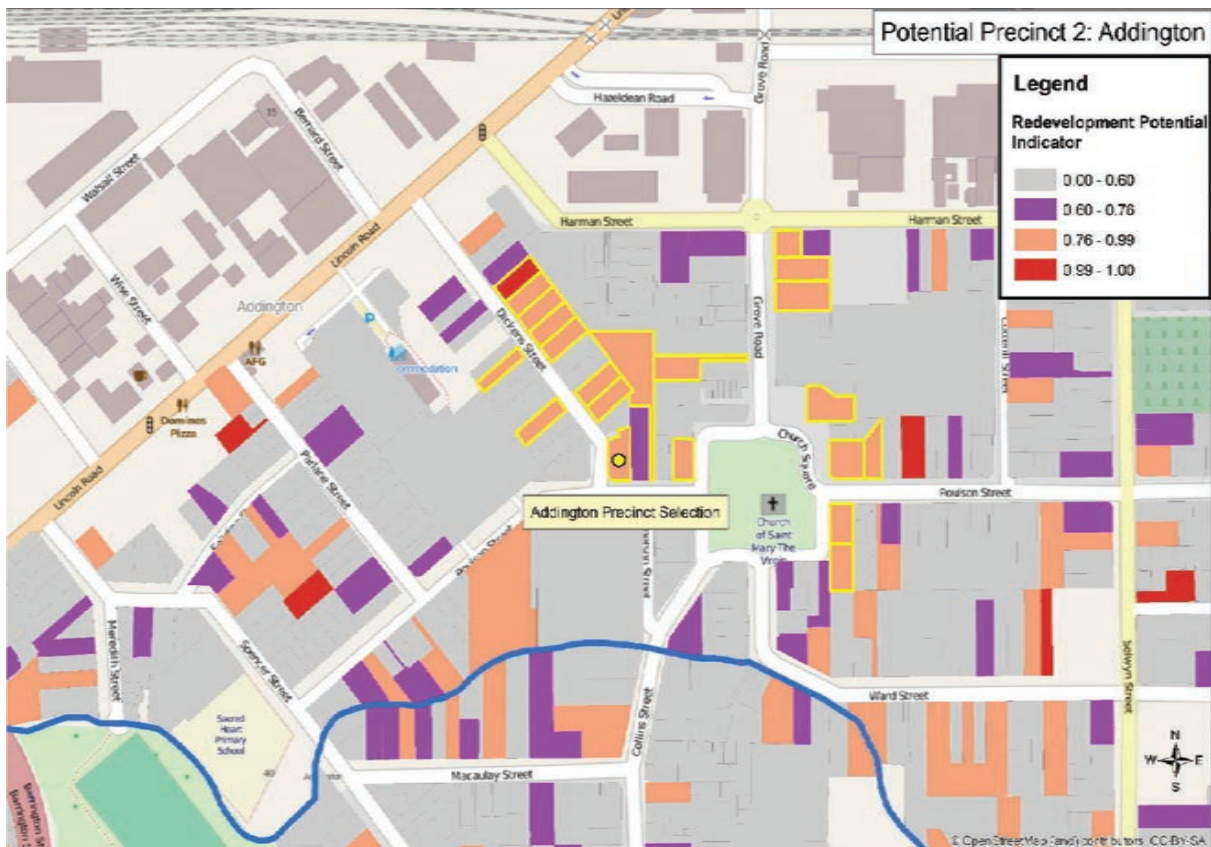
Figure 2 – Example of Addington area – showing high number of parcels with high RDPI

There were a number of other areas that this was applied to, and in each there were precincts that were identified that could be redeveloped comprehensively. This was modelled to show what current development outcomes would likely be, with an average of 4 dwellings per redeveloped site, as opposed to comprehensively developed sites. Comprehensively developed sites were found to take as much as 2× the number of dwelling that the status quo scenarios would. It is for this reason the researchers argue finding areas for intensification is important. This can then lead to higher outcomes for density in our cities.

0.8 Other Considerations that were not included:

With the development of this methodology a number of considerations were evaluated before a decision was made on the final elements of this methodology. Some options were excluded on grounds of poor empirical justification, others were excluded on the basis of the time and resources needed to evaluate their appropriateness and the constraints of these two factors. As such the main omission from the final index was risk from natural hazards.

New Zealand due to its geology, climate, and location has high natural hazard risk. Earthquakes, flooding, droughts, tidal inundation, fire, volcanic eruptions, mass movement, and coastal erosion are all common occurrences throughout the country. Whilst hazards are common, the profile of risk in each area is different based on the climate, and geological environments of the individual areas. This variation makes it difficult to capture a risk factor for each location whilst also correctly evaluating the limitations and opportunities for density. Where in Christchurch land that is low lying with silt substrates might constitute a liquefaction risk, a similar soil type in Auckland may be virtually risk free and very developable site. Likewise building code and compliance requirements vary throughout the country when it comes to risk.

This has created challenges and opportunities for those involved in construction. As we better learn how to deal with the risk of hazards, we may be able to build more intensely on areas affected by hazards. The problem however is that a number of areas have been identified as suitable in the Christchurch Scenario which are not suitable for intensification due to hazard risk, particularly from flooding, coastal inundation, sea level rise and erosion, and Liquefaction.

12

0.9 Building the Intensification Index

It is intended that this index be used in urban areas of New Zealand. To complete this a number of datasets need to be collected and some analysis and modification made to build the indicators.

The two core datasets: An initial Parcel database to attach scores to, and also a mesh block dataset to aggregate scores to.

For the DIST indicator – to build this dataset, the measure of each parcel away from a district centre, a network distance is required to be calculated between each parcel and the polygon representation of nearby district centres. It is important to also represent regional, and central centres as well in this network analysis. This score is then normalised and then averaged for all the parcels in a mesh block.

For the RDPI indicator – to build this dataset, the information of the land value and the capital improved value for each parcel is required. This information is available from district councils. A score based on the ratio is then created and then this is averaged at a mesh block level.

For the Age_Built indicator – to build this dataset, the age of the oldest dwelling on a parcel is assigned to the parcel. A score is then given as per above and then averaged at a mesh block level.

For the spr_land indicator – to create this dataset the size each parcel is required to be known, and also the size of any buildings on the site. The plot ratio is then applied to calculate how much spare land is available on each parcel. These results are then aggregated as an average for each mesh block.

For the Nrby_Redev indicator – to create this dataset all new development/building consents built of the last 10 years are plotted in a GIS system, for each parcel a count is completed for all new development within a 200m radius of the parcel. This data is then normalised as described earlier and then the average of each parcel is aggregated at a mesh block level.

0.10 Considerations for future work

The intensification index as presented here relies on a number of steps to produce the data. This is unfortunate as the availability of this data may vary between centres. The focus on the outcomes of each of the indicators may be able to be applied through the use of a similar dataset however.

More research needs to be carried out in New Zealand to understand when properties are most likely to redevelop to more intense uses. Much of the zoning to date is carried out focusing on centres, transport and accessibility. Seldom is consideration given to individual property and socio-demographic characteristics of areas that make intensification more suitable and allow it to be delivered. New Zealand is failing to meet intensification targets set at central and local government levels, and also to keep up with market demand (Osbourne, 2016). Intelligent intensification that achieves better outcomes is required and this index helps those seeking areas where this is suitable. Only once we begin to focus on whole of area approaches rather than site by site approaches will we see cities redevelop and intensify in a meaningful way.

0.11 Bibliography

Alonso, W. (1964). *Location and Land Use – Towards a general theory of land rent.* Cambridge, Massachusetts: Harvard University Press.

Auckland City Council. (2016). Housing Challenges: exploratory insights into views on the housing & growth challenges facing Auckland.

Dunbar, R., & McDermott, P. (2011). *Improving the Design, Quality and Affordability of Residential Intensification in New Zealand* (Rep.). Auckland: CityScope Consultants.

Glackin, S. (2013). Redeveloping the Greyfields with Envision: Using participatory support systems to reduce urban sprawl in Australia. *European Journal of Geography.* 3,3. Pp6 – 22.

Gray, N. (2009). *Smart Growth Management implementation issues report.* (Rep.). Tauranga.

Hayek, M., Arku, G. & Gilliland, J. (2010). Assessing London Ontario's brownfield redevelopment effort to promote urban intensification. *Local Environment 15.* 4.

Higgins, C. D., & Kanaroglou, P. S. (2016). Forty years of modelling rapid transit s land value uplift in North America moving beyond the tip of the iceberg. *Transport Reviews, 1647*(April). doi:10.1080/01441647.2016.1174748

Intensive Urban Development in New Zealand: Developer Experience. (2010).NZPI/ API Conference.

Johnson, A. (2015). Housing briefing paper. Child poverty action group. Wellington.

Joiner, D. (2010) Sustainable urban behaviour. Department of Building and Housing. Wellington.

Khor, L., Meyer, B., Bertram, N., Murray, S. & Ramirez-Lovering, D (2011). Infill Design Opportunities. Monash

Maré, D., Coleman, A., & Pinkerton, R. (2011). Patterns of population location in Auckland. Moto working paper 11-06. Moto Economic & Public Policy Research, Wellington.

Mills, E. (1972). *Urban Economics.* Glenview: Scott Foresman.

Muth, R. (1969). *Cities and housing: the spatial pattern of urban residential land use.* Chicago: University of Chicago Press.

Newton, P. (2010). Beyond Greenfields and Brownfields: the challenge of regenerating Australia's Greyfield suburbs. *Built environment.*

Osborne, P. (2016). *STATEMENT OF EVIDENCE OF PHILLIP MARK OSBORNE ON behalf of the Housing New Zealand Corporation – before the Independent hearings panel in the matter of the Christchurch Replacement district plan on the matter of additional residential medium density areas (Tech.). Christchurch.*

Pinnegar, S. & Randolph, B. (2012). Renewing the West: Prospects for urban regeneration in Sydney's western suburbs. City futures research paper no.13. UNSW, Sydney.

Scrafton, C. & Bredemeijer, W. (2013). Urban Intensification in a regional New Zealand City. *Quality Planning Journal, NZPI*, Wellington.

Sharpin, A. (2006). Urban Development Strategy working paper 6: The Social and Environmental Effects of Residential Infill Development in New Zealand. Wellington.

Social & economic research team. (2014). Auckland dwelling and households: initial results from 2013 census. Auckland council, Auckland.

Wildish, B. (2015). Housing choice and preference: A review of the literature. Technical report 2015/19. Auckland City Council. Auckland.