Measuring Neighbourhood Sustainability in New Zealand

Paper for UPE7: World Class Cities – Environmental Impacts and Planning Opportunities

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Abstract

The term 'world class cities' implies urban areas that offer a high quality of life that is, presumably, sustainable. Yet many 'world class' cities host neighbourhoods that are far from that. This paper explores the concept of neighbourhood sustainability in the context of world class cities. It argues that world class cities need to be built on world class neighbourhoods. It then discusses how neighbourhood sustainability might be framed and measured through a discussion of the development and testing of a Neighbourhood Sustainability Framework (NSF) in New Zealand. That Neighbourhood Sustainability Framework aims to improve neighbourhood sustainability in both existing and new neighbourhoods in New Zealand. The Neighbourhood Sustainability Framework has been tested by applying it to seven case study neighbourhoods using an assessment tool drawn from LEED-ND and data generated through surveying neighbourhoods. This paper draws on the case study findings and explains why neighbourhood sustainability can not be reliably assessed by looking at the built form alone and that an assessment of resident perception and behaviour needs to be an integral part of any meaningful neighbourhood sustainability framework.

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Introduction

According to the background to this conference, world class cities are said to be cities that host and sponsor a high quality of life for residents and visitors, aim for environmental improvement, creativity, and freedom and celebrate cultural assets and this is supported in work by Gerhard (2003), Knox (1995) and Taylor (1997;2000) among others. New Zealand is one of those countries that have aspirations for its largest city, Auckland, to become a world class city. But what does this mean?

Auckland is already fifth of 215 cities, according to Mercer Consulting's annual "World-wide Quality of Life Survey" (2006), when assessed on factors that include the political, social, economic and environmental, ahead of cities that already claim 'world class' status. But for people living in some neighbourhoods in Auckland, the quality of life does not feel as though it is close to the world's best. In other neighbourhoods, the quality of life may be sweet for the residents, but the neighbourhood itself encourages behaviours that are environmentally and socially unsound such as intense car use, low levels of participation in civic life and low levels of interaction and participation at the local level. How do we make sense of this in the context of 'world class cities'?

Part of the problem with the concept of world class cities is that it tempts us to ignore or avert our gaze from the inner workings of our cities. Many of our so-called 'world class' cities host neighbourhoods that are far from meeting any of the criteria associated with being liveable, sustainable, optimising human capacity and capability, or providing environments that promote social and economic well-being. It is easy for us to acknowledge this in relation to extreme examples such as the slums of Rio de Janeiro (Botas, 2003). It is less easy to admit to these in the North and the West. The Parisian slums have only recently been acknowledged (Bhattacharjee, 2006). But perhaps even more difficult is to admit that many 'ordinary'

neighbourhoods in many cities, including world-class cities, fall short of meeting the criteria of being world class, let alone being able to sustain a world class quality of life.

We suggest that world class cities should generate world class neighbourhoods and without world class neighbourhoods, the application of the term 'world class city' is the equivalent of the emperor with no clothes. If this is the case, how do we know what a sustainable neighbourhood is? How can we assess a neighbourhood and identify the critical points at which interventions are required to improve the liveability and sustainability of neighbourhoods? In the remainder of this paper we wish to present how Beacon Pathway Ltd is addressing those issues in the New Zealand context.

Urban New Zealand Neighbourhoods

Urban neighbourhoods are very important to sustainability in New Zealand because, although small in both land area and in population, New Zealand is a highly urbanised country and has been since the 1880s. Over 80% of the 4 million residents live in urban areas (Matthewman, 2001), with almost half the population living in the eight largest cities (BigCities, 2003). These cities are Dunedin, Christchurch, Wellington, Hamilton, Manukau, Auckland, Waitakere and North Shore City and four of these (Manukau, Auckland, Waitakere and North Shore City) are within the Auckland Region. The seven case study neighbourhoods were undertaken in these largest cities: two in Christchurch, one in Wellington, one in Manukau, one in Auckland and two in Waitakere.

The urban population of these larger cities is increasing, especially within the Auckland Region, and has a set of characteristics that distinguish it from the smaller cities and rural areas. City populations within New Zealand are, for example, very mobile, with 40% having shifted at some time during the past 5 years. They are also more ethnically diverse than the rest of New Zealand, especially with respect to Pacific and Asian populations, and the median age tends to be younger (Statistics New Zealand, 2003). Along with these factors, New Zealand's housing needs are changing. Many of our existing houses were built to cater for the traditional two-parent-and-several-children family. Statistics New Zealand (2003) predicts this 'conventional' family unit, while still dominant, is on the decline: Couples with no children is the largest growth sector in family types, one person households also show strong growth, and the number of two person households are expected to remain static or decline slightly by 2012.

Several suggestions have been made with respect to the sustainability of these large urban areas in New Zealand. These include planning for long term growth, managing and minimising waste streams, preserving biodiversity and air quality and increasing the use of alternatives to the use of private motor vehicles among others (BigCities, 2003).

In the Auckland Region, for example, the Auckland Regional Growth Strategy (ARGS) encompasses a number of strategies for managing the needs of its growing population and has determined the need for the city to grow 'up' not 'out' by

increasing the number of medium and high density developments – townhouses, multi-storey units, apartments and terraced housing - in place of stand-alone houses (Auckland Regional Council, 1999). Alongside the ARGS, the Auckland Regional Land Transport Strategy aims to provide affordable, safe and fuel-efficient transport alternatives to private cars for the city's residents. In conjunction with the ARGS, it plans to develop new housing centred around new and existing transport routes. It envisages a transport system that is safe, efficient, affordable and environmentally sustainable, and can cope with the demands of a projected larger population (Auckland Regional Council, 2005). Other cities, such as Christchurch and the cities in the Wellington region are considering and acting on similar mechanisms to enhance sustainability.

The Beacon Mission

It is within this context, together with global climate change and new international treaties for collective environmental responsibility (like the Kyoto Protocol), that Beacon Pathway Ltd (Beacon) developed its goal where New Zealanders will all live in:

Homes and neighbourhoods
that work well into the future
and don't cost the Earth

Beacon is a research consortium funded partially by the NZ Government through the Foundation of Research Science and Technology (FoRST) and partially by local government and business shareholders concerned with the built environment (see http://www.beaconpathway.co.nz for more information).

Beacon is concerned with the sustainability of dwellings, but it is also concerned with neighbourhoods. Scale is important - some things happen at a neighbourhood level that do not, indeed cannot, happen at either a city level or a household level. Beacon recognises that the sustainability of individual dwellings depends also on the constitution of the neighbourhood's built environments. Consequently, Beacon's goal for neighbourhoods is that:

Every new subdivision and any redeveloped subdivision or neighbourhood from 2008 onwards to be developed with reference to a nationally recognised sustainability framework.

Beacon's focus for neighbourhoods, encompasses buildings, infrastructure and space such as green and open space as well as connecting and dividing spaces. Neighbourhoods form an important connection between these levels as well as having particular functions of their own and by understanding the nature of sustainable neighbourhoods, Beacon intends planners and people in the building and construction industry to better understand and develop the designs, construction techniques, products and materials and approaches that will be required if our neighbourhoods are to last.

Defining Neighbourhoods for a Sustainability Framework

It is tempting to prescribe neighbourhoods in terms of a local unit consisting of a set number of dwellings but research into neighbourhoods shows that the size and boundary of neighbourhoods varies from society to society. Moreover, the residents who live within local areas self-define neighbourhood boundaries. In some cases there is a high degree of resident consensus around the boundaries of neighbourhoods, in others the boundaries of neighbourhoods are much more amorphous and ambiguous. What is clear, however, is that neighbourhoods are spatial nodes in which households and dwellings are clustered.

Neighbourhoods provide for residential functions and may facilitate non-residential functions through a built environment that allows for the interconnection and mutual use of infrastructure and services among neighbours and neighbouring dwellings. Neighbourhoods include the connecting spaces between individual dwellings, other structures and to the wider city system and are arenas of casual interaction as well as being a key site of the routines of everyday life. The boundaries of neighbourhoods are loosely defined but typically extend beyond a household's directly adjacent neighbours.

Over the last two and a half years Beacon's Neighbourhood Research Team has used this definition to work on the development of a Neighbourhood Sustainability Framework (NSF) that supports Beacon's aim. This framework has been tested through the application of the draft LEED-ND assessment (Congress for the New Urbanism *et al.*, 2005) and through data generated through the 'Place Where You Live' survey, which is based on instruments that Mike Jenks and Katie Williams at Oxford Brookes University have been using to assess aspects of sustainability and the built environment. That framework and the tools we are developing to measure neighbourhood sustainability and identify critical intervention points are aimed at maximising positive neighbourhood environmental, social and economic outcomes and mitigate the inevitable impacts of human settlement and human activities. They are being developed in such a way as to allow their application to both existing and new neighbourhoods and are directed at supporting both new design and neighbourhood retrofit and regeneration.

The Beacon Neighbourhood Sustainability Framework

Drawing on international experience and local knowledge, the Beacon Neighbourhoods Research Team established that neighbourhoods tend to work well when characterised by housing satisfaction (notably housing satisfaction is also determined by neighbourhood satisfaction); an acceptable physical appearance of the neighbourhood including low levels of dilapidation; safety in the street both from traffic and other people; low noise disturbance; access to facilities and services; access to other sites in the settlement system; manageable cost of both residence in the neighbourhood and in connecting to other parts of the city system; ability to have pleasant, friendly and non-threatening casual social relations; ability to provide opportunities for neighbourhood action on local issues, and low tenure mix.

With further investigation, the team concluded (Saville-Smith *et al.*, 2005) that the critical sustainability issues affecting and affected by the built environment at the neighbourhood level in New Zealand are as follows:

- *The motor vehicle*. Greenhouse gas emissions, stormwater pollution and air pollution are caused by vehicle emissions. Time spent travelling in motor vehicles has significant social and economic costs and presents the second highest direct costs to households. Those unable or unwilling to drive are at risk of social exclusion and marginalisation. Walking is associated with neighbourhood interaction and increased informal surveillance. Neighbourhood form impacts on both motor vehicle use and walking.

- *The quality and nature of public space*. Public space can generate interaction, provide local natural habitats, act as stormwater mechanisms, increase walking and provide for creative and physical activities. Design quality of public space is key to achieving these and other desirable outcomes.

- *Flexibility and adaptability*. Robust neighbourhoods stand the test of time, thereby avoiding neighbourhood decline and the associated social and economic costs. Key action pathways to ensure flexibility and adaptability include a mixture in building typology and dwelling size, mixed use, local facilities and the availability of public transport.

- *Higher density*. Density intensification can reduce sprawl, reduce the amount of land that is taken out of natural ecosystems, generate population critical mass, affect travel and neighbourhood behaviours. Higher density improves the viability of town centres and public transport and directly affects travel behaviour. Higher land prices encourage the market to reduce lot sizes. Intensification, whether through pricing or through regulation, is occurring in many neighbourhoods and presents challenges to current neighbourhood built environment design and the construction of the buildings in them.

We suggest there are six critical domains of neighbourhood sustainability (Figure 1).

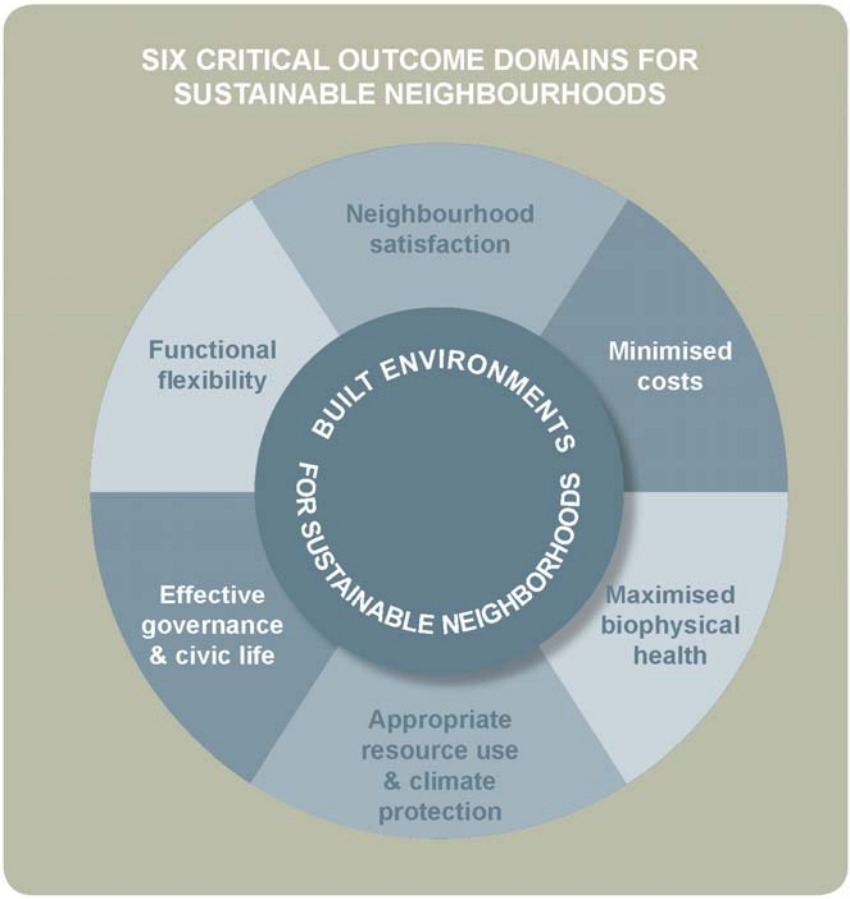

Figure 1: Six Critical Outcome Domains for Sustainable Neighbourhoods

Recognising that neighbourhoods are dynamic, unique in their development histories, their built environments, their population and their geographical and socio-economic positioning within the broader settlement, these six critical domains, together with three built environment elements, were identified as underpinning neighbourhood sustainability and form the basis of the prototype Neighbourhood Sustainability Framework. This is illustrated in Figure 2 and further described in Table 1.

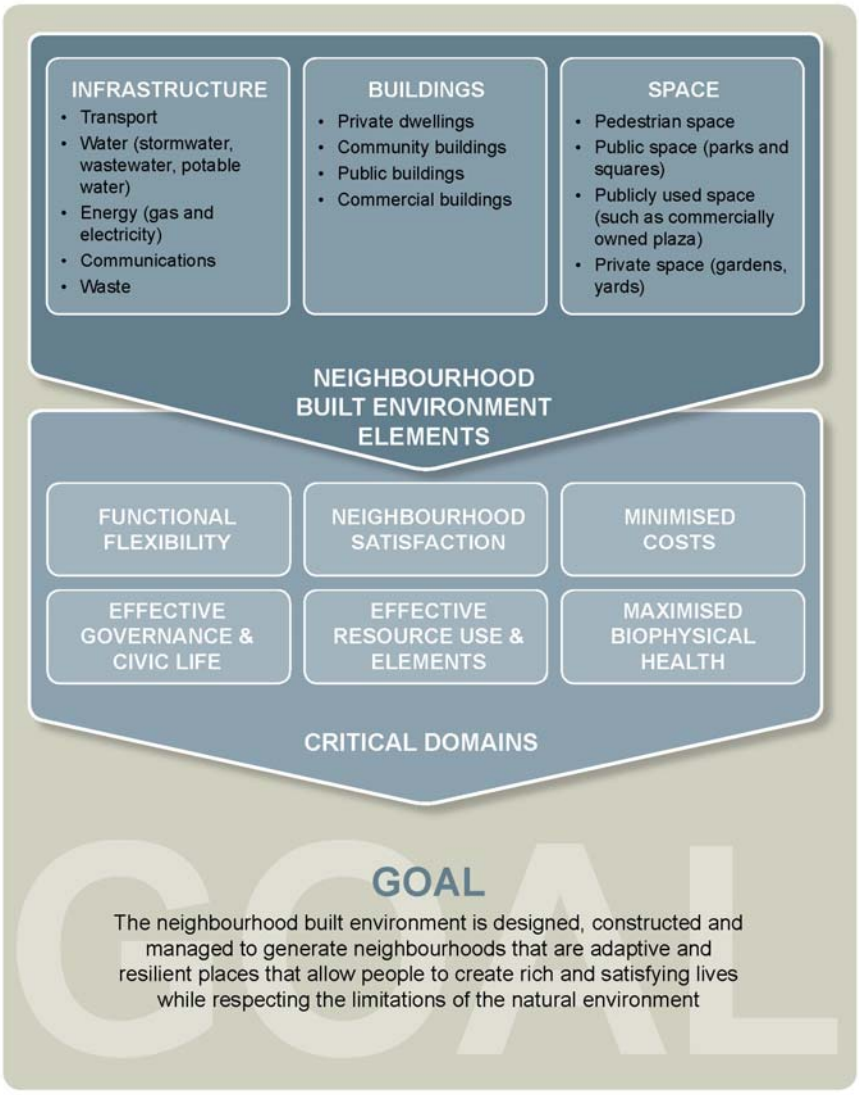

Figure 2. Goals, critical domains and elements for sustainable neighbourhoods (Saville-Smith *et al.*, 2005).

Critical Domains for Built Neighbourhood Environment Outcome	Functional Flexibility	The built environment can be continuously adapted to the needs of diverse and changing populations, social, economic and environment conditions: ▪ adaptability to changes in household structure ▪ adaptability to changes in transport costs and choices ▪ adaptability to changing ethnic and socio-economic mix of the population ▪ adaptability to the effects of climate change

	Neighbourhood Satisfaction	The built environment maximises the key determinants of neighbourhood satisfaction: ▪ housing quality ▪ durability and low levels of dilapidation ▪ street safety ▪ low noise disturbance ▪ opportunities for casual social interaction ▪ opportunities for enclave living.
	Minimised Costs	The built environment minimises the direct and indirect costs and cost uncertainty for households and cities associated with: ▪ travel ▪ dwelling and section provision, maintenance and repair ▪ infrastructure provision, maintenance and repair ▪ facility provision, maintenance and repair.
	Effective Governance and Civic Life	The built environment encourages: ▪ casual social interaction at street level ▪ access to neighbourhood and city wide facilities and amenities ▪ equitable access to basic services and amenities for children and adults with diverse levels of mobility within the neighbourhoods ▪ formal interaction and spaces for formal interactions for neighbourhood governance, civic participation and government.
	Appropriate Resource Use and Climate Protection	The neighbourhood built environment encourages resource efficiency, resource conservation and the use of more sustainable resources in relation to: ▪ maximisation of dwelling performance ▪ land consumption ▪ transport energy consumption ▪ energy and other resource sources ▪ sustainable and renewable sources of energy, potable water and materials. ▪ lifecycle impacts

	Maximised Bio-physical Health	The neighbourhood built environment is designed to protect and enhance the biosphere, with particular focus on:: ▪ reducing negative impacts on air quality ▪ ensuring aquatic health ▪ protecting/enhancing biodiversity and soil quality
Neighbourhood Built Environment Elements	Infrastructure	The fixed physical elements associated with shared services, including water infrastructure (wastewater, stormwater and potable water), transport infrastructure (roads, footpaths, cycleways, public transport), energy infrastructure (gas and electricity), communications infrastructure (phone, cable TV, etc) and waste infrastructure (e.g. recycling depot)
	Buildings	Neighbourhood buildings include private dwellings, community buildings (such as schools or a community house), public buildings (such as libraries or a town hall) and commercial buildings. Some private buildings have a public use, such as cafes, bars or the foyer of an office building or apartment complex.
	Space	Space is the area not covered by buildings or infrastructure. It includes private space (such as gardens), public space (such as parks and squares) and publicly used private space (such as a privately owned square in a shopping complex).

Table 1. Definitions and descriptions of terms (Saville-Smith et al, 2005).

Testing the Neighbourhood Sustainability Framework Prototype

In developing the Neighbourhood Sustainability Framework, the strategic intent is to contribute to New Zealand's capacity to:

- Identify, monitor, design and develop/adapt neighbourhoods which function sustainably.
- Assess the behavioural impacts of different neighbourhood forms, including whether claims and assumptions result in more sustainable lifestyles.
- Improve the capability and capacity of the construction industry, developers and regulatory agencies to develop medium density and mixed use neighbourhoods in a sustainable manner.
- Provide tools and systems to assist in quantifying the costs, benefits and trade-offs when developing and implementing sustainable designs in retrofit, greenfield, medium density and mixed use neighbourhoods situations.

The Neighbourhood Sustainability Framework cannot, however, achieve those strategic objectives if it does not provide a robust, evidence-based approach, which is nevertheless accessible to practitioners engaged in the design, building and management of neighbourhoods. For the Neighbourhood Sustainability Framework to be usefully operationalised, tools needed to be developed that could assess the six critical domains and three built environment elements as well as provide appropriate indicators for each domain, allow for adequate differentiation between neighbourhoods and involve the collection of data that can be practicably and cost-effectively accessed.

During 2005 and 2006 we tested the Neighbourhood Sustainability Framework by attempting to measure neighbourhood sustainability under different neighbourhood conditions through a case study methodology involving seven neighbourhoods; testing and refining the Neighbourhood Sustainability Framework framework by utilising international neighbourhood assessment tools; and establishing the range of information needed to provide robust assessments of neighbourhood build environments that are associated with different residential perceptions and different behaviours among residents.

As an observational assessment tool we applied the draft LEED-ND (Congress for the New Urbanism *et al.*, 2005), which aims to assess built environment sustainability and is focused on new developments as an assessment tool at the planning stage.. Its indicators and measures appeared to align well with the Neighbourhood Sustainability Framework. In applying LEED-ND to existing, and sometimes quite old, neighbourhoods, we used the LEED-ND tool in quite a different manner to that for which it was developed however, and this required some adaptation mainly to make it relevant to the NZ context by replacing US standards and laws with New Zealand equivalents. LEED-ND contains a number of prerequisites and credits that are grouped into four sections:

- **Location Efficiency** assesses the location of a new development in terms of previous land use, sprawl, infrastructure, services and employment.

- **Environmental Preservation** assesses the development in terms of its impact on the immediate natural environment, including soil quality, stormwater issues, habitat protection and riparian management.

- **Compact, Complete & Connected Neighbourhood** assesses issues such as density, housing diversity, the presence of social housing, public transport, walkability and the reuse of historic buildings.

- **Resource Efficiency** covers issues such as communal alternative water and energy infrastructure and waste management.

Each credit results in the awarding of one or several points and overall the tool is weighted to place particular importance on reducing car travel, increasing walkability and reducing sprawl.

We also surveyed neighbourhood residents using “The Place Where You Live” comprehensive, self-complete questionnaire adapted from two surveys developed by Oxford Brookes University in the context of their research into compact and

sustainable cities (Jenks and Williams, 2005). The survey was used to complement and to expand the LEED-ND assessment data in that it:

- Generated a profile of resident participant perceptions, behaviours and experiences of their neighbourhoods.

- Allowed us to test the extent to which 6 critical domains were amenable to direct measurement through residents' self-disclosure.

- Allowed us to test the robustness of neighbourhood sustainability rankings generated by LEED-ND.

The tools were applied to neighbourhood case studies that fitted a case frame that allowed us to analytically contrast between cases with different density conditions, and cases with different use conditions. We also included within the case frame a 'branding' criteria, for those neighbourhoods that have been branded as sustainable. This ensured that the selection of case studies allowed us to compare the neighbourhood characteristics and sustainability outcomes of neighbourhoods branded as sustainable neighbourhoods with those not marketed in that manner. In addition, because of the potential impact of housing classes on the social and economic resources in a neighbourhood, a measure has been included in the case frame to reflect this in the form of above average and below average housing access limit compared with the settlement average.

To generate a case set that represents permutations of all the characteristics within each of the neighbourhood condition categories would exceed the resources available to this project. For that reason, we used the technique of illustrative clusters. These clusters focus on particular sets of conditions that are, or appear to be emerging as, the neighbourhood conditions that are typically of concern to stakeholders. They are:

- Retrofit

- Greenfield/Brownfield Urban

- Greenfield/Brownfield Suburban

This, combined with the resource limits within the research project, generated the case frame set out in Table 2.

	Density	Use	Branding	Housing Access Limit
Greenfield/Brownfield Urban	1 higher density	1 mixed 1 single use		1 higher
Retrofit	1 higher density 1 lower density	1 mixed 1 single use	1 sustainable	1 lower
Greenfield/Brownfield Suburban	1 lower density 1 higher density	1 mixed 1 single use	1 sustainable	1 lower 1 higher

Table 2. Case Study Selection with Illustrative Clusters

In addition we identified secondary criteria which have been identified to manage confounding factors. Those variables are:

- Geographical location – The geographical location of neighbourhoods within both their immediate 'parent-settlement' and also nationally may be attached to variables that influence both the need and opportunities for neighbourhood adaptation. Those variables include cultural differences, north-south differences and also differences associated with ethnic mix. Geographical location is also important with regard to the particular position a location has in regional and national economies, may have implications for the structure of territorial governance arrangements and may also influence the acceptability and meanings of neighbourhood sustainability for local communities.

- Settlement age - Settlement age can have a profound affect on the shape, form and engineering of neighbourhood built environments, the connections that a neighbourhood has to transport infrastructure, the current capacity and adaptability of the built environment.

- Infill – Like settlement age, the use of infill may have an affect on the current capacity of the built environment and its adaptability.

The selection of case studies was also informed by practical considerations. In particular, the availability of the comprehensive range of data required for the case study itself and the willingness of local stakeholders to participate in the case study process. The specific case study areas were defined by significant roads as well as by the LEED-ND focus on access to various facilities within an 800m walk from the case study area. The selection of boundaries has been done in conjunction with

advice from the relevant local authorities to ensure the scale and size of each case study is reflective of what a neighbourhood might reasonably be in the given area.

Eighteen possible case studies were identified by the research team and then assessed against the case frame. Three case studies were selected for the initial phase of the project, after which the tool was amended, and a further four were identified for the second phase. The case studies are Harbour View (Waitakere City), Blake Street, Ponsonby (Auckland City), Petone (Hutt Valley City), Christchurch East Inner City (Christchurch City), Aranui (Christchurch City), Waimanu Bay (Waitakere City) and Dannemora (Manukau City).

Case Study Summaries

Harbour View

higher density, mixed use, sustainably branded, higher cost suburban greenfield

The section of the Harbour View development that was studied consists of 249 dwellings and three commercial properties. There is a mixture of townhouses (duplexes or terrace style houses) and free-standing dwellings, with a small number of apartments above a block of shops. The development is within easy walking distance (less than 800m) of the Te Atatu Peninsula town centre where a wide variety of shops, services, restaurants and cafes are available. Te Atatu Intermediate School is within walking distance and Rutherford College and Primary School are also nearby. However, a four-lane road (Te Atatu Rd) without pedestrian crossings separates the development from the college and primary school. Extensive walking tracks and outdoor recreational opportunities (including a skate park, playground and petanque court) are also available within walking distance. There are bus stops available close to the development but the bus service available on the peninsula is poor.

Key Positives	**Key Negatives**
• Good walking environment • Good range of services available locally • Protection of lower terrace from development • Stormwater mitigation • Slow narrow roads	• Poor public transport service. • Lack of affordable housing. • Very large dwellings. • High run-off (however this is treated and detained). • Street trees ad hoc and in poor condition. • Poor walking connection to western

• Excellent provision of public space • High level of resident satisfaction with the degree of privacy, the condition of their house, their dwellings out door environment and parking amenities.	side of the peninsula and Rutherford high school and primary school. • Low use of public transport, walking and cycling on journey to work. • Low degree of neighbourhood social contact. • High degree of use of services outside local area.

Table 3. Key Positives and Negatives for Harbour View.

Even though the study site itself does not contain any outstanding ecological features it forms part of a larger area, commonly referred to as Harbour View, that contains extensive wetlands and significant habitats for several native bird species on the lower terrace. The wetlands are buffered from the development area on the upper terrace that is the subject of this study.

Aside from Te Atatu Rd, Harbour View was observed as being a neighbourhood that is very walkable. Roads are narrow and quiet and, even though footpaths are not provided on all roads and most roads only have a footpath on one side, walking within the neighbourhood and to the adjacent town centre seems easy, safe and convenient. Pedestrian spaces and other public open spaces seemed pleasant and largely cared for. All are overlooked by houses, providing passive surveillance to those public spaces. Harbour View's quality public space and good walkability was confirmed by an independent urban design assessment.

The extensive lower terrace appears to buffer the sensitive coastal environment and associated habitat well from the developed area on the upper terrace. Stormwater is treated via stormwater ponds and wetlands in the lower terrace before being discharged into the sea. Access to the lower terrace is via boardwalks, therefore protecting ecologically sensitive areas. The walkways along the coast appear to be well used and extend to the south and north of the development.

There are several small neighbourhood reserves in the development and these provide for a variety of activities, such as a small children's playground, petanque and informal seating. The research team did however note that the raised, concave nature of some of the reserves made them less usable for ball games and the like. The streetscape appears pleasant but it was noted that street trees are ad hoc and often in poor quality.

The neighbourhood is reasonably affluent and characterised by large luxury dwellings near the waterfront and smaller higher density dwellings closer to the town centre. Section sizes are small and dwellings large; the rate of impermeable surfaces is therefore high. Densities increase towards the town centre and the development includes a group of smaller dwellings targeted at older persons near the town centre.

There are a few commercial buildings on the town centre edge of the neighbourhood and one of these is mixed use with apartments above retail space. The development also contains a commercial early childhood centre at the southern end. The housing stock should age well and the risk of dilapidation is considered to be low (leaky buildings aside). More generally, the Harbour View neighbourhood is marketed as executive, exclusive and desirable and dwellings are promoted as low maintenance and easy care. Some areas have sea and city views and there is access to a bathing beach. Marketing targets busy people, and families as well as those approaching retirement. It is presented as safe, private, close to amenities and facilities and with easy access to the motorway. Car parking is emphasised but so too is the walkability of the neighbourhood.

Petone

higher density, mixed use, older neighbourhood

The neighbourhood consists of 657 dwellings and contains a variety of dwellings from over 100 years old to less than one year old. It started out as relatively low cost workers housing but in recent years the area has become more upmarket, with Jackson Street (a heritage street) attracting people from the wider Wellington region. Bus services are regular, a train service exists at the western end of Petone and a ferry service into downtown Wellington was recently established. There are two full primary schools (year 1-8) and early childhood centres available locally, however there is no local secondary school. All residents are within easy walking distance of Petone beach and the associated reserve, and there are a number of smaller neighbourhood reserves and an extensive sports grounds available within walking distance. The area has a high percentage of impermeable surfaces and some contamination is present due to its previous use.

Key Positives	**Key Negatives**
• Good walking environment. • Good range of services available locally. • Good bus service available. • Very diverse neighbourhood. • Some affordable housing present. • Residents mainly use local services	• Lack of pedestrian crossings on The Esplanade. • No high school nearby. • Majority of residents felt that fast moving traffic was a problem that made walking unsafe.

and most access these by walking. • High level of casual interaction among neighbours.	

Table 4: Key Positives and Negatives, Petone

Petone is very walkable, with a wide variety of local services available in walking distance and a streetscape that is interesting and functional. Several of the residential streets are designated “Slow Zones” and have traffic calming measures. While there are issues with cars parking on the footpath and poor building/street interface in the light industrial area in the west of the study area, this is unlikely to be a significant deterrent to walking, although walking after dark in this part of the neighbourhood may be less pleasant and there are alternative routes available to access the train station or bulk retail areas from the main residential areas. The independent urban design assessment concurred and rated walkability for Petone as very high.

The housing stock in Petone is extremely diverse which appears to have adapted well over the last 100 or so years, catering for a wide mix of people. Small old workers cottages are adjacent to 1970s flats and newer town houses and there appears to be relatively affordable rental housing available alongside renovated owner occupied workers cottages. Although the neighbourhood features some buildings and small developments with extremely poor urban design, this appears not to affect the overall walkability and attractiveness of the area and Petone seems like a socially inclusive neighbourhood where people can meet most of their day-to-day needs locally.

Along the main street there are a number of new apartment developments alongside older blocks of flats and flats above shops. The area has vertical mixed use with many of the shops on the main street having accommodation above as well as industrial and commercial uses within the residential area. Many of the spaces would be suitable for locals starting a small business near home.

There are a variety of public spaces available in the neighbourhood. The beach reserve has an extensive playground catering for small and older children and there are a number of small more urban public spaces on the northern side of Jackson Street. The urban design audit however noted that the neighbourhood role of these spaces is limited. The natural environment has been heavily modified for a long time and as a result there are no significant ecological features in the study area. An exemption to this is the shoreline, which is likely to have some significance, however this too is heavily modified.

Petone is marketed by real estate agents as a place in which to invest. As well as investors, marketing targets families and first home owners. Descriptions such as charming, secluded and popular, traditional yet trendy are common. Petone is also often promoted as walkable, within easy access to a great variety of local facilities and amenities as well as motorway access to Wellington City. Dwellings are frequently marketed as ripe for capital gains and car parking is emphasised

Blake St, Ponsonby

higher density, mixed use, higher cost urban brownfield

The area studied is a relatively new (less than 10 years old) development south-west of the Jervois and Ponsonby Road intersection, consisting of 142 dwellings which are a mixture of relatively upmarket terrace houses and small apartments on a former light industrial site that is very urban in nature. There are several old villas and older commercial buildings within the study area and the area is in an older inner city location. The development is within an easy walk of both Jervois and Ponsonby Roads and the wide variety of services, shops and entertainment available there and the neighbourhood's character and vibrancy largely feeds off these neighbouring facilities, rather than off facilities within the neighbourhood. The site borders Ponsonby intermediate school and a primary school is nearby. Bus services are easily accessible and frequent. The area has a high percentage of impermeable surfaces and some contamination is present due to its previous use. The natural environment has been heavily modified many years ago and there would have been no significant ecological features or habitats present at the time of development of the new townhouses and apartments.

Key Positives	**Key Negatives**
• Good walking environment. • Good range of services available locally. • Good bus service available. • Very dense development. • High level of resident satisfaction with privacy, dwelling condition, their dwellings' outdoor environment and parking amenities. • Most residents report feeling safe walking at night.	• Lack of affordable housing. • High run off. • Reserves in walking distance are limited. • Very high proportion of residents access services outside the neighbourhood by car.

Table 5: Key Positives and Negatives, Blake St, Ponsonby.

The neighbourhood is very walkable, with a relatively pleasant streetscape although it contains no public space and there are very few neighbourhood reserves in walking distance. The independent urban design audit highlighted that the light industrial nature of Prosford Street and limited interaction between some buildings and the street make the streetscape less pleasant but still rated walkability for Ponsonby highly, although not as highly as Petone. The old light industrial units on the northern side of the neighbourhood provide an opportunity for small-scale industries to locate in the area and added a certain charm. Several homes are used for home occupations and some older villas have been converted to commercial premises. Both are an indication of housing stock flexibility.

The housing stock is of extremely high quality and the risk of dilapidation was assessed as being low. The provision of a high number of small apartments (mainly one bedroom) appears to fill a gap in the local housing stock, which is largely dominated by old villas and most buildings had a good relationship to the road, providing passive surveillance. The Blake Street case study area is marketed by real estate agents as a place in which to live the city lifestyle easily. It is promoted as sophisticated, executive, secure and private. Marketing targets busy people and high achievers. Emphasis is placed on carparking, the abundance and proximity to local facilities and amenities, and the possibilities of working from home.

Christchurch East Inner City

Higher density, mixed use, lower cost, urban retrofit

Christchurch East Inner City is an older area that has seen continuous re-development over the last 50 or so years. The section of Christchurch East Inner City studied contains 755 dwellings along with numerous commercial and community sites. Some of the original large and often two story homes and smaller workers cottages built early last century remain and a small number have been renovated. Many are in poor condition. The condition of dwellings is generally poor, with several abandoned houses and overgrown sections. There are a large number of derelict houses and empty sections, several of which appear to have been this way for some time. Empty sections are commonly used as car parks and some are fenced and gated with barbed wire along the top. Many of the larger two story old houses appear to be boarding houses. Overall the neighbourhood appears quite dilapidated and not cared for, this is especially the case towards the southern boundary of the study area.

Key Positives	**Key Negatives**
• Location close to the CBD. • Good range of services available locally.	• Poor walking environment. • Poor provision of open space. • No early childhood or high school

• High housing diversity. • Social housing included. • Good public transport service. • Majority of residents walk, cycle or catch public transport to work. • Large percentage of residents walk to access services within and outside the neighbourhood.	education within walking distance. • Cars travelling fast, making walking unsafe was reported as a problem. • Majority of people feel unsafe walking alone at night. • Low level of satisfaction with amenities. • Low levels of neighbourly interaction.

Table 6: Key Positives and Negatives, Christchurch East Inner City

A number of medium and higher density dwellings have been built in more recent times. These range from 1960s attached units to modern apartment blocks. Development seems piecemeal and quite poor from an urban design perspective, with many dwellings facing shared driveways rather than the street. The newer (post 1960s) housing stock already looks quite run down in some places and the risk of dilapidation is high. The area is characterised by high impermeable fences along long stretches of the footpath. Quite a few hotels and motels have been built in the area over the last 20 or so years. The area does contain some social housing, however the amount is unclear.

Because of its location near the centre of Christchurch, public transport and local services are good. Walkability however is low, largely because of fast moving traffic and reduced surveillance of the pedestrian space due to the number of high fences. Walking felt unpleasant, especially towards the end of the day (around 5pm) when daylight faded, largely due to the lack of pedestrian traffic and poor surveillance of footpaths. On a positive note there are a variety of local shops present and the area is served well by buses. The Avon Loop sub area seems to have more of a community feel to it and residents approached the researcher in this area repeatedly. Access to reserves is poor. A small neighbourhood park with small children's play equipment is within walking distance of the Avon Loop sub neighbourhood and Latimer Square, which has no seating or other facilities, is close to the remaining dwellings. A full primary school (year 1-8) is available within walking distance, however there are no early childhood centres or High Schools within walking distance.

The area contains several buildings listed by the Historic Places Trust that appear to have adapted well over time and there is some interesting re-use of historic buildings, including the conversion of the historic brewery complex into a gym and arts centre, outside of which is a sheltered dedicated bicycle parking facility. The Avon Loop sub area has a small neighbourhood park with play equipment and access to the reserve along the river and is reasonably well catered for in this respect. The area to the south of Kilmore Street however has no public spaces that allow for casual interaction and recreation. Latimer Square is nearby, but the research team feels that

this is unlikely to be a place for locals to meet or send their children to play. This is an area which has a reputation as being used by young people walking for prostitution purposes.

The area has been heavily modified for many years, and there are no significant ecological features, with the exception of the Avon River. It is however likely that recent development has resulted in an increase in stormwater runoff and there appears to be no mitigation of this.

Christchurch East Inner City is marketed by real estate agents as a site of future development. It is located in the historic precinct yet zoned for intensive development so investment opportunities are highlighted. It is promoted as valuable, special and eclectic. Along with investors and developers, marketing targets professionals and the artistic. Dwellings are presented as safe and secure as well as private. Walkability and proximity to the city are both frequently promoted but car parking is always emphasised.

Aranui

Lower density, single use, sustainably branded, low cost, suburban retrofit

The study area of Aranui consists of a large percentage of Housing New Zealand Corporation dwellings, and a smaller number of homes in private ownership. There are 322 dwellings in the study area. The area is older but has undergone an extensive neighbourhood renewal programme in recent years. As part of this a new road is being constructed and a number of new dwellings have been constructed. This gives better passive surveillance to the neighbourhood park.

Key Positives	Key Negatives
• Good walking environment. • Good range of community services available locally. • Majority of dwellings address the street well. • Very functional public space. • Affordable housing. • High degree of social interaction among neighbours. • High level of resident satisfaction with the degree of privacy, the condition of their house, their dwellings out door environment and parking amenities.	• Poor interface between some properties and the neighbourhood park. • Poor bus stops (no signs, timetables or shelters). • The majority of residents report feeling unsafe walking at night. • Low perception of quality of the neighbourhood and the people who live there.

Table 7: Key Positives and negatives in Aranui.

Aranui seems to be a pleasant, very walkable neighbourhood with good local services. Passive surveillance of roads is excellent and footpaths are functional. There appears to be a lot of interaction among neighbours with people chatting and children playing in the street. The housing stock is mixed with older 1960s and onwards state housing alongside some recently built Housing New Zealand Corporation (HNZC) developments. More HNZC dwellings are under construction. The area is dominated by social housing but some privately owned former HNZC dwellings also exist. Overall the area appears well cared for, probably because of regular maintenance by HNZC, rather than an inherently durable housing stock.

Wainoni Park is a largely functional reserve at the centre of the neighbourhood with extensive play equipment for younger and older children, including a full basketball court, playing fields and flying fox. There is some informal seating (on large rocks), but a lack of formal seating. A recreation centre on the park is currently being renovated. The park is lined by fences on two of its four sides. On the north/western edge a new road has been constructed that will have housing overlooking the reserve, improving the situation dramatically. The area behind the shops, along the service lane, was identified as a potentially problematic area because it lacks surveillance. This area is likely to have safety issues at night.

The row of local shops has a well stocked dairy, which sells fresh produce as well as the usual items, a bar and a number of community organisations aimed at drug rehabilitation, medical services and other social services. There is a local kindergarten and several churches. Over all most day-to-day needs can clearly be met locally. There are reasonable local bus services available, however most bus stops lack shelter and time table information. One bus stop did not even have a sign and was only identifiable by people waiting for a bus. There are no significant ecological features present in the neighbourhood. The reserve consists of grassed areas and some exotic trees. There are no contamination issues in the neighbourhood.

More generally, Aranui is marketed by real estate agents as a place in which to invest in for rental returns as well as a place in which to retire. The proximity to local facilities, amenities and public transport is often highlighted, and the development of a local supermarket is frequently mentioned. The Aranui neighbourhood is marketed as affordable. Marketing targets families and first homeowners as well as those approaching retirement. Car parking is emphasised.

Dannemora

lower density, mixed use, medium cost suburban greenfield

Dannemora is a relatively dense recently built environment on the edge of the urban area. There are lifestyle blocks and countryside to the east while the remaining surroundings consist of similar dwellings with “big box retail” to the north and west. The section of Dannemora that was studied consists of 214 dwellings and a small shopping centre with a number of commercial properties. All of the dwellings are relatively new (less than 10 years) and all are free-standing. Dwellings range in size from 3 bedrooms to 5-6 bedrooms and some are marketed as suitable for extended families. The housing stock is of high quality and the risk of dilapidation appears to be low. Section sizes vary and dwellings dominate the property so the rate of impermeable surfaces is high. There is no social housing in the study area. The neighbourhood includes a small commercial/retail area and is within easy walking distance of a primary school and childcare centre. Several homes were being used for home occupations, largely by converting garage space into home offices or showrooms.

Key Positives	**Key Negatives**
• Good walking environment • Good surveillance of public space • Good access to schools	• Poor public transport service • Lack of affordable housing • Large dwellings and low overall density • Poor treatment of streams • Lack of playgrounds or other park

	facilities

Table 8: Key Positives and Negatives, Dannemora.

Dannemora was observed as being very walkable, with a relatively pleasant streetscape and easy terrain. Roads are narrow and quiet and footpaths are provided on all urban roads (none in the lifestyle block areas). All urban roads are planted with street trees and these are in good condition. This neighbourhood includes a small retail area and is within easy walking distance of a primary school and childcare centre. Pedestrian spaces and other public open spaces are largely well cared for and all are overlooked by houses, providing passive surveillance to those public spaces.

There are, however, few amenities or facilities to walk to. Although the retail area provides a grocery, fruit shop and butcher, it does not have a full banking or postal service or any medical services. In addition, there is only one area of public open space (excluding the primary school which has lockable gates) and this is a square with a pathway through the middle to a pavilion. It is possible to walk in the nearby countryside, although road safety may be an issue. As well, urban arterial roads with speed limits of up to 80km create a significant barrier for extensive urban walking. There are extremely limited bus services to the area.

According to Auckland Regional Council hydrological maps there are two streams on the site. There is now little evidence of these and it is assumed that they are largely piped.

More generally, Dannemora is marketed by real estate agents as an area of sophistication and luxury. It is promoted as suitable for family life and proximity and access to schools is highlighted. Dwellings are promoted as guaranteed, well appointed, low maintenance and easy care. Marketing targets working couples, and families including those in extended family situations. It is presented as safe, private, and with easy driving access to amenities and facilities (particularly shops). Car parking is emphasised.

Waimanu Bay

lower density, single use, higher cost suburban greenfield

Waimanu Bay is a new affluent subdivision on the eastern coast of Te Atatu Peninsula. It consists of 202 dwellings most of which are large stand alone houses. There is a gated retirement community which has some smaller stand alone dwellings and some duplexes. The site has stunning sea views and there is significant habitat along the coast. A wetland area has been included in one of the reserves and this is vegetated with native plants. There is a stormwater pond at the northern end of the development.

Key Positives	Key Negatives
• Good walking environment • Good surveillance of public space • Walking tracks along the coast	• Poor public transport service • Lack of affordable housing • Very large dwellings and low overall density • Lack of local services • Lack of playgrounds or other park facilities

Table 9: Key Positives and Negatives, Waimanu Bay

Waimanu Bay was observed as being very walkable. Roads do appear excessively wide and many only have footpaths on one side, however traffic is light and there is good surveillance from houses making walking pleasant. There are extensive walkway systems along the coast, picnic tables and seating, but no children's play equipment and all public spaces are overlooked by houses. There is, however, very little to walk to, with the only services within 800m of most dwellings being a church and a toy library. Te Atatu Peninsula town centre is about a kilometre away from most houses and all day-to-day services, including a supermarket, are found there. There nearest schools, a primary and an intermediate school nearby are beyond 800m from most homes. The bus service is extremely poor.

Public space is limited to a wetland and walking tracks along the coast, which includes fernbird habitat (a species threatened at a national and local level). Some illegal vegetation clearance is recorded as occurring during the site development. While no ecological assessment was accessed it appears that the coastal habitat is likely to be negatively impacted by the development, mainly through stormwater run-off. One of the local reserves is very densely planted with native wetland plants and this is likely to have created habitat and provides some stormwater treatment.

Houses in the neighbourhood are large and there is little diversity and no commercial premises. Houses are clearly of high quality and are well cared for. The risk of dilapidation is therefore low. Waimanu Bay is marketed by real estate agents as an area of luxury and elegance with large dwellings befitting the occupier's position in life. The neighbourhood is described as executive, exclusive and desirable with stunning views and property prices reflect this. It is promoted as private and secure and seen as great value for money as well as a location for a healthier quality of life. Both proximity to local facilities, including shops, beaches and parks, and access to the city are highlighted. While car and boat parking is emphasised so too is walkability.

Case Study Neighbourhood Rankings

Sustainability	Relative Sustainability Approach (Survey-based Measures of N-SF)	Draft LEED-ND
High	**15+**	**46-60**
	Petone Blake St-Ponsonby	Blake St-Ponsonby Petone
Medium	**10-14.9**	**30-45**
	Harbourview ChCh East Inner	ChCh East Inner Aranui
Low	**<10**	**<30**
	Aranui	Harbourview

Table 10. Case Study Rankings

The rankings from the draft LEED-ND are simply the scores added up. The total, along with an analysis of where the points have come from shows:

- Blake Street-Ponsonby and Petone are in the top cluster. Their high score is helped by their location in the wider settlement near excellent public transport and a wide variety of services. Both are brownfield sites. The differentiation between the two developments is largely around density and block length.

- Aranui and Christchurch East Inner City form the middle cluster. Both are brownfield sites, however there was no contamination cleanup involved. Like Blake Street-Ponsonby and Petone, Christchurch East is located very centrally within the wider settlement and therefore scores highly on public transport availability and access to facilities (with the exception of reserves). Aranui also scores highly even though it is some distance from central Christchurch. This is because bus services are reasonable and there are a good variety of local services available.

- Harbour View, Waimanu Bay and Dannemora is the lowest cluster. All are greenfield developments adjacent to existing development, which results in considerably lower scores than the above brownfield developments. All three are located near sub-urban town centres where bus services are poor. All three score low for density, which is somewhat predictable in a suburban situation. They are differentiated by their scores for services within walking distance, treatment of the natural environment and housing diversity.

We used a relative approach to develop scores that would allow a sustainability ranking to be given to each of the neighbourhoods using the survey-based measures of the Neighbourhood Sustainability Framework. This approach sees sustainability as a relative condition which is societally specific. That is, the rankings assume that New Zealand neighbourhoods typically exhibit certain types of behaviours and attributes around sustainability performance. Specific neighbourhoods are ranked according to the extent to which those neighbourhoods score higher or lower than the average neighbourhoods. In this case, the average is represented by the sustainability score for the survey respondents across all neighbourhoods.

It is notable that relative to the six domains, LEED-ND generates a higher ranking for Aranui and a low ranking for Harbourview. This is easily explained. Relative to the other neighbourhoods, Aranui scores poorly on safety related criteria and a desire to move from the area. The latter appears to reflect two important factors. Firstly, Aranui residents in the public rental stock appear to have a sense that their residence in Aranui has been determined by others rather than through their own choice. Thus, while they regard the built environment as satisfactory and have high levels of neighbourhood engagement, moving into another neighbourhood appears to be associated with a sense of achievement. Secondly, Aranui residents score the area poorly, relative to other neighbourhoods, in relation to perception of safety. By comparison, Harbour View scores well in relation to perception of safety but poorly in relation to private vehicle use.

The resident self-report data which, unlike LEED-ND, captures the views of residents on the sustainability rankings of neighbourhoods, shows that resident-based information is important in the Neighbourhood Sustainability Framework assessments. The very differences between the rankings of LEED-ND and that data provide important information for decision-making around increasing the sustainability of particular neighbourhoods. From the Aranui and Harbour View rankings, for instance, two different sustainability directions are indicated. In the case of Aranui, the different assessments suggest that modifications to the built environment need to be directed to improving the perception and experience of safety as well as on promoting and maintaining positive social relations and participation among the people living in Aranui. There is little modification of the built environment required. By way of contrast, however, increasing the sustainability of Harbour View will require a focus on the consumption and travel patterns of residents, particularly the reduction of private vehicle use.

Overall it can be said that a limited number of criteria dominate the results. Brownfield developments with good public transport will always score highly for example. Even though the overall results rank the neighbourhoods in an appropriate order it needs to be questioned if quite so many assessment criteria are needed and if the “one size fits all” approach taken by LEED-ND is appropriate. Taking the same

approach to neighbourhoods regardless where they are situated within the wider settlement seems inappropriate. Given its poor access to public transport and suburban location the densities at Harbour View for example are probably appropriate, but Harbour View is measured against the same criteria as neighbourhoods such as Blake Street-Ponsonby which has an excellent bus service and is very close to Auckland's CBD. While intense urban developments with good access to public transport, employment and services are inherently more sustainable than developments in suburban areas, more differentiation is needed within the different development conditions identified in the Neighbourhood Sustainability Framework. Measurements that are divorced from resident perception are unlikely to provide a robust understanding of neighbourhood sustainability or the critical neighbourhood dynamics that need to be managed or redesigned to ensure sustainability.

Conclusions

We are confident that the draft Neighbourhood Sustainability Framework is fundamentally robust and reliable yet flexible. In order to be usefully applied, however, there is clearly a need for tools that can assess observational and hard data as well as perceptive and behavioural data. But these tools must also be practical and able to be easily applied.

Data collection for LEED-ND was labour intensive and some credits could not be assessed for some of the developments. Given this, it is questionable if, for our purposes, LEED-ND provides good value for the effort required. In its current form it is clearly not practical as an assessment tool as part of the Neighbourhood Sustainability Framework. In the New Zealand context, where resources are limited, a more simple, yet robust tool is needed. We believe that because neighbourhoods are unique a level of professional judgement is required when assessing elements, such as quality of space, or surveillance of streets. None of our neighbourhoods, for example, met the LEED-ND criteria for good surveillance of the street. Some neighbourhoods, however clearly had very good surveillance of the street, while others did not. Because of the rigidity of LEED-ND there was no differentiation between them. We believe that a built environment tool for New Zealand will need to include measured criteria as well as an element of professional judgement.

Equally, “The Place Where You Live” Survey cannot be transformed from a research tool to an assessment tool. It served us well as a research instrument which allowed us to test the implications of the built environment on resident perception and behaviour, confirming that analysing residential perception and behaviour is a necessary part of assessing neighbourhood sustainability. In addition, we found that data on the Neighbourhood Sustainability Framework elements amenable to resident reporting can be collected by using just a small number of the 81 questions in survey. This suggests that resident reporting can be integrated into neighbourhood planning and management by way of a practical information gathering and assessment tool that collects self-report information about resident perceptions and behaviours.

The current phase of the Beacon Neighbourhood Research programme aims to develop a user friendly tool, that will form the practical end user interface of the Neighbourhood Sustainability Framework.

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