

## THE IMPORTANCE OF URBAN NEIGHBOURHOODS: MEASURING NEIGHBOURHOOD SUSTAINABILITY IN NEW ZEALAND.

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### ABSTRACT

Neighbourhoods are the scale of most people's daily life activities and form an important connection between individual households, businesses and communities to the wider city system. With over 80 per cent of the total population in New Zealand living in urban areas and almost half the population living in the nation's eight largest cities, urban neighbourhoods especially are extremely important to sustainability in New Zealand. So how can we assess neighbourhood sustainability and the impact neighbourhoods have on climate change?

This paper will discuss the development and application of a 'Neighbourhood Sustainability Framework' (NSF) by the research consortium called Beacon Pathway Limited. Beacon Pathway Limited is a unique consortium in New Zealand's built environment research community because it brings together building industry research and Government research funders with private sector and local government to undertake research into sustainable residential environments. Beacon's overarching goal is that New Zealanders will all live in:

*Homes and neighbourhoods that work well into the future and don't cost the earth.*

Beacon's focus is on the residential built environment which, for neighbourhoods, encompasses buildings, infrastructure and space such as green and open space as well as connecting and dividing spaces. By understanding the nature of sustainable neighbourhoods, Beacon intends planners, developers 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.

A Neighbourhood Sustainability Framework and supporting tools has been developed and this has been tested and refined by applying it to nine case study neighbourhoods in urban areas throughout New Zealand. This paper explains why neighbourhood sustainability cannot 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. The paper demonstrates that tools can be constructed to measure neighbourhood sustainability in such a way as to aid decision making with regard to practical improvements in environmental, social and economic sustainability through the built environment in both new and existing urban neighbourhoods in New Zealand.

**Keywords:** neighbourhood, residential built environment, sustainability, assessment, New Zealand

### INTRODUCTION

As the introduction to this conference describes, the Green City vision talks about an ecologically healthy city with solar, wind and recycling technologies, green buildings and green businesses, urban environmental restoration projects, urban gardening and organic farming. It promotes car-free urban centres with option for safe foot, bicycle and public modes of transport alongside mixed use and 'balanced' development projects but these are currently non-existent at a city level. At the neighbourhood level, however, there are a number of examples across the globe of efforts to render a more balanced and sustainable local environment, such as Village Homes in Davis County, California for example.

Scale is important, some things can only happen at a city scale, such as effective public transport systems for example. Other things, like local accessibility to public transport stations and interchanges need to take into account neighbourhood conditions and variables. Neighbourhood level change may, in turn, rely on the collective effects of individual behaviours, such as the numbers walking and cycling but it also relies on effective built environments that facilitate and link individuals together locally as well as enabling effective connections with the wider settlement

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and region. Neighbourhoods, then, can be seen to be an important connection point between the individual (person, household, business, community) and the wider city system with the potential to contribute to more sustainable and ecologically healthy environments at a wider scale, including at the city-wide level.

Neighbourhoods are also important because they are the scale of most people's daily life activities and are, therefore, a scale at which positive change can be achievable in an inclusive and empowering way for local residents and users of that environment. Further, the fundamental 'built' structure of neighbourhoods (including 'natural' areas) is usually expected to last a significant amount of time. Moreover, beyond the functional, neighbourhoods symbolise and represent significant economic, cultural and emotional investment and attachment, often accrued over a great length of time. At the same time, neighbourhoods are anything but static. They are diverse and dynamic in intention, interpretation and experience, constantly engaged in an iterative and recursive relationship with the people living and working within and passing through them. This demands flexibility and also offers ongoing opportunity for the inclusion and application of sustainability principles through the various evolutions of each neighbourhood.

### **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 very urbanised country. Over 80 per cent of the 4 million residents live in urban areas (Matthewman, 2001), with almost 56 per cent living in the twelve largest cities in 2007 (Quality of Life Project, 2007) and 30 per cent of the total population living in the Auckland Region (Statistics New Zealand, 2006). Further, the majority of New Zealand's total population growth is projected to take place in twelve cities, and the pace of growth in these cities is already "placing considerable pressure on the environment, infrastructure and social fabric" (Quality of Life Project, 2007: 232) of those cities. Not only is the urban population of these larger cities increasing rapidly, especially within the Auckland Region, it has a set of characteristics that distinguish the larger cities from the smaller cities and rural areas. Larger city populations within New Zealand are, for example, very mobile, with 40 per cent 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. 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 predicts this 'conventional' family unit, while still dominant, is on the decline:

- Couples with no children is the largest growth sector in family types
- It's predicted that one person households will also show strong growth
- The number of two person households are expected to remain static or decline slightly by 2012

(Statistics New Zealand, 2003)

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 (Quality of Life Project, 2007). 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 recently reaffirmed 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 (Regional Growth Forum, 1999, July 2007). 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, plans are to develop new housing centres around major transport routes (Auckland Regional Transport Authority, 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 local 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. The Beacon shareholders are Building Research, Scion, Waitakere City Council, Fletcher Building, and New Zealand Steel (see <http://www.beaconpathway.co.nz> for more information).

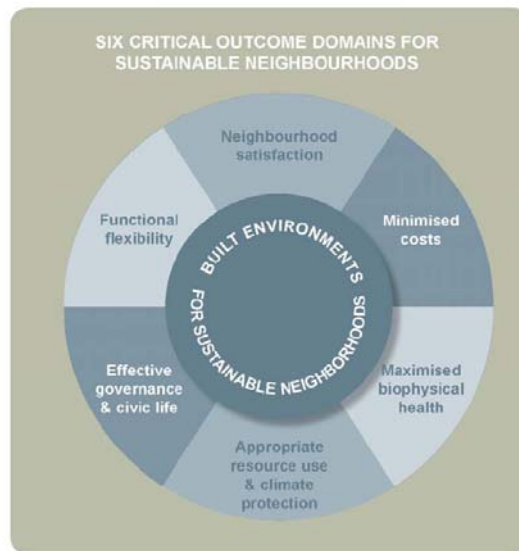
Beacon is primarily focused on the sustainability of dwellings, but it is also concerned with neighbourhoods. Beacon recognises that the sustainability of individual dwellings depends also on the constitution of the neighbourhood's built environments. Beacon's focus for neighbourhoods encompasses buildings, infrastructure and space such as green and open space as well as connecting and dividing spaces. 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 but 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 also 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 connecting and dividing spaces between individual dwellings, other structures and in relation to the wider city system. Neighbourhoods are arenas of casual interaction amongst residents and visitors as well as being a key site of the routines of everyday life. As such, the boundaries of neighbourhoods are loosely defined but typically extend beyond a household's directly adjacent neighbours. Over the last three and a half years Beacon's Neighbourhood Research Team has used this understanding of neighbourhoods 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 and through data generated through the 'Place Where You Live' survey, 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. The NSF 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 mitigating 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.

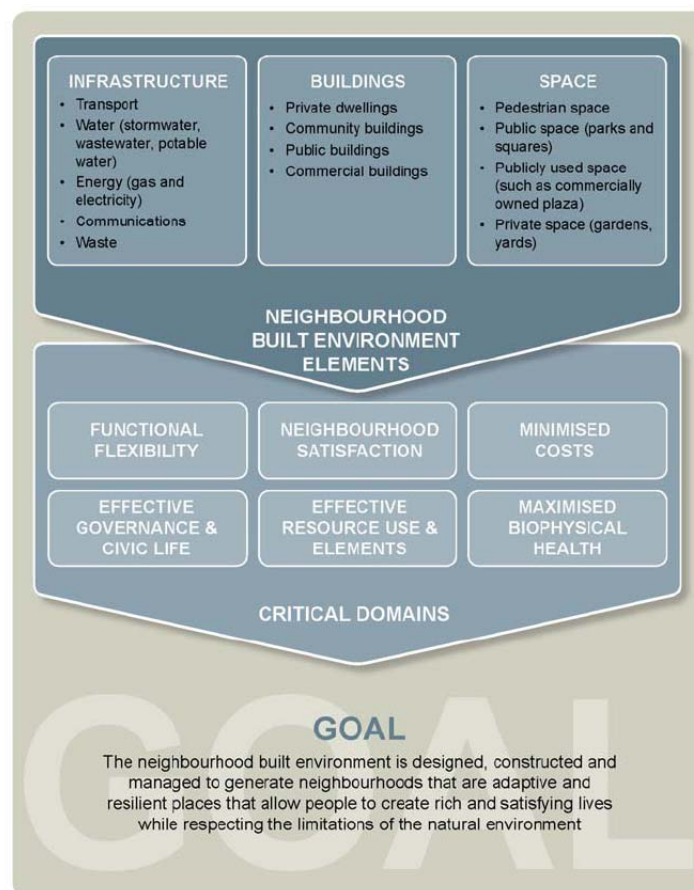
### **THE BEACON NEIGHBOURHOOD SUSTAINABILITY FRAMEWORK**

Working within our brief to develop useful and practical tools to guide the sustainable design, building, retrofitting and management of neighbourhoods, we distilled an international review of sustainability at the neighbourhood level into six critical domains, as illustrated and described in Figure 1 and Table 1.



**Figure 1:** Six critical outcome domains for sustainable neighbourhoods

These six critical domains, together with three built environment elements of infrastructure, buildings and space, were identified as underpinning neighbourhood sustainability and form the basis of the prototype NSF. 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 Outcome Domains for Neighbourhood Built Environment	Functional Flexibility	The built environment can be continuously adapted to the needs of diverse and changing populations, social, economic and environment conditions: <ul style="list-style-type: none"> <li>▪ adaptability to changes in household structure</li> <li>▪ adaptability to changes in transport costs and choices</li> <li>▪ adaptability to changing ethnic and socio-economic mix of the population</li> <li>▪ adaptability to the effects of climate change</li> </ul>
	Neighbourhood Satisfaction	The built environment maximises the key determinants of neighbourhood satisfaction: <ul style="list-style-type: none"> <li>▪ housing quality</li> <li>▪ durability and low levels of dilapidation</li> <li>▪ street safety</li> <li>▪ low noise disturbance</li> <li>▪ opportunities for casual social interaction</li> <li>▪ opportunities for enclave living.</li> </ul>
	Minimised Costs	The built environment minimises the direct and indirect costs and cost uncertainty for households and cities associated with: <ul style="list-style-type: none"> <li>▪ travel</li> <li>▪ dwelling and section provision, maintenance and repair</li> <li>▪ infrastructure provision, maintenance and repair</li> <li>▪ facility provision, maintenance and repair.</li> </ul>
	Effective Governance and Civic Life	The built environment encourages: <ul style="list-style-type: none"> <li>▪ casual social interaction at street level</li> <li>▪ access to neighbourhood and city wide facilities and amenities</li> <li>▪ equitable access to basic services and amenities for children and adults with diverse levels of mobility within the neighbourhoods</li> <li>▪ formal interaction and spaces for formal interactions for neighbourhood governance, civic participation and government.</li> </ul>
	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: <ul style="list-style-type: none"> <li>▪ maximisation of dwelling performance</li> <li>▪ land consumption</li> <li>▪ transport energy consumption</li> <li>▪ energy and other resource sources</li> <li>▪ sustainable and renewable sources of energy, potable water and materials.</li> <li>▪ lifecycle impacts</li> </ul>
	Maximised Bio-physical Health	The neighbourhood built environment is designed to protect and enhance the biosphere, with particular focus on: <ul style="list-style-type: none"> <li>▪ reducing negative impacts on air quality</li> <li>▪ ensuring aquatic health</li> <li>▪ protecting/enhancing biodiversity and soil quality</li> </ul>
	Neighbourhood Environment Elements	Infrastructure
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).

This conceptualisation of neighbourhoods, neighbourhood sustainability and neighbourhood outcomes recognises 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. It is also innovative and unique in that it provides a framework for end users wanting to improve the sustainability of neighbourhoods that they are planning, retrofitting and managing. The innovative aspects of the framework are:

- It clearly specifies the goal to which sustainable neighbourhood development and management will be directed. In doing so, this framework moves away from treating ‘sustainability’ as an end-point and treats it as an on-going and dynamic process.

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- The goal statement moves the focus away from debates about the meaning of sustainability and amorphous, poorly defined references to social, economic and environmental outcomes.
- The domain structure allows for the better integration of social, environmental and economic aspects of sustainability and makes explicit links between them.
- The domains and elements together provide the basis for developing specific measures and standards which can be applied through the assessment tools.

### TESTING THE NSF PROTOTYPE

In developing the NSF, 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 development forms, including whether claims and assumptions actually result in lifestyles that are more sustainable.
- 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 neighbourhood situations.

The NSF 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 NSF 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.

Between 2005 and 2007 we tested the NSF by:

- Applying the NSF by attempting to measure neighbourhood sustainability under different neighbourhood conditions through a case study methodology;
- Testing and refining the NSF framework by utilising international neighbourhood assessment tools;
- 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, and
- Developing and refining assessment tools for application in a range of urban New Zealand conditions.

Initially we applied the draft LEED-ND (Congress for the New Urbanism et al., 2005), as an observational assessment tool and the detailed "The Place Where You Live" self-complete questionnaire as a survey of resident behaviour. LEED-ND aims to assess built environment sustainability and is designed for new developments as an assessment tool at the planning stage. Its indicators and measures appeared to align well with the NSF. 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 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:

- The **Location Efficiency** section assesses the location of the new development in terms of previous land use, sprawl, infrastructure availability and proximity to services and employment.
- The **Environmental Preservation** section assesses the development in terms of its impact on the immediate natural environment. It assesses elements such as soils quality, stormwater issues, habitat protection and riparian management.
- The **Compact, Complete & Connected Neighbourhood** section assesses issues such as density, housing diversity, the presence of social housing, public transport, walkability and the reuse of historic buildings.
- The **Resource Efficiency** section 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.

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“The Place Where You Live” self-complete questionnaire was 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 survey has been scored in a somewhat more complicated manner, whereby it acts as a ranking that 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 neighbourhood case studies. The sustainability assessment derived from the Resident Self-Report Tool thus reflects the prevailing practices in relation to an aggregate of neighbourhoods.

These two tools were applied to neighbourhood case study areas that fitted a case frame which, in the first instance, allowed us to analytically contrast between cases with different density conditions, different use conditions, different housing access levels and different levels of branded sustainability. Secondary criteria was also identified in order to manage confounding factors including geographical location, settlement age and infill. Finally, 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. Case studies were undertaken in three phases:

1. Three case studies were undertaken to apply the international tools, after which the tools were amended.
2. Four further case studies were undertaken using the amended tools and the initial three case studies were re-evaluated using these tools.
3. Following a comprehensive review and redevelopment, a final two case studies were undertaken

### FINDINGS

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. Following comprehensive review and tools development a further two case studies were undertaken. The case study areas and their case frame criteria<sup>1</sup> are:

#### Phase one:

Harbour View (Waitakere City): *higher density, mixed use, sustainably branded, higher cost suburban Greenfield.*

Petone (Hutt City): *higher density, mixed use, medium cost, older neighbourhood*

Blake St, Ponsonby (Auckland City): *higher density, mixed use, higher cost urban brownfield*

#### Phase Two:

Christchurch East Inner City (Christchurch City): *higher density, mixed use, lower cost, urban retrofit*

Aranui (Christchurch City): *lower density, single use, sustainably branded, low cost, suburban retrofit*

Dannemora (Manukau City): *lower density, mixed use, medium cost suburban greenfield*

#### Phase Three:

Addison (Papakura City): *Medium density, medium-high cost, sustainably branded, suburban greenfield*

West Harbour (Waitakere City): *lower density, single use, low cost, suburban retrofit*

While the individual neighbourhood scores are interesting, our main purpose was to test the robustness of the tools and of our assumptions as presented in the NSF, as well as to develop practically applicable tools for the New Zealand environment. To do this, we developed a system of ranking the neighbourhoods as Table 2 shows.

Sustainability Rating	Observational	Resident Self-Report Assessment
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	Assessment	
High	46-60	15 +
	<ul style="list-style-type: none"> <li>▪ Blake St – Ponsonby</li> <li>▪ Petone</li> </ul>	<ul style="list-style-type: none"> <li>▪ Petone</li> <li>▪ Blake St – Ponsonby</li> </ul>
Medium	30-45	10-14.9
	<ul style="list-style-type: none"> <li>▪ Addison</li> <li>▪ Aranui</li> <li>▪ West Harbour</li> <li>▪ Harbourview</li> <li>▪ ChCh East Inner City</li> </ul>	<ul style="list-style-type: none"> <li>▪ Harbourview</li> <li>▪ ChCh East Inner City</li> </ul>
Low	<30	<10
	<ul style="list-style-type: none"> <li>▪ Waimanu Bay</li> <li>▪ Dannemora</li> </ul>	<ul style="list-style-type: none"> <li>▪ Addison</li> <li>▪ West Harbour</li> <li>▪ Aranui</li> </ul>

Table 2. Case Study Neighbourhoods Rankings.<sup>ii</sup>

Sustainability rankings have been given nominal categorisations of ‘High’, ‘Medium’ and ‘Low’. The use of nominal categories in which a range of scores are clustered is used to avoid any suggestion that neighbourhoods with close scores can be finely or precisely differentiated in relation to ranking. Over time, as practice in New Zealand neighbourhoods changes and the information in the database increases, these bands may be adjusted to rate neighbourhoods in relation to current best practice. It is important that the users not only understand where their assessed neighbourhood lies relative to other neighbourhoods at a particular point in time, but also whether neighbourhoods as a whole are becoming more or less sustainable. It is envisaged that users will be updated on those trends through regular national surveying for baseline data.

The similarity between the rankings generated by each instrument for each neighbourhood provides confidence in the overall robustness of these approaches. It shows that the domains are applicable to a wide range of neighbourhoods. Those neighbourhoods that have rankings which end up in different categories highlight the importance of measuring both aspects that can be assessed through observation or judgment along with assessments of perception and behaviour. Investigation of the results for these neighbourhoods, namely Addison, Aranui and West Harbour give clear indications of where the weaknesses are. This is a strength of the tool in that it provides decision-makers with clear insight into neighbourhood level issues and it also highlights the importance of including measurements of perception and behaviour. 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.

In Aranui for example, safety related criteria and a desire to move from the area were key areas of weakness. The latter appears to reflect two important factors. One factor appears to be that Aranui residents in the public rental stock have a sense that their residence in Aranui has been determined by others rather than 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, apart from a relatively small specific area, safety concerns are related to use of the environment rather than its structure.

By comparison, Addison’s sustainability is significantly compromised by its distance from places of work and education as well as a prevailing lack of public transport access. This is particularly reflected in the separation from public transport systems and practical opportunities for walking and cycling to work and education. These are two activities with which residents are routinely confronted and are also the activities that reduce the scores with regard to the low casual interaction indicators exhibited by residents. Casual interaction has been found in research to be a key part of neighbourhood satisfaction and attachment and is facilitated by routine, but unplanned, street-based meeting. Where people leave the area routinely each morning by private car and return each evening to their house also by private car, those interactions tend to be reduced.

In the case of Aranui, the different assessments suggest that modifications to the built environment in Aranui need to be particularly directed to improving the perception and experience of safety. However, the assessments also suggest that the focus in Aranui should be on managing safety within the built environment and supporting the engagement that residents in that community have within that environment. For Addison, the results suggest a focus on improvements to transport infrastructure and accessibility to local facilities (when these are built). Providing facilities to encourage residents to undertake daily tasks more locally and including innovative aspects such a

bicycle parks may help encourage residents out of their cars.

### **THE NSF AS A MODEL OF NEIGHBOURHOOD SUSTAINABILITY MEASUREMENT**

The application of the NSF to the case study neighbourhoods demonstrates that its overall structure and content works well. The domains showed themselves to be measurable and different measurement tools and data generated similar results. The elements – infrastructure, building and space – together provide the appropriate focus for measurement. At the same time, the NSF is not a silver bullet and it is important that it is used alongside other tools developed for the New Zealand situation. Further, the NSF has only been tested and developed in various urban situations in the larger cities of New Zealand, and may require adjustment for smaller urban areas.

As a result of this process and these results, the NSF and associated tools currently consists of three products:

1. The NSF itself which sets out domains key to neighbourhood sustainability and the characteristics in each domain that indicate sustainable states.
2. A neighbourhood sustainability calculator which, in turn has a number of components. Those are:
  - a) An instrument for collecting observed and measured data about a neighbourhood's built environment (The Built Environment Observational Assessment Instrument which involves a structured, expert assessment of the built environment)
  - b) A calculator that consists of scores and weightings for observed and measured data which transforms that data into a sustainability score and subsequent grading of a neighbourhood into a low, medium or high sustainability category. The scores and weightings reflect standards of sustainability that can be progressively changed in line with current best practice.
  - c) An instrument that collects resident self-reported data through a survey process (The Resident Self-Report Instrument which involves collecting and analysing resident's behaviour and perception in relationship to the critical domains of the NSF.)
  - d) A calculator that transforms self-reported data into a sustainability score for each domain in the NSF and allows a neighbourhood to be graded into a low, medium or high sustainability category. The scores are generated by a calculation involving the survey data collected by the resident self-report instrument and pre-loaded statistics drawn from The Place Where You Live Survey undertaken in 2005/6 (Lietz et al., 2006). Those statistics may be progressively up-dated as future surveys are completed.
3. A reporting template that presents:
  - a) An overall neighbourhood sustainability score.
  - b) A neighbourhood sustainability grade.
  - c) The constituent scores associated with the six domains, and identified key drivers of neighbourhood sustainability.
  - d) Whether sustainability pre-requisites are met.
  - e) Priorities for action in relation to:
    - sustainability pre-requisites
    - appropriate targeting of interventions in relation to the built environment or the management of communities living in those neighbourhoods

The **Observational Assessment Instrument** consists of a mixture of measurement and professional judgment structured through a set of well-defined requirements and guidelines and prioritises key criteria, as Table 3 illustrates. This prioritisation reflects the relative impact on sustainability these criteria have and is in turn accommodated through a weighting system within the calculations of results from each neighbourhood. This means that intense urban developments with good access to public transport, employment and services are inherently more sustainable than developments in suburban areas. That is what the tools set out to measure, not to accommodate the constraints of suburban locations. It is, for example, very unlikely that public transport options will improve in the Addison area in the near future and that arguably ought to be a reason for not building in such a location, if one of the objectives is to create a sustainable neighbourhood. At the same time, acknowledging transport related issues as a weakness, the tools remain useful in encouraging mixed use, intensified neighbourhoods that have good passive surveillance as well as strong walkable links within and to the surrounding area. In this way the tools can help promote the most sustainable outcome for that particular situation.

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Walking Access to Every Day Basic Facilities Access to Public Transport Efficient Use of Space and Viability of Local Centres Protection and Enhancement of the Natural Environment Dwelling Sustainability	}	Measured Credits
Quality of Space Diversity and Resilience Appropriate Street Network Innovation	}	A Mixture of Measurement and Professional Judgement, within Tight Guidelines

Table 3: Key Drivers of Neighbourhood Built Environment Sustainability

The **Resident Self-Report Instrument** has evolved from aligning the data derived from “The Place Where You Live” survey with the NSF domains. The tool involves the collection of self-report data from neighbourhood residents and, consequently, can only be applied to existing, rather than planned, neighbourhoods. The alignment with the NSF domains and the measurements used for the self-report data are set out in Table 4.

Domain	Measurement
<b>Functional Flexibility</b>	- % intention to move because of housing (Q2a)
	+ % foot/bicycle/public transport for work/ study (Q4)
<b>Neighbourhood Satisfaction</b>	- % intention to move because of neighbourhood (Q2a)
	+ % describing housing quality as ‘very good’ (Q17)
	+ % describing walking in street at night as ‘very safe’ (Q10)
	- % describing walking in street at night as ‘very unsafe’/ ‘do not go out at night’ (Q10)
	+ % noise disturbance described as ‘not a problem’ (Q11)
	-% noise disturbance described as a ‘serious problem’ (Q11)
	- % no chat or greeting of neighbours (Q16)
	- % no neighbours known by name (Q15)
	+ % knowing many in the neighbourhood (Q8)
	+ % strongly agreeing that the neighbourhood is friendly (Q65)
	+ % strongly agree that neighbourhood reflects own identity (Q65)
	+ strongly agree that has a sense of belonging (Q65)
<b>Maximised Bio-physical Health</b>	- % exceeding average aggregate kms last 4 weeks (649.96 kms) car use (Q3)
	+ % use walk/bike for work/study (Q4)
	+ % undertakes composting (Q14)
	+ % leaves undisturbed area for wildlife (Q9)
	+ % maintains shrubs and garden (Q9)
	+ % provides pond (Q9)
	+ % provides food and water for wildlife (Q9)
	+ % undertakes organic gardening (Q9)
<b>Effective Governance and Civic Life</b>	+ % membership and participation in local or neighbourhood groups (Q6)

	+ % participation in local or neighbourhood group at least once a month (Q7)
	+ % use of local public spaces at least once a month (Q5)
<b>Resource Use &amp; Climate Protection</b>	- % exceeding average aggregate kms last 4 weeks (649.96 kms) car use (Q3)
	+ % describe house as energy efficient (Q12)
	+ % describe house as water efficient (Q13)
<b>Minimised Cost</b>	+ % who expend more than half of their food expenditure in the neighbourhood (Q18)

Table 4: Measurement of NSF critical domains through self-report data

The assessments and associated reporting derived from the Observational Assessment Instrument and the Resident Self-Report Assessment Instrument provide an overall insight into the sustainability of a neighbourhood. They do more than this, however. They also provide a means by which priorities for optimising sustainability in the neighbourhood can be identified and acted on. In some neighbourhoods improved sustainability will be achieved through adaptation of the built environment. In other cases, sustainability may be improved through encouraging community development. In other cases again, improved sustainability is likely to be dependent on improving the linkages between the neighbourhood and the places where residents work, shop, play or are trained. In short, while the tools are still under development, the intention is that the tool outputs will provide clear indications of neighbourhood strength and weaknesses and provide guidance on how to address the identified weaknesses. Integrating resident behaviour and perceptions with built environment observation allows the user to judge if problems are best addressed by built environment interventions or if other community based solutions are needed. The tool encourages a multi agency approach to neighbourhood development and management.

Together, these three products have the potential to assess different aspects of neighbourhood sustainability as defined in the NSF. Their aim is to help decision makers identify interventions at the neighbourhood level that will lead to greater neighbourhood sustainability. They are not a gap closure instruments in that they do not indicate progress to an ideal or attempt to measure sustainability in absolute terms. They do however highlight strength and weaknesses of existing and planned neighbourhoods and draw attention to possible solutions, including using:

- The Observational Assessment as a triage tool, helping to fast track desirable neighbourhood developments: Under current practice it is often harder to obtain consent for more sustainable developments than for conventional developments. Sustainable developments don't tend to fit easily within District Plan rules and are therefore time consuming and costly to process and this causes much frustration for developers and local authority planners. Having a mechanism to identify a development as 'desirable' could mean that such developments are assigned to senior planning staff who are more able to use their discretion than more junior planners. At the same time more sustainable developments could be fast tracked and/or the developer could be given certainty of processing times. This would have only a low cost to local authorities but would present a large cost saving, and incentive, to developers.
- The Observational Assessment as an assessment tool for reductions in development contributions: Developers are required to pay a development contribution for every section that is created. This is to pay for future costs associated with providing infrastructure and services to the new residents. If the tool could be used to demonstrate that more sustainable neighbourhoods have lower costs for the ratepayer in the long run, it could be used by councils to waive part of the development contribution.
- The Observational Assessment to assess all new neighbourhood developments, as a requirement. This would require large scale buy in to the tool and probably would only work at a regional if not national scale.
- The Observational assessment to set a minimum threshold that must be met by all new neighbourhood developments.
- The Beacon Neighbourhood Tools for fine-tuning or retrofitting existing neighbourhoods by those managing neighbourhoods, such as local councils, Housing New Zealand Corporation, retirement village managers or body corporates.
- The Beacon Neighbourhood Tools for assessing existing neighbourhoods with the aim of drawing out the critical questions that need to be answered if neighbourhood sustainability is to be improved when planning for future change. By helping to facilitate discussion in a structured way and by supporting this discussion with relevant data and information the tool can be a powerful driver for practical neighbourhood action and long term planning.

- The Beacon Neighbourhood Tools as a tool used by developers to improve the quality of their developments. In staged developments the use of both the observational assessment and resident self-report tool would be valuable in ensuring that continuous improvement takes place.

### CONCLUSIONS AND FUTURE DEVELOPMENT

Firstly, this process has reinforced the importance that neighbourhood built environment plays in sustainability. The issues highlighted by the case study assessments demonstrated that neighbourhoods are not merely the sum of the dwellings and other buildings contained in them, but that neighbourhood sustainability is significantly influenced by the space in between the buildings and by shared infrastructure, such as roads and public transport. One of the key behaviours that impact on sustainability is the way people choose to access services. The research clearly shows that neighbourhood built environment influences these choices.

Secondly, the initial testing process highlighted the importance of assessing resident perceptions and behaviour as well as built environment sustainability to gain a complete picture of neighbourhood sustainability and to investigate appropriate interventions at the neighbourhood level that lead to greater sustainability.

The next steps are to develop an end-user friendly interface, supported by detailed information about the tool to guide users and marketing plan. These are currently under discussion.

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<sup>i</sup> Detailed descriptions and analysis of each case study neighbourhood can be found in the NH102 report on the Beacon pathway website: [www.beaconpathway.co.nz](http://www.beaconpathway.co.nz)

<sup>ii</sup> We had too few survey returns from Dannemora and Waimanu Bay to include them in the analysis to test the robustness of the survey-based measures