

healthy places, healthy lives: urban environments and wellbeing

A report to the Minister of Health

Prepared by the

PUBLIC HEALTH ADVISORY COMMITTEE

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The PHAC is a sub-committee of the National Health Committee (NHC). It provides the New Zealand Minister of Health with independent advice on public health issues.

The views expressed in this report belong to the PHAC, as does responsibility for any errors or omissions.

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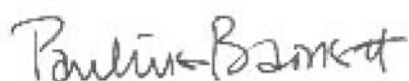
Message from the PHAC Chair

The way we plan our cities and towns affects the health of New Zealanders. There is a strong link between urban design and aspects of poor health that place a large burden on our communities and health services. In our urban areas, people are walking less, there are more cycle crashes on our roads, and urban air pollutants contribute to the increasing burden of respiratory illness. Cities and towns can be designed in ways that will improve the health of New Zealanders and reduce health service costs.

The Ministry of Health's 2009/10 Statement of Intent focuses on developing an 'adaptable and resilient' health system and slowing the growing demand for medical services. The best way to achieve this goal is to reduce demand for services through improving the public's health. Although individuals can, and do, take responsibility for aspects of their own health, it is not within their personal influence to create healthy urban infrastructure, such as walkways, accessible green spaces or safe roads.

Internationally, health systems are playing an increasing role in the way cities are developed. The United Kingdom's National Health Service has developed a Healthy Urban Development Unit to improve cooperation between the town planning and health systems. South Australia has a 'health in all policies' approach with a strong focus on creating healthy physical and social environments. The Australian Federal Government's preventive health strategy calls for better links between health and urban planning. All of these approaches are consistent with the World Health Organization's (WHO's) call for health systems to champion and support other sectors in placing health and health equity at the centre of urban governance and planning.¹

The permanence and cost of urban infrastructure – including buildings, houses, roads and walkways – mean we must make good planning decisions. As New Zealand society becomes more urbanised, we have the opportunity to future proof our cities and towns and create environments that promote the health of New Zealanders. By taking health into account as we build and renew our urban infrastructure, we can improve the health of our population, reduce demand for health services and create health savings, now and in the future.



Pauline Barnett
Chair
Public Health Advisory Committee

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Executive summary and recommendations

This report to the Minister of Health is an evidence-based review of how the urban environment influences the health of communities. It identifies where New Zealand's health system can best add value in the creation of urban areas that promote people's health.

Cities and towns influence health in a way that goes far beyond the presence of health services in these areas. The way that urban areas are planned and laid out – known as urban form – shapes people's life choices and has a strong bearing on health outcomes. Urban form affects where we live, how we travel to work or school, how clean our air and water is, whether we are active, and what shops or facilities we use.

Opportunities for good health are reduced when urban areas are not conducive to physical activity for either recreation or 'active transport', and when urban areas have fewer opportunities for social interaction, more motor vehicle emissions, greater risk of road traffic injuries, and differential access to healthy food. The populations whose health is most affected by urban environments are those that are more constrained in getting around urban areas as a result of financial limitations, limited mobility or dependency on others. These populations include children, older people, people living with disabilities and people living in more socioeconomically deprived neighbourhoods.

To respond to some current health issues, such as chronic conditions, which place a major and increasing burden on the health system, we must plan and design our cities to promote health. The permanence and costs of infrastructure render it necessary to create an urban form that will promote health, while having regard to the environment, economy and society and being adaptable to population changes.

To achieve 'healthy urban form', health perspectives need to be firmly considered alongside economic, environmental and social concerns in urban planning decisions. The World Health Organization (WHO) recommends that governments place health and health equity at the centre of urban governance and planning. This challenge has already been taken up in countries like Australia and the United Kingdom. In spite of the connection between urban form and health, health outcomes do not feature as a major consideration in most urban planning decisions in New Zealand.

As part of its mandate to prevent ill health and promote health, and in order to reduce demand on health services, New Zealand's health system has an opportunity to help shape urban form for improved health outcomes. There is growing evidence about the features of urban form that provide the greatest potential for improving health outcomes. These features will be of interest to other sectors because they provide co-benefits for climate change, the economy and society. Cities around the world have made changes for positive health outcomes, and some of New Zealand's urban areas are also showing leadership in the area.

There are three arenas in which the Public Health Advisory Committee (PHAC) believes the health system should be working to create healthy urban environments. Each is outlined below along with the related recommendations of the PHAC.

Urban form and transport

Here the health system can display leadership and coordinate with other sectors to include health factors in urban planning decisions.

Recommendations to the Minister of Health

1. The PHAC recommends that the Minister of Health encourages the health system to support the development of:
 - (a) urban infrastructure that promotes active transport for all populations
 - (b) other features of urban form that promote positive health outcomes for all populations (for example, a controlled number of alcohol outlets, and increased quality of and access to open spaces).
2. The PHAC recommends that the Minister of Health works with his ministerial colleagues whose portfolios have direct links with urban form and transport to place health and health equity at the centre of urban governance and planning.

If designed appropriately, urban form and transport can increase physical activity, improve air quality, reduce road traffic injuries, increase social cohesion, and achieve maximum health benefits from services and facilities. Urban form can also help create a sense of place. This is important for the health and wellbeing of all populations living in urban areas, especially Māori.

Health system leadership to increase active transport and public transport is especially important for reducing the prevalence and improving the management of chronic conditions. The health system also has an obvious role to play in other urban planning issues, for example, control of alcohol outlet density, access to healthy food outlets, access to green spaces and Māori engagement.

The PHAC has identified four approaches the health system can take to ensure that health is considered in urban form. First, the health system can be involved in key urban environment decisions to provide a health perspective. It can also support standards, requirements or practices that consider health and promote healthy urban form. Third, it can work with other sectors to determine the health benefits of plans and policies. Finally, it can gain and disseminate evidence about urban form, transport and health.

Environmental health

In this arena the health system can work in partnership with relevant agencies to minimise, monitor and respond to environmental hazards.

Recommendations to the Minister of Health

3. The PHAC recommends that the health system enhances the provision of public health expertise to relevant local, regional and central government agencies in order to improve environmental health.
4. The PHAC recommends that the Minister of Health works with his ministerial colleagues whose portfolios have direct links with environmental health to build explicit consideration of human health into environmental standards, regulations and initiatives.

Environmental health is an essential function of the health system. The health system has been a leader in environmental health since the 19th century, when it established a public works infrastructure to minimise the risk of disease outbreaks. The WHO argues that the health system must work to ensure that the health impacts of environmental plans and policies are explicitly acknowledged. New environmental hazards with potential human health impacts continue to emerge. Patterns of urban form affect many environmental health issues, including air quality, water quality, stormwater capacity and land use.

Health facility infrastructure

In this arena the health system can lead by example through its own facility infrastructure and employment practices.

Recommendations to the Minister of Health

5. The PHAC recommends that the Minister of Health directs the health system to give priority to:
 - (a) providing services in locations where they can be easily accessed by active and public transport
 - (b) using the principles of universal design when deciding on the location and design of all facilities providing publicly funded health services.
6. The PHAC recommends that the Minister of Health directs employers in publicly funded health services to develop travel plans for their employees that encourage and incentivise active, public and shared transport modes.

The health system is a major part of the urban infrastructure of many cities and towns, and is one of the country's largest employers. The PHAC proposes that the health system leads by example in making sure its own infrastructure and practices promote the features of healthy urban environments discussed in this report. In particular, it should promote active and public transport accessibility in the design and location of facilities, and healthy employment practices.

About this report

In recent years, the Public Health Advisory Committee (PHAC) has produced two reports to the Minister of Health on the health of people and communities. The first report focused on the impact of significant environmental issues on the public's health.² The second examined the relationship between socioeconomic status and health.³

This report to the Minister of Health also discusses the health of people and communities. It is an evidence-based look at how the urban environment influences the health of communities. The report is the culmination of a three-year project that the PHAC initiated in response to growing evidence of the connection between urban design and health outcomes such as chronic conditions, road traffic injuries and respiratory disease. The PHAC recognises that the disciplines of public health and urban planning have shared origins in the 19th century industrial city. Since that time, the two disciplines have parted ways, but the PHAC believes that a re-engagement is warranted.

The goal of the PHAC project was to provide advice to the Minister of Health on the links between the urban environment and health, and on opportunities for the greater involvement of the *health system* in urban environmental issues. To develop its collective thinking, the PHAC consulted with key stakeholders and produced a series of research papers (some of which are available on the PHAC website) comprising:

- an international review of evidence on the relationship between urban environments and health
- reviews of the impact of urban environments on key populations – older people, people with disabilities and children
- a review of healthy urban planning
- a series of 'think pieces' on the links between urban environments and health
- a survey of urban and transport planners about urban environments and health
- research into the history of the evolution of public health and urban planning in New Zealand from 1840 to 2005.

Although many aspects of life in cities and towns affect people's health, this report focuses primarily on the design and planning of our urban infrastructure. *Infrastructure* – the basic physical and organisational structures needed for the operation of a society⁴ – is what gives character and functionality to urban life. *Urban infrastructure* includes physical facilities such as roads, traffic lights, pavement, buildings, water systems and recreational spaces. It also comprises social elements – formal and informal systems through which people relate to and support each other, ranging from formal governance structures to informal networks that create community cohesion.⁵

This report does not focus on the indoor features of urban infrastructure, such as housing quality, because significant evidence has already been gathered and public health initiatives developed in this area. Housing policy, energy issues and economic development are also beyond the scope of this report, although the PHAC recognises their impact on health in an urban setting.

This report has three parts. Part 1 describes how the layout and design of urban areas shapes people's life choices and has a strong bearing on health outcomes. Part 2 describes the leadership role that the health system can take to help New Zealand's urban environments better promote people's health. Part 3 presents an evidence-based overview of the features of our urban infrastructure that have the greatest potential to improve health outcomes and provide cost benefits to the health system.

A glossary of important terms is provided at the end of the report. The first time a word in the glossary appears in the body of this report, it is written in *italics*.

Part 1: Urban form affects health

Part 1 describes how the layout and design of urban areas affect health outcomes. It highlights the impacts of urban form on particular populations and the need to develop urban form in ways that promote health.

1.1 Cities and towns are important for health and wellbeing

Although New Zealand portrays a rural image, the country has become increasingly urbanised. A century ago, half of all New Zealanders lived in an urban area; now the proportion in that category has reached 86 percent. The urban category includes New Zealand's 16 major urban areas, as well as smaller towns and settlements (see Box 1).

Box 1: New Zealand's urban areas

Statistics New Zealand's rural/urban profile divides New Zealand's population into seven categories on a rural-urban continuum. Three of these fit within the PHAC's definition of 'urban':

1. **Main urban areas** are Whangarei, Auckland, Hamilton, Tauranga, Rotorua, Gisborne, Napier-Hastings, New Plymouth, Whanganui, Palmerston North, Kapiti, Wellington, Nelson, Christchurch, Dunedin and Invercargill.
2. **Satellite urban communities** are towns and settlements with strong links to a main urban area (for example, Waikanae and Huntly).
3. **Independent urban communities** are towns and settlements, often in rural areas, with independence from main urban areas (for example, Westport, Masterton and Hawera).

Urban areas provide people with a range of opportunities. The economic and educational potential of urban areas tends to attract people, and the social and cultural potential is what makes cities and towns enjoyable places to live. Most New Zealand cities and towns were built upon earlier Māori settlements, and so *mana whenua* have spiritual connections with this land. For *taurahere* and other diverse populations migrating to urban areas, it is important that these places allow for establishment and retention of cultural expression. Cities and towns can provide children with resources and safe environments that enable them to flourish and grow. In urban communities, older people may be better able to access necessary services, remain socially connected and live in their homes longer.

Cities and towns also influence health in a way that goes far beyond the presence of health services in these areas (see Figure 1). The way urban areas are planned and laid out – known as *urban form* – shapes people's life choices and has a strong bearing on health outcomes. Urban form affects where we live, how we travel to work or school, how clean our air and water are, whether we are active, and what shops or other facilities we use. Appropriate planning of urban areas has the potential to help New Zealanders live healthier lives in a range of ways. For instance, planning can provide opportunities for physical activity and social interaction, and access to employment, health services and green space.

Figure 1: The determinants of health and wellbeing in our neighbourhoods



Source: WHO Collaborating Centre for Healthy Cities and Urban Policy, University of the West of England, Bristol, URL: <http://www.bne.uwe.ac.uk/who/researchthemes.asp>

In high-income countries such as New Zealand, advances in engineering during the past 50 years have reduced physical activity in daily urban life. People drive to work, school or the shops, work is more sedentary than it was for people in previous generations, and recreation is also increasingly passive.⁶ Many of New Zealand’s urban areas, built over the past 50 years in response to population growth, were planned around these advances in engineering. Such neighbourhoods often have poorly connected street networks (for example, cul-de-sacs rather than grid-like streets) and low-density housing that is beyond walking distance to shops, workplaces and public transport.⁷

International and New Zealand research suggests that the way we have been designing and planning our cities over recent decades is leading to some unintended negative consequences for health. Planned primarily around cars, these neighbourhoods are not conducive to physical activity for either recreation or *active transport*. In the resulting environments, there are fewer opportunities for social interaction, more motor vehicle emissions contributing to poorer air quality,



Planned primarily around cars, some neighbourhoods are not conducive to physical activity for either recreation or active transport. (Photo courtesy of aucklandtrains.co.nz)

and greater risk of road traffic injuries. The prevailing type of urban form also has negative consequences in terms of the environment and climate change and adds to New Zealand's 'carbon footprint' (see Box 2).

Box 2: Urban form and climate change

In New Zealand, global climate change is predicted to raise sea levels, place increased pressure on stormwater infrastructure, increase food- and water-borne diseases, increase heat-related illness and affect agricultural production.⁸

New Zealand has the fourth-highest per capita greenhouse gas emissions in the developed world.⁹ Motor vehicles are a major contributor to outdoor air pollution and account for almost 20 percent of New Zealand's carbon emissions. Between 1990 and 2005, when overall emissions increased by 25 percent, road transport emissions increased by 65 percent.¹⁰ Reaching targets to reduce emissions requires a significant reduction in car usage and vehicle miles travelled. Vehicle miles travelled (which affect carbon emissions) are connected to the sprawling features of urban areas. Sprawling neighbourhoods also rely heavily on scarce resources such as oil, are less efficient in reabsorbing carbon dioxide than bush or farmland, and can affect water quality.

Studies of other recent urban planning trends suggest that there is an unequal spatial distribution of services and amenities across urban areas. Some neighbourhoods have easy access to shops, work, parks and services. Other neighbourhoods have poor access to the above services. Still others have a relative overabundance of 'unhealthy' services, such as takeaway food outlets, non-casino gaming machines and alcohol outlets.¹¹

1.2 Urban form and prevalent health problems

Some prevalent health outcomes related to current trends in urban form are as follows.

Physical inactivity and associated diseases

Physical inactivity, obesity and a number of ailments (for example, hypertension, emphysema, asthma, abdominal problems and severe headaches) have been found to be associated with features of *urban sprawl*. These features include low-density dispersed development, *single-use* development, poorly connected street networks, and shops and public transport that are out of walking distance.¹²

People of all ages now spend more time in cars and less time walking or cycling for transport or recreation, particularly in urban areas.¹³ More than half of New Zealand children walked or cycled to school in 1989/90 and now less than one-third do so.¹⁴ Physical inactivity accounts for almost 10 percent of New Zealand's 20 leading causes of death.¹⁵ It is a contributor to obesity and type 2 diabetes, which together cost the *health system* over \$500 million per year.¹⁶ Obesity is associated with lower productivity at work.¹⁷

Poor diet and associated diseases

Overseas research has concluded that limited access to food shopping facilities (such as supermarkets) has an adverse impact on diets, including fruit and vegetable intake. Studies in New Zealand have not found the same connection,¹⁸ but have identified that residents living furthest from multinational fast-food outlets have greater vegetable intake.¹⁹

Along with greater physical inactivity, the increased consumption of fatty, high-calorie foods is a major contributor to obesity and lifestyle-related chronic conditions. Almost 30 percent of New Zealand's 20 leading causes of death have been attributed to poor diet.²⁰

Road traffic injuries

Traffic accidents are strongly tied to certain features of contemporary urban areas, including multi-lane streets, high traffic volume and high vehicle speed.²¹ There are more accidents and fatalities per capita in areas with urban sprawl. It is likely that this association is due to the higher vehicle miles travelled and higher traffic speeds in sprawling areas.²²

Although the rates of people walking and cycling have decreased over recent years, the pedestrian death/injury rate has stayed fairly constant and the cycling death/injury rate has increased.²³ Pedestrian injuries are more common in urban areas and among children,²⁴ and transport-related deaths are the greatest cause of mortality for children under 14 years of age.²⁵ The social cost of pedestrian injuries and fatalities is estimated to be \$290 million per year (based on 1996–1999 averages).²⁶ The social cost of all road traffic injuries was estimated to be \$3.7 billion in 2008.²⁷

Respiratory disease and cardiac conditions

Greater vehicle emissions and air pollution are associated with urban sprawl, because a sprawling design leads to more time in cars. Emissions exposure is greater on busy streets and worse for drivers and passengers than for those outside a vehicle.²⁸ Motor vehicle emissions can trigger asthma and heart attacks.²⁹

New Zealand has significant problems with respiratory conditions such as asthma, which can be exacerbated by air pollution.³⁰ Air pollution accounts for over 3 percent of New Zealand's 20 leading causes of death.³¹ Motor vehicle pollution, which is more common in urban areas, causes an estimated 500 deaths per year, an extra 540 cases of bronchitis, and an extra 250 hospital admissions for acute respiratory and cardiac conditions in New Zealand in adults over 30 years.³² Vehicle emissions can cause or exacerbate respiratory and cardiac illness, which costs the health system and economy an estimated \$415 million per year.³³

Social isolation

People become more isolated in low-density development in which people spend more time in cars and walk less.³⁴ Low-density development is linked with less civic engagement and weakened sense of community.³⁵ It can also lead to social exclusion for those who do not have a car.³⁶

Social cohesion is important for health. Individuals in communities with higher social cohesion tend to live longer, experience better cardiovascular health, recover faster from minor illness and be psychologically healthier.³⁷

Stress and anxiety

There is some evidence that traffic congestion and related travel delays are linked to high blood pressure, more sick days off work, more days in hospital and poorer job performance.³⁸ In contrast, access to high-quality green space is linked with quicker recovery from stress and lower rates of depression.³⁹ The links between urban form and mental health are less conclusive than for other health outcomes.

Alcohol-related harm

The location of alcohol outlets affects health outcomes. There are increased rates of injury, violent crime and other alcohol-related harm in areas where there is a high density of alcohol outlets.⁴⁰

Alcohol is estimated to cause 800 deaths per year⁴¹ and is a contributor to violence and road traffic injuries.

1.3 Populations most affected by urban form

The populations whose health is greatly affected by urban environments are those that are more constrained in getting around urban areas; as a result of financial limitations, limited mobility or dependency on others. Such populations include children, older people, people living with disabilities and people living in more socioeconomically deprived neighbourhoods.

Children

Physical activity is an important part of physical, mental and cognitive development. Physical activity among children can prevent cardiovascular disease later in life, through a reduction in risk factors (including obesity and sedentary lifestyles).⁴² Children are less likely to play outdoors or walk/cycle to school where there is limited access to recreational areas, where parents and children have fears about traffic safety and crime and where streets are poorly connected and sprawling.⁴³ A transport system dominated by cars can also exacerbate chronic conditions. Children with asthma, for instance, are particularly affected by air pollution because of their lung development.

Older people

Among older people, physical activity is an important means of minimising, avoiding or reversing poor health.⁴⁴ Physical activity not only reduces the risk of falls, but also contributes to social cohesion and mental wellbeing.⁴⁵ The outdoor environment greatly influences the extent to which older people remain active. There is evidence that older people who live in communities with quality footpaths, safe street crossings, and services close to home are more likely to walk and use public transport. Fast and busy traffic is a disincentive for older people to be active,⁴⁶ and older people have a high pedestrian fatality rate.⁴⁷ In addition, outdoor air pollution exacerbates respiratory and cardiac conditions among older people.

People with disabilities

Physical activity is beneficial for people with disabilities. In addition to all of the benefits experienced by the general population, physical activity can help to reduce the occurrence of secondary conditions that can result from some disabilities.⁴⁸ Urban areas are generally designed around the needs of an ‘average’ commuter, rather than the more varied needs of other populations, including people with disabilities. Although urban areas have become more accessible for people with disabilities over recent decades (for example, curb ramps are now a common feature), there remain a number of barriers, such as inaccessible buildings and facilities and a lack of accessible public transport.⁴⁹

People living in more socioeconomically deprived neighbourhoods

People in more socioeconomically deprived neighbourhoods experience higher rates of obesity and chronic conditions,⁵⁰ and are often exposed to environmental factors that exacerbate ill health. For example, levels of outdoor pollution are higher in New Zealand’s more deprived neighbourhoods.⁵¹ The prevalence of traffic accidents and the risk of pedestrian injuries are also greater in some deprived urban neighbourhoods.⁵² Some more deprived neighbourhoods have poorer access to high-quality green spaces.⁵³ People living in low-income households without a car and in areas with few services and little public transport are less likely to be able to reach important services such as supermarkets and health care facilities.⁵⁴

Urban environments designed without consideration of the needs of the above populations generate costs to health. Furthermore, some of these populations overlap with each other, with some groups in the population facing multiple health disadvantages. For example, the prevalence of disability increases with age; and older and disabled people have a greater likelihood of earning less and hence residing in more deprived neighbourhoods.



Urban environments designed without consideration of the needs of some populations generate costs to health. (© Project for Public Spaces, www.pps.org)

1.4 Planning to promote health

Urban form is just one of the many factors that affect health. Factors, such as socioeconomic status, education, ethnicity, health information, lifestyles and health service delivery, also affect health outcomes. Urban form is important because it shapes people’s living environments and influences the decisions they make about their lifestyles. Individuals can, and do, take responsibility for aspects of their own health, but they cannot create walkways, accessible green spaces or safe roads.

To respond to some current health issues, such as chronic conditions, which place a major burden on the health system and are expected to increase, we must plan and design our cities to promote health. This is especially important for those populations that are more constrained in getting around urban areas.

The way we approach urban planning will also be important for the health of future generations given that *infrastructure* is both permanent and costly. New Zealand is projected to become even more urbanised over the next 20 years. It is estimated that 90 percent of our total population growth will take place in the North Island, and almost two-thirds of the growth will be in Auckland. The number of people aged over 65 years will increase dramatically, as will the size of Māori, Pacific and Asian populations, and the number of single-parent and single-person households.⁵⁵ We need to create an urban form that is adaptable to population changes and will minimise some of the unintended health consequences that we see today.

There is a growing body of research highlighting that it is possible to design cities and towns for positive health outcomes. The evidence, which is detailed in Part 3, suggests that healthy urban form provides:

- opportunities for walking and cycling
- easy access to public transport
- community cohesion
- maximum health benefits from services and facilities
- clean air, water and soil and effective waste disposal.



There is a growing body of research highlighting that it is possible to design cities and towns for positive health outcomes.

Many of these features have been shown to both be cost effective and provide cost benefits to the health system. *Equity*, integrated planning, Māori engagement and community engagement are all important aspects of urban planning. They help urban form be more cohesive and supportive for populations most vulnerable to ill health.

Part 2: The health system's role in creating healthy urban areas

Part 2 describes the leadership role that the health system can take to help New Zealand's urban areas better promote people's health. It provides recommendations to the Minister of Health about priority areas. It also describes current examples of how the health system can influence the creation of healthy urban areas.

2.1 An international move to create healthy urban areas

Many of the world's most notable cities have been planned to promote healthy, active and social living. Florence's abundance of cafés encourages walking and social interaction. Copenhagen's support for cycling paints a new picture of 'commuter traffic'. New York City's intricate public transport system efficiently carries millions of passengers every day, and its numerous public parks provide opportunities for recreation and social cohesion.

Some of these features have historic roots, as in Florence and New York City. Others involve a deliberate shift in their shape and form. In these cases, leaders have recognised that developing multiple transport modes, opportunities for walking and cycling, and mechanisms for social interaction bring 'co-benefits' in terms of the environment, tourism, business, health and society. The changes undertaken in Copenhagen and Portland, Oregon provide two examples of this kind of leadership.

In Denmark, cycling to work plummeted between 1950 and 1975. Then the 1970s oil crisis prompted the Government to invest in cycling and public transport infrastructure. Policies included establishing cycle lanes and paths, modified intersections, traffic signals that prioritised cyclists, and *traffic calming* measures. Private car use was discouraged through parking fees, taxes and tough driving tests. These changes have meant that one-third of Copenhagen residents now cycle to work, and there has been a 25 percent drop in cycle accidents.⁵⁶ The Government is investing another US\$16 billion in high-speed intercity trains, light rail and city bicycle lanes. The aim is to increase the proportion of Copenhagen commuters cycling to work to 50 percent by 2020.⁵⁷

In the 1970s Portland, Oregon was threatened with a deteriorating urban centre, degraded housing and poor air quality.⁵⁸ Through both city and state leadership in urban planning, the Government prioritised *urban regeneration*, the expansion of public transport, walking and cycling infrastructure, and integrated urban development and transport planning. City authorities turned down a proposed bypass highway in favour of light-rail and public transport-oriented development when they realised that the latter would produce significantly fewer vehicle miles travelled and lower levels of congestion.⁵⁹ These efforts have led to positive outcomes for health, the environment and the economic growth of the city. The city is rated as one of the most walkable and cycleable in the United States. Greenhouse gas emissions decreased by 13 percent per year from 1990 to 2003. Walking traffic led to more retail spending, and the regenerated city became a focal point for business, attracting skilled workers, residents and tourists.⁶⁰

The efforts of Copenhagen and Portland highlight the changes to cities that leadership and a focus on healthy *urban design* can achieve. Many urban areas are developing compact, liveable communities that reduce urban sprawl, increase transport options, create a sense of community and place, and preserve natural resources. Different sectors and traditions have converged to advocate for these changes in response to climate change, resource depletion, rising greenhouse gas emissions, obesity, excessive water use, water and air pollution, traffic congestion, and social isolation. They have found that these changes also create more foot traffic and retail spending and have lower public service and infrastructure costs per capita.⁶¹

Public health leaders have been among those gathering evidence about urban form and advocating for such changes. The Healthy Cities movement of the World Health Organization (WHO) has focused increasingly on urban planning. The recent report produced by the WHO and the Commission on Social Determinants of Health highlights improved living conditions (including health-focused urban governance and planning) as one of three overarching recommendations to improve health equity.⁶²

2.2 New Zealand's move to create healthy urban areas

Some momentum for a changed urban form is apparent in New Zealand. Cities such as Waitakere, Manukau, Christchurch and Tauranga are part of international movements – Healthy Cities, Eco-Cities and SmartGrowth. Some territorial authorities have made efforts towards public transport-oriented development, as Wellington City Council has done with its urban growth ‘spine’. A series of government plans and initiatives, including the Urban Design Protocol, growth plans and regional strategies, aim to create high-quality, coordinated urban growth. Furthermore, there is a growing body of research in New Zealand linking urban form to health. Surveys confirm that many New Zealanders want their children to walk and cycle to school but are constrained from taking up this option by fear or practical obstacles. Many New Zealanders also believe that the environment should be protected even if it slows economic growth. These views suggest widespread support for a changed urban form.⁶³

In spite of these efforts, health outcomes do not currently feature as a major consideration in most urban planning decisions. The PHAC surveyed almost 800 urban and transport planners about the extent to which they consider health and wellbeing in undertaking their work. Although 89 percent of the 234 respondents acknowledged that there is a strong or moderate link between urban planning and health, almost 70 percent said that health and wellbeing considerations have a minor impact or none at all on their final planning decisions.

2.3 The importance of health system involvement

As part of its mandate to prevent ill health and promote health; and in order to reduce demand on health services, the health system has a responsibility to take leadership to ensure that health concerns are firmly considered alongside economic, environmental and social concerns in urban planning decisions. With a growing body of evidence about health and urban form, a strong international movement and potential co-benefits for the environment, economy and society, it is an opportune time for the health system to increase its leadership role.

Overseas, health systems are playing an increasing role in urban form and transport. The United Kingdom’s National Health Service has established the London Healthy Urban Development Unit and the Australian Federal Government is prioritising stronger links between health and urban planning in response to chronic conditions.⁶⁴

There are three arenas where the PHAC believes the New Zealand health system can have the greatest impact in creating healthy urban environments:

- urban form and transport – displaying leadership and coordinating with other sectors to include health factors in urban planning decisions
- *environmental health* – working in partnership with relevant agencies to minimise, monitor and respond to environmental hazards
- health facility infrastructure – leading by example through the health system’s own facility infrastructure and employment practices.

2.3.1 Urban form and transport

Recommendations to the Minister of Health

1. The PHAC recommends that the Minister of Health encourages the health system to support the development of:
 - (a) urban infrastructure that promotes active transport for all populations
 - (b) other features of urban form that promote positive health outcomes for all populations (for example, a controlled number of alcohol outlets, and increased quality of and access to open spaces).
2. The PHAC recommends that the Minister of Health works with his ministerial colleagues whose portfolios have direct links with urban form and transport to place health and health equity at the centre of urban governance and planning.

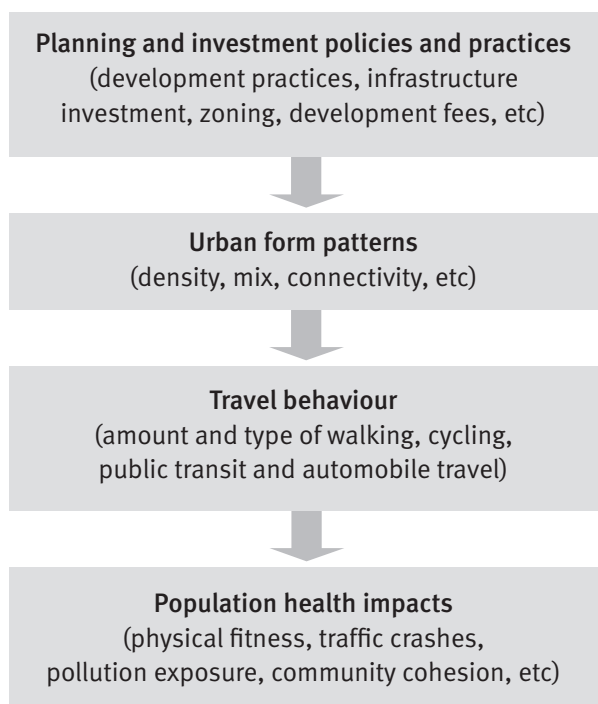
Why urban form and transport?

If designed appropriately, urban form and transport can increase physical activity, improve air quality, reduce road traffic injuries, increase social cohesion, and achieve maximum health benefits from services and facilities (see Figure 2). How urban areas can be designed and planned for the greatest health benefits is described in Part 3.



Accessible public transport increases everyday physical activity.

Figure 2: From land use to travel behaviour to health



Source: Frank et al, 2006 (see note 22).

Urban form can also help create a sense of place. This is important for the health and wellbeing of all populations living in urban areas, and especially of Māori. For many Māori, the wider physical and natural environment is intrinsically connected to their concept of health and wellbeing. Urban areas that display a Māori cultural landscape, protect the natural environment and biodiversity, and use correct tribal names for places help strengthen Māori connections to these areas and improve their health in turn.⁶⁵

The involvement of the health system in increasing public and active transport (replacing shorter driving trips to work or school, for example, with walking or cycling) is especially important. These transport ‘modes’ provide the potential for improved health outcomes. Walking and cycling are some of the most accessible and effective ways to meet the required physical activity levels, and they are a key part of chronic disease prevention and management.⁶⁶ Accessible public transport increases everyday physical activity because passengers walk and cycle to transport stops. The health system has an obvious role to play in other urban planning issues as well: for example, control of alcohol outlet density, access to healthy food outlets, access to green spaces and Māori engagement.

Current barriers to considering health in urban form and transport

Public health and urban planning have shared origins in their initial purpose of improving urban living conditions at the end of the 19th century. However, more recently the two disciplines have diverged. Health functions are now focused more specifically on environmental health, and planning functions are focused on land use.

The PHAC has identified a range of barriers that prevent or limit consideration of health in urban form and transport. These barriers are summarised in the first column of Table 1 on page 14. The PHAC’s survey of urban and transport planners – those directly responsible for shaping urban form and transport – identified that some planners lack knowledge about the links between urban planning and health, and ways to integrate health considerations into planning.

Survey respondents also identified time constraints and strict assessment requirements as barriers against taking such considerations into account.

Table 1: Approaches to achieving health and equity considerations in urban planning

Barrier to considering health and equity	Health system approach to overcome barrier
Decision-makers (or clients) have priorities other than health.	1. Be involved in key urban environment decisions to provide a health perspective.
There is no legislative mandate for urban planning to consider health. Planners face other assessment requirements or time constraints.	2. Support standards, requirements or practices that consider health and promote healthy urban form.
Planners do not know about the link between urban form and health, or about ways to integrate health considerations into planning.	3. Work with other sectors to determine the health benefits of plans and policies. 4. Gain and disseminate evidence about urban form, transport and health.

Furthermore, planners highlighted that there is little legislative mandate for health. In contrast, they have a clear mandate to consider environmental impacts of planning decisions through requirements of the Resource Management Act 1991 (RMA). The PHAC believes action on health requires leadership and prioritisation by key decision-makers at the local, regional and central government levels. However, survey respondents and other stakeholders emphasised that consideration of health impacts is not a priority among decision-makers. This relative lack of priority is potentially the biggest barrier to consideration of health in urban form and transport.

Many policies and planning decisions lack an explicit focus on reducing inequities. The PHAC’s survey of urban and transport planners found that 40 percent of respondents do not consider equity issues in their planning decisions. Other New Zealand research has similarly identified that transport planners fail to address equity issues, such as effects of the distribution of transport on people on low incomes.⁶⁷ If equity is not taken into account in urban form, this oversight will have significant costs for the health system as well as poor health outcomes for some communities.

How the health system can influence healthy urban form and transport

Responsibility for monitoring and improving New Zealand’s urban environments sits across the health system. The Ministry of Health is currently working with other central government agencies such as the Ministry of Transport and the Ministry for the Environment. Medical officers of health and public health units are beginning to work more closely with Regional Land Transport Committees, and with local and regional government on regional strategies and district plans related to urban form and transport. The PHAC believes this work is essential and could be expanded.

The PHAC has identified four approaches the health system can use to overcome key barriers identified by urban and transport planners. These approaches are summarised in Table 1 and discussed in more detail below.

1. *Be involved in key urban environment decisions*

For health to become a priority, a ‘health voice’ needs to be at the decision-making table. This voice can provide evidence about the health effects of aspects of urban planning, and highlight the important infrastructure elements from a health perspective. In some cases, the health system can also provide funding towards infrastructure improvements, as it is doing for ‘Warm Up New Zealand’ and regional Healthy Housing initiatives. The recent experience of housing insulation and clean heating also shows us that the health ‘lens’ can be an important trigger for initiating change.

All parts of the health system can be a voice for healthy urban form and transport. For example:

- the Minister of Health has an essential role in Cabinet, participating in discussions such as transport policy, the RMA review and climate change strategies
- the Ministry of Health can take a leadership role within cross-agency central government initiatives
- medical officers of health can be part of Regional Land Transport Committees
- District Health Boards (DHBs) and public health units can become actively involved in key opportunities for regional/local government planning and develop relationships with mayors and other local authority leaders
- clinicians and primary health organisations can participate in community forums by sharing their medical knowledge and identifying health priorities for their communities.

The PHAC believes the health ‘voice’ needs to be more consistent and occur at all levels.

2. *Support standards, requirements or practices that promote healthy urban form and transport*

Standards, requirements and practices that promote healthy urban form and transport provide both the mandate and the accountability to consider health effects of planning decisions. For example, an objective of the Land Transport Management Act 2003 is to promote and protect public health. It technically requires transport policies to consider health; however understanding of the meaning of public health is weak, as is accountability for meeting this objective.

Another way to promote standards and practices that consider health is through incentives. The health system can encourage local and central government to provide incentives for explicit health considerations and the development of features of urban form that promote health.

The PHAC believes there needs to be stronger accountability for health through legislation, standards or incentives.

3. *Work with other sectors to determine the health benefits of plans and policies*

The health system has an important role in working with other sectors to assess the health benefits of plans and policies. A range of tools has been developed for this purpose. One tool is Health Impact Assessment (HIA), which the WHO initiated as part of its Healthy Cities initiative in the 1990s. HIA provides a health ‘audit’ on proposed policies or programmes, and increases awareness about health-related issues during policy and programme development. This tool is now widely used in Canada, the United Kingdom, Finland, the Netherlands, Australia, Thailand,

South Africa and New Zealand. The PHAC laid the groundwork of health and wellbeing impact assessment in New Zealand by producing a comprehensive resource that has been used at local, regional and national levels.⁶⁸

Other tools include the Whānau Ora HIA, the Whānau Ora tool, the Health Equity Assessment Tool, and resources such as the publication, *Health Promotion and Sustainability through Environmental Design* by the Christchurch City Council and Canterbury DHB. The health system can help other agencies make use of these resources or offer training courses in HIA and related tools. The Ministry of Health's HIA Support Unit supports DHBs, local government and other agencies through training, advice and funding for assessing health benefits.

Public health positions in local and regional government and in the transport sector have been piloted both in New Zealand and overseas. Such positions enable the health system to be involved in key urban environments decisions and to work with other sectors to determine the health benefits of plans and policies. Finally, the health system can work with academic institutions to introduce public health elements into urban planning qualifications, as well as urban planning policies and plans in public health training.

4. Gain and disseminate evidence about urban form and health

To foster understanding about healthy urban form, the health system can actively disseminate evidence about urban environments and health to other agencies. This work could include disseminating studies and summaries of evidence. In addition there is a growing number of completed HIAs on topics such as urban development and transport strategies, growth and concept plans, housing developments, water schemes, electricity plans and graffiti prevention.

The health system can gather evidence through recording assessments of health benefits and monitoring the health impacts of environmental modifications. It can conduct research to generate evidence on topics such as cost–benefit analyses of health effects of land use decisions, economic benefits of certain types of urban form and urban governance models that support health.

Current opportunities

Opportunities for the health system to work in partnership with other agencies to achieve health benefits from urban form and transport exist at local, regional and national levels. Table 2 lists a selection of current opportunities.

Table 2: Current opportunities to develop active transport and other urban form features to promote positive health outcomes

Example of actions	Health system role
Expansion of the national cycleway to urban areas	<p>Minister of Health – Promote to Cabinet the expansion of the national cycleway to urban areas.</p> <p>DHBs – Promote the expansion of cycleways to more socioeconomically deprived neighbourhoods in conjunction with local and regional governments.</p>
Greater investment in public and active transport	<p>Minister of Health – Encourage Cabinet to prioritise funding for public transport and walking and cycling infrastructure.</p> <p>Minister of Health – Encourage Cabinet to require territorial authorities to adopt minimum requirements for public transport accessibility in urban development within each district.</p> <p>DHBs – Encourage territorial authorities to include provisions for all modes of travel in roading improvements; increase compact, healthy development; and increase public transport accessibility in more deprived neighbourhoods.</p> <p>DHBs – Support district plan specifications that require promoters of residential developments above a certain threshold size to take account of acceptable walking times to a specified range of local services and facilities.</p>
Health considerations in urban form	<p>Minister of Health – Encourage Cabinet and government departments to assess major planning and infrastructure decisions for health benefits, through HIA or a focus on health within strategic environmental assessments.</p> <p>Ministry of Health – Promote inclusion of health in National Policy Statement on Urban Design.</p> <p>DHBs – Encourage local government urban design groups to include assessments of healthy infrastructure alongside other assessments.</p> <p>DHBs – Work with local government and New Zealand Land Transport Agency to assess health benefits of urban form plans and policies, using tools such as HIA.</p> <p>DHBs – Establish public health positions in relevant agencies. Determine health and wellbeing urban planning priorities with territorial authority leaders.</p>
Auckland ‘super city’ governance	<p>Ministry of Health and DHBs – Work with the Auckland Transition Agency and other relevant organisations to ensure that new governance models enable appropriate consideration of community health issues and concerns.</p>
Planning around schools	<p>Ministry of Health – Work with Ministry of Transport and Ministry of Education to develop policies and activities for creating safe walking and cycling routes to school.</p> <p>DHBs – Work with local governments to place zoning restrictions on alcohol outlets and takeaway food outlets near schools.</p>
Research on urban form and health	<p>Ministry of Health – Work with Ministry for the Environment and Ministry of Transport to develop a research agenda on urban form and transport.</p> <p>Ministry of Health and DHBs – View modifications to urban areas as natural experiments and analyse impacts on health with relevant agencies and academic departments.</p>
Review of Sale of Liquor Act 1989	<p>Ministry of Health and DHBs – Work with the Law Commission to build public health provisions into the review of the alcohol legislation with respect to density and location of alcohol outlets.</p>
Expansion of healthy food ‘outlets’	<p>DHBs – Promote the use of public and private spaces (eg, car parks) for farmers’ markets in urban areas, in locations accessible by public transport.</p>

2.3.2 Environmental health

Recommendations to the Minister of Health

3. The PHAC recommends that the health system enhances the provision of public health expertise to relevant local, regional and central government agencies in order to improve environmental health.
4. The PHAC recommends that the Minister of Health works with his ministerial colleagues who have direct links with environmental health to build explicit consideration of human health into environmental standards, regulations and initiatives.

Why environmental health?

Contemporary public health originated over a century ago in the organised provision of potable drinking water, sewage disposal and general waste disposal to reduce infectious diseases. Around the world, health authorities established public works infrastructure, set standards and implemented monitoring to minimise the risk of outbreaks. This infrastructure is less visible than other aspects of urban form but is another essential aspect of it.

New environmental hazards with potential human health impacts continue to emerge. Patterns of urban form affect many environmental health issues, including air quality, water quality, stormwater capacity and land use (see Part 3 for further discussion). For example, a sprawling urban design can increase water pollution from runoff. Some of these issues are also detailed in the PHAC's 2002 report on environmental health.⁶⁹



Patterns of urban form affect many environmental health issues, including air quality, water quality, stormwater capacity and land use.

How the health system can improve environmental health

Protecting and improving environmental health is an essential public health function. The WHO argues that the health system must work to accelerate the improved delivery of environmental health interventions.⁷⁰ Specifically, it highlights the following important responsibilities for the health system in terms of environmental health.

1. Ensure that environmental health issues are adequately reflected in inter-sectoral policy development and implementation.
2. Set and oversee the implementation of health-protecting norms and regulations.
3. Incorporate environmental health in disease-specific and integrated health programmes.
4. Practise environmental health in health care facilities.
5. Prepare for and respond to outbreaks of environment-mediated diseases.
6. Identify and respond to emerging threats and opportunities for health.⁷¹

These functions are relevant to environmental health in urban areas (in particular for air quality, water quality, land use and waste management). Currently the Ministry of Health, DHBs and public health units are actively involved in these functions. The Health Act 1956 provides for the appointment of designated officers (medical officers of health and health protection officers) and the appointment of environmental health officers in territorial authorities to carry out health functions. The Ministry of Health is responsible for advising other agencies, such as local and regional governments, the Ministry for the Environment and the Ministry of Agriculture and Forestry, on the human health effects of ecological issues.

The health system works to ensure that the health impacts of environmental plans and policies are explicitly acknowledged. It works with other agencies to develop health-protecting standards and regulations, and to monitor their implementation and contribution to achieving population health gains.⁷² Standards and regulations are usually based on best available evidence, scientific consensus and WHO recommendations. It is important to monitor environmental health in order to provide key evidence to environmental health practitioners, decision-makers and the community. Such evidence can inform action when risks or threats arise.⁷³ The health system also works to assess health benefits in other ways, including through the use of HIA.

Current opportunities

There are a number of ways for health to be considered in environmental regulations and standards. Table 3 lists a selection of opportunities.

Table 3: Current opportunities for the health system to work in partnership with other agencies to achieve improved environmental health outcomes

Example of actions	Health system role
Review of the RMA	Minister of Health – Advocate that human health be incorporated as a priority outcome in Phase II of the RMA review.
Review of Resource Management Regulations 2004 (the air quality standards)	Ministry of Health – Work with the Ministry for the Environment to ensure that air quality standards consider health impacts in addition to environmental impacts.
Assessment of health benefits	Ministry of Health and DHBs – Work with relevant agencies to assess the health benefits of plans and initiatives related to air quality, land use, water quality and waste management, using tools such as HIA.
Climate change mitigation	Minister of Health, Ministry of Health and DHBs – Ensure that economic and social policy responses to climate change and other forms of environmental degradation take into account health and health equity.

2.3.3 Health facility infrastructure

Recommendations to the Minister of Health

5. The PHAC recommends that the Minister of Health directs the health system to give priority to:
 - (a) providing services in locations where they can be easily accessed by active and public transport
 - (b) using the principles of universal design when deciding on the location and design of all facilities providing publicly funded health services.
6. The PHAC recommends that the Minister of Health directs employers in publicly funded health services to develop travel plans for their employees that encourage and incentivise active, public and shared transport modes.

Why health facility infrastructure?

The PHAC proposes that the health system lead by example in promoting, through its own infrastructure and practices, features of healthy urban form (as identified and discussed further in Part 3). In particular it should promote accessible active and public transport in the design and location of its facilities, as well as promoting healthy employment practices. It can also promote principles of *universal design* to increase access for all populations.



The health system is an important part of the *urban infrastructure* of many cities and towns, and is one of the country's largest

The health system is an important part of urban infrastructure. Health facility design and layout can facilitate access and promote health. (© Imageworkz. Courtesy of Chow:Hill)

employers. The design and layout of its services can facilitate access and promote health. Buildings can be designed to promote access for people with disabilities and older people. They can also be designed for safety and cohesion, with windows and doors facing streets to provide surveillance and enable streets to be an integrating (rather than dividing) element within neighbourhoods.⁷⁴ Finally, they can be designed for multiple transport modes, be located near public transport routes, and provide paths and adequate lighting (in larger-scale facilities).

The WHO highlights that health services have an obligation to set an example by creating and improving opportunities for participation in physical activity.⁷⁵ Over recent years, the United Kingdom has focused on hospital and health service design; encouraging service designs that are clinically efficient, integrated within the community and accessible for consumers and the public, and that encourage patient and staff wellbeing.⁷⁶ Two key elements of the recommended design of health care buildings are 'integrated design' (which includes ease of access and integration with public transport) and 'public open space' in which pedestrians have priority over cars and landscaping enhances the natural landscape.⁷⁷ Sustrans in the United Kingdom is

a national charitable group that has produced a guide for health care organisations to promote healthy travel for staff and visitors – dealing with areas such as travelling to work, and the location of meetings to accommodate people with disabilities.⁷⁸

How the health system can create its own healthy infrastructure

New Zealand’s health services are inconsistent in the extent to which they promote the features of healthy urban environments. Some encourage physical activity, mode choice and accessibility for all populations because they are located along walking and public transport routes, and include design features to accommodate people with disabilities and older people. Middlemore is an example of a hospital situated near public transport.

Other services have poor disability access and limited pedestrian or public transport access, or have not clearly advertised the access that is available. New Zealand’s recently developed mobile dental clinics have no disability access, limiting their functionality for children with disabilities. Using principles of universal design might have avoided this limitation.

Health services under construction – hospitals, general practices, mobile clinics, rest homes, surgical hospitals or integrated family health centres – have the opportunity to:

- select their location based on proximity to public transport, walking or cycling routes, and other relevant services
- build walking and cycling routes and supporting facilities (for example, bicycle racks, lighting and showers) on campus
- construct stairs so they are centrally and attractively situated in the building with at least equal prominence to elevators
- provide high-quality access for people with disabilities and older people.

Existing services are more limited in their ability to modify buildings or locations, but still have opportunities to:

- improve walking and cycling routes and facilities on campus
- develop public transport, walking and cycling maps for clients and staff
- advocate for public transport stops near the facility (for example, the newly refurbished Wellington Regional Hospital has a bus stop outside the main entrance)
- upgrade access to meet accessibility standards
- alert users to public transport access rather than just advising of parking facilities.

A number of tools are available to assist in health facility location and design. Health services can become signatories to the Urban Design Protocol, which provides information and resources on quality urban design. Health architects can also follow the Centre for Health Assets Australasia’s Health Facility Guidelines. The location and design of a proposed health facility can be assessed for health benefits, using tools such as HIA.

Health system employers can model employer practices to encourage active and public transport, as well as sustainability. Not only do such practices set an example for other employers; they also benefit the health system in that physically active employees are more productive. Employers can:

- provide pool bikes in addition to pool cars
- provide walking shoes as a staff benefit instead of staff parking spaces
- undertake travel planning and develop public transport, walking and cycling maps (a travel plan sets out steps to encourage staff to travel by public transport, active transport or car share).

Current opportunities

There are a number of ways for the health system to lead by example in the location and design of its own infrastructure and in its employment practices. Table 4 lists a selection of these opportunities.

Table 4: Current opportunities for the health system to lead by example in promoting active transport and accessibility

Example of actions	Health system role
Integrated family health centres	Ministry of Health – Require that health architects developing the centres become signatories to the Urban Design Protocol and adhere to its principles as part of the proposal process.
Improvements to existing service location and design	DHBs – Work with local government to modify requirements for provision of parking spaces for health facilities. DHBs – Work with local authorities to have public transport stops located closer to health facilities.
Travel planning	Ministry of Health, DHBs, primary health organisations (PHOs) and general practices – Develop (or continue) travel planning schemes for employees, and provide pool bicycles and public transport vouchers along with pool cars.
Incentives for active transport	Ministry of Health, DHBs, PHOs and general practices – Develop supporting infrastructure for walking and cycling. Provide financial incentives for employees who use active transport.
Locality planning	DHBs – Build considerations of service location and design into locality planning.

Part 3: An overview of how to create healthy urban form

Part 3 presents an evidence-based overview of the features of our urban form that have the greatest potential to improve health outcomes and create health savings. It considers New Zealand and overseas examples for improving these features.

The WHO views a healthy urban environment as one that: provides all populations with access to basic goods; is socially cohesive; is designed to promote physical and psychological wellbeing; and is protective of the natural environment. The WHO emphasises the importance of equity for achieving healthy urban environments and improving overall health status.⁷⁹

Healthy urban planning is a fundamental part of efforts to create a healthy urban environment because it can shape how people live, travel, relate to each other and feel connected to their community – all important aspects for health. Healthy urban planning promotes the idea that a city is much more than the sum of buildings, streets and open spaces. It focuses on planning for people.⁸⁰ The PHAC considers three principles to be fundamental to healthy urban planning:

- integrated planning
- Māori engagement
- community engagement.

In addition to these principles, the PHAC reviewed the growing body of New Zealand and overseas evidence around urban form and health. It also reviewed the increasing number of case studies that illustrate ways to design cities, towns, neighbourhoods and streets to promote health. The PHAC identified that some features of urban form have the potential to turn around poor health outcomes burdening the population and the health system, provided that all populations have equitable access to these features. There is also evidence that these features provide cost benefits to the health system. From the evidence it has reviewed, the PHAC has concluded that ‘healthy urban form’ provides:

- opportunities for walking and cycling
- easy access to public transport
- community cohesion
- maximum health benefits from services and facilities
- clean air, water and soil, and effective waste disposal.

These features are interconnected and best implemented using the previously described principles of healthy urban planning. They each also require a focus on equity.

Physical infrastructure shapes how people live and travel but, alone, it does not shape the social fabric of a city. Health research has highlighted the complex and interconnected risk factors of ill health. It has underscored that any changes to urban form are most effective when made along with other changes. Some examples of complementary changes are policies to improve housing mix and affordability, information campaigns on the benefits of walking and cycling, and community development initiatives to improve street landscapes.

The rest of this part describes the principles of healthy urban planning and the features of healthy urban form identified by the PHAC. It also highlights examples of jurisdictions that are establishing and strengthening these features.

3.1 Integrated planning

An integrated approach to decision-making – both across and within agencies – enables economic, social and environmental policies to complement each other, to achieve the optimal benefits.⁸¹ This approach involves a shared recognition of the problems and of the need for synergy to tackle them effectively and comprehensively.⁸²

The agencies, policies, legislation and programmes involved in creating and sustaining urban areas are vast and complex (see Appendix 1). Agencies responsible for transport, land use, energy, pollution control, water, housing and health each have specialist expertise, but often work or plan in isolation. In many instances, the boundaries of each agency's work area are historic and do not reflect the intricacies of health, social, economic and environmental issues in urban areas today.

A primary aspect of integration is integrated land use and transport planning. Consideration of this aspect is essential in developing cohesive urban form. When land use planning is integrated with transport planning, transport can be planned for people as well as cars. Experience suggests that integrated planning is needed across both urban and suburban areas, including across local government boundaries so that urban development between adjoining boundaries is complementary.⁸³ Currently there are only weak statutory connections between land use and transport planning. Consequently non-statutory strategies such as the Bay of Plenty's SmartGrowth are all the more important because they seek to integrate planning and delivery of transport with land use planning and infrastructure development (see Box 3).

Integrated planning also incorporates economic development, environmental sustainability, safety, community cohesion, and health across all sectors, including the private sector. Regional strategies such as the Wellington Regional Strategy and the Christchurch Urban Development Strategy acknowledge the interrelated nature of these issues. They consider future population demands and constraints on essential resources such as oil, water and land. The Long-term Council Community Plan (LTCCP) process is another tool with which communities and agencies can articulate medium- to long-term priorities. At a practical level, such strategies and tools can be used to assign funding and provide a base for turning higher-level aspirations into a reality.

Internationally central governments provide guidance and strategic direction for cities. In Australia the Federal Government has proposed introducing national criteria for the future planning of Australian cities. The closest approximation to this national guidance is an Auckland-based interdepartmental office, the Government Urban and Economic Development Office (GUEDO), but its work is focused solely on Auckland.

The PHAC believes integrated planning is essential to creating healthy environments, and that health system involvement in these interventions should be consistent.

Box 3: Case studies of integrated planning

1. SmartGrowth – Bay of Plenty

SmartGrowth, led by Environment Bay of Plenty, Tauranga City Council, Western Bay of Plenty District Council and tāngata whenua, seeks to integrate planning and the delivery of improved transport with land use planning and infrastructure development, to achieve social, economic and environmental goals.

2. Wellington Regional Strategy

The Wellington Regional Strategy was adopted in 2007 as a sustainable growth strategy for the Wellington region. It was developed by the nine local authorities in the region – the Greater Wellington Regional Council and the eight local city and district councils. These authorities are working in tandem with central government and business, education, research and voluntary sector interests. The strategy contains a range of initiatives to realise economic potential and to enhance ‘regional form’: transport, housing, urban design and open spaces.

3. Greater Christchurch Urban Development Strategy

Selwyn and Waimakariri District Councils, Christchurch City Council, Environment Canterbury and the former Transit New Zealand collaborated to produce the Greater Christchurch Urban Development Strategy. The strategy aims for sustainable future growth in the region. Canterbury DHB undertook an HIA on the strategy in 2005. Among other actions, the HIA report (released in 2006) recommended the development of cross-sectoral collaborative project groups to focus on improving air quality. Potential partners included Environment Canterbury, the territorial authorities, the DHB, the former Transit New Zealand, the Ministry of Health, the Ministry for the Environment and private building companies.

3.2 Māori engagement

The PHAC believes urban environments should reflect Māori values and identity comprehensively.

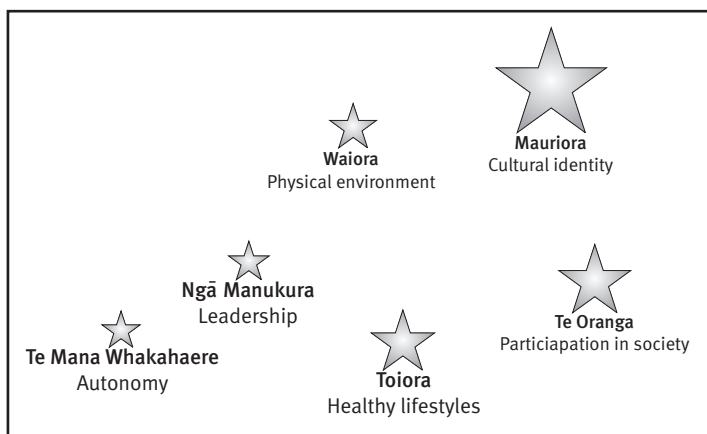
For many Māori, the wider physical and natural environment is intrinsically connected to their concept of health and wellbeing. In addition, as tāngata whenua of our urban areas, Māori have the role of kaitiaki (guardians) of the environment. The role of iwi, hapū and tāngata whenua as kaitiaki is recognised in the RMA. The Local Government Act 2002 also recognises this unique role, but is more general in requiring local authorities to promote Māori participation in decision-making processes.

Whānau ora – supporting Māori families to maximise their health and wellbeing – is an important objective of the health system.⁸⁴ Māori engagement in urban planning can contribute to whānau ora in a number of ways. Te Pae Mahutonga (a Māori model of health promotion developed by Professor Mason Durie) can be used to outline elements of Māori engagement in urban environments (see Figure 3).



An urban landscape that reflects cultural symbols helps create a sense of place for many Māori and is an important part of Mauriora.

Figure 3: Te Pae Mahutonga



Source: Durie M. 1999. Te Pae Mahutonga: A model for Māori health promotion. *Health Promotion Forum of New Zealand Newsletter* 49. 2–5 December 1999.

- ★ Waiora promotes the idea that aspects of the physical environment important to Māori are protected.
- ★ Toiora suggests that neighbourhoods where Māori live promote active and social living.
- ★ Mauriora includes an urban cultural landscape that reflects cultural symbols, as well as the correct use of tribal names.
- ★ Through Te Oranga, Māori are supported to participate in community engagement processes and design of urban features.
- ★ The principles of Ngā Manukura and Te Mana Whakahaere are important for ensuring that Māori priorities are expressed and incorporated into urban planning, and that iwi have the autonomy to determine urban development priorities.

The PHAC believes that Māori engagement is essential to whānau ora. A number of methods are available to engage with both iwi and taurahere (Māori living within the mana whenua of another iwi). These methods include establishing Māori representation on local authority seats, iwi groups working in partnership with local authority environmental groups, and setting up Māori advisory groups and Māori urban authorities (Box 4).

Box 4: Case studies of Māori engagement

1. Te Aranga strategy – Gisborne

Te Aranga strategy is a Māori cultural landscape design strategy to increase the capacity of Māori professionals in urban design. Gisborne District Council has adopted Te Aranga strategy, and has included the development of the Gisborne Civic Square as a core LTCCP project. The development of the square will pilot the application of Te Aranga strategy, which will incorporate Ngai Tamanuhiri involvement (from design brief to opening ceremony) and appropriate local/Māori landscape and artistic design inputs.

2. Enhancing waterways and restoring cultural values – Christchurch

Drainage is no longer the Christchurch City Council’s primary focus so the council’s work in this area has been integrated with certain core ‘values’ (ecology, landscape, recreation, heritage and culture) to form the foundation of a philosophy that is multidisciplinary and sustainable. For example, the council undertook a project to enhance drainage and waterways while also restoring cultural values when it worked with iwi to redevelop the junction of Saint Mary’s Stream and the Otākaro (Avon River).⁸⁵

3.3 Community engagement

Community engagement includes both formal (as a statutory requirement) and informal community consultation. Benefits of participation include greater knowledge about the nature of community problems, a sense of ownership and buy-in to shared decisions, goodwill, an increased likelihood of successful implementation, and a better fit between design and user needs. Community engagement can minimise the risk of planning oversights. **The PHAC supports formal and informal models of community participation in urban planning.**

Cities need to be built to provide a positive environment for all populations. Involving children, older people, people with disabilities, and the variety of ethnic groups in the planning and development of urban areas helps achieve appropriate design and improve accessibility. It protects the interests of people whose needs might otherwise be ignored.⁸⁶ Despite evidence of the importance of community participation in addressing urban living conditions, decision-making processes often remain beyond the reach of people at local and community levels.⁸⁷

Box 5: Case studies of community engagement

1. Waihi Beach HIA

Waihi Beach is a community where almost half of the population is 45 years or older, and the number of residents over 65 will increase significantly over the next 10–20 years. As part of the SmartGrowth strategy, Waihi Beach was identified as an intensification zone in terms of accommodating future population growth. An age-friendly HIA was undertaken. It examined the extent to which, within a context of urban intensification policies, provision for the health and wellbeing of the ageing population at Waihi Beach could be improved. The assessment identified a need for improvements in amenity planning within the town centre, transport options, and primary health and community support care service delivery, and noted a responsibility for land and health services to meet their Treaty of Waitangi obligations to local Māori.

2. Manukau Built Form and Spatial Structure Plan

The Manukau Built Form and Spatial Structure Plan will guide the development of Manukau's city centre for the next 50 years. 'Manukau the Healthy City' commissioned a HIA of the plan as part of its overarching intent to place health and wellbeing high on the political and social agenda of Manukau City. As part of this assessment, a children's consultation workshop was held to identify the experience of children in the city centre area and the changes they would like to make to the environment.

3.4 Opportunities for walking and cycling

An urban form that creates opportunities for walking and cycling is important for health. Walking and cycling for active transport integrate physical activity into daily routines.⁸⁸ Walking and cycling are some of the most accessible and effective ways to meet the required physical activity levels, and they are a key part of chronic disease prevention and management.⁸⁹

In addition to increasing physical activity, a ‘walkable’ urban form reduces the risk of injuries, increases equity in access to services for people who have no car, enhances community cohesion, provides the ‘eyes on the street’ that help keep neighbourhoods safe, and enables older people to remain socially connected.⁹⁰



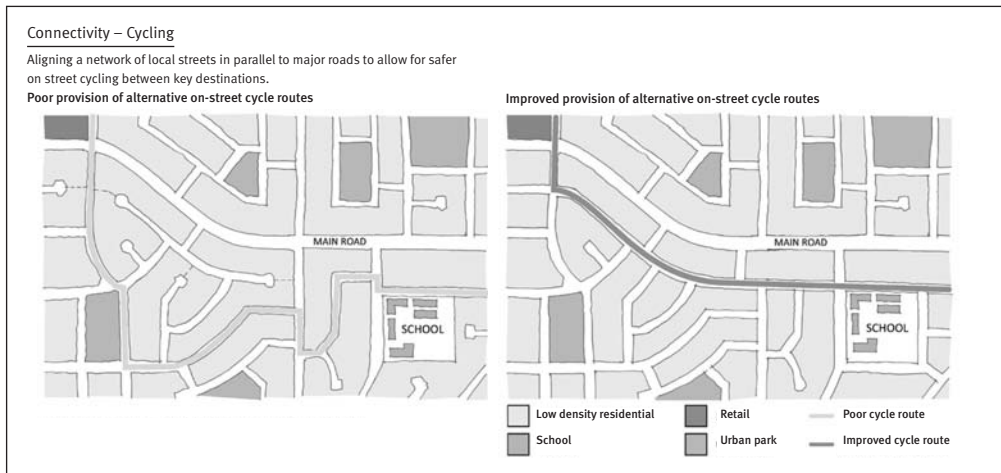
Urban design can provide more balance between transport modes, particularly for short distances.

Overview of a walkable urban form

Walking and cycling can never replace cars. However, urban design can provide more balance between transport modes, particularly for short distances. Those distances that are easy to walk or cycle comprise almost 30 percent of New Zealand’s motor vehicle trips.⁹¹ Walkable urban design can broaden people’s travel choices. It is important for creating safe routes to and from school, for providing young people with independent travel, and for supporting older people and people with disabilities to be active.

A walkable urban form comprises much more than high-quality walkways and cycleways. For walking and cycling to be feasible, roads need to be safe, direct and pleasant, and there must be destinations within short distances.⁹² Studies highlight how an urban form that has *urban density*, with *mixed land use* and *street connectivity*, increases rates of walking and cycling for transport (see Table 6 on page 30). This in turn increases physical activity, and reduces respiratory illnesses and road traffic injuries. Dense residential communities that are interspersed with shops and businesses (ie, mixed land use) help people get around easily on foot or bicycle.⁹³ Highly connected streets reduce the travel time and distance for pedestrians and cyclists (see Figure 4).⁹⁴ This feature has been shown to particularly affect active transport in New Zealand.⁹⁵

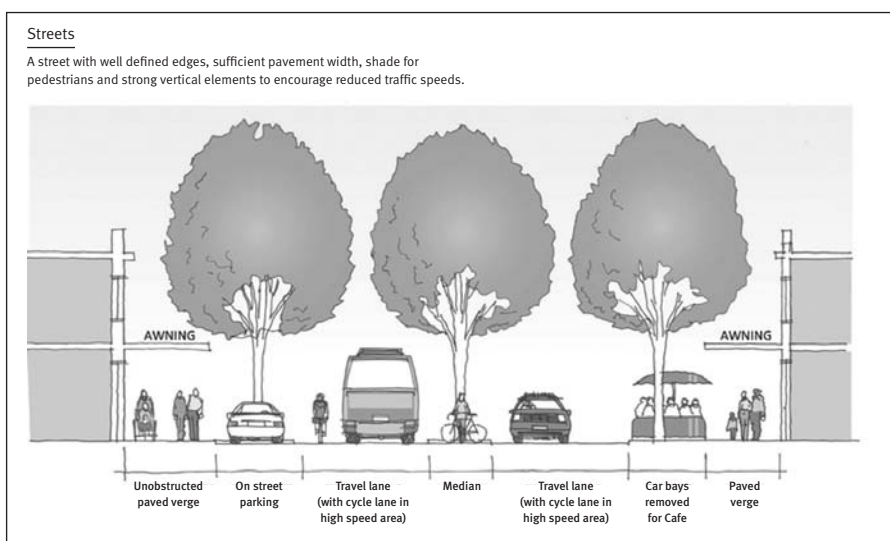
Figure 4: Street connectivity that promotes walking and cycling



Source: Healthy Spaces and Places, www.healthypaces.org.au

Furthermore, a ‘streetscape’ design that is attractive, with reduced traffic flow and speeds and high-quality footpaths linking main activities and public transport, creates a safer, more pleasant environment for walking and cycling (see Figure 5).⁹⁶

Figure 5: A streetscape that promotes walking and cycling



Source: Healthy Spaces and Places, www.healthypaces.org.au

Table 5 lists some of the infrastructure features required to create opportunities for walking and cycling.

Table 5: Infrastructure features to assist walking and cycling

<p>Footpaths, cycle paths, and trails link residential areas and services.</p> <p>Footpaths are smooth and free from hazards.</p> <p>Cycle lanes are clean (free from glass, gravel) and safe (providing enough distance from cars).</p> <p>Footpaths have lowered curbs at street crossings.</p> <p>There is a sufficient number of street crossings in appropriate locations.</p> <p>Pedestrian street crossing times are long enough for older people and people with disabilities.</p> <p>There are water fountains, rubbish bins and seating on walkways.</p> <p>There is good lighting and signage on walkways and cycleways.</p> <p>Bicycle lockers and racks are provided at public transport stops and in city centres.</p> <p>Trains and buses are cycle-friendly (allow bicycles on services and provide cycle racks).</p>

Source: Based on Healthy Spaces and Places, www.healthyplaces.org.au

Designing for diversity

There are some useful design concepts to help ensure that urban areas are walkable for all populations. Universal design is a set of principles that together aim to make urban areas available to all populations. Universal design principles place people at the centre of urban design, considering the needs of all groups within the population including young and old, and people with and without disabilities.

Table 6: Summary of evidence on walkable urban form and health

Feature of urban form	Description	Health outcome	Other outcomes ⁹⁷
Urban density	People or jobs per hectare	<p>Physical activity – Higher population and employment density is associated with more walking and cycling trips, and higher rates of public transport use.⁹⁸ This trend includes young people, who have been shown to walk at least 1 km a day where there is higher intersection density, population density and mixed land use.⁹⁹</p> <p>Air quality – High-density developments reduce trip lengths and emissions per capita.¹⁰⁰ <i>Infill</i> development almost halves vehicle miles travelled and emissions, compared with development that expands urban boundaries.¹⁰¹</p>	<p>Provides land, energy and infrastructure savings.</p> <p>Reduces the economic cost of time allocated to mobility.</p> <p>Reduces rain runoff from vehicles to water.</p> <p>Reduces emissions to air and atmosphere.</p>

Feature of urban form	Description	Health outcome	Other outcomes ⁹⁷
Connectivity	Degree to which roads and paths are connected and allow direct travel between destinations	Physical activity – Connected streets are associated with increased levels of physical activity, including more children walking to school. ¹⁰² A North Shore study found that transport-related physical activity was higher among people travelling through connected streets. ¹⁰³	Enhances natural surveillance. Reduces emissions through fewer non-work trips. Increases viability of local service shops and facilities.
Mixed land use	Residential, commercial and industrial land use are located close together	Physical activity – Mixed land use is associated with increased rates of walking for transport. This association strengthens for each additional destination within 1.5 km. ¹⁰⁴ This trend includes children, who do 14 percent more non-school physical activity when there are a number of destinations in a short distance. ¹⁰⁵ Air quality – Mixed land use is associated with shorter vehicle trips and an increase in use of non-motorised transport, as well as car sharing. ¹⁰⁶ In one study, residents of mixed use neighbourhoods used non-motorised modes 12.2 percent of the time, compared with 3.9 percent in single-use communities. ¹⁰⁷	Makes more efficient use of parking and transport infrastructure. Increases the viability of local services, shops and facilities. Lowers household expenditure on transportation. Improves access to essential facilities and amenities.
Streetscape environment	Scale and design of streets and pavement and how various uses are managed Traffic calming refers to street design features intended to reduce traffic speeds and volumes.	Physical activity – The presence of cycle lanes, pavement, street lighting, and other infrastructure is related to greater active travel. ¹⁰⁸ Children are more likely to be active when there are footpaths and controlled intersections. ¹⁰⁹ Road traffic injuries – Traffic calming features such as traffic circles, roundabouts and speed bumps reduce collisions. ¹¹⁰ Reduction in lane numbers and width is associated with crash reductions. ¹¹¹ There are fewer pedestrian accidents in streets with pavements and where there are street crossings, medians and crossing signals. ¹¹² Curbs and street trees add to perceptions of safety. ¹¹³ Collision rates at specific intersections decline with increases in pedestrian and cyclist numbers. ¹¹⁴	

International steps to a walkable urban form

Many developed countries are prioritising funds for walking and cycling. Federal funding for cycle infrastructure in the United States has increased four-fold over the past five years, with significant increases in the number of cyclist commuters in some areas.¹¹⁵ Sweden has a ‘Vision Zero’ road safety policy to achieve zero road fatalities or disabling injuries. Policy areas include speed control in all urban areas, road traffic reduction and urban design to reduce risk of injury. Many of the countries and cities have developed design codes to prioritise and guide the development of compact walkable form (see Box 6 for some overseas and New Zealand examples).

Investment in walking and cycling infrastructure can both be cost-effective and provide savings to the health system. Australian research conservatively estimates that cycling for recreation and commuting saves over A\$220 million per year in health costs.¹¹⁶ In Western Australia, the cost benefit for ‘treating’ 150 ‘black spots’ (streets or intersections with high accident rates) is almost five to one.¹¹⁷ Studies in Finland estimate that deaths from coronary heart disease would be reduced by 3 to 7 percent if another 8 percent of the working population chose to walk or cycle to work.¹¹⁸ The United Kingdom’s economic payback for cycle infrastructure spending is 20:1, compared with 3:1 for road and rail projects.¹¹⁹

There are also potential co-benefits between actions for climate change and health. The increase in cyclist commuters in Copenhagen that arose from an investment in cycling infrastructure has already been mentioned in Part 2. In the United Kingdom, York’s policies that favoured walking and cycling led to a 40 percent reduction in road casualties, compared with a 1.5 percent reduction in casualties across the rest of the country during the same period.¹²⁰ Modelling done by the ‘Making the Land Use, Transportation and Air Quality Connection’ study in Portland found a 10 percent reduction in vehicle miles travelled with a region-wide increase in the quality of the pedestrian environment.¹²¹

Implications for New Zealand

Achieving a walkable urban form in New Zealand’s cities and towns requires an increase in walking and cycling infrastructure and changes to land use patterns. Although most of New Zealand’s urban infrastructure already exists, new development is occurring everyday, and we must ensure that it prioritises walking and cycling. From a health perspective, medium- to high-density neighbourhoods and mixed land use are preferred, provided that increasing density is accompanied by efforts to reduce the number of drivers on the road and therefore air pollution.¹²²

The cost of transport infrastructure can be lower in densely populated areas. The proportion of community income used on transport rises from less than 6 percent in densely population cities where most trips are made by walking, cycling and public transport, to 12 percent in cities where the car is the almost exclusive mode of transport.¹²³ Recent New Zealand data also highlight that if 5 percent of urban trips involving a distance of up to 7 km were cycled rather than driven annually, 116 premature deaths from ill health would be prevented and \$193 million saved per year.¹²⁴

In spite of the known projected benefits of walking and cycling, these modes of transport are still seen as minor components of the transport system in New Zealand.¹²⁵ National funding for walking and cycling infrastructure has long been low. Spending is also low at a territorial authority level. Auckland City Council has not budgeted new cycle spending in its 10-year plan,

and Christchurch City Council has allocated only \$24 million of its \$800 million roading and transport spend over 10 years to cycling infrastructure.¹²⁶

The PHAC is concerned at the lack of investment in walking and cycling in New Zealand. It commends the Government for its investment in the national cycleway, and believes that this cycleway should be extended to urban areas. With such an extension, it would be beneficial not only for tourism but also for the health of the New Zealand population at large and for the environment. When road infrastructure, such as a new Auckland harbour crossing, is built, the PHAC encourages the prioritisation of walking and cycling alongside motor vehicle transport. Walking and cycling are not just leisure activities. With the right type of design, they are realistic forms of everyday transport for people.

There has been some progress in New Zealand in developing urban form in ways that promote walking and cycling. Examples include changing zoning codes, using urban design principles to encourage high-quality development, introducing traffic calming schemes, focusing on urban regeneration and *retrofitting* to improve existing infrastructure. These changes have occurred with guidance and direction from national policy statements and environmental standards, the Ministry for the Environment's Urban Design Protocol, regional policy statements and regional plans. Box 6 provides details of some New Zealand examples.

The PHAC believes all new development should incorporate a walkable urban form. An example is the review of the Code for Subdivision Development in the Kapiti Coast (see Box 6). An opportunity for making walkable urban form more consistent across urban areas is available through the urban design workstream in Phase II of the RMA review, which is reviewing urban design issues in the context of the RMA process. It is important to have health outcomes as a priority in this process, and give greater priority to a walkable urban form.

From a health perspective, more socioeconomically deprived communities have greater need for a walkable urban form than less deprived communities. Communities experiencing higher socioeconomic deprivation have a higher prevalence of lifestyle-related diseases and often an existing urban form that provides fewer opportunities to walk or cycle. They also have lower rates of car ownership. Retrofitting existing urban areas to improve their walkability and better align them with universal design principles should be an important concern of both local government and central government agencies. Strengthening public transport infrastructure can improve walkability by providing bus and train stops to which people can walk and cycle. This measure is discussed more in section 3.5.

Box 6: Case studies of walkable urban form

1. Review of the Code for Subdivision Development – Paraparaumu

Kapiti Coast District Council viewed its Code for Subdivision Development as a barrier to innovative and quality urban design. It revised the code under the District Plan, which focused on more integrated sustainable management and compact, connected development. The subsequent Jade Garden subdivision had higher density, with a connected road network, living spaces that face the street, close proximity to the planned railway station and an extensive open space area.

2. Liveable Neighbourhood Community Design Code – Western Australia

In 1998 the Western Australia State Government began trialling the ‘Liveable Neighbourhood Community Design Code’ to facilitate: greater access to services; more efficient use of land; less car use; and more walking, cycling and public transport use. It created new urban developments according to this code. The ‘Residential Environment’ project entails a longitudinal study to determine whether the code has increased walking, cycling and public transport use among local residents.

3. Traffic calming scheme – Glasgow

A traffic calming scheme recently developed on a main road in Glasgow included speed cushions, zebra crossings and parking bays. A study of outcomes from this scheme identified a decrease in traffic-related nuisances and increased pedestrian activity – in particular, walking and a willingness to allow children to exercise and play.¹²⁷

4. Neighbourhood accessibility plan – Nelson

Nelson developed a neighbourhood accessibility plan in response to a series of transport problems: busy intersections that were not accessible to pedestrians; problems with traffic faced by people with disabilities and cyclists; and unsafe or absent parking for cyclists. Changes included improved cycle lanes, traffic lights, cycle storage lighting and the provision of a cycle design course for all design engineers. After the changes had been implemented, Nelson City recorded its lowest ever pedestrian injury rate.

5. Coastal Walkway – Taranaki

Taranaki’s Coastal Walkway is a 7 km path that forms an expansive sea-edge paved walkway stretching the length of New Plymouth. The walkway has helped reposition New Plymouth as a fashionable place to visit and live. Anecdotal evidence indicates numerous economic, social and health environmental benefits, including the following.

- Residential property prices have increased significantly.
- The region has a stronger identity and sense of pride.
- There are more recreation opportunities, particularly for walking and cycling.
- Visitors are extending their stay to enjoy the walkway.
- The open space network has been enhanced and better integrated.
- The foreshore embankment has been retained.¹²⁸

3.5 Easy access to public transport

Effective public transport infrastructure is important for health in a number of ways. Reducing car use decreases road traffic accidents, air pollution and carbon dioxide emissions while increasing access to services and employment for people without cars or with a disability.¹²⁹ Studies have also found that it increases everyday physical activity because passengers walk and cycle to public transport stops.¹³⁰ Public transport-oriented neighbourhoods (for example, ones built adjacent to a train line) are associated with higher walking and cycling rates.¹³¹



Public transport-oriented neighbourhoods are associated with higher walking and cycling rates.

Proximity to public transport is an essential component of access. People living near a railway station are five times more likely to commute by rail, and the strongest influence on choosing to use a bus is close proximity to a bus stop.¹³² Conversely, for every 400 m increase in distance between a public transport stop and home, the odds of taking public transport decrease by 16 percent.¹³³ Proximity can be achieved both by increasing public transport infrastructure (including ensuring that outlying areas are accessible) and by building new development around existing public transport. The WHO recommends that all new residential development be built within 400 m of bus services, and that all new office, retail and leisure developments be within 300 m of walking distance from public transport.¹³⁴

Overview of public transport infrastructure

Much of the infrastructure required for walking and cycling also supports public transport. A compact, walkable urban form can improve proximity to public transport, and walking and cycling networks help people reach public transport destinations. Compact urban form also makes public transport less expensive to operate.¹³⁵ Countries that have increased their investment in public transport often have extended their walking and cycling infrastructure as well. Such initiatives reflect an overall shift in planning towards multiple transport modes, in many instances to reduce vehicle emissions and respond to climate change. The developments in Copenhagen and Portland have already been highlighted in this report. For United Kingdom examples, see Box 7.

Other important components of public transport accessibility are affordability, reliability, frequency and usability by all populations. Table 7 describes elements required to make public transport more accessible for all populations.

Table 7: Infrastructure features for easy access to improved public transport

Bus shelters are visible and well lit, and protect people from sun, rain and wind.
Services are frequent.
Buses and trains connect with each other.
Streets with main bus routes contain a priority passage for buses.
Buses and trains have accessible entrances and seating for older people, people with disabilities and parents with children.
Fare increases are not greater than the consumer price index.
Integrated ticketing exists for different types of public transport.
Information about routes, fares etc is available in multiple languages.

Implications for New Zealand

Overseas, public transport investment has led to positive health, environmental and economic benefits. For instance, Portland found investment in light rail was good for business, with services vying for close proximity to public transport stops.

Within New Zealand, there is some tension between the objectives for public transport as a social service and its objectives as a commercial venture. In some centres, this tension has led to inefficiencies, for instance creating higher costs for users. In Dunedin there are three public transport providers covering a similar area and many buses have only a small number of passengers. Greater regional governance over public transport would give a more comprehensive and integrated service.¹³⁶

Where public transport routes are limited, people have greater difficulty accessing basic services like supermarkets or health care facilities. Studies have described people choosing less healthy food options from dairies or takeaway outlets or foregoing medical appointments because of the difficulty in taking public transport to reach services.¹³⁷ People with disabilities report ongoing difficulties with using public transport.¹³⁸

In New Zealand, public transport trips comprise a relatively small proportion of all travel. **The PHAC supports an increase in public transport, as well as regional governance to help integrate services and assess routes for access.** The PHAC believes proximity to public transport should be a requirement of all new development. The target of the New Zealand Transport Strategy 2008 is that 7 percent of all trips will be public transport trips by 2040. Even this modest target will not be reached without significant improvements in public transport access and availability.¹³⁹ On the other hand, relatively small steps to increase the number of routes and the frequency of services and to improve timing of buses in urban areas could improve public transport usage.

The PHAC emphasises that improving public transport infrastructure is especially important for people in outlying, more socioeconomically deprived neighbourhoods, who often experience poor transport links to urban centres, spend a higher proportion of their income on transport, have lower rates of car ownership, and are more likely to have chronic conditions. Prioritising affordable public transport in these areas can help increase residents' access to employment and health services as well as improving physical activity levels. Planners of public transport infrastructure in these areas may also need to determine required destinations of residents. For example, low-income labourers travelling from one end of a city to an industrial area at the other end are generally not well served by public transport.

The PHAC believes a universal design approach to public transport is essential in increasing its use by all populations. A well-designed system will increase the independence of people with disabilities and older people, and reduce the social exclusion that often accompanies lack of mobility.

Box 7: Case studies of effective public transport infrastructure

1. Integrated transport hierarchy – United Kingdom

York has developed an integrated transport network that does not prioritise private cars and meets local air quality objectives. In 2001 the city developed a hierarchy of transport users for making decisions related to land use and transport. The hierarchy starts with pedestrians, followed by people with mobility problems, cyclists, public transport users, powered two-wheelers, commercial or business vehicle users, car-borne shoppers/visitors and car-borne commuters. The system's goals were environmental impact, safety, economy, accessibility and integration. Key successes over the first five years were:

- peak period traffic levels were limited to 1999 levels and reduced at peak periods
- bus patronage increased by 45 percent
- an increase of 72 percent in the number of 'Park & Ride' passengers to over 2.6 million in 2005/06 (Park & Ride is a system whereby commuters park their car at a bus station on the ring road and then continue their journey by bus into the city centre)
- a 19 percent reduction in road casualties and serious injuries
- achieving the status of the United Kingdom's top cycling city in 2004
- a 10 percent shift from car travel to more sustainable transport modes at peak times
- a doubling of the number of children cycling to school.

2. Sustainable travel demonstration towns – United Kingdom

Three sustainable travel demonstration towns in the United Kingdom (Darlington, Worcester and Peterborough) achieved a 11–13 percent reduction in car trips, a 13–22 percent increase in public transport use, a 17–29 percent increase in walking and a 25–79 percent increase in cycling in just over two years. Activities included workplace and school travel planning, car-sharing schemes, an increased promotion of walking and cycling, improved public transport and general marketing.

3.6 Opportunities for community cohesion

Community cohesion is an important part of the vitality of an urban area. Active community organisations, community members who trust each other, and high levels of regular interaction create greater social cohesion, and counteract social isolation. Community cohesion is important for health because individuals in cohesive communities have increased life expectancy, better cardiovascular health, faster recovery from minor illness and better mental health.¹⁴⁰

Overview of infrastructure required for community cohesion

Attractive, well-lit interconnected walking and cycling networks increase cohesion because they encourage people- and family-centred activity and create opportunities for casual meetings between people.¹⁴¹ There is also evidence that connected, well-lit walking paths, together with buildings that face the street, reduce crime rates (see Box 8).¹⁴² One study found more people walked when they lived closer to attractive and large public open spaces.¹⁴³

Other elements of urban form that create opportunities for community cohesion are high-quality, accessible public spaces where people can meet, play, socialise and hold group events.¹⁴⁴ Such spaces include parks, sporting fields, outdoor play areas for children, community gardens, leisure areas and community halls. Availability of green space, including parks as well as trees and grass, is related to increased levels of outdoor social activity. High-quality public spaces and parks are linked with higher participation in community and cultural activities.¹⁴⁵

There are many international and New Zealand examples of high-quality public spaces with local character that are community focal points. The town square, a common feature in many European and Latin American cities, is one such space. Another example is the generation of parks or community gardens from unused urban space (see Figure 6 and Box 8).

Figure 6: An unused space converted into a community garden (Auckland)



Photo courtesy of Patch from Scratch.

Local character is another important part of community cohesion. Local character activates people's sense of identity with their neighbourhood, and encourages them to be active within their neighbourhoods.¹⁴⁶

Each population and community has different priorities that need to be addressed in public spaces. Young people may value having parks and recreational spaces close to where they live, while working age adults may appreciate having cafes and shops within a walkable distance to home and work. Older people are sensitive to the presence of a high-quality pavement system or street crossings.¹⁴⁷ Table 8 lists some infrastructure features required to improve community cohesion.

Table 8: Infrastructure features for improving community cohesion

Public spaces are high quality and accessible for all populations.
Multi-purpose spaces accommodate activities for different age groups.
Public spaces are located near more deprived areas.
Public spaces are accessible by public transport and a connected network of walking routes.
Seating, shelter and shade are available in public spaces.
Toilets are available in public spaces.
Facilities are able to be shared, to ensure a wide range of people can access them.

Public spaces have other benefits to health, the environment and economy. Having green space, play spaces and recreational facilities within walking distance is linked to greater levels of physical activity (and in some cases reduction in obesity) among people of all ages.¹⁴⁸ Neighbourhood ‘greenness’ is also associated with more physical activity.¹⁴⁹ Girls increase their non-school physical activity when there are parks within walking distance.¹⁵⁰ The presence of green spaces is associated with recovery from stress and lower rates of depression. It is also linked to improvements in children’s mental development. Community gardens increase access to fruits and vegetables, and strengthen social cohesion. Tourists and investors are attracted by local character. High-quality public spaces attract people and activity, leading to enhanced economic performance.¹⁵¹



Open spaces enable people to be active, play, socialise and hold group events.

The PHAC believes high-quality public spaces are important for health from an equity perspective not only because of their associations with social cohesion but also for their implications for physical activity. Such public spaces can improve opportunities for people on a low income to participate in recreation, leisure and physical activity when they otherwise may not be able to afford to. Overseas, public parks are the most common sites for exercise among people from low-income neighbourhoods, but access is affected by distance to and quality of parks.¹⁵² Although some New Zealand studies show that more socioeconomically deprived neighbourhoods have equal access to green space,¹⁵³ other evidence suggests that more deprived urban neighbourhoods have less access to high-quality green space.¹⁵⁴

Implications for New Zealand

Although New Zealand’s urban centres are more ‘green’ than cities in many other countries, this green is not always accessible or of high quality. Some territorial authorities are also selling sports fields and public spaces for local development, which can have a big impact on vulnerable populations. **The PHAC believes it is important for territorial authorities to retain parks and fields, particularly in areas tagged for future densification. The PHAC also emphasises that the development or maintenance of high-quality public spaces should be prioritised in more deprived socioeconomically areas.**

The PHAC considers the creation of an inclusive local character for urban areas is important for health equity. The design of a community or urban centre reflects and replicates the underlying

local cultural values of those that live in or access services within those communities. Ensuring that local character reflects the diverse populations living within an urban area creates a sense of place. Protecting a cultural and spiritual connection to urbanised areas among Māori is a particular challenge; with urban areas often built on land of ancestral importance, and many Māori migrating to urban areas.¹⁵⁵ The Ministry for the Environment’s Urban Design Protocol and the work of territorial authorities’ urban design divisions are mechanisms currently in place aiming to build quality and character into public spaces. **The PHAC supports these initiatives, but suggests strengthening their cultural component through engagement with Māori and other communities.**



Maintaining a cultural and spiritual connection to urban areas is important for Māori health and wellbeing.

Box 8: Case studies of infrastructure that enhances community cohesion

1. Crime prevention through environmental design – Florida, USA

Beginning in 1990 in Sarasota (Florida), changes in local zoning required development to be undertaken in a way that created a safe and attractive environment. This development, which met the ‘Crime Prevention through Environmental Design’ specification, included better street lighting and orienting shops towards the street. As a combined result of changes to the environmental design and increased police patrols in the area, from 1990 to 1998 the North Trail Corridor experienced fewer calls for police service and fewer crimes against people.

2. Waitangirua Park – Porirua

An extensive community consultation process identified the need for a community space on land in front of a run-down mall in Eastern Porirua – specifically a space that supported youth activities. A community design group was formed that included representatives from local services and residents. They created a park concept plan that incorporated elements of Pacific cultures and the arts, and addressed landscaping, traffic safety, street improvements and connections to the privately owned mall. The park has a Māori gateway, pedestrian promenade, community picnic ground, children’s adventure playground, covered performance area and fitness circuit.

3. Walking school bus – Auckland

The walking school bus (WSB) concept, which provides structured, adult-supervised walks to school, has been initiated around the country (particularly in Auckland) to create safe routes to school for primary school children. Initially developed to contribute to traffic de-congestion and protect children from traffic and stranger dangers, WSBs provide other benefits. Not only do they enable children to be physically active while they commute to school, but they also enable both children and parents to socialise with others.¹⁵⁶ WSB initiatives have been found to be highly beneficial for community cohesion.¹⁵⁷

3.7 Maximum health benefits from services and facilities

Urban areas contain a range of public and private services and facilities – from health, education and social services, to offices, industries, cultural facilities, places of worship, public spaces and green space. Some of these services and facilities, for example, health services, fruit and vegetable stores and public pools, naturally promote health. Others, such as takeaway outlets and non-casino gaming machines, do not.

As described in Part 2, the location of all facilities in any urban area influences health in a number of ways. Location influences the mode of transport used. It also creates opportunities for employment, social services, recreation and leisure. Where services and facilities are located and how they are designed can have significant health benefits for air quality, safety, physical activity, accessibility and equity.¹⁵⁸

Service type, location and design

Services such as schools and hospitals are more than just sites for education and medical intervention. They serve broader functions within communities, helping to shape community identity, and can serve as important sites for social connection.¹⁵⁹

Other sections of this report have highlighted that when housing, local employment, retail, education and health services are interspersed and located along public transport routes, a higher proportion of trips are made on foot, bicycle or public transport.¹⁶⁰ In contrast, long distances between services or facilities and residential areas mean they are only accessible by car.

Service location is especially important for services that can directly affect people's health, such as health services and supermarkets. A study in Leeds found an increase in fruit and vegetable consumption when a new supermarket was introduced in a neighbourhood, with the greatest increases in intake among low socioeconomic groups. A United States study found residents' fruit and vegetable intake increased with the number of supermarkets in their census area.¹⁶¹ However, studies in New Zealand have not shown the same association, although this research topic is a new one in New Zealand.¹⁶²

There is evidence that location of health services has a strong influence on their usage.¹⁶³ This connection often depends on the type of service, and on a patient's health condition and socioeconomic status. For instance, in New Zealand, travel time to get to a general practitioner has been shown to be an influential factor in diagnosis for breast and colorectal cancers. Travel time influences the likelihood of getting blood pressure tests in urban areas.¹⁶⁴ Distance and travel time in urban areas have also been shown to influence health service use among people living in socioeconomically deprived neighbourhoods or on lower incomes.¹⁶⁵

Discouraging an overabundance of services that cause ill health is another important feature of service location. There is strong evidence overseas that the density of alcohol outlets affects violent assaults,¹⁶⁶ and this association is currently being investigated in New Zealand. There is excess provision of non-casino gaming machines in more socioeconomically deprived neighbourhoods, which have higher rates of problem gambling.¹⁶⁷ Food outlets and advertising are more prevalent around secondary schools, and healthy advertisements are less common in more deprived neighbourhoods. However, it is unclear how much such trends affect higher obesity rates in these neighbourhoods.¹⁶⁸

The location of some services can have direct health effects for users. For example, over recent years, public health officials have voiced concerns about ill health effects from locating schools and early childhood centres near main roads and motorways.

Implications for New Zealand

Spatial planning of retail locations for optimal consumer activity is a well-established discipline.¹⁶⁹ This strategic assessment occurs less frequently in the case of social services and community facilities, but examples still exist in New Zealand (see Box 9). Through appropriate planning of key service areas, services in a district can be co-located or easy to reach.¹⁷⁰ Effective service planning requires appropriate zoning by local government, risk assessments of locations (for example, not locating schools or early childhood centres near polluted busy streets), and integrated planning between all sectors that base their facilities in urban areas.



Using parking lots to house markets is an innovative way to increase people's access to healthy food.

The PHAC believes there should be greater spatial planning of health promoting services to improve their access among all populations and by multiple transport modes. The PHAC also believes zoning specifications should limit the presence and clustering of alcohol and takeaway outlets, particularly around schools and in more socioeconomically deprived neighbourhoods.

Where services are limited, there are innovative ways of increasing access to services and facilities and creating positive health outcomes. The establishment of 'public-private partnerships' between schools and swimming clubs in Auckland is one example. Using parking lots to house weekend fruit and vegetable markets is another. The PHAC supports these innovative solutions.

The PHAC believes health services can set an example by being located in ways that encourage active transport, deter car dependence and increase accessibility.¹⁷¹

Box 9: Case studies of infrastructure that increases access to services

1. Health service facility planning – Auckland

Hauora o Puketapapa/Roskill Union and Community Health Centre was established in 2001 after careful analysis of the question of ‘where’ to place a primary care facility. An analysis using Geographical Information Systems identified the optimal location for a new clinic in relation to levels of socioeconomic deprivation and distance to the nearest existing general practices and other amenities. This non-profit health clinic, owned and operated by the community, delivers accessible, affordable and appropriate primary health care to low-income and mainly migrant groups in close proximity to community facilities and public transport routes used by the practice population.¹⁷²

2. Ministry of Social Development Early Years Service Hubs

Thirteen Early Years Service Hubs were established in high-need areas to provide a central point where families could access a range of health, social and education services. Hubs were established where there were already services operating in the location, using existing community-based facilities.

3. Neighbourhood services – Hutt Valley

Te Runanganui o Taranaki Whanui of Waiwhetu improved the mix of neighbourhood services in Hutt Valley by co-locating the Waiwhetu medical centre, kōhanga reo, Atiawa Toa FM radio station, Tamaiti Whangai centre of learning and gymnasium.

3.8 Clean water, air and soil, and effective waste disposal

The environment is important for health. Individuals have little or no control over the purity of the air they breathe or the safety of the water they drink. Contamination of these sources has the potential to have major health impacts. One recent example comes from Walkerton, Ontario in 2000. After regulations on drinking water were loosened in this Canadian town, a large proportion of residents became ill from drinking municipal water contaminated by *Escherichia coli* bacteria. Seven people died, and many suffered debilitating injuries.¹⁷³

Some of New Zealand’s recent environmental health challenges have arisen due to features of our urban form and require consideration along with land use planning. A few examples are described below.

Outdoor air quality

This report has mentioned the contribution of motor vehicle emissions to outdoor air pollution. New Zealand has a high number of motor vehicles per capita in comparison to other developed countries.¹⁷⁴ A recent report by the New Zealand Institute of Economic Research found urban air quality to be the current environmental priority because of the loss of life quality and premature death associated with it.

New Zealand monitors two of the air pollutants known to have the greatest health effects: particulate matter (PM₁₀) and nitrogen dioxide, both of which come from motor vehicles. Home heating is another key contributor to PM₁₀ pollution in urban environments. The WHO estimates

that reducing PM₁₀ pollution from 70 to 20 mcg per cubic metre can cut air quality-related deaths by around 15 percent.¹⁷⁵ In 2007, 23 of the 40 'airsheds', which monitor air quality, exceeded the national environmental standard for PM₁₀ levels. In 2005, the two monitored sites in Auckland exceeded the national environmental standards for nitrogen dioxide.¹⁷⁶ There are global concerns about health effects of another pollutant, PM_{2.5}, which New Zealand does not monitor.¹⁷⁷

Of particular concern is that little is known about the combined effects of various air pollutants, which could be greater than the effects of individual pollutants.



Individuals have little or no control over the safety of the water they drink or swim in. Contamination of these sources has potential major health impacts. (Photo courtesy of Wellington Regional Council)

In June 2009 the Minister for the Environment announced a review of the Resource Management (National Standards Relating to Certain Air Pollutants, Dioxins and other Toxics) Regulations 2004. One of the objectives is to review the PM₁₀ regulations in the air quality standards to ensure they provide the maximum net benefit to New Zealanders, taking into account the economic, social and environmental benefits and costs of air pollution. **The PHAC believes more research and monitoring should be done to better understand the effects of air pollution on human health.**

Water quality and stormwater capacity

Water quality is another significant environmental health issue in New Zealand, and one that is affected by urban sprawl. Water (including ground, surface and recreational water) can become contaminated with toxins, excessive nutrients, and human and animal wastes.¹⁷⁸ Contamination of drinking water and recreational water can lead to health problems, including gastrointestinal (enteric) diseases.

Medium and high urban density can allow better provision of services such as reticulated water supplies if planned for appropriately.¹⁷⁹ In urban areas, water becomes polluted through runoff from non-point sources, for example, oil, grease and chemicals from roadways and parking lots.¹⁸⁰ Runoff increases with impervious surface covers (roads, buildings), which do not absorb surface water.¹⁸¹ Runoff generated in sprawling land use patterns is approximately 10 times greater than that produced by more dense, 'infilled' urban areas. These higher levels of runoff arise because large parking lots and wider roads, combined with high volumes of lawn care chemicals, give higher pollutant and runoff loads in suburban areas.¹⁸²

Stormwater can also be polluted by pesticides and fertilisers from homes, farms and vehicles, ending up in streams, lakes and estuaries, which provide town supply. Nitrogen and petroleum compounds from motor vehicles contribute to eutrophication of lakes and algal blooms. Some urban recreational water has been polluted by nearby commercial run off (see Box 10).

The PHAC is pleased to see that new strategies have been released, or will soon be released, addressing fresh water and drinking water. The strategy *New Start for Fresh Water* sets out the Government's new direction for water management in New Zealand. The proposed National Policy Statement for Freshwater Management aims to enhance the overall quality of freshwater resources as well as managing the increasing demand for water. The National Environmental Standard for Sources of Human Drinking Water will reduce the risk of contaminating drinking water sources such as rivers and groundwater.

Waste management

Effective waste management is required to minimise pollution of the land, water and air. Urban areas produce the majority of New Zealand's waste. In the last decade there have been significant reductions in the number of landfills, from 327 in 1995 to 60 in 2006. Regulatory requirements on leachate collection, burning of waste and landfill gas management have also tightened,¹⁸³ and territorial authorities are required to meet strict indicators that are part of the New Zealand Waste Strategy 2002. Projected population growth and the increasing urban population will require further strategies to minimise waste production.

Under the Waste Minimisation Act 2008, territorial authorities must have regard to the targets set out in the New Zealand Waste Strategy 2002 when preparing their waste management and minimisation plan (WMMP). A territorial authority's waste assessment, as prescribed in the Act, plays a key role in determining the content of a WMMP. Section 51 of the Act also requires a statement as to how proposals will ensure that public health is adequately protected.¹⁸⁴

Industrial and horticultural meet residential

As urban areas expand, industrial and residential areas become closer, and industrial, agricultural and horticultural land is rezoned as commercial and residential land. In some instances such changes have resulted in harmful exposures for residents on newly zoned residential land. For example, expansion of urban areas in the Hutt Valley resulted in lead exposure when residents moved onto the land of an old battery recycling plant. There have also been issues with rezoned land in Mapua, which was contaminated with organochlorines resulting from the production of pesticides in the area, and issues with land previously used for orchards in the Bay of Plenty. The Ministry for the Environment is currently developing standards to improve the management of contaminated land. These standards are based on human health (rather than ecological) effects.

Box 10: Case studies of infrastructure to improve water, air and waste disposal

1. Waiwhetu stream clean-up – Hutt Valley

Waiwhetu Stream in Lower Hutt is one of New Zealand's most polluted waterways. Toxic chemicals from nearby factories were discharged into it until the late 1970s. It has a legacy of high concentrations of lead, copper, arsenic, zinc, copper mercury and the DDT insecticide. The stream, which runs through high-density urban areas, has little aquatic life, and is unsafe for swimming. It is an important stream for Te Atiawa, who participated in the planning of this project, which is funded by the Hutt City Council, Wellington Regional Council and Ministry for the Environment.

2. Waterway Enhancement Programme – Christchurch

The Waterway Enhancement Programme is a partnership between Christchurch City Council and local communities to protect natural areas, restore native habitats, enhance ecosystems and develop green corridors in the Christchurch area.¹⁸⁵

3. Waitangi Park – Wellington

One of Wellington's largest urban stormwater catchments drains into the harbour via newly built Waitangi Park. The Waitangi Park wetland treats stormwater through filtration, absorption and biological and chemical transformation, in a manner that satisfies local ecological and cultural concerns.

Appendix 1: Agencies, legislation and plans responsible for urban areas

Aspect of the urban environment	Key agencies responsible	Key relevant legislation and plans
Roads, rail and walkways	Ministry of Transport Land Transport Agency Regional government Local government Private sector	Land Transport Management Act 2003 Local Government Act 2002 Regional land transport strategies Walking and cycling strategies
Buildings	Department of Building and Housing Ministry for Culture and Heritage Energy Efficiency and Conservation Authority Private sector	Building Act 2004 District plans
Houses	Housing New Zealand Corporation Local government Department of Building and Housing Energy Efficiency and Conservation Authority Private sector	Building Act 2004 Affordable Housing: Enabling Territorial Authorities Act 2008 District plans Health Act 1956
Air, fresh water, drinking water and waste	Local government Regional government Ministry for the Environment Ministry of Health Ministry of Agriculture and Forestry Public health units Private sector	Resource Management Act 1991 Health Act 1956 Hazardous Substances and New Organisms Act 1996 Waste Strategy 2002 Waste Minimisation Act 2008 Coastal Policy Statement
Energy	Ministry for the Environment Ministry of Economic Development Energy Efficiency and Conservation Authority Regional government Private sector	New Zealand Energy Strategy 2007 Regional policy statements
Open space/land	Local government Regional government Department of Conservation	Resource Management Act 1991 Conservation Act 1987 Biosecurity Act 1993
Services (eg, early childhood centres, schools, health services, social services, recreational facilities, sports clubs, businesses)	Ministry of Education Ministry of Health District Health Boards Primary health organisations Ministry of Social Development Local government Sport and Recreation New Zealand Voluntary sector Private sector	Education Act 1989 New Zealand Public Health and Disability Act 2000 Health Act 1956 Burial and Cremation Act 1964 Sport and Recreation Act 2002

Aspect of the urban environment	Key agencies responsible	Key relevant legislation and plans
Urban design/ development	Ministry for the Environment Local government Regional government Ministry of Transport Land Transport Agency Department of Internal Affairs Ministry of Economic Development Department of Labour Private sector	Resource Management Act 1991 Local Government Act 2002 Regional policy statements District plans Urban development strategies Long-term community council plans Concept plans Urban Design Protocol Spatial and growth plans
Community cohesion	Department of Internal Affairs Local government Department of Conversation Sport and Recreation New Zealand	Local Government Act 2002 Resource Management Act 1991 Long-term Council Community Plans Conservation Act 1987
Māori engagement	All agencies Tāngata whenua Taurahere	Treaty of Waitangi 1840 Local Government Act 2002 Resource Management Act 1991
Community health (eg, food quality and safety, alcohol, gambling, smoking, noise)	Food Safety Authority Liquor Licensing Agency Department of Internal Affairs Ministry of Health Department of Labour Local government Private sector	Food Act 1981 Sale of Liquor Act 1989 Smokefree Environments Act 1990 Gambling Act 2003 Health Act 1956 Health and Safety in Employment Act 1992 Building Act 2004

Glossary

Term	Definition
Active transport	Includes non-motorised forms of transport involving physical activity, such as walking and cycling. It also includes public transport to meet longer distance trip needs as public transport trips generally include walking or cycling components as part of the whole journey.
Determinants of health	The factors that influence health, either positively or negatively. Determinants include not only individual factors, such as age, sex and health lifestyle, but also factors such as income and social status, education, employment conditions, access to appropriate health services, and the physical environment.
Environmental health	Addresses all the physical, chemical and biological factors external to a person affecting their health, and all related factors impacting on their behaviour. It encompasses the assessment and control of those environmental factors that can potentially affect health. The purpose of a focus on environmental health is to prevent disease and create environments that support health.
Equity	Concerns the removal or absence of systemic and social barriers to fairness. Not all people experience similar levels of access or entitlements, because of variance among social conditions (for example, income, housing and neighbourhood) that are expressions of these systemic barriers. A focus on equity attempts to put in place remedies to redress barriers that have prevented or diminished access to goods and services.
Health system	All organisations, institutions and resources whose primary intent is to improve health, either directly or indirectly (through efforts to influence the determinants of health). Most national health systems include public, private, traditional and informal sectors.
Infill	The use of existing or vacant land and property within a built-up area for further construction or development.
Infrastructure	The basic physical and organisational structures needed for the operation of a society. See also <i>urban infrastructure</i> .
Mana whenua	The customary authority exercised by an iwi or hapū in an identified area.
Mixed land use	A situation in which many sectors of a community are located together in a balanced mix, including residential development, shops, employment, community and recreation facilities, and parks and open space.

Term	Definition
Public health	The science and art of promoting, protecting and improving health and wellbeing through organised efforts of society.
Retrofitting	The process of furnishing a building, facility or neighbourhood with new or modified parts not available or considered necessary at the time of original construction.
Single land use	Single land use refers to a situation in which the many sectors of a community are separated, with isolated zoned areas for businesses, schools, hospitals and residential areas.
Social cohesion	A state in which all groups have a sense of belonging, participation, inclusion, recognition and legitimacy.
Street connectivity	The principle by which a system of streets is created with multiple routes and connections serving the same origins and destinations.
Taurahere	Māori who are living within the mana whenua of another iwi.
Traffic calming measures	Measures that attempt to slow traffic speeds and/or cut-through volumes on a street network by changing traffic routes or flows, street alignment, installation of barriers, and other physical measures.
Universal design	A set of principles that together aim to make urban areas available to all populations. Universal design principles place people at the centre of urban design, considering the needs of all groups within the population including young and old, and people with and without disabilities.
Urban	Defines settlements with a population of 1000 people or more (by the Statistics New Zealand definition). This definition includes New Zealand's 16 main urban areas, satellite urban communities (towns and settlements with strong links to main urban areas) and independent urban communities (towns and settlements, often in rural areas, independent from main urban areas).
Urban density	A term used in urban planning and urban design to refer to the number of people inhabiting a given urbanised area.
Urban design	The design of the buildings, places, spaces and networks (both public and private) that make up our towns and cities.
Urban form	The way urban areas are planned and laid out. It is partly determined by natural features – such as the hills in Wellington and Dunedin, the rivers in Christchurch and Hamilton and geothermal activity in Rotorua – and is partly the result of public and private decisions made over many years.

Term	Definition
Urban infrastructure	Physical facilities like roads, traffic lights, pavement, buildings, water systems and recreational spaces. It also comprises social elements – formal and informal systems through which people relate to and support each other, ranging from the structure of governance through to informal networks that create community cohesion.
Urban planning	The institutionalised process of making decisions about the future use and character of land and buildings in city regions. The discipline emerged during the 19th century, largely as a result of concerns about the health and housing of populations in early industrial cities.
Urban regeneration	The attempt to accommodate the vast majority of new development within existing urban boundaries. This approach applies especially in regions experiencing growth and economic restructuring and where existing urban density is low. It requires effective planning policies to ensure that valued public open space is not lost and connectivity is built in to new developments.
Urban sprawl	The unplanned, uncontrolled spreading of urban development into areas adjoining the edge of a city. It is usually characterised by low-density housing spread, single land use, lack of distinct town centres, large block sizes and poorly connected street networks.
Whānau ora	Supporting Māori families to maximise their health and wellbeing. It involves facilitating positive and adaptive relationships within whānau and recognising the interconnected nature of health, education, housing, justice, welfare, employment and lifestyle as elements of whānau wellbeing.

Endnotes

- 1 WHO, Commission on Social Determinants of Health. 2008. *Closing the Gap in a Generation: Health equity through action on the social determinants of health*. Geneva: World Health Organization.
- 2 PHAC. 2002. *The Health of People and Communities: The effect of environmental factors on the health of New Zealanders*. Wellington: Public Health Advisory Committee.
- 3 PHAC. 2004. *The Health of People and Communities – A Way Forward: Public policy and the economic determinants of health*. Wellington: Public Health Advisory Committee.
- 4 Oxford dictionary.
- 5 Kearns R. 1999. Seeing the social in infrastructure. *New Zealand Planning Quarterly* September: 12–14.
- 6 Capon A, Blakey E. 2008. Checklist for healthy and sustainable communities. *NSW Public Health Bulletin* 18(3–4): 51–54.
- 7 Saelens B, Sallis J, Frank L. 2003. Environmental correlates of walking and cycling: findings from the transportation, urban design and planning literatures. *Annals of Behavioural Medicine* 25(2): 80–91.
- 8 Woodward A, Hales S, de Wet N. 2001. *Climate Change: Potential effects on human health in New Zealand*. Wellington: Ministry for the Environment.
- 9 Metcalfe S, Woodward A, Macmillan A, et al. 2009. Why New Zealand must rapidly halve its greenhouse gas emissions. *New Zealand Medical Journal* 122(1304): 72–95.
- 10 Greenaway S, McCreanor T, Witten K. 2008. Reducing CO₂ emissions from domestic travel: exploring the social and health impacts. *Ecohealth* 5: 504–12.
- 11 Witten K, Exeter D, Field A. 2003. The quality of urban environments: mapping variation in access to community resources. *Urban Studies* 40(1): 161–77.
- 12 Ewing R, Schmid T, Killingsworth R, et al. 2003. Relationship between urban sprawl and physical activity, obesity and morbidity. *American Journal of Health Promotion* 18(1): 47–57.
- Sturm R, Cohen, D. 2004. Suburban sprawl and physical and mental health. *Journal of the Royal Institute of Public Health* 118(7): 488–96.
- 13 Keall M, Chapman R, Howden-Chapman P. 2009. Changes in New Zealand transport mode choices over time by size of city. Presentation delivered at University of Otago, Wellington.
- 14 Ministry of Transport. 2009a. *How New Zealanders Travel: Trends in New Zealand household travel 1989–2008*. Wellington: Ministry of Transport.
- 15 Ministry of Health. 2004. Looking upstream: causes of death cross-classified by risk and condition New Zealand 1997. *Public Health Intelligence Occasional Bulletin No. 20*. Wellington: Ministry of Health.
- 16 Health Committee. 2007. *Inquiry into Obesity and Type 2 Diabetes in New Zealand. Report of the Health Committee*. 48th Parliament: August.
- 17 California Center for Public Health Advocacy. 2009. *The Economic Costs of Overweight, Obesity and Physical Inactivity among California Adults – 2006*. Davis, CA: California Center for Public Health Advocacy.
- 18 Pearce J, Hiscock R, Blakely T, et al. 2008. The contextual effects of neighbourhood access to supermarkets and convenience stores on individual fruit and vegetable consumption. *Journal of Epidemiology and Community Health* 62: 198–201.
- 19 Pearce J, Hiscock R, Blakely T, et al. 2009. A national study of the association between neighbourhood access to fast-food outlets and the diet and weight of local residents. *Health and Place* 15(10): 193–7.

- 20 Ministry of Health. 2004 (see note 15).
- 21 National Pedestrian Project. 2000. *New Zealand Pedestrian Profile: An overview of pedestrian activity & injury in New Zealand*. Wellington: New Zealand Transport Agency.
- Jacobsen P, Anderson C, Winn D, et al. 2000. Child pedestrian injuries on residential streets: implications for traffic engineering. *ITE Journal* 71–75.
- Roberts I, Norton R, Jackson R, et al. 1995. Effect of environmental factors on risk of injury of child pedestrians by motor vehicles: a case-control study. *British Medical Journal* 310: 91–94.
- 22 Frank L, Kavage S, Litman T. 2006. *Promoting Public Health through Smart Growth: Building healthier communities through transportation and land use policies and practices*. Vancouver: Smart Growth British Columbia.
- 23 Ministry of Transport. 2009a (see note 14).
- 24 National Pedestrian Project. 2000 (see note 21).
- 25 Child and Youth Mortality Review Committee. 2008. *Fourth Report to the Minister of Health: Reporting mortality 2002–2005*. Wellington: Child and Youth Mortality Review Committee.
- 26 National Pedestrian Project. 2000 (see note 21).
- 27 Ministry of Transport. 2009b. *Transport Safety and Security: Social cost of accidents*. URL: <http://www.transport.govt.nz/ourwork/TMIF/SS009/>
- 28 Fischer P, Hoek G, van Reeuwijk H, et al. 2000. Traffic-related differences in outdoor and indoor concentrations of particles and volatile organic compounds in Amsterdam. *Atmospheric Environment* 34: 3713–22.
- Brugge D, Durant J, Rioux C. 2007. Near highway pollutants in motor vehicle exhaust: a review of epidemiological evidence of cardiac and pulmonary health risks. *Environmental Health* 6: 23.
- Frumkin H. 2002. Urban sprawl and public health. *Public Health Reports* 117: 201–17.
- 29 PHAC. 2008b. *Review on International Evidence Linking Health and the Urban Built Environment*. Wellington: Public Health Advisory Committee.
- 30 Lai C, Beasley R, Crane J, et al. 2009. Global variation in the prevalence and severity of asthma symptoms: Phase Three of the International Study of Asthma and Allergies in Childhood (ISAAC). *Thorax* 64: 476–83.
- 31 Ministry of Health. 2004 (see note 15).
- 32 Fisher G, Kjellstrom T, Kingham S, et al. 2007. Health and air pollution in New Zealand (HAPiNZ): Final Report, New Zealand. URL: <http://www.hapinz.org.nz>
- 33 Fisher G, Rolfe K, Kjellstrom T, et al. 2002. *Health Effects due to Motor Vehicle Pollution in New Zealand: Report to the Ministry of Transport*. Wellington: Ministry of Transport.
- 34 Dora C, Phillips M. 2000. *Transport, Environment and Health*. WHO Regional Publications, European Series No. 89. Copenhagen: WHO Regional Office for Europe.
- 35 Putnam R. 2000. *Bowling Alone*. New York: Simon & Schuster.
- 36 Rose E, Witten K, McCreanor T. 2009. Transport-related social exclusion in New Zealand: evidence and challenges. *New Zealand Journal of Social Sciences Online*. URL: <http://www.royalsociety.org.nz/Site/publish/Journals/kotuitui/2009/028.aspx>
- 37 PHAC. 2008b (see note 29).
- 38 Schaeffer M, Street S, Singer J, et al. 1988. Effects of control on the stress reactions of commuters. *Journal of Applied Social Psychology* 11: 944–957.
- 39 Kuo F, Sullivan W. 2001. Environment and crime in the inner city: does vegetation reduce crime? *Environment and Behavior* 33(3): 343–367.

- 40 Zhu L, Gorman D, Horel S. 2004. Alcohol outlet density and violence: a geospatial analysis. *Alcohol and alcoholism* 39(4):369–75.
- 41 Ministry of Health. 2004 (see note 15).
- 42 Dora and Phillips. 2000 (see note 34).
- 43 Davison K, Lawson C. 2006. Do attributes of the physical environment influence children’s physical activity? A review of the literature. *International Journal of Behavioral and Physical Activity* 3: 19–36.
- Mackie H. 2009. *‘I want to ride my bike’: Overcoming barriers to cycling to intermediate schools*. NZ Transport Agency research report 280. August.
- 44 WHO. 2002. *A Physically Active Life through Everyday Transport with a Special Focus on Children and Older People and Examples and Approaches from Europe*. Geneva: World Health Organization.
- 45 Edwards P, Tsouros A. 2006. *Promoting Physical Activity and Active Living in Urban Environments: The role of local government*. Copenhagen: World Health Organization.
- 46 Frank et al. 2006 (see note 22).
- 47 National Pedestrian Project. 2000 (see note 21).
- 48 Edwards and Tsouros. 2006 (see note 45).
- 49 Edwards and Tsouros. 2006 (see note 45); Rose et al, 2009 (see note 36).
- 50 Ministry of Health. 2008. *A Portrait of Health: Key results of the 2006/07 New Zealand Health Survey*. Wellington: Ministry of Health.
- 51 Pearce J, Kingham S. 2007. Environmental inequalities in New Zealand: a national study of air pollution and environmental justice. *Geoforum* 39(2): 980–93.
- 52 Roberts I, Norton R, Taua B. 1996. Child pedestrian injury rates: the importance of ‘exposure to risk’ relating to socioeconomic and ethnic differences, in Auckland, New Zealand. *Journal of Epidemiology and Community Health* 50: 162–5.
- Dora and Phillips. 2000 (see note 34).
- 53 ARPHS. 2006. *Improving Public Health and Wellbeing: A public health perspective for local authorities in the Auckland region*. Auckland: Auckland Regional Public Health Service.
- 54 Dora and Phillips. 2000 (see note 34).
- Colvin K. 2006. Presentation on transport issues facing young families, single mothers, migrants, low-income and unemployed. Transport and disadvantage conference. Monash University.
- 55 Statistics New Zealand. 2008. Projections overview. URL: <http://www.stats.govt.nz>
- 56 Ministry of Transport. 2008. *Raising the Profile of Walking and Cycling in New Zealand: A guide for decision-makers*. Wellington: Ministry of Transport.
- 57 Providence Bicycle Coalition. 2009. *Bike Providence. Part 2 on Copenhagen Transit Policies*. October 18. URL: <http://bikeprovidence.org>
- Macfie R. 2009. Crash course. *The New Zealand Listener* 17 Oct, pp 17–21.
- 58 Gow L. 2000. *Curbing the Sprawl: Urban growth management in the United States – lessons for New Zealand*. Wellington: Ministry for the Environment.
- 59 Ewing R, Bartholomew K, Winkelmann S, et al. 2008. *Growing Cooler: The evidence on urban development and climate change*. Washington, DC: Urban Land Institute.
- 60 Gibson K, Abbott C. 2002. Portland, Oregon. *Cities* 19(6): 425–36.
- 61 Edwards and Tsouros. 2006 (see note 45); Frank et al, 2006 (see note 22).
- 62 WHO and Commission on Social Determinants of Health. 2008 (see note 1).

- 63 Rose E, Huakau J, Casswell S. 2005. *Economic Values: A report of the New Zealand values study, 2005*. Auckland: Massey University.
- Mackie. 2009 (see note 43).
- 64 Preventative Health Taskforce. 2009. *Australia: The healthiest country by 2020. National Preventative Health Strategy*. ACT: Commonwealth of Australia.
- 65 Hoskins R. 2008. 'Our faces in our places': Cultural landscapes – Māori and the urban environment. In: *Rethinking Urban Environments and Health*. Wellington: PHAC.
- Kearns R, McCreanor T, Witten K. 2006. Healthy communities. In: M Thompson-Fawcett and C Freeman (eds) *Living Together: Towards inclusive settlements in New Zealand*. Dunedin: Otago University Press.
- 66 Frank et al. 2006 (see note 22).
- 67 Ball J, Ward M, Thornley L, Quigley R. 2009. *Applying Health Impact Assessment to Land Transport Planning*. New Zealand Transport Agency Research Report 375.
- 68 PHAC. 2005. *A Guide to Health Impact Assessment*. Wellington: Public Health Advisory Committee.
- 69 PHAC. 2002 (see note 2).
- 70 Rehfuess E, Bruce N, Bartram J. 2009. More health for your buck: health sector functions to secure environmental health. *Bulletin of the World Health Organization* 87(11): 805–84.
- 71 Rehfuess et al. 2009 (see note 70).
- 72 Rehfuess et al. 2009 (see note 70).
- 73 Ministry of Health. 2009a. *Environmental Health Indicators for New Zealand 2008*. Wellington: Ministry of Health.
- 74 Jones E. 2001. *Liveable Neighbourhoods*. Conference presentation in Australia: Walking the 21st Century. 20–22 Feb 2001. Perth, Western Australia.
- 75 Edwards and Tsouros. 2006 (see note 45).
- 76 Gesler W, Bell M, Curtis S, et al. 2004. Therapy by design: evaluating the UK hospital building program. *Health and Place* 10: 117–28.
- 77 CABE. 2006. *Designed with Care: Design and neighbourhood healthcare buildings*. London: Commission for Architecture and the Built Environment.
- 78 Edwards and Tsouros. 2006 (see note 45).
- 79 WHO and Commission on Social Determinants of Health. 2008 (see note 1).
- 80 Barton H, Tsourou C. 2000. *Healthy Urban Planning*. New York: World Health Organization.
- 81 Ministry for the Environment. 2005. *The Value of Urban Design: The economic, environmental and social benefits of urban design*. Wellington: Ministry for the Environment.
- 82 Edwards and Tsouros. 2006 (see note 45).
- 83 Barton and Tsourou. 2000 (see note 80).
- 84 Ministry of Health. 2009c. *Statement of Intent 2009–2012*. Wellington: Ministry of Health.
- 85 Ministry of Health. 2009b. *Public Health in New Zealand: Local government's contribution to wellbeing*. Wellington: Ministry of Health.
- 86 Ministry for the Environment. 2005 (see note 81).
- 87 WHO and Commission on Social Determinants of Health. 2008 (see note 1).
- 88 Dora and Phillips. 2000 (see note 34).
- 89 Frank et al. 2006 (see note 22).
- 90 Barton and Tsourou. 2000 (see note 80); National Pedestrian Project, 2000 (see note 21).

- 91 Eley C. 2003. Smart Growth down under: taking steps towards sustainable settlements in New Zealand. Unpublished document.
- 92 Dora and Phillips. 2000 (see note 34); National Pedestrian Project, 2000 (see note 21).
- 93 Edwards and Tsouros. 2006 (see note 45).
- 94 Frank et al. 2006 (see note 22).
- 95 Badland H, Schofield G, Garrett N. 2008. Travel behaviour and objectively measured urban design variables: associations for adults travelling to work. *Health and Place* 14(1): 85–95.
- 96 Frank et al. 2006 (see note 22); Edwards and Tsouros. 2006 (see note 45).
- 97 Ministry for the Environment. 2005 (see note 81).
- 98 Frank L, Pivo G. 1994. Impacts of mixed use and density on utilization of three modes of travel: single-occupant vehicle, transit, and walking. *Transportation Research Record* 1466: 44–52.
- 99 Frank L, Kerr J, Chapman J, et al. 2007. Urban form relationships with walk trip frequency and distance among youth. *American Journal of Health Promotion* 21(4): 305–11.
- 100 Environmental Protection Agency. 2001. *Our Built and Natural Environments: A technical review of the interactions between land use, transportation, and environmental quality*. United States Environmental Protection Agency.
- 101 Environmental Protection Agency. 2001 (see note 100).
- 102 Handy S. 1996. Understanding the link between urban form and non-work travel behaviour. *Journal of Planning Education and Research* 15: 183–98.
- 103 Badland et al. 2008 (see note 95).
- 104 McCormack G, Gilles-Corti B, Bulsara M. 2007. The relationship between destination proximity, destination mix and physical activity behaviours. *Preventive Medicine* 46(1): 33–40.
- 105 Evenson K, Scott M, Cohen D, et al. 2007. Girls' perception of neighborhood factors on physical activity, sedentary behavior, and BMI. *Obesity* 15(20): 430.
- 106 Frumkin H, Frank L, Jackson R. 2004. *Urban Sprawl and Public Health*. Washington: Island Press.
- 107 Rutherford G, McCormack E, Wilkinson M. 1996. Travel impacts of urban form: implications from an analysis of two Seattle travel diaries. Presentation at TMIP conference on urban design, telecommuting and travel behaviour.
- 108 Sallis J, Frank L, Saelens B, et al. 2004. Active transportation and physical activity: Opportunities for collaboration on transportation and public health research. *Transportation Research Part A* 38: 249–68.
- 109 Davison and Lawson. 2006 (see note 43).
- 110 Leaf W, Preusser D. 1999. *Literature Review on Vehicle Travel Speeds and Pedestrian Injuries*. National Highway Traffic Safety Administration. URL: <http://www.nhtsa.dot.gov>
- 111 ND Core Committee. 2006. *Understanding the Relationship between Public Health and the Built Environment (LEED Report)*. URL: <https://www.usgbc.org>
- 112 ND Core Committee. 2006 (see note 111).
- 113 Naderi J. 2003. Landscape design in the clear zone: the effects of landscape variables on pedestrian health and driver safety. *Transportation Research Board, 82nd Annual Conference Proceedings*. Washington, DC: Transportation Research Board.
- 114 Jacobsen P. 2003. Safety in numbers: more walkers and bicyclists, safer walking and bicycling. *Injury Prevention* 9: 205–9.

- 115 Bike Radar. 2009. *Surge in Cycle Commuting in USA*. 18 August. URL: <http://www.bikeradar.com>
- 116 Ministry of Transport. 2008. *Risk on the Road: Ongoing New Zealand Household Travel Survey 2003–2007*. URL: <http://www.transport.govt.nz/research/Documents/Riskontheroad2008.pdf>
- 117 Main Roads Western Australia. URL: <http://www.mainroads.wa.gov.au>
- 118 Dora and Phillips. 2000 (see note 34).
- 119 Macfie. 2009 (see note 57).
- 120 Dora and Phillips. 2000 (see note 34).
- 121 Frank et al. 2006 (see note 22).
- 122 Shoup D. 2005. *High Cost of Free Parking*. Chicago: APA Planners Press.
- 123 Edwards and Tsouros. 2006 (see note 45).
- 124 Macfie. 2009 (see note 57).
- 125 Mackie. 2009 (see note 43).
- 126 Macfie. 2009 (see note 57).
- 127 Morrison D, Thomson H, Petticrew M. 2004. Evaluation of the health effects of a neighbourhood traffic calming scheme. *Journal of Epidemiology and Community Health* 58: 837–40.
- 128 Ministry for the Environment. 2005 (see note 81).
- 129 Barton and Tsourou. 2000 (see note 80).
- 130 Frank et al. 2006 (see note 22).
- 131 Cervero R, Gorham R. 1995. Commuting in transit versus automobile neighbourhoods. *Journal of the American Planning Association* 61(2): 210–25.
- 132 Cervero R. 1993. Ridership impacts of transit-focused development in California. University of California Transportation Center, Working Paper No. 176.
- 133 Lawrence Frank and Company. 2005. *King County Land Use, Transportation, Air Quality, and Health Study (LUTAQH)*. Final Report.
- 134 Barton and Tsourou. 2000 (see note 80).
- 135 Frank et al. 2006 (see note 22).
- 136 Eley, 2003 (see note 91).
- 137 Rose et al. 2009 (see note 36).
- 138 Rose et al. 2009 (see note 36).
- 139 Rose et al. 2009 (see note 36).
- 140 PHAC. 2008a. *Review on Healthy Urban Planning*. Wellington: PHAC.
- 141 PHAC. 2008a (see note 140); Ministry for the Environment, 2005 (see note 81).
- 142 Ministry for the Environment. 2005 (see note 81).
- 143 Giles-Corti B, Donovan R. 2003. Relative influences of individual, social environmental, and physical environmental correlates of walking. *American Journal of Public Health* 93(9): 1583–89.
- 144 Edwards and Tsouros. 2006 (see note 45).
- 145 Ministry for the Environment. 2005 (see note 81).
- Pearce J, Bowers S. 2009. Chapter 5: Improving urban design. In: S Bowers, K Carter, D Gorton, et al (eds), *Enhancing Food Security and Physical Activity for Māori, Pacific and Low-income Peoples*. Wellington: Clinical Trials Research Unit, University of Auckland; GeoHealth Laboratory, University of Canterbury; Health Promotion and Policy Research Unit, University of Otago; Te Hotu Manawa Māori.

- 146 Edwards and Tsouros. 2006 (see note 45).
- 147 Frank, et al. 2006 (see note 22).
- 148 Sallis et al. 2004 (see note 108); Edwards and Tsouros, 2006 (see note 45).
- 149 Pearce and Bowers. 2009 (see note 145).
- 150 Cohen D, Ashwood S, Scott M, et al. 2006. Public parks and physical activity among adolescent girls. *Pediatrics* 118(5): 1381–89.
- 151 Ministry for the Environment. 2005 (see note 81).
- 152 Pearce and Bowers. 2009 (see note 145).
- 153 Pearce J, Witten K, Bartie P. 2006. Neighbourhoods and health: a GIS approach to measuring community resource accessibility. *Journal of Epidemiology and Community Health* 60: 389–95.
- 154 ARPHS. 2006 (see note 53).
- 155 Hoskins. 2008 (see note 65).
- 156 Kearns R, Collins D, Neuwelt P. 2003. The walking school bus: extending children’s geographies? *Area* 35(3): 285–92.
- 157 Collins D, Kearns R. 2009. Walking school buses in the Auckland region: a longitudinal assessment. *Transport Policy* 17: 1–8.
- 158 PHAC. 2008a (see note 140).
- 159 Kearns et al. 2006 (see note 65).
- 160 Barton and Tsourou. 2000 (see note 80).
- 161 Gebel K, King L, Bauman A, et al. 2005. *Creating Healthy Environments: A review of links between the physical environment, physical activity and obesity*. Sydney: NSW Health Department.
- 162 Pearce J, Hiscock R, Blakely T, et al. 2008. The contextual effects of neighbourhood access to supermarkets and convenience stores on individual fruit and vegetable consumption. *Journal of Epidemiology and Community Health* 62: 198–201.
- 163 Joseph A, Phillips D . 1984. *Accessibility and Utilization: Geographical perspectives on health care delivery*. New York: Harper & Row.
- 164 Hiscock R, Pearce J, Blakely T, et al. 2008. Is neighborhood access to health care provision associated with individual-level utilization and satisfaction? *Health Services Research* 43(6): 2183–200.
- 165 Higgs G. 2004. A literature review of the use of GIS-based measures of access to health care services. *Health Services and Outcome Research Methodology* 5: 125–45.
- 166 National Drug Law Enforcement Research Fund. 2007. *Predicting Alcohol-related Harms from Licensed Outlet Density: A feasibility study*. Monograph series No. 28.
- 167 Wheeler B, Rigby J, Huriwai T. 2006. Pokies and poverty: problem gambling risk factor geography in New Zealand. *Health and Place* 12: 86–96.
- 168 Maher A, Wilson N, Signal L. 2005. Advertising and availability of ‘obesogenic’ foods around New Zealand secondary schools: a pilot study. *New Zealand Medical Journal* 118: 1218.
- 169 Birkin M, Clarke G, Clarke M. 2002. *Retail Geography and Intelligent Network Planning*. West Sussex: John Wiley & Sons.
- 170 Colvin. 2006 (see note 54).
- 171 Edwards and Tsouros. 2006 (see note 45).

- 172 Lawrence J, Kearns R. 2005. Exploring the 'fit' between people and providers: refugee health needs and health care services in Mt Roskill, Auckland, New Zealand. *Health and Social Care in the Community* 13(5): 451–61.
- 173 Prudham S. 2004. Poisoning the well: neoliberalism and the contamination of municipal water in Walkerton, Ontario. *Geoforum* (35)3: 343–59.
- 174 Ministry of Health. 2009a (see note 73).
- 175 WHO. 2009. *Air Quality and Health*. URL: <http://www.who.int/mediacentre/factsheets/fs313/en/index.html>
- 176 Ministry of Health. 2009a (see note 73).
- 177 WHO. 2009 (see note 175).
- 178 Ministry of Health. 2009a (see note 73).
- 179 Ministry of Health. 2009a (see note 73).
- 180 Frumkin. 2002 (see note 28).
- 181 Frumkin. 2002 (see note 28).
- 182 Frank et al. 2006 (see note 22).
- 183 Ministry for the Environment. 2002. *New Zealand Waste Management Strategy: Towards zero waste and a sustainable New Zealand*. Wellington: Ministry for the Environment.
- 184 Ministry of Health. 2009b (see note 85).
- 185 Ministry of Health. 2009b (see note 85).