

Planning for Sustainability: *Tools for the management of settlement form*



Learning Sustainability

**Foundation for Research, Science and Technology
Funded Research Programme**



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International Literature Review

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Abbreviations

ACC	Auckland City Council
ARGF	Auckland Regional Growth Forum
ARC	Auckland Regional Council
DCC	Dunedin City Council
DfT	UK Department for Transport
LG	local government
MfE	Ministry for the Environment
OECD	Organisation for Economic Co-operation and Development
RMA	Resource Management Act (1991)
LA	Local Authority (Regional, District, City and Unitary Councils/Authorities)
LGA	Local Government Act (2002)
LTCCP	Long Term Council Community Plan
LTMA	Land Transport Management Act (2003)
TLA	Territorial Local Authority (District, City and Unitary Councils/Authorities)
WCC	Wellington City Council



1 Purpose and scope of this report

This report presents an introduction to some of the methods and tools or [public policy instruments](#)¹ that have been used in New Zealand and internationally to manage [settlement form and design](#) in order to support the principles of [sustainability](#) (see sections 2.1 and 2.2 for definitions).

The purpose of this report is to provide a basic overview of methods and tools for sustainable management of settlement form and design that can be used by:

- New Zealand local authorities and their stakeholders, to identify a portfolio of policy instruments to achieve their individual community visions and policy objectives, particularly as part of growth management planning
- Central government in their consideration of governance mechanisms that can be used to support more sustainable and liveable settlements in New Zealand
- Other stakeholders, including interest groups and other researchers.

This report is not intended to be a comprehensive examination of the methods and tools presented, nor does it cover all of the potential methods and tools for the management of settlement form and design. It does, however, where possible, provide details of further resources on the topics covered.

In addition to presenting information on individual methods and tools, the report also discusses the importance of taking an [Integrated Approach](#) to planning.

1.1 The Learning Sustainability research programme

This research project was undertaken as part of the 'Learning Sustainability' research programme, which is funded by the Foundation for Research, Science and Technology. This programme explores how we can manage the form and design of cities and settlements to reduce environmental degradation, optimise their "liveability", and ensure that our cities and settlements are sustainable.

1.2 Structure of this report

- Section 2 provides an introduction to sustainability and how it can be affected by settlement form and design.
- Sections 3-7 provide an overview of some of the key methods and tools used internationally to manage settlement form and design in order to promote liveability and sustainability. Relevant examples of how these tools have been used internationally and in New Zealand are discussed. Advantages and disadvantages of each of the tools are also discussed.
- Section 9 provides further resources on the topics covered.

¹ Public policy instruments may be defined as "the set of techniques by which governmental authorities wield their power in attempting to ensure support and effect or prevent social change" (Vedung, 1998, p.21 cited in Bengston *et al.*, 2004)



2 Introduction to sustainability and settlement form and design

This section provides a very brief introduction to sustainability and how it is affected by settlement form and design. It does not provide a comprehensive review of the literature on this topic nor discuss in detail the elements of form and design that have been related to sustainability outcomes. Readers are provided with some further references on this topic at the end of the section.

2.1 What do we mean by sustainability?

Sustainability is a complex concept that has been used to refer to both a process for managing resources and a desired societal outcome.

The importance of the concept of sustainability initially came about due to the recognition that many of the resources we depend on or value are becoming depleted or destroyed. This problem has been widely recognised in relation to our dependence on fossil fuels and other non-renewable resources, but is also increasingly relevant for many of the 'taken-for-granted' resources such as: clean water and air; good quality agricultural land; and open spaces. The notion of sustainability acknowledges that our consumption of resources has important moral and ethical considerations in terms of equity both within and between generations. This principle of inter-generational equity is captured in one of the most commonly cited definitions of sustainability from the Brundtland Report *Our Common Future* (WCED 1987), which defines sustainable development in the following way:

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Along with a concern for inter and **intra-generational equity and fairness**, there are a number of other principles and concepts that are commonly associated with sustainability, these include:

- **Systems thinking** – understanding the interconnections between the environment, economy, and society
- **Integrated decision-making and goal-setting** – related to economic, social, and environmental aspirations, and finding the point which maximises each
- The **precautionary principle** – erring on the side of environmental caution when there is incomplete information or the threat of serious or irreversible environmental damage
- Conservation of **biological diversity and ecological integrity**
- **Carrying capacity** – recognising the size of the population that can be supported indefinitely using the available resources and services of the ecosystem.

In New Zealand, the concept of sustainability is included in both the Local Government Act 2002 (LGA) and the Resource Management Act 1991 (RMA).



The concept of sustainability is relatively weak in the RMA, which gives as its purpose the “sustainable management” of natural physical resources (Section 5) where sustainable management is defined as:

Managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for the social, economic and cultural well-being and for their health and safety while –

- (a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
- (b) Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and*
- (c) Avoiding, remedying or mitigating any adverse effects of activities on the environment.*

This definition recognises the intergenerational component of sustainability but largely limits its focus to environmental sustainability to the exclusion of the social and cultural elements of sustainability (Taylor, 2006; Freeman, 2007). As Freeman (2007, p.18) argues:

Sustainable development is a concept that embraces the environment, economic, social and cultural elements of development, whereas “management” in the RMA context focuses on the environment, in particular on “natural and physical resources”.

The focus on management has acted to stifle initiative in New Zealand, emphasising a reactive and possibly bureaucratic rather than progressive approach to planning and development in accord with wider social and economic development goals.

Perhaps reflecting the criticisms that have been made about the RMA, the concept of sustainability is broader in scope under the relatively recent LGA (2002). The stated purpose of the LGA is to provide for “local authorities to play a broad role in promoting the social, economic, environmental and cultural wellbeing of communities, taking a sustainable development approach” (Section 3(d)). Section 14(1)(h) of the LGA further clarifies that:

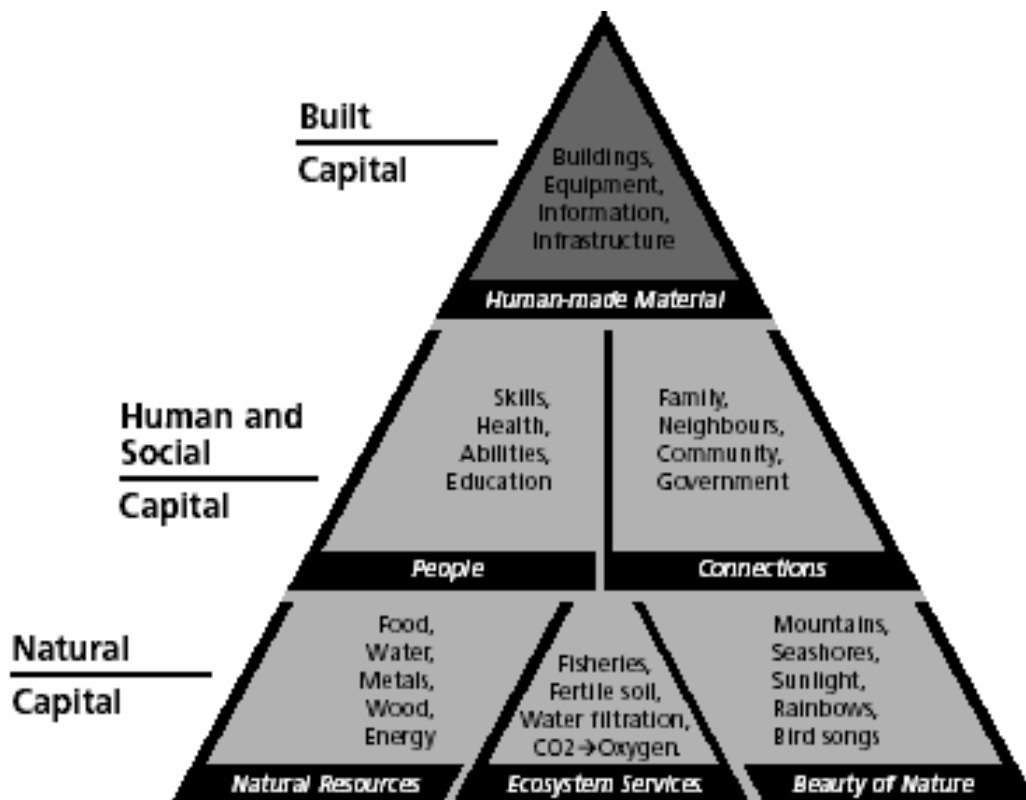
in taking a sustainable development approach, a local authority should take into account:

- (i) the social, economic, and cultural well-being of people and communities; and*
- (ii) the need to maintain and enhance the quality of the environment; and*
- (iii) the reasonably foreseeable needs of future generations*



This broader concept of sustainability, which encompasses not only the management of natural and physical resources (as reflected in the RMA) but also promoting social and cultural goals, is more reflective of the discussion of sustainable communities in international research and theory (Taylor, 2006).

For example, Maureen Hart (1999), a consultant from the United States (US) has developed a collection of indicators of sustainability based around the notion of three forms of capital: Built Capital; Human and Social Capital; and Natural Capital (see Figure 1 below). She argues that a “sustainable community” must ensure that it takes good care of all of its capital in order to ensure the quality of life of present and future generations.



Source: Hart 2000

Figure 1. Hart's (1999) 3 dimensions of capital



Likewise, Kline (1996) discusses four characteristics of sustainable communities:

Economic Security

A more sustainable community includes a variety of businesses, industries, and institutions which are environmentally sound (in all aspects), financially viable, provide training, education, and other forms of assistance to adjust to future needs, provide jobs and spend money within a community, and enable employees to have a voice in decisions which affect them. A more sustainable community also is one in which residents' money remains in the community.

Ecological Integrity

A more sustainable community is in harmony with natural systems by reducing and converting waste into non-harmful and beneficial purposes, and by utilizing the natural ability of environmental resources for human needs without undermining their ability to function over time.

Quality of Life

A more sustainable community recognizes and supports people's evolving sense of well-being which includes a sense of belonging, a sense of place, a sense of self-worth, a sense of safety, a sense of connection with nature, and provision of goods and services which meet their needs, both as they define them and as can be accommodated within the ecological integrity of natural systems.

Empowerment and Responsibility

A more sustainable community enables people to feel empowered and to take responsibility based on a shared vision, equal opportunity, ability to access expertise and knowledge for their own needs, and a capacity to affect positively the outcome of decisions which affect them (Kline, 1996, p.1).



Finally, the Melbourne Principles (Figure 2), which were developed through the United Nations Environment Programme, are part of an approach called Cities as Sustainable Ecosystems (Newman, 2005).

The Melbourne Principles for Cities as Sustainable Ecosystems.

1. Vision	Provide a long-term vision for cities based on: intergenerational, social, economic and political equity; and their individuality.
2. Economy and Society	Achieve long-term economic and social security.
3. Biodiversity	Recognise the intrinsic value of biodiversity and natural ecosystems, and protect and restore them.
4. Ecological footprint	Enable communities to minimise their ecological footprint.
5. Model cities on ecosystems	Build on the characteristics of ecosystems in the development and nurturing of healthy and sustainable cities.
6. Sense of place	Recognise and build on the distinctive characteristics of cities, including their human and cultural values, history and natural systems.
7. Empowerment	Empower people and foster participation.
8. Partnerships	Expand and enable co-operative networks to work towards a common, sustainable future.
9. Technology	Promote sustainable production and consumption, through appropriate use of environmentally sound technologies and effective demand management.
10. Governance and Hope	Enable continual improvement, based on accountability, transparency and good governance.

Figure 2. The Melbourne Principles (taken from Newman, 2005)

These wider concepts of sustainability also encompass the idea of the [quality of life](#) within communities and settlement 'liveability', concepts that are being explored within the *Learning Sustainability* programme. While it has been noted that there may be inherent value conflicts between the idea of sustainable development and liveability (Godschalk, 2004), these conflicts will not be explored in this paper. Instead, the discussion will be limited to a brief introduction to what is meant by settlement form and design, and how settlement form and design can affect sustainability based on this broader notion of sustainability. This paper will then explore tools that have been used to manage settlement form and design to address these affects.



2.2 What do we mean by settlement form and design?

By the term settlement form and design, we are referring to the [spatial arrangement of settlements](#) as well as their 'look and feel'. This includes the:

- [shape of a settlement](#) as seen from the air or on a map, including the overall pattern of development, for example:
 - a single centred compact city, with one large central business district
 - a multi-centred city with more than one activity hub (nodal development)
 - a stellar or radial form
 - a compact / bound city surrounded by satellite towns; or
 - an unbounded city characterised by continuous sprawling development.
- [functional arrangement](#) of different activities in a settlement and how different settlements are connected
- [amount and location of open space](#) within each settlement, for example: town belts, parks, reserves, and coastal esplanades; and the degree to which landscape areas are protected
- [design of urban commercial precincts](#), for example: a car-centred design or a pedestrian and / or public transport-oriented design
- [design of transportation systems](#), for example: traditional car-oriented systems or systems designed to support integrated public transport and walkability
- [design of residential neighbourhoods](#), for example: the density of housing, the mixture of uses, the overall street layout, and the degree to which it is car, pedestrian, or cycle-oriented.

This definition incorporates both the built environment (land use) and transportation infrastructure, which strongly influences how people use and move within the built environment. Given this dual focus, wherever possible, we have tried to provide examples of how the methods and tools introduced in this document have been used in both land use and transportation planning. We also discuss the importance of taking an integrated approach to planning for sustainability.

2.3 How is sustainability affected by settlement form and design?

In the fields of urban and transportation planning there is a growing recognition that the form and design of settlements is a major aspect of a community's and ultimately a society's well-being and ability to be sustainable.

One of the most commonly discussed aspects of settlement form and design, in terms of its affect on sustainability, is the overall compact or dispersed nature of settlements. '[Urban sprawl](#)²', as it is often referred to, is considered by many to be an important cause of environmental degradation, loss of open space, and lack of community identity.



Urban sprawl has been associated with a number of environmental, economic, and social costs including:

- inefficient conversion of land leading to loss of productive agricultural land and open space
- increased cost of infrastructure for services (water, sewer, roads)
- increased total vehicle miles travelled (VMT) leading to increased fossil fuels consumption, greenhouse gas emissions, effects on water quality associated with deposition of air pollutants, traffic noise, and air pollution related health effects
- economic and social costs to individuals of increased travel times (time and money)
- environmental impacts from road building, including: disruption and fragmentation of habitat, and effects on water quality and storm water management
- economic segregation and concentration of deprivation (USEPA, 2001; Transportation Research Board, 2002).

As a result, several recent planning movements have focused on proactively addressing the effects of urban form and design on aspects of community well-being and environmental sustainability through promoting a number of urban planning and design principles. For example, the [Compact City](#), [New Urbanism](#), [Transit-Oriented Design \(TOD\)](#), and [Smart Growth](#) movements attempt to promote sustainability³ and well-being through the creation of more compact, walkable, and mixed-use neighbourhoods served by strong public transit. Figures 3-5 below highlight some of the key guiding principles of these movements.

² Burchell *et al.* (2002) define urban sprawl as urban form characterised by relatively low-density, 'leap frog' (non-contiguous), automobile dependent, and unbounded, residential and non-residential development that consumes large amounts of farmland and other open space "in a relatively pristine setting" inefficiently.

³ Although some critics (Beatley and Manning, 1997) assert that New Urbanism inspired design do little to reduce the ecological footprint or environmental impact of these developments.



Preamble:

Existing patterns of urban and suburban development seriously impair our quality of life. The symptoms are: more congestion and air pollution resulting from our increased dependence on automobiles, the loss of precious open space, the need for costly improvements to roads and public services, the inequitable distribution of economic resources, and the loss of a sense of community. By drawing upon the best from the past and the present, we can plan communities that will more successfully serve the needs of those who live and work within them. Such planning should adhere to certain fundamental principles.

Community Principles

- All planning should be in the form of complete and integrated communities containing housing, shops, work places, schools, parks and civic facilities essential to the daily life of the residents.
- Community size should be designed so that housing, jobs, daily needs and other activities are within easy walking distance of each other.
- As many activities as possible should be located within easy walking distance of transit stops.
- A community should contain a diversity of housing types to enable citizens from a wide range of economic levels and age groups to live within its boundaries.
- Businesses within the community should provide a range of job types for the community's residents.
- The location and character of the community should be consistent with a larger transit network.
- The community should have a center focus that combines commercial, civic, cultural and recreational uses.
- The community should contain an ample supply of specialized open space in the form of squares, greens and parks whose frequent use is encouraged through placement and design.
- Public spaces should be designed to encourage the attention and presence of people at all hours of the day and night.
- Each community or cluster of communities should have a well-defined edge, such as agricultural greenbelts or wildlife corridors, permanently protected from development.
- Streets, pedestrian paths and bike paths should contribute to a system of fully-connected and interesting routes to all destinations. Their design should encourage pedestrian and bicycle use by being small and spatially defined by buildings, trees and lighting; and by discouraging high speed traffic.
- Wherever possible, the natural terrain, drainage and vegetation of the community should be preserved with superior examples contained within parks or greenbelts.
- The community design should help conserve resources and minimize waste.
- Communities should provide for the efficient use of water through the use of natural drainage, drought tolerant landscaping and recycling.
- The street orientation, the placement of buildings and the use of shading should contribute to the energy efficiency of the community.

Regional Principles

- The regional land-use planning structure should be integrated within a larger transportation network built around transit rather than freeways.
- Regions should be bounded by and provide a continuous system of greenbelt/wildlife corridors to be determined by natural conditions.



- Regional institutions and services (government, stadiums, museums, etc.) should be located in the urban core.
- Materials and methods of construction should be specific to the region, exhibiting a continuity of history and culture and compatibility with the climate to encourage the development of local character and community identity.

Implementation Principles

- The general plan should be updated to incorporate the above principles.
- Rather than allowing developer-initiated, piecemeal development, local governments should take charge of the planning process. General plans should designate where new growth, infill or redevelopment will be allowed to occur.
- Prior to any development, a specific plan should be prepared based on these planning principles.
- Plans should be developed through an open process and participants in the process should be provided visual models of all planning proposals.

Authors: Peter Calthorpe, Michael Corbett, Andres Duany, Elizabeth Moule, Elizabeth Plater-Zyberk, and Stefanos Polyzoides

Editor: Peter Katz, Judy Corbett, and Steve Weissman (Adopted in 1991)

Taken from: <http://www.lgc.org/ahwahnee/principles.html>

Figure 3. New Urbanism - Ahwahnee principles for resource-efficient communities

- Mix land uses
- Take advantage of compact building design
- Create a range of housing opportunities and choices
- Create walkable neighbourhoods
- Foster distinctive, attractive communities with a strong sense of place
- Preserve open space, farmland, natural beauty and critical environmental areas
- Strengthen and direct development towards existing communities
- Provide a variety of transportation choices
- Make development decisions predictable, fair and cost effective
- Encourage community and stakeholder collaboration in development decisions

Taken from: Smart Growth Network (n.d.) *Getting to Smart growth: 100 policies for implementation*

Figure 4. Smart growth principles



- Walkable design with pedestrian as the highest priority
- Train station as prominent feature of town center
- A regional node containing a mixture of uses in close proximity including office, residential, retail, and civic uses
- High density, high-quality development within 10-minute walk circle surrounding train station
- Collector support transit systems including trolleys, streetcars, light rail, and buses, etc
- Designed to include the easy use of bicycles, scooters, and rollerblades as daily support transportation systems
- Reduced and managed parking inside 10-minute walk circle around town center / train station

Taken from www.transitorienteddevelopment.org

Figure 5. Principles of Transit-Oriented Design (TOD)

Many of these principles have been promoted by the New Zealand Ministry for the Environment (MfE) through the New Zealand Urban Design Protocol and in their urban design guidance⁴. For example, MfE promote:

- compact urban form with strong centres / nodes characterised by higher density and mixed use development
- interconnected street networks and small block sizes
- adaptable buildings
- integrated public transport that ties logically to land use
- local services and amenities
- good cycling and pedestrian routes
- 'environmental responsiveness' – protection of environmentally sensitive areas, provision of green linkages, and development of region wide strategies for natural resource management (water, energy, waste, natural features, open space)
- good streetscapes
- local character and history.

The principles of good urban design are also supported by Transit New Zealand (<http://www.transit.govt.nz/planning/urban.jsp>)

The theoretical claims about the relationship between urban form and design to sustainability are generally supported by a growing body of research evidence, though not without some critique (see for example, Neuman, 2005). While it is not the purpose of this report to provide an overview of the research literature, a few examples are discussed below.

⁴ For example, *People + Places + Spaces: A design guide for urban New Zealand*

For example, the social and environmental costs of different patterns of urban expansion were investigated by Camagni, Gibelli and Rigamonti (2002). Their study aimed to establish whether different patterns of urban expansion could be associated with specific environmental costs, in particular for land consumption and mobility generation. The analysis confirmed the expected "wasteful" character of sprawling development patterns in terms of land consumption. Public transport was strongly influenced, both in terms of efficiency and competitiveness, by the structural organisation of an urban area. They found the more dispersed and less structured the development, the lower its level of efficiency and competitiveness, and consequently its share of the mobility market. On the other hand, neighbourhood designs which included a mix of land uses, an increased density of development around public transport nodes, and an arrangement of streets that supports walkability were seen to positively influence: travel behaviour (less time travelling by car, more walking/cycling, and improved public transport use); home affordability and value; the formation of social ties; and accessibility to community services.

Various authors have provided a number of explanations for these patterns.

- A mix of land uses means amenities and employment are closer to residents.
- A higher density means enough people are in a neighbourhood to support public transport and local shops.
- Interconnected streets make it easier and faster to get to where you are going by all modes of transport.
- Neighbourhoods that are less car dependent encourage better health through more physical activity and are also more conducive to the development of social ties.
- Higher densities reduce development costs, which leads to more affordable housing as well as improved housing choice (Auckland Regional Public Health Service, 2006; Burton, 2000; Teed *et al.*, 2002; Badland and Schofield, 2005).

Furthermore, higher densities (at a minimum net density of 100 persons per hectare) render district heating schemes viable (Newman and Kenworthy, 1999; Teed *et al.*, 2002).

However, the research evidence also indicates that there may be social and environmental costs associated with increased densities, such as increased crime, adverse health effects from increased exposure to air pollution, and an inequitable distribution of costs and opportunities (Burton, 2000; Williams, 2000).

Summaries of research findings can be found in the New Zealand publications: Ministry for the Environment (2005) *The Value of Urban Design* and Auckland Regional Public Health Service (June 2006) *Improving Health and Well-being: a public health perspective for local authorities in the Auckland region*, as well as the US publications USEPA (2001) and Transportation Research Board (1996), and several key textbooks on the subject including: Jenks *et al.* (1996); Williams *et al.* (2000); and Williams (ed.) (2005). Further research resources are provided in Section 9.



3 Introduction to methods and tools for the sustainable management of settlement form and design

Changes to urban form and design arise from a number of factors including large scale economic forces that drive land and job markets and other market forces such as:

- changes in consumer preferences
- population growth and demographic changes
- changes in transportation technology and infrastructure
- changes to buildings materials and construction techniques
- public policies tools⁵ (including government investment decisions, taxation, incentives, and regulatory tools).

How these different factors interact and result in different patterns of urban form is not well understood (Fulton *et al.*, 2006). Furthermore, the specific characteristics of an urban area, such as topography and 'maturity', also have a large influence on urban form (Fulton *et al.*, 2006). For example, Button and Pearce (1989) discuss the importance of understanding the growth cycles of urban economies. They characterise urban economies as going through five cyclical stages: 'decline' → 'depression' → 'take off' → 'rapid expansion' → 'peaking' back to 'decline' and so on. Each of these stages has a unique set of sustainability issues to address, and tends to be more receptive to the use of different policy instruments.

While many of the factors that shape urban form are beyond the direct control of policy makers, many of them influence, and are influenced by, urban and transportation planning policy. Therefore, policy makers need to recognise the systemic nature of urban systems and take into account these various pressures when designing policies. For example, when urban economies are in the 'take-off' period, the danger is that initial expansion will occur on financially cheap but environmentally sensitive sites, e.g. suburban rather than urban areas. Consequently, policies that involve land use planning controls, zoning, and differential land taxes, could be used to improve the overall efficiency of land use (Button and Pearce, 1989).

In order to achieve a more sustainable urban form, it is also necessary to move from a governance system focused on merely reacting to the effects of development and established environmental problems, to a system that actively attempts to guide and shape development towards a certain vision for the future. The move to a more **proactive planning approach** requires a set of policy tools that can be used to shape the future of communities in a way which goes beyond merely responding to market trends (Button and Pearce, 1989; Nelson *et al.*, 1995).

⁵ Research by Fulton *et al.* (2006) found that in the United States the geographic pattern of urban growth within a metropolitan area is shaped primarily by three public policy tools: land use regulations on both a local and regional level (including urban containment boundaries); patterns of infrastructure investment (including roads, water and sewers); and patterns of open space protection and acquisition programmes.



Effective management of settlement form and design also requires [coordination](#) and, ideally, [integration](#) between national, regional and local government authorities; key stakeholders (for example, developers, utility operators, community service providers); and the community. Coordination is important to ensure that policies and methods are focused toward the same goals. Coordination is also important as research indicates that some instruments can have unintended negative side-effects, particularly on surrounding areas. For example, Pendall, Martin, and Fulton (2002) reviewed research on the effects of urban containment policies and noted that policies intended to prevent urban sprawl into areas immediately outside an urban boundary through the use of 'green belts' can sometimes lead to "leapfrog development" into areas outside the protected green belts. Leapfrog development was particularly evident in areas that also had urban planning standards that limited the density of development inside the urban boundary or where surrounding areas were subject to more liberal planning regimes.

There are a number of methods and tools (or policy 'instruments') that can be used in the management of settlement form and design to help achieve sustainability. These can be roughly categorised as belonging to four types:

- governance methods and tools
- information and technological methods and tools
- economic and market-based instruments
- urban planning instruments.

These instruments will be briefly discussed in the following sections, including their application to both land use planning and transportation planning, their potential applicability in the New Zealand context, and some examples of use in New Zealand.

When selecting instruments to achieve sustainability outcomes, consideration needs to be given to:

- the potential for unintended negative side-effects from some instruments
- how the instruments will interact with other policies being pursued
- how the instruments will interact with other methods and tools being used
- the nature of the community including the population size and density, geography, age, spatial form, industrial mix, proximity to other urban areas, and institutional arrangements
- the general economic condition of the settlement in which the instrument is to be used (the stage in the growth cycle the economy has reached).



Consideration should also be given to the instruments’:

- **efficiency** – the optimality of input-output ratios
- **effectiveness** – the degree to which the instrument is likely to achieve its objectives
- **equitability** – the degree to which the costs and benefits achieved by the instrument are distributed across society
- **acceptability** – the degree to which the instrument is perceived as “just” and “lawful”
- **administrative and technical feasibility.**

Furthermore, in choosing policy instruments that have been developed overseas for use in New Zealand, particular attention needs to be given to how the different geographic, environmental, social, legislative, cultural, historical and economic context of New Zealand may affect the outcomes. Some key differences between New Zealand and other countries include:

- our relatively small population and historically low population density even in city centres
- the large distances between our major cities and lack of fast intercity ground transport (either rail or road)
- the age of most development, including the limited amount of dense pedestrian or tram-oriented inner city areas and the car-oriented nature of most urban form
- the physical isolation of New Zealand in relation to other countries
- the unique nature of our economy and its transport, infrastructure, and work force requirements.



4 Governance methods and tools

The first set of instruments used in the management of settlement form and design are governance methods and tools. How an authority chooses to govern is the backbone of their 'management' system and is the most important tool in determining not only 'where' they are going (the policy direction) but also 'how' they will get there.

There are three aspects of governance, as it relates to the management of settlement form and design, which have important outcomes for sustainability and well-being. These include:

- policy integration
 - how policies and actions are integrated 'vertically' between different layers of government (central government, regional authorities and local authorities)
 - how policies are integrated 'horizontally' between different authorities (across regions with overlapping local authorities and other key agencies)
 - how policies are integrated internally within an authority (particularly between economic development, property investments, infrastructure provision, urban planning, and transportation planning)
- the use of strategic vs. reactive planning tools
- how the community and private sector are involved in the development and implementation of policies and actions.

Each of these aspects of governance is described below. Links to further information on some of the specific tools discussed can be found in Section 9.

4.1 Integrated and coordinated urban planning systems

Overwhelmingly, the evidence from the international literature reviewed indicates that in order to achieve the policy objectives associated with increased sustainability, methods and tools for the management of settlement form and design need to be designed and implemented as part of a coherent and **integrated** portfolio of measures coordinated across jurisdictional boundaries, taking into account the specific circumstances of each community. This is because the effectiveness of different policy instruments is dependent on both other policy instruments that are in use, and the characteristics of the community in which they are used. Furthermore, unless they are coordinated, public policies that have an affect on urban form will often work at cross-purposes and lead to unanticipated and unwanted effects (Button and Pearce, 1989; Pendall, Martin, and Fulton, 2002; Bengston *et al.*, 2004; Fulton *et al.*, 2006).

The hallmark of effective growth management... is that these individual techniques are interlinked and coordinated in a synergistic manner rather than applied incrementally and individually (Porter 1997, p.13).



Coordination requires consistency across both policy objectives and the policy instruments used to achieve them. In other words, it is no use having one part of local government implementing measures to encourage economic growth in a way that is inconsistent with another part of local government that is trying to preserve particular environmental, amenity, or cultural features in a community (Button and Pearce, 1989; Pendall, Martin, and Fulton, 2002). Likewise, attention needs to be given to the social and economic conditions of a community, as these can affect the outcomes achieved by different methods and tools.

The first aspect of governance is how policies and actions are **integrated: vertically** between different layers of government; **horizontally** between different authorities; and **internally** within an organisation.

Integration is important to both the effectiveness of planning systems (the achievement of outcomes) and the efficiency of planning (the costs for outcomes achieved). The important elements for integration in each case are:

- overall vision and goals
- policies and objectives
- procedural aspects, including stakeholder participation
- funding procedures.

For example, research by John Carruthers (2002) in the US indicates that the effectiveness of growth management programmes is affected by the institutional framework of planning, including the cohesiveness of government institutions and the nature of collaboration or centralised control in multi-jurisdictional metropolitan areas, as much as the individual methods and tools used⁶.

4.1.1 Vertical and horizontal integration

Strong regional approaches to urban planning are generally seen as a necessary precursor to successful management of settlement form in multi-jurisdictional metropolitan areas. This can be achieved either through centralised control (via State intervention in urban planning as used in many parts of the US and Australia) or strong regional governance (for example, the Metro agency in the city of Portland, Oregon in the US). If centralised control is not used, true integration is necessary to avoid the problems associated with fragmented, uncoordinated, and often competitive local government policies and actions.

True **integration** involves agreement by all stakeholders on common outcomes and joint commitment to actions and targets to achieve agreed outcomes. It is more than coordination, which still allows different outcomes to be pursued. In addition, there needs to be simplification and clear identification of the decision-making authority when it comes to decisions that affect the management of settlement

⁶ The author argues that “when communities fail to cooperate the result is a ‘porous’ land market where land developers and households are able to seek out areas that remain comparatively free from regulation (Landis 1992). In this way, strict regulation at the local level often produces spillover effects – especially increased growth and congestion – in adjacent communities (Fischel 1985, 1990 Kelly 1993, Downs 1994, 1999).”



form and design. There also needs to be regular communication and discussion about proposed methods and tools, and coordinated implementation to ensure policy instruments are complementary and not at odds with each other.

Increasingly, it has been recognised that the division of authority in many planning systems does not always support integration, particularly as it relates to the management of settlement form and design. Of particular interest are the links between urban planning and transportation planning given the important influence that urban form has on transportation outcomes, and transportation policy has on urban form. As a result, internationally, many land use and transportation planning authorities are pursuing an agenda for integration between the disciplines at the regional, local and landscape (catchment / corridor) levels.

For example, in the United Kingdom (UK), the government has pursued an agenda of vertical integration and increased interdisciplinary working in the planning process using sustainability as a guiding principle (Newman, 2005). National policy and guidance sets the agenda for planning at a regional and local level. The government sets priorities, for example relating to land use and transport, and expects these to be reflected in strategies at the local level. As a result, sustainability appraisal is now required for Local Development Frameworks (local plans) and there is a requirement for policies that 'reduce the need to travel' to be incorporated into local planning documents.

A number of other countries have used sustainability strategies to achieve a similar goal, including the US, Australia, and Canada. The Government of Western Australia, for example, has published a state-wide sustainability strategy that includes a requirement for all government agencies to produce sustainability action plans. Similar work has been done in the Australian Capital Territory (ACT), Victoria, New South Wales (NSW) and Tasmania. Another example is Vancouver where they are planning for a sustainable future through their Cities^{PLUS} (Planning for Long-term Urban Sustainability) initiative, which is strengthened by Canada's New Deal for Cities and Communities – "a landmark national plan that signals a new way for governments, business and communities to work towards sustainability" (Lindsey and McDonald 2005, p.27). The former Mayor of Vancouver reasons that these sensible planning choices are the reason for Vancouver being often cited as 'one of the most liveable and desirable cities' (*ibid*). However, despite these examples, Bengston *et al.* (2004) claim that, internationally, both vertical and horizontal coordination of urban form management are often absent or inadequate.

In New Zealand, the relatively new LGA (2002) has the potential to help local authorities (LAs) to be more strategic and integrated in settlement planning and management through the preparation of a Long Term Council Community Plan (LTCCP) and the requirement to consult with other levels of government and organisations (including government agencies and service providers) in the identification of 'Community Outcomes'. However, how the LTCCP and the district plan processes are to be linked is not clearly established in the legislation.

Furthermore, in metropolitan areas where there are overlapping authorities, there is also increasing use of partnership approaches between: local and regional authorities; infrastructure agencies; and



key developers, as discussed in Section 4.2. However, these partnerships are probably closer to cooperation than true integration. Furthermore, a recent review of the implementation of the Auckland Regional Growth Strategy indicates that there have been some significant problems with implementing the strategy in terms of the integration both between local authorities and with public and private sector infrastructure and service providers (Auckland Regional Growth Forum, 2007).

There are also opportunities to pursue policy integration through the use of National Policy Statements as provided for under Section 45 of the RMA. So far the New Zealand Government's approach has appeared to favour guidance (for example the Urban Design Guidelines) more than direction, although there appears to be a greater move towards national direction in the areas of air and freshwater quality (through the introduction of National Standards) and transport planning (through the LTMA 2003).

Integration is also occurring to a certain degree with the Land Transport Management Act 2003 (LTMA) now requiring an integrated approach to transportation planning, a theme which is echoed in the more recent Transport Sector Strategic Directions Document 2006/7.

4.1.2 Internal integration

The last aspect of integration is how policies and actions are integrated and coordinated within an organisation. As discussed in the previous section, an important aspect of the effectiveness and efficiency of the management of settlement form and design is how policies and actions within an organisation are designed to work together as a package. Internal integration requires the policies and actions of all parts of an authority to be coordinated as part of a strategic plan guided by clear and shared objectives for urban form and design.

Unfortunately, in New Zealand anecdotal evidence suggests that integration is not often achieved, with different parts of local authorities clearly pursuing different objectives, particularly in terms of economic policy and urban planning policy. For example, most utilities are operated as commercial entities that must be run within a mandate for economic efficiency. As a result, there is often a poor link between the provision of infrastructure and services, and urban form and design policies. Similarly, in the past there has been a poor link between motorway planning and the growth management objectives of local authorities. This has clearly led to decisions which are in conflict with sustainable urban form objectives (ARGF, 1997).

The new requirements for more integrated planning in the LGA (2002) and LTMA (2003) may improve performance in these areas. It appears that increasing pressures from growth in many areas have already seen councils recognise the need for a more strategic and integrated approach to settlement planning. This is demonstrated by the increased number of councils developing growth management strategies in the last 5 years, as discussed below. What will be critical for effective management of urban form is that practitioners working with the LGA (2002), LTMA (2003), and RMA (1991) ensure that policy integration occurs across the various statutory planning instruments developed by different agencies under these statutes, as well as ensuring internal consistency of policies within agencies.



4.2 Strategic policy development and planning for urban growth management

In addition to the need for better integration of policies and actions, there is also a need for more strategic and proactive policy development and planning. This trend is evident in both the fields of urban (land use) and transportation planning.

4.2.1 Urban planning

Internationally in the field of urban planning, there has been a growing realisation that the use of 'reactive' planning, where a local authority's powers are limited to the control of environmental and social externalities in an environment of market led development, is insufficient to address the goals of improved sustainability and quality of life in urban areas and other settlements. As a result, there has been a revival of traditional proactive urban planning practices, for example through: the development of master planned town centres and neighbourhoods; the integration of urban design principles into planning; detailed and more prescriptive urban plans; as well through more strategic level planning, including the development of growth management strategies.

The approach to urban planning in New Zealand has followed this trend with a gradual move from total reliance on the effects-based approach inherent in the RMA 1991 to an increasing recognition of the importance of traditional "planning" through the use of: growth management strategies; urban design strategies and frameworks; and structure plans (see Section 7). A good example is the recent proliferation of urban design guidelines and planning policies in metropolitan Auckland (Tucker and Waghorn, 2006). The creation of these instruments was a direct response to: (1) the concerns of the public, urban managers, and decision-makers about the poor design and quality of housing built in the 1990s, when planning controls were relatively light-handed in respect of design issues, and (2) the increasing negative effects of unplanned growth, including effects on transportation infrastructure and traffic management, and the loss of open space and land of significant agricultural or natural value.

[Growth Management or Urban Growth Strategies](#) are not required under New Zealand legislation with the exception of the Auckland Regional Growth Strategy, which is required by the LGA Amendment Act 1998 to define preferred locations for future growth and to provide "information about future growth to assist regional providers of infrastructure to plan to meet future requirements". However, the RMA 1991 does require a Regional Policy Statement, which can provide one mechanism to create a framework for growth and give guidance for district plans at the local level.

Despite the lack of requirements, several councils have developed or are in the process of developing urban growth strategies. In addition, metropolitan regional growth strategies developed through partnerships between local and regional authorities (often in close cooperation with national agencies, iwi, landowners / developers, and other key community organisations and stakeholders) are also becoming increasingly important in the management of growth in large metropolitan areas or areas experiencing rapid growth (see Table 2). In some cases, the agreements reached through these partnership approaches are being formalised through Memorandum of Understanding documents (MOUs).



While the scope and approach of growth management strategies varies significantly from authority to authority, region to region, in general they are used to:

1. provide strategic planning direction and a link between different local government functions, including urban planning, transportation, infrastructure, and service delivery
2. identify the desired location and design of new residential (and sometimes commercial and industrial) development (including: 'greenfield' or 'brownfield'⁷ development, infill and intensification)
3. identify policies, objectives and actions to address key growth 'issues' for the district / city / region

As a result, these strategies are setting clearer directions for urban growth (in terms of identifying locations and objectives for future growth), rather than purely relying on the management of 'effects' of development. Furthermore, the outcomes they are trying to achieve in the management of growth generally reflect the principles for more sustainable urban form and design discussed in Section 2, in particular the need to develop more compact and public transport-oriented cities through intensification and densification in target areas.

As part of the Learning Sustainability Programme, a review of recent approaches to growth management planning in a selection of local authorities is being undertaken and is due to be completed at the end of 2007.

Table 1. Local Authority Growth Management Strategies

Local Authority	Name	Status
Auckland City Council	Growth Management Strategy	December 2003
Franklin District Council	Franklin District Growth Strategy	Draft
Hastings District Council	Hastings Urban Development Strategy	August 2005
Napier City Council	Napier Urban Growth Strategy Review	1999
Palmerston North City Council	Urban Residential Growth Strategy	2002
Queenstown Lake District Council	Growth Management Strategy	May 2007
Taupo District Council	Taupo District 2050 - Growth Management Strategy	June 2006
Upper Hutt City Council	Urban Growth Strategy	Submissions heard September 2007
Waipa District Council	Waipa Urban Growth Strategy	November 2003

⁷ 'Greenfield' development is development on previously undeveloped land, for example farm land, whereas 'Brownfield' development is development on land previously developed, for example conversion of land from one land use (commercial) to another (residential).



Local Authority	Name	Status
Wellington City Council	Northern area – a framework for growth management Followed by 7 specific strategies including <i>Urban Development Strategy</i>	2003
Whangarei District Council	Strategic Plan 2002 - 2017	2002
Waitakere City Council	Growth Management Strategy For Waitakere City	Working Draft (since August 2006)
Westland District Council	Glacier Country Growth Strategy	Adopted November 2004
Unitary Authorities		
Nelson City Council	Nelson Urban Growth Strategy	Published December 2006
Tasman District Council	Takaka Eastern Golden Bay Growth Strategy	Phase II Community Discussion Paper (July 2006)

Table 2. Partnership growth management strategies

Description	Author	Status
<i>Smart Growth Bay of Plenty</i>	Environment Bay of Plenty, Tauranga City Council, and Western Bay of Plenty District Council	Updated May 2007
<i>Greater Christchurch Urban Development Strategy Forum</i>	Christchurch City Council, the former Banks Peninsula District Council, Selwyn and Waimakariri District Councils, Environment Canterbury, and Transit New Zealand	July 2007
<i>Auckland Regional Growth Strategy: 2050</i>	<i>Auckland Regional Growth Forum</i> (Auckland City, Waitakere City, Rodney District, Franklin District, North Shore City, Papakura District, Manukau City, and Auckland Regional Council)	November 1999
<i>Wellington Regional Strategy</i>	Greater Wellington Regional Council, Masterton District Council, Upper Hutt City Council, Wellington City Council, Porirua City Council, Kapiti Coast District Council	February 2007



4.2.2 Transportation planning

Internationally, a more proactive approach is also evident in the transportation planning field. For example, Hayashi and Tomita (2003) document a paradigm shift within transport planning from analysis based on 'forecast' to procedures that 'backcast'. A definition of 'backcasting' vs. 'forecasting' is offered by the IBI Group (2000, pg. 11):

Forecasting involves extrapolation of current interactions and trends in to the future. It involves determining what can be done to avoid an unwanted future. In contrast, backcasting defines a desirable future and identifies the conditions for this future to materialize.

An example of this proactive 'forecasting' approach is Environment Canada's planning for the Quebec Windsor Corridor, undertaken as part of the Organisation for Economic Cooperation and Development (OECD) environmentally sustainable transport (EST) project. In this project, the study team was required to develop a number of future scenarios, including: business-as-usual, technology change, and activity reduction scenarios, as well as a combination scenario. The scenarios were then evaluated against environmental sustainability criteria (Environment Canada, 1999).

Another important development in transportation planning is the move from traditional 'predict and provide' roading to the 'predict and manage' approach. This transition has been facilitated by the introduction of [Travel Demand Management](#) (TDM) strategies. TDM involves a holistic approach to transportation planning aimed at: reducing the demand for travel through various approaches and ensuring the use of existing infrastructure is maximised. TDM approaches are often a combination of: (1) 'carrots', for instance incentives to use alternatives modes, such as improving public transport services, and constructing cycle ways; and (2) 'sticks', for instance penalising people for driving through road user charges and increased parking charges. The development of TDM strategies has escalated in recent years due to the recognition that the implementation of these strategies can reduce pressure on the transport system and delay expensive roading capacity expansion projects. TDM is also an important tool for making transport systems more sustainable.

In New Zealand, Section 175(2) of the LTMA (2003) requires regional councils to include in their Regional Land Transport Strategies a demand management strategy that has targets and timetables appropriate to the region. The extent to which this has been implemented varies across the country. Some areas have had demand management strategies in place for several years (for example Auckland and Wellington), whereas other places are in the process of developing their strategies (for example Bay of Plenty), or are planning to do so within the next 2-3 years (for example Southland).

4.3 Community involvement in planning

In addition to the move to a more strategic policy planning approach, there is a growing recognition of the importance of community participation in the identification of values and visions for the future. The importance of community participation is recognised in both urban planning theory and practice today (for example Forester 1989, 1999; and Innes and Booher, 2000) and architecture and design theory and practice (for example Guy, 2002; and Sanoff, 2000). Community participation in the



identification and implementation of solutions is critical to policy success, for example, in getting people out of their cars and into public transport or out of their post-war designed suburbs into more compact, mixed-use and transit-oriented neighbourhoods.

Community participation in the management of settlement form and design can be initiated either by government, private developers, or the community. Participation can take a number of forms, based on:

- the level of involvement (from information provision, to consultation, to active participation, to collaboration)
- the stage in the design process (from creating the overall community vision that will guide the process, to involvement in policy identification or detailed concept plans)
- the different techniques and methods used to involve community members.

There are a number of popular techniques for engaging the community in settlement form and design.

- **Visioning** involves active participation by the public in creating a vision for the future of the community that is used as a reference point for the development of specific policies and objectives.
- **Scenario-testing** engages the community in high level discussions (information provision and consultation) about what type of future they want and what types of policies will allow them to achieve that future through the use of models of future growth and their impacts.
- **Design charrettes** actively involve the community in developing specific projects (usually at the neighbourhood or precinct level). Commonly used by **New Urbanist** architects, this technique involves an intensive participatory planning process in which design professionals work closely with community participants through design workshops.

More information on community involvement techniques is presented in the Learning Sustainability programme Working Paper: *Methods to Involve the Community in Settlement Form and Design*.

Community involvement is strongly supported in New Zealand legislation, for example:

- RMA (1991) sections 60, 64, 65 and 73 refer to Schedule 1(3), which outlines the requirements for consultation in the preparation of district plans and regional plans and policy statements.
- LTMA (2003) Section 15 requires consultation to be undertaken according to the provisions under Schedule 2, which detail when consultation is required for transportation plans and projects, the groups that must be consulted, and the areas on which consultation must be undertaken.
- LGA (2002) sections 82-90 outline the principles for consultation and Section 84 outlines the Special Consultative Procedure, which must be used in the preparation of and any changes to the LTCCP.



Anecdotal evidence suggests, however, that the practice of consultation as part of strategic planning in New Zealand has often been fairly basic in the past; although, it appears that, in recent years, local authorities have been increasingly using more innovative techniques (Johnson, 2006).

4.4 Collaboration and partnerships with the private sector

Button and Pearce (1989, p.169) discuss the importance of collaboration and partnerships with the private sector to achieving large improvements in urban conditions. They state “moral [per]suasion (*sic*) coupled with carefully couched arguments about private interests can provide a useful tool in bringing private sector involvement into the process of urban regeneration...”

In order to manage settlement form and design to improve sustainability outcomes, government cannot act alone. Increasingly, local, regional, and, in some cases, national authorities are working with the private sector and the community to design and implement policies and projects aimed at creating a more sustainable urban form.

A number of vehicles exist to codify these partnerships:

- **Business improvement districts** are a partnership between public and private interests focused on marketing a defined area in a city or town to enhance local business. The activities of the partnership can include planning and managing events and enhancing the public spaces. Partnerships are sometimes funded through special rating provisions (MfE, 2006).
- **Main Street and town centre programmes** are programmes that involve the planning and coordination of public and private initiatives within a town centre or main shopping street through an authorised manager based on a four-point management approach. This approach includes organisation and management; physical enhancement; economic development; and marketing and promotion. Partners in these programmes usually include: the local authority (LA), economic development agencies, businesses, building owners, and the local community (MfE, 2006).
- **Urban development corporations** (see Section 6.11) are quasi-governmental authorities that are established and given specific powers to develop particular areas, including land acquisition and sometimes plan-making powers. Examples include the London Docklands Development Corporation and Sydney Harbour Foreshore Authority (MfE, 2006).
- **Coordinating authorities** are used to coordinate and promote development in particular areas. For example, Melbourne has recently set up a Growth Area Authority (GAA). According to their website, the role of the GAA is to “work closely with growth area councils, local communities, developers and State Government agencies to reduce the regulatory burden on developers and Local Government and ensure that infrastructure and services are better coordinated with development and meet the needs of families living in new neighbourhoods. The new Authority will work with stakeholders to ensure a strategic release of land, and to secure a more timely delivery of infrastructure and services to new communities. It will also play a role in coordinating other government agencies, and streamlining how new developments are planned, approved and delivered in growth areas. The GAA will also develop planning and infrastructure standards for new



communities which will also provide information to the market to support planning and decision making for infrastructure provision” (<http://www.gaa.vic.gov.au/>).

In transportation planning, useful collaboration has taken place in the UK regarding the introduction of Travel Plans for businesses and organisations, with the aim of reducing the number of single occupant car commuters. Travel plans usually include policies to encourage employees to use public transport, walk, cycle or ride share, by providing financial or practical incentives such as reduced cost bus passes, provision of changing facilities, ride matching software, or cash incentives. Travel plans can also include policies encouraging ‘homeworking’ or ‘telecommuting’, which, according to Balaker (2006), is the only commuter mode in the US, apart from single occupancy driving that has increased since 1980.

There are a number of ‘main street’ programmes in New Zealand (see Section 6.6.1). Main street programmes are an important tool by which local authorities can form partnerships with local businesses.

At a smaller scale, private developers are also working with councils through a process of private plan changes. An example is the Kaikoura Peninsula Tourism Zone and the Ocean Ridge Comprehensive Living Zones in the Kaikoura District where private developers successfully undertook major consultative processes with the community, NGO’s, government agencies and the councils which resulted in planning outcomes with broad community support (Kaikoura District Council *pers. com. July 2005*).

Several local authorities are also pursuing TDM programmes that include collaboration with major local employers (see Section 4.2)



4.5 Advantages and disadvantages of governance methods and tools

Table 3. Advantages and disadvantages of governance methods and tools

Instrument	Advantages	Disadvantages / Cautions
4.1 Integrated and coordinated urban planning systems	<ul style="list-style-type: none"> improved coordination and efficiency 	<ul style="list-style-type: none"> may meet some pain and resistance from those who do not wish change to happen¹. may be difficult to encourage joint working after a long period of 'silo' approach
4.2 Strategic policy development	<ul style="list-style-type: none"> a proactive approach is more likely to be efficient and effective at achieving sustainability outcomes. 	<ul style="list-style-type: none"> may be seen as contrary to the 'effects-based' approach inherent in the RMA (1991) may be seen as too much government / LA intervention
4.3 Community involvement in planning	<ul style="list-style-type: none"> access to local knowledge increased community support for solutions builds community capacity and social capital increased accountability 	<ul style="list-style-type: none"> difficult to reach a full cross-section of the community and may be captured by vocal minority or entrenched interests does not prevent the need for politicians to make hard decisions can raise community expectations for greater influence can take a lot of time
4.4 Collaboration and partnership with the private sector	<ul style="list-style-type: none"> enables coordinated action to achieve overall goals in areas with mixed private ownership may enable improvements to happen sooner due to greater financial investment from mix of partners 	<ul style="list-style-type: none"> may take considerable time to reach agreement need to keep everyone happy may lead to outcomes with limited scope for improvement of settlement sustainability

Table References: 1 Owens and Cowill (2002 cited in Newman, 2005)



5 Information and technological methods and tools

A number of high and low-tech tools have been developed to improve the decisions of developers, planners and elected decision-makers related to the management of settlement form and design. These include tools that are used to:

- describe and analyse the environment spatially through mapping
- evaluate the potential impact of individual development projects on environmental, social (including human health), economic and cultural values
- forecast and model future trends and develop scenarios, and their resulting impacts, based on various policy options
- monitor current trends and trace performance against indicators of sustainability
- audit environmental performance
- increase the knowledge-base available to decision-makers through research
- improve the environmental, social and economic performance of activities through information, communication, and technology (ICT) systems.

Several examples of information and technology tools are described below. Links to further information on the tools can be found in Section 9.

5.1 Mapping

Mapping has been an important tool in managing settlement form and design since the earliest days of the urban planning profession. Traditionally, pen and paper maps were used to record legal property boundaries, urban zones, land uses and a wide range of geographic characteristics, including important environmental resources. Aerial photos have also been used to map land use and environmental information.

Since the 1990s, pen and paper maps have been largely replaced by computer-based **Geographic Information Systems (GIS)**, which enable information to be stored and analysed more efficiently as electronic data. This electronic data can also be used to model and predict future trends, as discussed below. A common and widely used GIS mapping tool is ArcView / ArcGIS. This system is able to perform any GIS task, including: mapping, data management, geographic analysis, data editing, and geo-processing (<http://www.citilabs.com/arcgis/arcview.html>).

Internationally, the city of Honolulu is at the forefront of the use of advanced GIS in spatial planning, as well as city management (<http://www.honolulu.gov/>).

The introduction of GIS mapping has also been a step forward for transport planning, and is used widely to assist in the planning process. GIS can be used for a range of purposes, from planning a public transport network, to road safety analysis. In particular, the development of GIS software has been instrumental in improving the understanding of public transport accessibility dynamics, and has



enabled the development of **accessibility mapping**. Accessibility in this context primarily relates to access to key facilities (for example: health, education, employment, shops, leisure, and other services) by modes other than the private car, such as public transport, walking and cycling. Households without access to a car are often at a disadvantage accessing these services, and this is an issue of social equity. Accessibility mapping and planning are therefore key tools in ensuring sustainable settlement form.

In order to produce an accessibility map, computer-simulated travel 'time plots' are calculated to produce a map showing the time it takes to reach a destination by public transport, walking or cycling. This type of assessment highlights areas that have poor accessibility by public transport or active travel modes, and can be a useful guide to objectively identifying residential areas requiring improved public transport services. To assist in accessibility mapping and planning, a tool known as 'Accession' has been developed in the UK. Accession is a GIS-based mapping tool that enables users to determine network accessibility measures, undertake local accessibility analysis, and calculate composite accessibility functions.

GIS is used extensively by LAs in New Zealand to aid in their urban planning functions. Most councils now have property information accessible through GIS systems. An example is the publicly accessible 'WebMap' developed by the Dunedin City Council (DCC) which links information on land tenure, rates and resource consent applications to maps and aerial photo / boundary overlays (www.cityofdunedin.com).

Likewise in transportation planning, the LTMA (2003) states that in preparing Land Transport Programmes, regional councils and the Auckland Regional Transport Authority (ARTA) must take into account how each activity "improves access and mobility". While there is no formal requirement for regional councils to carry out accessibility mapping, several councils have used it informally or are currently exploring it.

5.2 Forecasting and modelling tools

The complement to a lot of the modern GIS-based mapping tools are a range of spatial analysis models that have been developed to:

- analyse past and present spatial patterns and 'progress' against key indicators and measures
- predict future spatial patterns and changes in indicators based on trends
- test future policies / scenarios in terms of future patterns
- develop more sophisticated and responsive urban and transport planning responses.

These tools are particularly useful for analysing complicated and multidimensional information to better understand the economic, social, and environmental aspects of urban change (Lahti, 1999).

In land-use planning, several '**growth models**' have been developed to look at phenomena such as the interaction between: population size, urban form (land consumption), employment, and



transportation, as well as scenario performance against a variety of social and environmental indicators.

Models are also used to inform the transport planning process by allowing the testing and analysis of different scenarios. Models provide unbiased information that allows decision makers to assess the effects of different options. In transportation planning, models are frequently used to:

- determine network capacity
- predict where future congestion points will be in the network, based on growth in population and car ownership
- assess the effects of different interventions on traffic flows (for example, public transport, bus lanes, or junction improvements).

Some transport models also include an element relating to air pollution and air quality, so that the effects of different traffic flows on air quality can be forecasted.

Examples of forecasting and modelling tools are listed in Table 4.

Table 4. Forecasting and modelling tools

Name	Description	URL
Index ®	Interactive GIS tool for land use planning. Uses over 80 indicators to assess current conditions and model impacts of different scenarios. Indicators relate to land use, transport, urban design, housing, employment, and the environment. Analysis allows ranking of alternatives in terms of their impact. Also used for consultation and monitoring once plans are adopted.	http://www.crit.com/index/index.html
QUEST	Modelling software for land use planning at local or regional level. Allows evaluation of alternative scenarios by scoring their performance according to specified priorities. Designed particularly for use in engagement with stakeholders. Produces range of sustainability indicators to monitor progress.	http://www.envisiontools.com
What If?	Interactive GIS-based system which allows exploration of alternative development scenarios. Allows assessment of alternative public policies in terms of their impacts on future land use patterns and population and employment trends.	http://www.what-if-pss.com/
Prescott College / Blueline Group spatial growth modelling	Modelling software for planners, policy makers and the public. Allows modelling of alternative scenarios both for growth and emergency management. Impacts of scenarios analysed in such areas as growth, natural resources, and local budgets.	http://www.tbrpc.org/spatial/



Name	Description	URL
Community Viz™	GIS-based analysis and 3D modelling for planning and resource management. Allows users to explore and identify different land use alternatives and their environmental, economic, and social impacts.	http://www.communityviz.com/
UrbanSim	Simulation model used for planning and analysis of urban development, particularly: land use, transport, and public policy. Can provide interface between existing travel models and the new land use forecasting and analysis capabilities. Free under GNU General Public Licence to stimulate continuing research and development.	http://www.urbansim.org/index.shtml
Moland model	Software tools developed to assist with preparation, development, and implementation of EU policies and legislation. Tools include: 1) landscape fragmentation analysis – for impact of urban expansion on spatial structure of urban and regional landscapes and 2) urban growth modelling – forecasting impacts to compare alternative future development scenarios.	http://moland.jrc.it/
CUBE	Software used to model and analyse all modes of surface transportation, for both passenger and freight movement, includes modelling capabilities.	http://www.citilabs.com/
Sim Traffic	Software for modelling urban traffic networks to allow transport professionals to analyse capacity and fine tune signal operation to maximise traffic flows.	http://www.trafficware.com/
CityGreen	GIS-based system for land use planning and policy making. Analyses ecosystem services including: storm water quality, air quality, carbon storage, and tree growth. Models impact of different development scenarios on ecosystem.	http://www.americanforests.org/productsandpubs/citygreen/
LTHIA	Curve number-based model linked to GIS that analyses the effects of land use changes on aspects of hydrology such as surface runoff, groundwater recharge and non-point source pollution.	http://gis.esri.com/library/userconf/proc99/proceed/papers/pap417/p417.htm
ACCESSION	Software tool for accessibility planning and mapping in transport developed by the UK Department for Transport.	http://www.within-reach.org.uk/data.asp

5.3 Impact assessment tools

5.3.1 Environmental impact assessment (EIA)

There are a number of different information tools which fall under the category of “impact assessment tools”. The first, and most common, is EIA. EIA refers to the process of evaluating the potential adverse and beneficial environmental (and in some cases social and economic) effects of a proposed development or activity. Ideally, this information should be used to improve a proposal as it is being developed, and / or decide amongst alternative sites or designs. More commonly, EIA is used to aid in the decisions of local and regional authorities as part of the statutory planning approval process for a proposal. As such, EIA provides a useful information tool that allows authorities to assess how individual proposals may fit with the objectives associated with settlement form and design.

EIA has five key stages:

- scoping – identifying key issues and concerns of interested parties
- screening – deciding whether an EIA is required based on the information collected in the scoping stage
- identifying and evaluating alternatives – examining alternative sites, designs, or techniques, and the impacts of each
- mitigation – designing mitigating measures to avoid, remedy, or mitigate potential negative effects
- reporting – publishing the findings of the assessment in a report.

In New Zealand, there is a requirement for all activities requiring resource consent under the RMA (1991) to undertake what is called an ‘[Assessment of Environmental Effects](#)’ (AEE). An AEE is similar to an EIA but, in practice, fails to meet the best practice criteria for EIA, as it is often a justification for a proposal rather than a tool to improve the design of a proposal.

5.3.2 Strategic environmental assessment

Strategic Environmental Assessment (SEA) evaluates the environmental (and social) impacts of policies, plans and programmes (Shepherd and Ortolano, 1996). SEAs vary from those which use a similar methodology to project-level EIA, to those that use a “top-down” approach to assess policies, plans and programmes against a set of sustainability principles, which can be articulated through objectives and targets, green plans, or sustainability strategies (Shepherd and Ortolano, 1996). The advantages to SEA in addition to project-level EIA include:

- the ability to consider a wider range of alternatives at an early stage
- the ability to better address cumulative effects
- the potential for improved efficiency at the project-level EIA through reference to analyses at the SEA level
- the ability to integrate with a monitoring programme



- the ability to expand the scope for public involvement through earlier involvement and by considering the overall vision and direction of a community rather than only reacting to individual projects (Shepherd and Ortolano, 1996).

The concept of SEA has been adopted by many countries. In 2005, the European Council SEA directive was adopted which requires all policies, plans and programs with environmental impacts to be subject to the SEA process. For the first time in the UK, Local Transport Plans were subject to SEA, and the possible impacts of different transport options assessed against a range of environment, health, sustainability, and social factors.

SEA is not required by the RMA (1991) or other legislation in New Zealand, although there are overlaps with processes under the RMA (1991), particularly sections 32 and 35 (Dixon 2002, 2005). Furthermore, a report by Local Government New Zealand (2004) commented that SEA could be used to improve practice under the RMA (Local Government New Zealand, 2004 cited in McGimpsey, 2007).

Nonetheless, there are signs that SEA is starting to have a role in strategic transportation planning in New Zealand. A recent study by McGimpsey (2007) discusses the use of SEA as part of the Wellington Regional Land Transport Strategy, reported by the author as potentially the first case of SEA being undertaken formally in New Zealand.

5.3.3 Sustainability assessment

A more recent trend in assessment methods is the move toward assessments based on sustainability criteria, known as Sustainability Assessment (SA). SA can be used at the policy, programme, plan or project level. Newman (2005) argues that the difference between sustainability assessments and traditional impact assessment is a move from an approach of minimising the impacts to promoting positive outcomes in an integrated way. The move towards SA is closely linked with national, regional and local level monitoring programmes (see Section 5.4) particularly those based on sustainability indicators or 'quality of life' indicators. SA is also integrated into strategic policy development and action plans for sustainability (see Section 4.3).

SAs are used in Australia (see Newman, 2005), the UK, Canada (see Gibson, 2001), and the Netherlands (see Verheem, 2002).

In New Zealand, Landcare Research are currently developing and trialling a sustainability assessment model (SAM) (<http://www.landcareresearch.co.nz>).

5.4 Monitoring tools

A key aspect of finding a path towards sustainability is having effective information systems and feedback mechanisms. In environmental and land use planning, monitoring systems are used to evaluate progress towards stated goals and objectives and to identify trends in the status of (environmental, economic and social) resources of interest. Monitoring information can be used to improve the management of policies and programmes, and identify where future interventions need to occur.



Monitoring usually involves gathering data on ‘indicators’, which represent the status of the environmental, economic and social resources of interest. These can include individual indicators, such as carbon monoxide levels as an indicator of air quality, and composite indicators, which encompass a number of individual measures to gain an overall picture of a system. An example of a composite indicator is the ‘ecological footprint’, which measures the land area required to sustain a given population in terms of resource consumption and waste discharge by the population.

Internationally, a number of different indicator sets have been developed to measure sustainability; some of these are presented in Table 5 below.

Table 5. Indicator systems

Name	Description	Access Details
Sustainable Development Index	The International Institute for Sustainable Development (IISD) is working on developing a Sustainable Development Index. They have already developed a number of aggregate indicators and the Dashboard of Sustainability (below).	http://www.iisd.org/cgsdi/
Dashboard of sustainability	The dashboard of sustainability is an online tool designed to be understood by experts, the media, policy-makers, and the general public. Using the metaphor of a vehicle's instrument panel, the ‘Dashboard’ displays country-specific assessments of economic, environmental, social, and institutional performance toward (or away from) sustainability. The Dashboard has garnered international attention and displays the United Nations’ set of sustainability indicators. As a contribution to the World Summit on Sustainable Development in 2002, IISD expanded the Dashboard to allow users to compare 10 years of environmental, social and economic data. The Dashboard also displays the Millennium Development Goals indicator set.	http://www.iisd.org/cgsdi/dashboard.asp
Ecological footprint	An ecological footprint measures how much land is required to supply an individual’s or community’s living and lifestyle needs, including: food, housing, energy/fuel, transport, and consumer goods and services.	http://www.mfe.govt.nz/withyou/do/footprint/ http://www.ecologicalfootprint.org/Global%20Footprint%20Calculator/GFPCalc.html
Maureen Hart’s Sustainable Measures	This is a set of indicators developed by a private consultant Maureen Hart.	http://www.sustainablemeasures.com/
Australia’s headline indicators	Environment Australia has developed a set of indicators to measure progress towards the core objectives of the National Strategy for Ecologically Sustainable Development (NSED)	http://www.deh.gov.au/esd/national/indicators/report/ http://www.ea.gov.au/esd/national/indicators/report/index.html



Name	Description	Access Details
New Zealand Quality of Life in 12 cities	A comprehensive set of indicators for monitoring aspects of quality of life in New Zealand's 12 largest urban areas	http://www.bigcities.govt.nz/
Genuine Progress Indicators (GPI Atlantic)	An example of international good practice, involving the bottom-up development of a Canadian Index of Wellbeing.	www.gpiatlantic.org
Sustainable Seattle	An example of a community-driven urban sustainability indicator project.	http://www.sustainableseattle.org
Fraser River Basin, Canada	The Charter for Sustainability established a vision for the region and a set of principles. The sustainability indicators program was developed to track sustainability trends over time	http://www.fraserbasin.bc.ca

Monitoring is also an important tool in transportation planning and can be used by governments to encourage local authorities towards more sustainable transport systems. For example, in the UK, reporting to the national government on indicators shows progress against national objectives and can be used to highlight areas where authorities are underperforming in meeting sustainability outcomes. Sustainable transport indicators include: bus patronage, number of cars entering city cordon, and number of organisations with travel plans. Transport Canada has also adopted a set of 14 sustainable transportation performance indicators (TC, 2001). Likewise in the US, environmental performance measures are being used widely to monitor the transportation plan implementation progress. The OECD has also integrated environmental concerns into transport policies through the development and use of indicators (Amekudzi and Meyer, 2006).

There is no legislatively prescribed role or responsibilities for central government in terms of sustainability, liveability or quality of life monitoring in New Zealand. The government does, however, participate in a number of international reporting programmes such as the United Nations (UN) framework on Climate Change and the Kyoto Protocol. Nonetheless, central government has been involved in producing a number of reports that cover sustainability, liveability or quality of life. For example, MfE recently produced *Gentle footprints: boots 'n' all* (April 2006) – a report described as not a “state of the environment” report but rather a discussion piece that reports on a number of environmental indicators.

MfE also produced a “state of the environment” report in 1997 and another is planned for the end of 2007 (www.mfe.govt.nz). In addition, MfE has been involved in the development of a set of national environmental indicators on a variety of themes, which began as identifying in-depth and multiple indicators for each theme. As part of this programme, a significant amount of background work was done in 2000 looking at urban amenity indicators, however, this was never formalised into a suggested set of urban indicators. In the last few years MfE's indicator work changed focus to a



search for a small set of core indicators to measure environmental priority areas. Recently, a draft set of 11 environmental priorities and 15 core indicators was produced⁸.

Statistics New Zealand (SNZ) has also been involved in indicators work related to the New Zealand government's sustainable development agenda. A 2002 report *Monitoring Progress Towards a Sustainable New Zealand* was produced as part of this programme. More recently SNZ has been involved in the *Linked Indicators* Programme, the purpose of which was to facilitate the monitoring of New Zealand's sustainable development, though in other places SNZ also discuss monitoring "well-being". The published set of "linked indicators" is broken into four sets: economic, social, environmental and cultural. These indicators were developed in consultation with MfE and representatives of local government.

Quality of Life in New Zealand's Largest Cities is a cooperative project amongst currently 12 territorial authorities that provides social, economic, and environmental indicators of quality of life in cities / districts which are either primarily urban in nature or are facing high urban growth on the fringe of urban areas. Reports have been produced so far in 2001, 2003, and 2007.

At a regional and local level in New Zealand, local authorities are required to undertake monitoring as part of their duties under both the LGA (2002) and RMA (1991). Both of these acts require outcomes monitoring and performance monitoring. In order to meet these requirements, local authorities are increasingly being encouraged to develop integrated monitoring strategies (www.qualityplanning.org.nz).

The LGA (2002) requires monitoring and reporting progress toward community outcomes identified in the LTCCP, as well as trying to understand how the activities of council discussed in the LTCCP are contributing to these community outcomes.

The RMA (1991) requires monitoring of the 'state of the environment', which generally includes monitoring and reporting on key trends in significant environmental and social indicators in the district or region. The RMA also requires monitoring and reporting on the efficiency and effectiveness of the district plan to determine whether the districts plan's policies and methods are the most effective and efficient way of achieving the plan's objectives and assessing if the plan's objectives are appropriate in terms of the purpose and principles of the RMA.

Regional councils are also required under the LTMA (2003) to submit an 'annual report' detailing progress with implementation of their 'regional land transport strategy', but as yet there is no requirement to report on a set of indicators, although the Ministry of Transport (MOT) has signalled an intention to develop such indicators.

5.5 Environmental auditing and accreditation systems

Environmental auditing systems are another group of tools that can have an important role in improving decisions. Similar to impact assessment, environmental auditing systems help people

⁸ See MfE (October 1996) newsletter Reporting on our Environment



consider the potential negative impacts of their activities and how their activities can be made more sustainable. In some cases, auditing systems are linked to accreditation schemes where an external auditor checks the performance of an activity, building, or the organisation’s internal environmental management systems and certifies them. Accreditation has been shown to have the potential for significant financial returns in a marketplace in which consumers often demand more eco-friendly products. Some examples of these systems are listed below in Table 6.

In New Zealand, the use of environmental accreditation schemes is voluntary and generally run through the private and not-for-profit sector. The benefits of such schemes (for example Forest Stewardship Council Certification) are that they often provide a level of environmental protection higher than is required by district and regional plans, while also providing for a recognisable economic benefit to the companies and organisation which adopt them through higher prices for goods and services.

Table 6. Environmental auditing and accreditation systems

Name	Description	Access Details
Sustainability Checklist	The Sustainability Checklist, created by Network 21, provides a tool to help project managers identify the most sustainable way forward for their projects by asking them to consider how their project might impact on various features organised under the headings of: ‘community’, ‘economy’, ‘environment’, and ‘the future’.	http://www.network-21.info/html/sustainability_checklist/sustainability_checklist.php
ISO 14001	ISO 14000 is a series of international standards on environmental management that provide a framework for the development of an environmental management system and supporting audit programme. ISO 14000 was developed as a result of the Rio Summit on the Environment held in 1992. ISO 14001 is the corner stone standard of the ISO 14000 series and provides a framework of control for an Environmental Management System against which an organisation can be certified by a third party.	http://www.iso14000-iso14001-environmental-management.com/iso14000.htm
World Business Council for Sustainable Development	The World Business Council for Sustainable Development (WBCSD) is a coalition of 180 international companies united by a shared commitment to sustainable development via the three pillars of: economic growth, ecological balance, and social progress. Their mission is to provide business leadership as a catalyst for change toward sustainable development, and to promote the role of eco-efficiency, innovation, and corporate social responsibility.	www.wbcscd.ch

5.5.1 Green building certification

Internationally, the use of environmental certification for buildings as a means of promoting sustainability is increasing. Table 7 presents a number of building certification systems, including the new Green Star system, recently developed for use in New Zealand. These systems work naturally in



the market as a promotional tool for developers and building owners but can also be used in conjunction with planning instruments, for example by providing development bonuses in conjunction with green building design (see Section 7.3).

Table 7. Examples of green building certification

Name	Description	Access Details
Australia Green Building Council	The green building council is a membership-based initiative to promote more environmentally sustainable building practices in the property industry, which includes a Green Star environmental rating system.	www.gbcaus.org
BASIX (Building Sustainability Index) & METRIX systems	<p>BASIX is a web-based tool developed by the New South Wales Government to assess the environmental performance of residential buildings against new water and energy consumption targets. BASIX currently includes three targets relating to water, energy and thermal comfort. Eventually nine BASIX targets will be set for new houses, including targets related to landscaping, stormwater, materials, waste, social performance, and transport. This upgrade of the program is now referred to as METRIX.</p> <p>BASIX uses a score out of 100, which represents the percentage savings the house design will achieve compared to the average consumption for water or energy in each region. The minimum target scores until July 2006 are:</p> <ul style="list-style-type: none"> • Water – between 0 and 40 for potable water consumption (local water reduction targets apply for areas outside the Sydney metropolitan area) • Energy – 25 for energy consumption (greenhouse gas). 	www.basix.nsw.gov.au
NABERS	NABERS (the National Australian Built Environment Rating System) is a performance-based rating system for existing buildings. NABERS rates a building on the basis of its measured operational impacts on the environment.	http://www.nabers.com.au/
LEED®	Developed by the US Green Building Council, the Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is the US benchmark for the design, construction, and operation of high performance green buildings. LEED promotes a whole-building approach to sustainability by recognising performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.	http://www.usgbc.org



Name	Description	Access Details
NZ Green Building Council Green Star NZ	Green Star NZ is New Zealand's first comprehensive environmental rating system for buildings. Green Star NZ – Office Design version 1 is used to assess the environmental impact of offices. It was released in April 2007 after extensive industry and public consultation. Green Star NZ evaluates building projects against eight environmental impact categories, plus innovation. Within each category, points are awarded for initiatives that demonstrate that a project has met the overall objectives of Green Star NZ and the specific criteria of the relevant rating tool credits. Points are then weighted and an overall score is calculated, determining the project's Green Star NZ rating.	http://www.nzgbc.org.nz/

5.6 Research

Research provides an important tool to improve decision-making in the quest for sustainability. Research related to sustainable settlements planning transverses the science and social disciplines and includes qualitative and quantitative approaches using a variety of methodologies. Research occurs in both the theoretical (academic) and applied context.

One recent and important strand of research has used modelling to better understand urban dynamics, trends in settlement form, and the affects of settlement form and design on aspects of sustainability and well-being. In the realm of transportation planning, research has been used to better understand the causes of car use, including the underlying decision processes and behaviour mechanisms. Research is also important for technology development, for example for cleaner fuels and alternative fuel technologies. Examples of different types of theory-building academic research are given in Section 2.2.

Both the central government and many local authorities in New Zealand have used research to help them inform their policy development and planning in relation to settlement form and design.

For example, MfE along with the Wellington City Council (WCC) and the Auckland Regional Council (ARC) recently commissioned a review of research on 'the value of urban design' (MfE, 2005). The research identifies the economic, social and environmental benefits of urban design and is intended to support the implementation of the New Zealand Urban Design Protocol and urban design work programmes in WCC and ARC (<http://www.mfe.govt.nz>).

The Auckland Regional Public Health Service also undertook a study *Improving health and wellbeing: A public health perspective for local authorities in the Auckland region*, which summarised some of the research on the relationship between urban development, transportation, and public health (<http://www.arphs.govt.nz>).



The New Zealand government also provides strong support for settlement sustainability research through:

- Foundation for Research Science and Technology FRST programme on Sustainable Cities (<http://www.frst.govt.nz>)
- Ministry for the Environment's Sustainable Management Fund (<http://www.mfe.govt.nz>)

Many local authorities also use research to examine housing trends, demands for services and residential satisfaction. An example is the ARC which has commissioned research on resident and business perceptions of mixed-use development, as well as studies into future housing demands. Nonetheless, there is not a strong research culture amongst New Zealand local authorities apart from the major metropolitan authorities and a selection of others experiencing rapid growth (for example Queenstown Lakes District Council (QLDC)).

5.7 Technological instruments

Technology is playing an increasing role in enabling movement towards more sustainable urban form and design. This role is evident in the move to more technologically complex decision-making tools, such as the GIS and modelling tools discussed in sections 5.1 and 5.2. Technology is also important in the implementation of policy through the provision of 'smarter' settlement infrastructure.

Of particular importance is the increasing role technology plays in transportation planning and management. An example is the use of [Intelligent Transport Systems \(ITS\)](#). ITS encompass all tools that involve adding information technology to transport infrastructure or vehicles to improve safety or reduce vehicle wear, transportation times, and fuel costs.

The applications of ITS are extremely wide-ranging. For example, ITS has the power to contribute to sustainability by:

- improving traffic flows (by optimising signal operation and providing real time information via variable message signs)
- improving public transport (by giving priority to public transport vehicles at signals or providing much improved real time information for users)
- facilitating behavioural changes (by using internet databases for matching potential ride-sharers).

Some examples of different applications of ITS tools are provided in Table 8, but there are many more in the literature (see Section 9).



Table 8. Examples of ITS tools in transportation planning and management

Name	Description	URL
Passenger transport signal priority	Sensors are used to detect approaching passenger transport vehicles and alter signal timings to improve passenger transport performance, for example by extending the green light phase, or prompting a change from red to green.	http://itsdeployment2.ed.ornl.gov/technology_overview/Options.asp?System=AM&SubSystem=TC&Tech=Priority
Variable message signs	Sign boards displaying LED text or graphics are controlled by central software/user interface and used to warn drivers of traffic congestion, accidents, roadworks, variable speed limits, air quality conditions, and alternative routes. Signs can be used to divert traffic and improve traffic conditions; and provide timely, accurate, and useful information.	http://www.daktronics.com/vms_prod/dak_vms_products.cfm
Real Time Passenger Information e.g. ACIS	ACIS uses GPS (Global Positioning System) to monitor the movements of buses in order to provide 'real time' information on when the next buses are due at bus stops or 'off route' (e.g. cinemas, shopping centres).	http://www.acis.uk.com/default.asp
Ride matching/car sharing	Ride matching software is used to match people travelling the same journey at the same time, so that they can share a car rather than travelling separately. www.liftshare.org is the UK car sharing website and provides a free online journey matching service that finds members travelling companions. Liftshare has 101,672 members and over 1 million journeys have been registered on the site.	http://www.liftshare.org/
SCOOT urban traffic control	SCOOT is an adaptive traffic control system for managing traffic signals in urban areas. The system responds to changes in traffic flows through detectors embedded in the road. Centrally controlled computers then allow signals to be co-ordinated in real time to deal with changing traffic patterns. SCOOT can reduce traffic delay by approximately 20% in urban areas.	http://www.scoot-utc.com/
Public access terminals, e.g. iPlus networks	'Touch screen' interactive terminals are provided free to use in public places with information on bus timetables and routes or other tailored information.	http://www.cityspace.com/services/index.asp

ITS are used reasonably extensively in New Zealand as part of transportation planning and management. For example, several cities use the **SCATS** (Sydney Coordinated Adaptive Traffic System) traffic signal system for co-ordination and management of traffic signals, including Auckland and Christchurch. Bus priority at traffic signals has been introduced in some locations, including Auckland and Wellington. Another example is providing improved information for public transport passengers in the form of 'real time' information on certain bus routes in Auckland, Wellington, Christchurch, and Hamilton. Wellington also has public access terminals that include public transport



information. Variable message signing is widely used across the country for a variety of applications including for closure of passes, electronic ice detection warning signs, variable speed limits outside schools in Wellington, and lane control and warning on the Auckland motorway system. Auckland also has a journey planner tool (www.maxx.co.nz), and a personal notification system if your train is late that uses mobile phone SMS 'text' messages.

5.8 Communication methods and tools

Communication methods are generally used to ensure developers and the broader community understand and appreciate the policies and objectives for sustainable settlement form, and how they can contribute to the design and implementation of these objectives. Communication should begin with community participation in policy and strategy formation (see Section 4.3). It is also an important tool of policy implementation, for example providing urban design guidelines or other guidance to developers (see Section 7.11).

In transportation planning, communication often forms part of a cognitive-behavioural strategy for changing people's travel behaviour. This type of strategy can include a number of tools based on the provision of information, education, and communication about feasible alternatives to car use, and in some cases, personalised [travel plan support](#). An example is the [TravelSmart Individualised Marketing®](#) concept piloted in South Perth in 1997. This tool involved contacting people in their homes and identifying those that were interested in changing their travel behaviour. Tailored information was then sent out including bus stop timetables and walking / cycling / public transport maps. In addition, a free public transport ticket that lasted for one month was provided to those households that agreed to a home visit to explain to them how to use the public transport system. The pilot study resulted in 14% less car travel, and increased walking (up 16%), cycling (up 91%), and use of public transport (up 21%). These changes were sustained when measured one and two years later. The pilot was so successful it has since been extended in Perth, and introduced in other locations. While some questions have been raised about the reliability of these statistics (O'Fallon and Sullivan, 2003), the UK Department for Transport still recommends individualised marketing as the best alternative mode marketing initiative (DfT 2002). Other communication methods relating to transport often fall within the realms of Intelligent Transport Systems (see Section 5.7), and relate to improving communication about the systems that are available, for example providing current, easily accessible timetable information.

Communication methods and tools are widely used in New Zealand. For example, design guides have been produced by several local authorities (see Section 7.11). In transportation planning, Individualised Marketing was trialled in 2002 in Birkenhead, a northern suburb of Auckland, although, in this study the sample size of households wanting to take part was too small to confidently state the size or extent of any shift to alternative travel modes (O'Fallon and Sullivan 2003).



5.9 Advantages and disadvantages of information and technological methods and tools

Table 9. Advantages and disadvantages of information and technological methods and tools

Instrument	Advantages	Disadvantages / cautions
5.1 GIS mapping	<ul style="list-style-type: none"> • very useful instrument for storing as well as communicating information • useful visual tool 	<ul style="list-style-type: none"> • Costs to transfer information into electronic form
5.2 Forecasting and modelling	<ul style="list-style-type: none"> • supports proactive rather than merely reactive policy-making • useful for demonstrating to the public the potential long-term consequences of our planning and lifestyle choices 	<ul style="list-style-type: none"> • models are only as good as the data that power them and many areas lack data of sufficient quality at the appropriate scale
5.3 Impact assessment	<ul style="list-style-type: none"> • potentially useful for improving the decisions related to policy and project approval 	<ul style="list-style-type: none"> • often used as a justification for a proposal rather than an objective assessment to aid project development or approval • important to use before the final decision has been made to inform decision making, rather than as an afterthought
5.4 Monitoring	<ul style="list-style-type: none"> • potentially useful for improving the decisions related to policy and project approval 	<ul style="list-style-type: none"> • often good data is not available at the appropriate scale • often results are only used to publish reports and not fed back into decisions • can be time consuming to collect and collate data on different indicators
5.5 Environmental auditing	<ul style="list-style-type: none"> • allows for the management of resources in a measurable and comparable way (spatially and temporally) 	<ul style="list-style-type: none"> • the standards associated with auditing systems may be too lenient for some and too strict for others
5.6 Research	<ul style="list-style-type: none"> • useful for informing policy decisions 	<ul style="list-style-type: none"> • the quality of 'research' varies considerably and caution is required in its interpretation. Some "research" is merely justification for policies that are already favoured
5.7 Technological instruments	<ul style="list-style-type: none"> • great potential to improve sustainability performance 	<ul style="list-style-type: none"> • start-up and maintenance costs • entrenched interests may resist
5.8 Communication instruments	<ul style="list-style-type: none"> • a necessary part of any policy programme 	<ul style="list-style-type: none"> • need to ensure that messages reach, and are appropriate to, all target audiences



6 Economic and market-based instruments

Given that one of the key drivers of settlement form is the urban economy, and in particular the market for land, an important way in which policy makers can influence settlement form is to influence this market. There are a number of methods and tools that have been used to increase the sustainability of settlements through influencing the urban economy and marketplace. Other tools that fall under the category of economic instruments attempt to adjust or correct pricing signals, in particular how the costs of different actions (including their environmental and social impacts) are internalised. The use of these types of tools in settlement management recognises that within the array of existing regulatory structures, most of the decisions that affect the shape of settlements are made through the investment decisions of organisations and agencies investing in residential, commercial, and infrastructure developments. Therefore, many market-based tools are designed to mitigate the impacts of decision-making in a market where the costs, particularly the externalised costs, of those decisions are not priced on the market (Fulton *et al.* 2004).

The economic and market-based instruments reviewed in this section include:

- ensuring stewardship over resources through secure property rights
- incentive and subsidy programmes
- user pays and polluter pays programmes
- development impact fees / developer contributions
- road tolls and congestion charging
- differential rating
- market based trading instruments
- transferable development rights
- mitigation banking
- government economic policy
- infrastructure provision
- public land banking
- purchase of development rights.

In the context of human settlements, fiscal instruments have most commonly been used in the management of environmental resources. However, these instruments are increasingly used to control the environmental externalities associated with urban expansion, for example: pollution, traffic congestion, and loss of amenities (Siong, 2005).



6.1 Secure private property rights

One of the simplest and most common market-based tools is to ensure secure private property rights for natural resources. The logic behind this initiative is that, if people have secure ownership over resources, they are more likely to manage them in a sustainable way in order to maximise their financial gains from the resource over time. Conversely, it is assumed that uncertainty in the allocation or duration of property or resource rights can discourage people from managing the resource sustainably and accelerate the rate of depletion of an exhaustible resource (Pearce and Warford, 1993). The issue of property rights has received particular attention in terms of the management of state-owned pastoral lands, forestry, and mining resources in the US and in Australia. For example, in the US, some have argued that environmental mismanagement has occurred as a result of public land leaseholders not having a strong enough financial interest in the long term sustainability of the land. As a result, leaseholders have tried to maximise their short term gain through over-grazing.

The argument for securing private property rights over Crown owned pastoral land in order to improve its environmental management has not been as strong in New Zealand. Nonetheless, under the land tenure review process, a large portion of the Crown lease-hold pastoral land has been moved into free-hold in exchange for land of high conservation value being moved into the conservation estate. However, the benefits of this process in terms of the overall environmental effects have been strongly questioned because the outcome, in some circumstances, has been the subdivision of rural land for residential development. In turn this has led to urban sprawl and adverse impacts on landscape values.

Another important subject for property rights arguments in some parts of New Zealand is council or Port / harbour company owned leasehold land. For example, in Dunedin, some developers have argued that the leasehold land tenure of the harbourside and other commercial areas, largely occupied by historic buildings, has resulted in a disincentive for building owners to invest in their historic buildings and as a result the failure to manage this cultural resource in a sustainable manner.

6.2 Incentive and subsidy programmes

Incentive and subsidy programmes attempt to encourage good practice through providing either direct or indirect economic incentives for changing practices (from the level of the company to the individual). Incentives and subsidies can be provided by government, local authorities or by the private sector. Examples include:

- **Direct subsidies** are used to help pay for environmental enhancement, such as “end-of-pipe” treatment or payment to support less environmentally damaging alternatives, such as urban public transport subsidies.
- **Transfer-inducing tax deductions, interest free loans, or subsidies** can be used to purchase environmental equipment or cleaner productions processes (for example solar or wind technology), or to buy public transport passes or bicycles.



- **Revitalisation incentives** are used to encourage developers to redevelop brown and grey-field sites in preference to green-field sites.

Tsenkova (1996) argues that while subsidies can encourage sustainable development, each subsidy must be holistically designed to ensure that reduction in one impact does not result in a corresponding increase in another. Likewise, Button and Pearce (1989, p. 162) caution that direct subsidies “can have economically disadvantageous effects in terms of efficiency, and even may be counter productive environmentally (Baumol and Oates, 1988)”. For example, transfer-inducing subsidies designed to move people into less environmentally intrusive activities have the potential to increase the overall level of the activity, thereby negating any reductions gained from the change in method unless the degree of substitutability is large (Button and Pearce, 1989). Furthermore, subsidies and incentives can have the unwanted effect of rewarding those who have been poor environmental performers prior to the introduction of subsidies. They may also be inefficient where they are paid to those who would take action in the absence of these financial incentives (ARGF, 1999).

Overseas examples of incentive and subsidy programmes include the Irish government’s tax relief for investors renovating or redeveloping properties in certain targeted areas of Dublin, and government support for public-private investments in transport options, such as the light rail associated with the redevelopment of London’s Canary Wharf (Williams *et al.*, 2000).

In New Zealand, subsidy programmes are permitted under the LTMA (2003) which allows for financially supported public transport services, and are commonly used by regional councils to subsidise non-commercially viable bus services. Another example of an incentive / subsidy scheme is the Clean Heat initiative launched in 2003 by Environment Canterbury. This scheme offers a loan, partial subsidy or full financial assistance (depending upon circumstances) for households in Christchurch with open fires / solid fuel burners to upgrade to cleaner heating appliances (for example heat pumps) and install insulation measures. MfE runs several incentive programmes including:

- **‘Projects to Reduce Emissions (PRE)’** includes awarding emissions units or ‘carbon credits’ that are tradeable on the International market to initiatives that will reduce greenhouse gases.
- **‘Energy Intensive Businesses’** assists energy intensive businesses to improve their energy efficiency and reduce greenhouse gas emissions through grants and education programmes.

6.3 User pays and polluter pays programmes

Environmental economists have long argued that to secure an efficient use of resources in the context of sustainable development, outputs should be priced at their marginal social cost. This cost comprises the marginal cost of production and the external costs of the pollution or resource degradation caused by producing the good. The theory is that when the full costs of activities are priced, “consumption” of resources would occur at an optimum level (Button and Pearce, 1989;



Pearce and Warford, 1993; Tsenkova, 1996). The principle of marginal social cost pricing is strongly supported by the OECD in the 1995 Treaty of Rome.

User pays and polluter pays programmes are tools that attempt to internalise the environmental and social costs of development. They can involve the collection of money for things such as the provision of infrastructure or future environmental clean-up operations. They are designed to not only provide funds to mitigate or remedy environmental externalities, but also to discourage environmental impacts in the first place, through market signals.

They involve two main types of programmes:

- **User-pays programmes** focus on ensuring the user of a resource pays the full cost of supplying the resource.
- **Polluter pays programmes** focus on ensuring the costs of environmental damage are borne by the producer of the damage (and down the track by the consumer) (Button and Pearce, 1989).

These types of programmes include: developer contributions, road tolls, pay-as-you-drive pricing, parking pricing, road pricing, congestion charging, and differential rating.

Other examples of tools under this category include:

- **Product charges** are taxes on products that are polluting or for which disposal is difficult.
- **Administrative charges** are used for registration and enforcement systems.
- **Tax differentials** are used to provide more favourable tax rates for environmentally friendly products and / or tax penalties on the use of polluting products. These have been used in UK, Finland, Denmark and other countries to encourage the switch to lead-free petrol (Button and Pearce, 1989).

In many cases, correcting price signals does not require the addition of costs or fees but rather the removal of counterproductive subsidies. For example, Litman (2005) argues that current transport markets often violate efficient market principles, such as: providing consumer choice, efficient pricing (reflecting production costs), and policy neutrality (one public 'good' is not favoured over another). These economic biases in the transport system can encourage one type of transport behaviour (for example car driving) over another. He gives the example of car commuters who use parking subsidised by their employer when a similar subsidy is not provided for those who use other modes such as walking, cycling, public transport, or telecommuting. Furthermore, Litman's research shows that commuters who are allowed to choose cash instead of subsidised parking typically reduce their car commute trips by about 20%, suggesting that about a fifth of commuter traffic results from this bias in commuter benefits that favours driving over other modes.

Similarly, many vehicle fees (such as insurance and taxes) are fixed, rather than being directly based on a vehicles' annual mileage, although the costs they represent (such as accidents and air pollution) increase with distance travelled. Fixed fees give motorists an incentive to drive as much as they can



to get their money's worth from their investment. Correcting these unintended subsidies can have a significant effect on transport choices.

6.3.1 Development impact fees and developer contributions

Economists advocate that to maximise their equity and efficiency, user-pays programmes should be based on a three-part tariff that includes:

- a charge for the capital cost of the facility / service
- a charge for the costs of delivering the service, which varies by area or distance
- actual use charge, for example through water-metering (ARGF, 1997).

An example of a user-pays programme is the use of [development impact fees](#) or [developer contributions](#). These are charges placed by authorities on developers in order to cover the marginal costs of providing public services, such as roads, sewers and schools, to new developments. The services covered by the fees vary, with the fees usually covering the marginal costs of the building, upgrading, and / or maintenance of the built infrastructure. In addition, local authorities can require developers to dedicate all public improvements designed to serve the subdivision, such as roads, parks, and infrastructure, as well as other land for wider public use, such as for new schools.

Development impact fees not only provide revenue to meet the costs of growth, they can also be used to encourage efficient development by directing development into areas where there are already adequate facilities or which are less costly to serve. Therefore, they can have an important role in discouraging green-field development.

Twenty-eight US states have introduced legislation permitting the use of development impact fees. Similarly, in the UK, under the Planning and Compensation Act (1991), developers can be required to contribute to enhancing existing schools, as well as providing new schools, infrastructure, and other improvements (Fulton *et al.*, 2004).

In New Zealand, the RMA (1991), LTMA (2003), and LGA (2002) provide for the use of user-pays instruments.

Financial contributions

The RMA (1991) provides for the principle of user pays in its provisions for 'financial contributions' of land or money (or a combination of the two) under Section 108. The system of financial contributions must be specified in the operative plan and can be used to fund infrastructure including:

- roading
- drainage (sewerage and stormwater)
- water supply
- community facilities (libraries, community centres)
- parks and reserves
- parking.



The use of financial contributions for the management of urban form under the RMA (1991) is governed by the principles that apply to plan-making. These include: the council's functions under Section 31, the purpose of the Act under Part II, the duties to consider alternative methods under Section 32, any regulations made under the RMA, and the extent to which the plan must be consistent with other planning documents (for example, regional plans, plans prepared under other legislation). Furthermore, contributions must "fairly and reasonably" relate to the activity to which they are attached and the level of contribution must be determined in the manner described in the plan (Kirkpatrick, 1999, p.9). This means that funds can only be collected to fund infrastructure that has to be provided by council as an effect of the development⁹.

Section 108(2)(c) of the RMA also allows for the imposition of resource consent conditions "requiring that services or works, including (but without limitation) the protection, planting, or replanting of any tree or other vegetation, or the protection, restoration, or enhancement of any natural or physical resource, be provided".

As conditions on consents, financial contributions are subject to appeal both at the plan development stage and at the resource consent stage and have been problematic because many decisions have been challenged and overturned in the Environment Court (www.qualityplanning.org.nz).

The RMA also provides for 'polluter pays' through conditions on resource consents in respect to remedial, restoration, or maintenance work and the collection of bonds to ensure compliance.

It has been suggested that financial contributions could be used in conjunction with [inclusionary zoning](#) to provide funding for affordable housing in cases where developers are unwilling to provide affordable housing as part of their developments (Housing Minister Chris Carter, 2006).

Development contributions

The provisions for financial contributions in the RMA (1991) are slowly being replaced by the provisions for '[development contributions](#)' under the revised LGA (2002) (New Zealand Law Society, 2005). This shift is the result of the problems encountered with using financial contributions to fund the infrastructure required for growth, including: high compliance costs in negotiation, mediation, and litigation; delays and poor responsiveness; and difficulty in establishing clear and quantifiable links between the effects of a development and the amount collected through financial contributions (www.qualityplanning.org.nz).

Under the LGA (2002), development contributions for new developments must be set out in a development contribution policy developed as part of the LTCCP. Development contributions can be collected on developments if the "effect of the developments is to require new or additional assets or assets of increased capacity and, as a consequence, the LA incurs capital expenditure to provide appropriately for – (a) reserves; (b) network infrastructure; (c) community infrastructure" (Section 199).

⁹ According to the decision in *Nicoll*, this includes recouping costs of providing services in anticipation of development (Kirkpatrick, 1999).



This definition includes expenditure already incurred in anticipation of development and the costs related to the cumulative effects of development. Development contributions can consist of land or money. They can be required at the time of resource consent, building consent, or service connection, although they are not a condition of consent. The LGA sets out the methodology to determine the development contributions as well as a statutory maximum for contributions in Section 203. Development contributions can not be used if the money to provide the infrastructure has been collected through a financial contribution under the RMA (1991); the developer will provide the infrastructure directly; or the LA has received money for the same purpose from elsewhere. They also cannot be used for renewal projects or to improve levels of service. However, once established, the advantage of development contributions over financial contributions is that as part of the LTCCP they can only be challenged in the High Court on points of law and judicial review of the process.

6.3.2 Road tolls and congestion charging

Road tolls are fees charged to motorists for using a stretch of road or sometimes a specific piece of infrastructure, such as a bridge or tunnel. Tolls are most commonly used as a revenue gathering source to recoup the costs of building the roading infrastructure, although sometimes after this has been achieved, tolls are used as a general revenue stream. However, an important side-effect is that the cost of tolls may provide an incentive for drivers to: reduce the number of trips they make across a tolled road, use public transport, ride-share, or undertake more efficient trip-making. These changes to transport behaviour can have a significant impact on the sustainability of an urban area.

Road pricing or **congestion charging** charges drivers to use a certain area of the city. Congestion charging is used to both reduce vehicles on the road, as well as raise money for improved public transportation and other key transportation projects. This tool has received a great deal of attention due to its perceived effectiveness in reducing traffic in central London (by up to 30%) though not without controversy (<http://www.tfl.gov.uk/tfl/>).

On the flip-side, road tools and congestion charging can have significant negative side effects. Button and Pearce (1989) discuss evidence of road pricing policies in Singapore leading to rapid and excessive building on land adjacent to the road pricing areas. Some concern is also evident in the literature regarding the effect of road pricing and other fiscal measures on low-socioeconomic groups. For example, Crane and Schweitzer (2003) recognise a fear that low-income motorists would be 'priced off the road' by tolls or higher petrol taxes, which would clearly exacerbate problems of social exclusion. For this reason some governments have been reluctant to introduce such measures unless there is absolutely no alternative.

The LTMA (2003) provides for user-pays programmes in the form of road tolls and congestion charging. The LTMA allows tolls to be used as a way of advancing some projects (for example new roads) that might otherwise be delayed because of funding and other constraints. However, tolls cannot be introduced for existing roads unless the existing road is physically or operationally integral to a new road.



Congestion charging was considered for use in Auckland along with other pricing policies including levies on inner city car parking (see <http://www.transport.govt.nz/auckland-road-pricing-evaluation-study>).

6.4 Differential rating and fees waivers

Property taxes ('rates' in New Zealand) can be an important mechanism (both intentionally and often unintentionally) for directing land use development and urban form. In the US, "split-rate" property taxes have been used to encourage infill and redevelopment of urban areas (Gihiring, 1999). Split-rate taxes work by providing differential tax rates for (1) the 'land value' and (2) the 'value of improvements'. In order to encourage infill development and redevelopment in target areas, the tax rate on the 'land value' is increased and the rate on the 'value of Improvements' is decreased. The use of this type of differential rating provides a tax relief for redevelopment into land-intensive uses (such as apartments), as well as increases the tax burden on inefficient land uses, such as parking lots, or holding undeveloped property as part of land speculation.

In New Zealand, Section 16 of the Local Government (Rating) Act 2002 provides for differential rating powers that can be used to encourage certain types of development or reward conservation efforts. **Special rating areas** are also available to target the costs of infrastructure which benefits only part of the community, for example a flood protection scheme such as the Leith Lindsay Scheme in Dunedin.

As an example, multi-unit development or mixed-use developments could be rated at a lower level than development that uses land or other valuable resources inefficiently. Rates relief can also be used to encourage certain types of developments of interest to the wider community, or for land voluntarily protected for natural, historic, cultural or conservation purposes. An example is the Auckland City Council (ACC) using rates relief to encourage inner city tourist and residential development (ARGF, 1997).

Councils can also waive resource consent and building consent fees to encourage different types of development, such as green buildings, higher density development, affordable housing, or other projects of wider benefit for the community.

6.5 Market-based trading instruments

Air pollution **trading programmes** are perhaps the oldest and best-known example of market-based trading instruments. They have been used widely as a policy instrument over the last decade by environmental regulatory agencies in the US, such as the Environmental Protection Agency (EPA). These programs consist of three basic types: credit programmes, cap-and-trade programmes, and quota programmes.

In a **credit programme**, polluters gain credits when they reduce their emissions below the limit required for that type of source-specific emission. They are then able to sell or trade the resulting credits to another source allowing it to meet its emission control target. This type of programme was



used in the US for the phase down of leaded gasoline and heavy duty motor vehicle engine emissions (Fulton *et al.*, 2004).

A **cap-and-trade programme** is based on determining an overall level of pollution or 'cap' that must be achieved by all the polluting industries in a specified area. This amount is then divided among the companies in the form of permits which they are able to trade amongst themselves. Examples of these programmes in the US include the trading of ozone depleting substances, and the EPA's sulphur dioxide allowance trading programme (Fulton *et al.*, 2004).

In a **quota programme**, a limit is set on the use or development of a natural resource (for example total water take or total allowable catch for fisheries). All users of the resource are then given a maximum take (quota) within that total that they are able to trade or sell.

The RMA (1991) provides for limited transferability of the whole or any part of a water¹⁰ or discharge permit. Therefore, in theory, trading programmes are available in respect to the management of water use and pollution, however, given the reticulated nature of urban areas, they will have limited applicability to the management of settlement form.

Nonetheless, there are two other types of trading programmes that hold promise in terms of the management of settlement form: transferable development rights and mitigation banking. These are described below.

6.5.1 Transferable development rights

Transferable development rights (TDR) programmes involve the transfer of unused development rights from one site (the sending area) for permission for more intensive development on another site in a designated growth area (the receiving area). The land on which development rights have been sold is then protected for example by a conservation easement or a recorded title restriction. The benefit of a TDR system is that unlike regulations, landowners receive compensation for giving up their right to development. TDRs are used, for example, to protect heritage buildings by the transfer of unused airspace above a building to another site or the protection of ecological habitats or open spaces.

Fulton *et al.* (2004, p.2) describe TDRs as "tools [that] hold the promise of making everyone happy – compensating some landowners for losses, facilitating additional development profits for other land owners who can move forward, and achieving significant public land planning and land conservation objectives at little public cost". However, they warn that expertise and appropriate conditions are needed for government agencies to create successful markets in this way. Land markets are difficult to manage, since it is hard to predict the number of landowners in the marketplace, the magnitude of their interest in the market, and the timeframe in which they will make decisions about developing or conserving their land. A further potential problem is that as political circumstances change with time,

¹⁰ See <http://www.maf.govt.nz/mafnet/rural-nz/sustainable-resource-use/water-efficiency/transferable-water-permits/htoc.htm>



stakeholders may be unwilling to accept the outcomes of the markets as such mechanisms are implemented. They also note that in the US, programmes using TDRs often fail to curb the negative impacts of urban sprawl because they are not implemented at the appropriate scale, i.e. the metropolitan or regional level.

Despite these problems, Fulton *et al.* (2004) conclude that TDRs hold 'great promise' and will continue to be part of the land conservation policy debate in the future. Currently, there are over 135 TDRs programmes in the US that have been effective to varying degrees. They have been most effective in urban settings, but there have been a few successful rural programs for example Montgomery County, Maryland, and the Pinelands in New Jersey which have preserved thousands of acres of open space.

In order to be successful, TDRs require a great deal of certainty about where development will be permitted to happen and where it will not and therefore they require a comprehensive plan or growth management program. The design of the receiving areas requires the most attention. The evidence also indicates that mandatory rather than voluntary programmes are more likely to be successful (ARGF, 1997).

TDR programmes have been used in New Zealand since the early 1970s, mainly for the protection of historic buildings and heritage sites (ARGF, 1997). They have also appeared in some District Plans prepared under the RMA (1991) to control development. For example, the Western Bay of Plenty District Council have a TDR programme to help regulate subdivision and preserve land, which is reported to have proved a success and "helped regulate subdivision and preserved a wealth of environmental treasures" (Surveying Services Newsletter, 2004). Franklin District Council also have a TDR scheme referred to as 'Transferable Rural Lot Rights', which has been established to protect areas of rural land that are valuable agriculturally (for example versatile soils) from residential development, and redirect residential development towards areas that are poorer in agricultural terms. In addition to these formal processes, development rights are also traded informally (and without record of conditions of trade) as transactions between private parties.

Brabant (2003, p.7), however, believes that the TDR process is contrary to the fundamental provisions of the RMA (1991), representing "a 'trade-off' approach to land use planning which has no place under the Act".

6.5.2 Mitigation banking

Mitigation banking uses a credit system to trade negative impacts incurred at a development site in exchange for positive impacts created on an alternative site. Mitigation banking has been used in the US as an initiative for landowners to reduce the impacts of settlement development on wetlands, by giving compensation credits for units of restored or created wetlands. Mitigation banking is often used in conjunction with other land acquisition policies (Fulton *et al.*, 2004).



Under the RMA (1991), it's not possible to trade off negative impacts on one site with positive impacts on another site, however, sometimes these types of tradeoffs are done to secure support for a project from council departments or other organisations.

6.6 Government economic policy

A number of government policies are, on the surface, 'aspatial' but can have important effects on the patterns of urban development. Examples include government policies on:

- **Tax deductions for mortgage repayments** influence the demand for housing and the land taken for residential development.
- **Fuel and other motor vehicle taxation** influences the level of urban traffic and the popularity of different types of vehicles.
- **Anti-trust and mergers policies and commercial and industrial taxation policies** influence the location and size of industrial activities (Button and Pearce, 1989).

Furthermore, the investment decisions of government can have important influences at the macroeconomic level, for example by shifting the balance of capital investment from environmentally damaging to benign activities, and determining whether economic growth can be achieved at a lesser environmental cost (Tsenkova, 1996).

Making government economic policy more sustainability-focused includes:

- considering the overall portfolio of public sector investment
- considering the portfolio of investment available to any single agency
- ensuring that project appraisal within a sector or agency is carried out in such a way that environmental values are properly represented.

According to MfE, the New Zealand government spends at least \$25 billion per year on goods and services and is responsible for more than 30 percent of buildings in New Zealand. It also has an extensive impact on the environment, for example through its large workforce, IT, paper usage, and vehicle fleet. In response to this, the MfE developed the GOVT3 programme. GOVT3 is focused on making central government agencies more sustainable by changing their procurement policies to require more sustainable products and changing the behaviours of agency staff, particularly their use of resources (www.mfe.govt.nz).

Likewise, local authorities are often owners of strategic resources, industries, and critical infrastructure such as: forestry, power generation, water supplies, housing, and other buildings. As discussed in more detail in the following section, their investment decisions in regards to these resources can have important implications to both urban form and sustainability.

Furthermore, how LAs run their companies can have important implications for the management of urban form and sustainability. An example in New Zealand is the forest resources managed by City



Forests, a company owned by the DCC. The company contributes to the management of urban form by providing recreation areas on the borders of the city as part of its forest resources. It also uses environmental accreditation (Section 5.5) to improve its environmental and social performance.

6.6.1 Infrastructure provision

Button and Pearce (1989) argue that the provision of infrastructure, its renewal, and its gradual improvement are important tools to protect and improve the urban environment. This infrastructure includes:

- solid waste disposal facilities
- water treatment facilities
- roads
- housing
- public transport
- street lighting
- open spaces
- affordable housing
- urban civic and commercial centres.

Firstly, Button and Pearce (1989) emphasise that the supply of infrastructure should be optimal, including, where relevant, allowing for the full costs of provision to be internalised and charges to be levied on peak-use once capacity has been reached. Infrastructure can be funded through a variety of mechanisms including rates, taxes, and development contributions (Section 6.3.1). However, the ARGF (1999, p.7) emphasises the need for local area strategies to be developed which outline the cost structures for developer contributions where retrofitting of existing infrastructure is required – as in the case of intensification plans for neighbourhoods. They state:

Failure to give certainty as well as sending out the right price signals early in the development process i.e. prior to land purchase, will result in market uncertainty and frustrate the intensification process. These costings need to form an identifiable part of any local authority asset management planning process.

In addition to the need for certainty in policy, there is also a need for consistency across local authorities in a region. Furthermore, council-funded infrastructure improvement plans need to be coordinated regionally and clearly articulated through the LTCCP and Annual Plan process.

Secondly, Button and Pearce (1989) emphasise the importance of infrastructure improvements to [urban renewal programmes](#) focused on improving the economic and social performance of cities. Infrastructure upgrades can attract investment and employers through improvements to the liveability of cities. The importance of local government investment in infrastructure upgrades, particularly to



public spaces in Central Business Districts (CBDs), has been demonstrated in a number of cities including: Baltimore in the US; Liverpool, Glasgow, and London in the UK; and Sydney and Brisbane in Australia.

Florida (2002) explored the importance of settlement liveability (including the quality of urban environments) to attracting “creative” industries and people by looking at recent regional economic development trends in a number of cities. His research indicates the importance of the urban environment to attracting the “creative class” (scientists, engineers, architects and other professionals as well as artists and musicians) and thereby those (particularly hi-tech) industries which rely on this talent.

Thirdly, investment in infrastructure can be an important tool for directed growth by attracting residential or commercial development in some areas, or limiting it in others (particular in conjunction with the use of *Adequate Public Facility Ordinances*, see Section 7.4). For example, the ARGF (1997) discuss the strong link between motorway development in Auckland and its dispersed urban form. Conversely, they discuss how public investments in Sweden have led to approximately 90% of residents living in planned transit villages.

Finally, an important international trend is the “greening” of infrastructure and development of alternative approaches to mainstream infrastructure, which are seen to both enhance local sustainability and reduce, in the long-term, environmental and infrastructure costs for local governments and communities.

Many of these international trends in using infrastructure provision to achieve more sustainable outcomes are apparent in New Zealand.

For example, several local authorities have used investment in infrastructure as a mechanism to encourage economic growth, as well as manage urban form and design. An example is ACC’s investment in the continued renewal of its waterfront areas to maximise public access and enjoyment, maintain heritage and local character, strengthen transportation links (including passenger transport, walking and cycling), promote the ‘live, work, play’ concept, and provide for mixed uses and activities. Several other councils have been involved in ‘main street programmes’, for example Geraldine, Featherston, Mangatoroto, and Lawrence, and ‘town centre programmes’, for example Paraparaumu Beach, Picton, and Whangaparoa. These councils have used investment in infrastructure to improve the amenity of their CBDs and encourage economic development.

The ARC, Kapiti Coast District Council, Nelson City Council, North Shore City Council, and WCC are examples of councils that are currently exploring and implementing low impact urban design and development policies and practices

(<http://www.landcareresearch.co.nz/research/urban/liudd/index.asp>).



Examples of the “greening” of infrastructure include:

- the development of ‘green buildings’ such as the Landcare Research building on the University of Auckland Tamaki campus and the new Department of Conservation (DOC) Wellington office
- the uptake by councils and developers of alternative approaches to managing stormwater, such as use of: swales, rain gardens, and infiltration trenches in both greenfield and brownfield sites
- the management of open spaces to serve as ecological corridors.

6.7 Public acquisition of land, public land banking, and open space protection

Public land banking involves the large-scale purchase of land by local authorities or other levels of government for the purposes of:

- withholding areas of land from development for the purposes of maintenance of open spaces (for example through greenbelts)
- controlling the rate / type of growth by making land available for future development in a planned way (through comprehensive land use plans).

An alternative to purchasing land is the purchase of development rights.

Public acquisition of land for the purposes of developing systems of urban parks, parkways, and nature preserves has been an important tool in urban planning since the 19th century. Today, there is renewed interest in purchasing green ways for walking and cycling corridors (for recreation and to support a modal shift), as well as ecological corridors.

In the US, there are also a number of large-scale open space programmes which subsidise landowners to protect their land from development activities through the sale of easements to public or private conservation agencies. These programmes have been used to protect over 1.3 million acres of farmland from settlement development or other encroachments (Daniels, 1991).

In addition to protecting open space, Fulton *et al.* (2006) found that open space policy has a major influence in shaping metropolitan growth patterns. However, as a policy for urban growth planning they are ‘defensive’ rather than ‘offensive’ as they direct development away from certain locations though not necessarily towards certain locations. As discussed in Section 7.4, the result can be ‘leap frog’ development outside of protected areas, rather than more intensive development inside the existing urban area.

It is difficult to ascertain to what extent the purchase of development rights has been used in New Zealand. However, land purchase has been used in a piecemeal way, primarily to provide for recreational areas, and in some cases land for specific uses, for example city centre development (Manukau City Council) and industrial development (DCC).

An alternative method for open space protection in New Zealand is the use of covenants on land. A voluntary programme of land covenants is administered by the [QEII National Trust](#). The QEII National



Trust is an independent organisation established in 1977 by an Act of Parliament to protect, provide, and enhance open space. The open space covenant is a legal agreement between the landowner and the Trust to protect an area of open space. An open space covenant is registered against the land title and is binding, not only on the present landowner or leaseholder, but all subsequent owners or leaseholders.

At a much smaller scale, the RMA (1991) (Section 77) allows for the requirement of easements to be granted as a condition of subdivision. This could be used to provide for green networks or areas of recreational space.

6.8 Urban development corporations

Urban development corporations (UDCs) are quasi-governmental authorities established to develop key (often depressed) areas in cities, usually as part of urban renewal programmes.

In the UK, UDCs were first introduced in 1981 for the London Docklands and Merseyside under the Local Government, Planning and Land Act (LGPLA) 1980. Their aims were (1) to improve the local environment, making it more attractive to business; (2) to give cash grants to firms setting up or expanding within the area; (3) to renovate and reuse buildings; and (4) to offer advice and practical help to firms considering moving to the location. They were limited-life bodies and the original UDCs were wound up by the mid-1990s.

However, as part of the UK Government's *Sustainable Communities Plan*, published in February 2003, new UDCs have been established in Thurrock, East London (also covering the Olympic site) and West Northamptonshire. These are taking a more collaborative approach with local, regional and national stakeholders.

The new UDCs have been established under the original LGPLA (1980) and, therefore, have largely the same objectives and powers as the earlier UDCs, namely:

- bringing land and buildings into effective use
- encouraging the development of existing and new industry and commerce
- creating an attractive environment
- ensuring that housing and social facilities are available to encourage people to live and work in the area.

For these purposes, a UDC can:

- acquire, hold, manage, reclaim and dispose of land and other property
- carry out building and other operations
- seek to ensure the provision of water, electricity, gas, sewerage and other services
- carry on any business or undertaking for the purposes of regenerating the area



- generally do anything necessary or expedient for this purpose.

The UDCs have been invested with development control for strategic applications in support of their objectives / purpose, leaving routine applications to the LA. The UDCs do not have powers in relation to determining the overall level of development or in relation to the location and distribution of development, which are matters for the Regional Spatial Strategy and Borough and District Councils.

The UDCs have a term of seven to ten years and are reviewed after five years. They are funded by the central government and run by boards.

In Australia, development corporations have also been set up to guide the redevelopment of key areas. These include:

- VicUrban – developers of the Melbourne Docklands (<http://www.vicurban.com.au>)
- Landcom – a State-owned corporation and a development arm of the New South Wales (NSW) Government (<http://www.landcom.com.au>).
- the Sydney Harbour Foreshore Authority – responsible for many historically and culturally significant waterfront locations in Sydney (<http://www.shfa.nsw.gov.au/>).
- Honeysuckle Development Corporation (HDC) – a corporation set up and owned by the NSW state government in 1992 to guide redevelopment of disused industrial land on the southern foreshore of Newcastle Harbour as part of a major urban renewal project on the harbourfront.

Examples of UDCs from the US include: Philadelphia, Pennsylvania (<http://www.urbandevelopmentcorp.com/>) and Buffalo, New York (<http://budc.ecidany.com/>).

There is no legislation in New Zealand that provides for comprehensive UDCs as in the UK. However, development corporations have been set up to develop council owned land in a strategic way, for example: the town centre for the 1700 ha (est. 40,000 people) new town for Flat Bush in Manukau (<http://www.manukau.govt.nz>).



6.9 Advantages and disadvantages of economic policy tools

Table 10. Advantages and disadvantages of economic policy tools

Instrument	Advantages	Disadvantages / cautions
6.1 Secure property rights	<ul style="list-style-type: none"> • may encourage stewardship over resources 	<ul style="list-style-type: none"> • some see sell-off of public land to private interests as cause of unsustainable practices • reduces public accountability
6.2 Incentives and Subsidies	<ul style="list-style-type: none"> • can be used to change practices in cases where regulation is difficult or inappropriate • encourages action to overcome environmental problems⁵ • can make cleaner alternatives more affordable and be used to stimulate the market 	<ul style="list-style-type: none"> • if employed in isolation offer little incentive for people to adopt more sustainable practices¹ • can be economically disadvantageous in terms of efficiency¹ • need to ensure that reduction in one impact does not result in a corresponding increase in another² • does not satisfy 'Polluter pays' principle⁵ • may reward those who have been poor performers prior to the introduction of subsidies⁵ • may pay those who would undertake action even without a subsidy⁵
6.3 User pays and polluter pays programmes	<ul style="list-style-type: none"> • highly flexible and can be linked directly to the effects of development • work with the market to achieve optimum consumption of resources, including efficient use of land • taxation incentives / rates relief can be useful to stimulate private action to protect resources or provide for particular types of development • can be used to fund specific infrastructure needs • can be used to distribute costs equitably across a community • can be used to raise revenue for collective treatment of the environmental problem, research on new abatement technologies or subsidising new investment by polluters in such technologies⁵ • the stock of land may last longer⁶ 	<ul style="list-style-type: none"> • can be difficult to set the charges at the appropriate level⁵ • "polluter pays" costs need to be applied consistently across the whole range of environmental costs to be fully efficient² • cannot work alone and have to be supplemented with other regulatory instruments² • need to continually monitor effectiveness to ensure they are meeting desired environmental outcome, especially as economic conditions and hence production and pollution levels change⁵ • concerns that revenue raised will not be used for the environmental problems but as another source of income for the government⁵ • may slow growth to such a degree that communities lose necessary revenue for services⁶ • may lead to increased housing prices⁶



Instrument	Advantages	Disadvantages / cautions
6.4 Differential rates and fee waivers	<ul style="list-style-type: none"> • can be used to both encourage desired developed and discourage bad practices 	<ul style="list-style-type: none"> • need clear policy
6.5 Market-based trading instruments	<ul style="list-style-type: none"> • don't have the stigma and on-going enforcement costs of regulation • TDRs offer a middle ground between acquisition and regulation and landowner gains compensation⁶ • tradeable permits set a ceiling on the allowable amount of degradation⁵ 	<ul style="list-style-type: none"> • need to be implemented at the appropriate scale⁴ • often difficult to create an active market for⁴ • creates complexity in the land transfer system⁶ • potential for high administration costs⁶ • does not address third parties interests or environmental impacts in receiving site well⁶
6.6 Government economic policy and infrastructure provision	<ul style="list-style-type: none"> • government provides a significant market force • important tool in the economic and social revitalisation of urban areas¹ • works with the markets to direct private investment and development⁶ 	<ul style="list-style-type: none"> • initial costs in changing technology or upgrading infrastructure • may be difficult to find public funds in economically deprived areas • costs and benefits of programmes are often not spread equally across ratepayers • may be pressure from private sector to fund infrastructure based on their needs over community goals⁶ • does not guarantee regeneration and economic investment
6.7 Public acquisition of land	<ul style="list-style-type: none"> • ensures a supply of land for particular uses (which can include activities that may not be favoured by the market such as affordable housing, agricultural or job-creating activities)⁶ • provides certainty about the location of future development • permanently secures areas of high environmental, social or cultural value for the public good 	<ul style="list-style-type: none"> • costly⁶ • interferes with property market⁶ • requires effective regional coordination⁶ • on-going maintenance costs for the tax-payer • key consideration is whether programmes target properties that have high environmental values or whether the goal of the programme becomes merely the total amount of land protected⁷.
6.8 Urban Design Corporations	<ul style="list-style-type: none"> • can create a fully integrated approach to the renewal of key areas 	<ul style="list-style-type: none"> • interferes with property market

Table References: ¹Button and Pearce (1989);²Tsenkova (1996); ³Baumol and Oates (1988, cited in Button and Pearce, 1989, p. 162); ⁴Fulton *et al.* (2004); ⁵Auckland Regional Growth Forum (1999); ⁶Auckland Regional Growth Forum (1997); ⁷Daniels, 1991



7 Urban planning instruments

Urban planning instruments are the most common set of tools used in the management of settlement form and design. Urban planning tools range from restrictions enforced via government regulatory plans and policies, to spatial plans of desired future form and design, to guidance instruments.

The urban planning instruments reviewed in this section are:

- zoning
- regulatory standards and rules
- planning incentives
- urban containment policies
- growth caps and moratoria
- urban villages and planned communities
- structure plans
- urban design strategies
- guidelines
- urban design panels.

Links to further information on the tools can be found in Section 9.

7.1 Zoning

Zoning originated in the early days of the industrial revolution in Germany and Sweden. The traditional type of zoning, sometimes referred to as 'euclidean zoning' (from the town of Euclid, Ohio in the US) partitions land usage (for example, residential, rural, and industrial) into different geographical districts with a settlement. Euclidean zoning has been used throughout the world as a way of managing the negative effects of development by separating what are seen as incompatible activities – most commonly by separating residential and industrial activities. More recently, many planning practitioners and theorists have criticised euclidean zoning for causing unsustainable patterns of urban form, because it has encouraged low density single use suburban development, which creates car dependence, makes public transport uneconomic, discourages walking and cycling, is expensive to service, leads to social segregation, and leads to rapid expansion of urban boundaries (www.virtuocity.com).

A more recent form of zoning ([performance or externality zoning](#)) tries to control the effects of activities (for example, discharges, noise, or odour) in different zones, rather than the activities themselves, in theory allowing more diversity in activity types. Performance or externality zoning is practised, to varying degrees, in several countries, including New Zealand where the principle behind the RMA (1991) is the management of the "effects" of development rather than development itself.



In addition to these common types, ‘[overlay zones or districts](#)’ are often used to provide additional standards to significant areas of settlements, for example: historic districts, areas of significant landscape values, or ‘main street’ retail areas.

Other types of zoning not typically used in New Zealand include:

- [Incentive zoning](#) is where a basic set of zoning rules and standards is accompanied by a list of additional design options which, if included in a development, will be rewarded through planning incentives (see Section 7.3).
- [Cluster zoning](#) encourages the clustering of development on a large (usually open space) site into a concentrated area of the site rather than spread evenly over the site. This allows both a maintenance of the open space on the majority of the site, and more efficient servicing of the site (either reticulated or on-site). Covenants on the remaining area of land may be used to prevent future development.
- [Form or design based zoning](#) focuses on controlling the form of buildings, more so than land uses. Aspects of building form which may be controlled include: building height and bulk, façade treatments, the location of parking, and the relationship of buildings to the street and each other. Usually, a number of illustrative plans are developed for different building types for different areas of land. These plans are often generated through a public design workshop or charrette. In some cases, permissible uses, stated in general terms (e.g. residential or commercial), are identified for each building type. Figures 6 and 7 provide examples of form based codes.

The New Urbanism and Smart Growth design movements have strongly promoted form-based zoning, in particular, for the following reason.

- Development is better linked to transport corridors than in traditional zoning.
- It recognises that uses may change over time, but the buildings will endure.
- It encourages mixed use development, especially in neighbourhood and town centres.
- It has a greater ability to provide for good urban design.
- It is clearer and more accessible, using graphics and photos instead of lengthy repetitive text. It can thereby avoid arguments over the interpretation of ambiguous language used in traditional planning rules.
- It provides opportunities for effective public participation in designing settlements, as the plans are more readily understood by residents (Katz, 2004; Local Government Commission, n.d.).

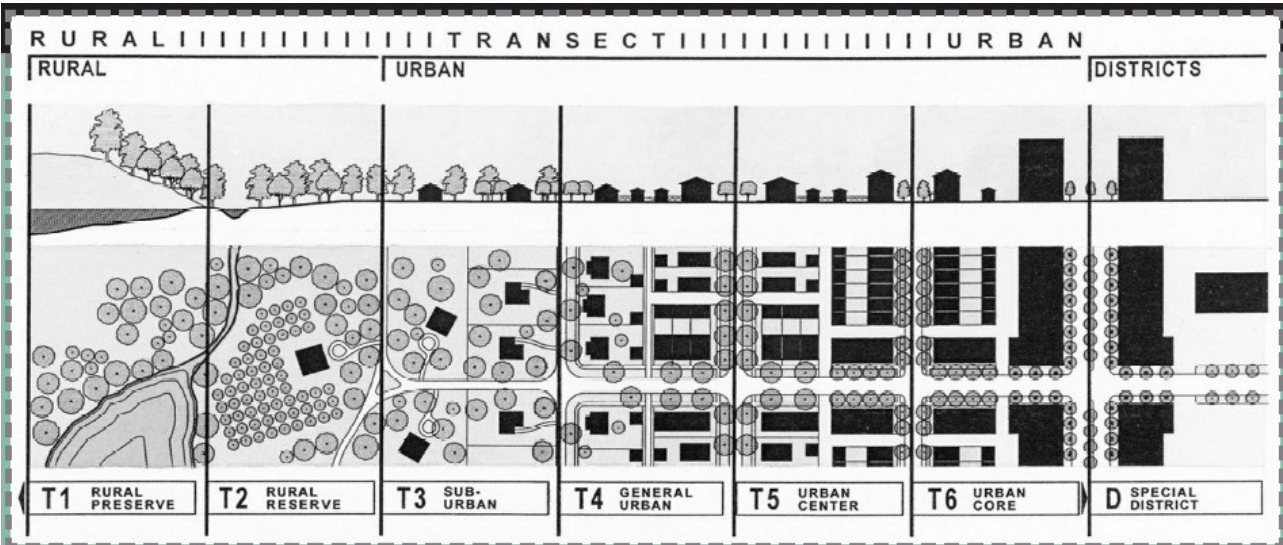


Figure 6. Transect diagram developed by Andres Duany to illustrate different areas of a city to guide form based codes (taken from <http://www.lgc.org>)

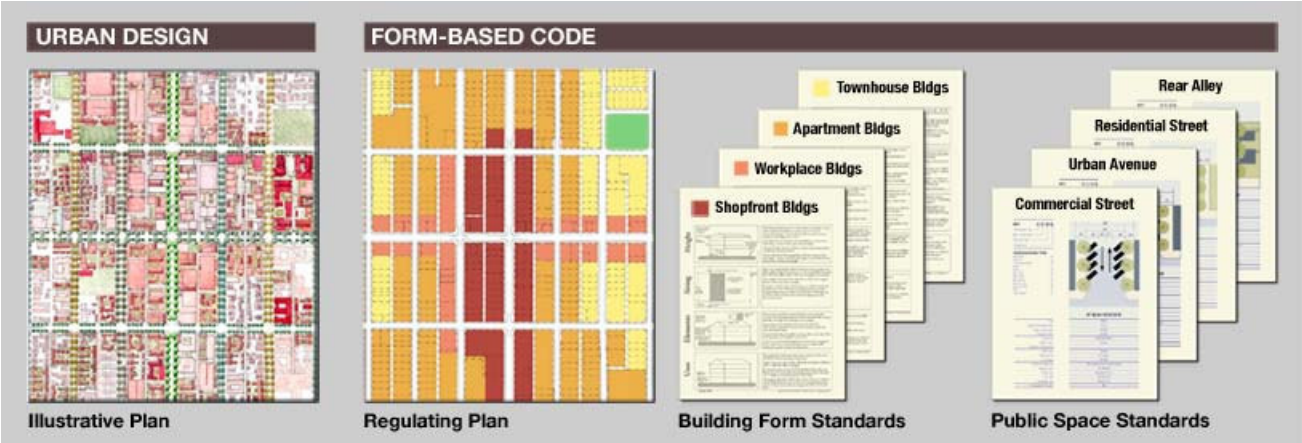


Figure 7. Images of form based codes (taken from wikipedia)

Zoning is often used in conjunction with regulatory standards (rules) and / or guidelines for different zones. However, zoning can also be used in conjunction with economic instruments, for example by creating ‘special activity areas’ or ‘enterprise zones’ in which economic incentives (rates relief, fast-track consent processing, or subsidies) are used to encourage particular types of development beneficial to the community.

7.2 Regulatory (performance) standards and rules

The most common tools for both resource management and urban planning are regulatory (performance) standards and rules. Rules can be of three types:

- **Proscriptive rules** describe what cannot be done, e.g. buildings must not be closer than 4 meters from the front boundary.



- **Prescriptive (open) rules** describe what is expected in terms of standards but leaves it open as to how to achieve the standard, e.g. residential development water discharge from the site must not exceed X amount.
- **Prescriptive (strict) rules** describe what is expected and how it is to be achieved, e.g. new roads must provide onsite swales to collect stormwater, or buildings must be built with some portion of the building touching a build-to-line 4 meters from the front boundary.

One benefit of the first two types of rules is that they provide a great deal more flexibility, and, therefore, more potential for creativity by the developer in meeting the standard. However, they may require regular monitoring of the quality of the effected resources to establish compliance with the standard and, therefore, have higher long-term compliance costs.

The third type of standard or rule directly prescribes the design specification that needs to be achieved. The advantage of this type of rule is that it provides more certainty in terms of outcomes for communities and potentially lower compliance monitoring costs.

Many New Urbanist and Smart Growth advocates are increasingly advocating the use of prescriptive (proactive) rather than proscriptive (reactive) rules and standards, as a way of implementing more coherent urban design principles into settlements. However, advocates also say it is important that architectural creativity and individuality be allowed to occur under a prescriptive framework¹¹. New Urbanists have also advocated different approaches to how 'zones' and 'rules' are geographically applied. They argue the boundaries of zones based on urban design standards need to reflect the importance of different types of streets and town / neighbourhood centres, as well as the 'edges' of settlements. They also focus more on linking rules to different building 'types' rather than just spatial location (see form-based zoning above).

Other examples of proactive rules include:

- **Maximum distance from transit**; for example, to promote public transportation and a reduction in private vehicle trips, the regional plan in Ottawa-Carleton required that: large employment centres (5,000 or more jobs) be located within a 5 minute walk of the transit-way and smaller employment centres (2,000 or more jobs) near all day transit; and shopping centres of more than 375,000 square feet be located within a 5 minute walk of a transit station (TRB, 1996).
- **Minimum densities** are used to ensure the efficient use of land within an Urban Growth Boundary or to guarantee the viability of frequent and accessible public transport and / or neighbourhood retail and services within walking distances.

Overall, zoning and rules have an important effect on urban form and design (both intended and unintended). An example checklist of issues to ask about zoning and rules in relation to the principles of Smart Growth is provided in Figure 8.

¹¹ even though some New Urbanist neighbourhoods have been criticised for encouraging bland and monotonous designs. See for example editorial critique posted at: <http://www.metroactive.com/papers/metro/11.06.03/evergreen-0345.html>



Do the rules and zoning:

- reflect a growth management strategy, in terms of identifying areas that will encourage new housing for a growing population (either through infill, intensification, or greenfield development), while indicating a clear boundary for the developed urban area through strict restrictions on development outside of this boundary?
- provide for the efficient use of land and provision of infrastructure through target minimum densities where appropriate?
- link the location of residential development to employment and retail centres, local services, and transportation links?
- allow for mixed land uses? For example, can housing units exist atop street-level shops, or does the zoning rigidly separate housing, retail, office, and other land uses?
- allow creative solutions to parking challenges? Or do they require excessive amounts of parking?
- encourage new buildings to be built in a way that's compatible with older buildings in the area, for example by providing pedestrian-oriented rather than auto-oriented setbacks?
- permit out-of-scale, poorly designed development; development in the wrong places; too much development, i.e. more commercial or retail space than the local economy can absorb without inordinate displacement of existing businesses?
- require new construction to fit in harmoniously with what's around, or can anything, no matter how incompatible, be built?
- create a streetscape that encourages pedestrian activity and cycling, for example: does it permit drive-through fast-food outlets, or stores surrounded on all sides by carparking? Or does the zoning require landscaping, with trees and bushes, to soften the harsh effects of carparks?

Adapted from www.nationaltrust.org/smartgrowth/toolkit_planning.pdf

Figure 8. Checklist of issues to consider in relation to zoning and rules

In New Zealand, the use of zoning in conjunction with standards and rules as part of regional and district plans prepared under the RMA (1991) is the most common instrument used for the management of urban form and design. However, the rules or 'performance standards' associated with different land use activities (excluding transportation) are often of the proscriptive type, telling people what they cannot do rather than what is desired. Examples of proscriptive rules include performance standards relating to permitted activities within zones, for example: maximum site coverage, minimum distance from boundaries, maximum densities, or maximum height.

Furthermore, many rules in plans are aimed at controlling the potential negative effects associated with development, particularly on amenity, rather than proactively trying to create a sustainable urban form or design. In order to be used for the purposes of achieving a more sustainable urban form in the face of growing cities, a radical change in the nature of zones and rules needs to occur in New Zealand. This changes needs to be driven by policies and objectives focused on achieving sustainability and liveability in a growth context rather than merely maintaining existing levels of amenity.



7.3 Planning Incentives

Planning incentives provide flexibility in the normal land use standards, for example height limit, site coverage, or maximum floor area, in a particular area or on a particular site in exchange for the development providing for a specific community benefit. Planning incentives have been used to encourage developments with public open space, walkways, protection of a heritage building, or provision of affordable housing.

In New Zealand, the Auckland and Wellington district plans have included planning incentives for downtown districts in the form of bonus floor area in developments in exchange for public features such as public artworks, plazas, through site links, or cycle facilities. The reported uptake of these incentives by developers has been high (Paetz and Pinto-Delas, 2007). For example, this type of system was used for the Vero building in Auckland (MfE, 2005b).

7.4 Urban containment policies

Urban containment policies (also known as settlement perimeter restrictions) are measures used to direct growth and control the geographic size of an urban area. These policies are part of a broader array of land-use tools known as **growth management tools**, which are designed to encourage urban development in some areas and discourage it in others.

Urban containment policies seek to direct growth by shaping urban land markets. As such, they are also an economic policy instrument. By drawing a line around an area designated for urban growth and preventing urban development outside of the line, urban containment policies should theoretically raise the price of land inside the boundary and thereby encourage developers to develop at higher densities. Conversely, the price of land outside the boundary should decline, thereby ensuring the economic viability of resource-based activities in these areas (Pendall, Martin and Fulton, 2002). The more tightly drawn and hard to change the boundary, the more dramatic the effect it is likely to have. However, in some cases, for example in Boulder, Colorado and some parts of California in the US, they have been used in conjunction with limits on residential developments (limits on density or limits on building permits) to limit the overall amount of growth as well as to shape it.

There are three main types of urban containment policies:

- **Greenbelts** are designed to be permanent or at least very difficult to change and involve the purchase of land or development rights on open space lands on behalf of the public. They are designed to prohibit urban development in these areas.
- **Urban Service Boundaries (USBs)** are policies which describe where infrastructure provision (water, sewerage) will go to, and when and how it will be extended in the future. USBs are generally used, with rules that prevent subdivision in areas without adequate infrastructure (termed *Adequate Public Facilities Ordinances* or APFOs in the US), to limit the spread of urban development. USBs are designed to be flexible and work over relatively short time periods to control growth, rather than prevent it (Pendall, Martin and Fulton, 2002).



- **Urban Growth Boundaries (UGBs)** are a line between land intended for urban development and rural or other open space land. Unlike greenbelts they are designed to be flexible and generally are created to accommodate growth over a 15-30 year period. They are designed to manage the spread of urban areas and are usually accomplished through differential zoning.

Research from the US has shown that urban growth boundaries can help to redirect urban growth; however, by themselves, they cannot encourage a fundamentally different urban form (Fulton *et al.*, 2006). UGBs are also difficult to set accurately – allocating too much land encourages sprawl and allocating too little land causes land and house price inflation (Knaap and Hopkins, 2001). Furthermore:

- Where UGBs have been used, there is often too much emphasis on whether they contain sufficient land to accommodate 20 years of growth and too little emphasis on how frequently, how much, or under what circumstances UGBs should be expanded.
- Where market factors are used, they have been used inappropriately to increase the size of the UGBs.
- UGBs are likely to work better if expansions occur not after an arbitrary period of time, but when the supply, or the price of land, reaches some critical threshold (for example an event-driven system of inventory control rather than a time-driven system) (Knaap and Hopkins, 2001).

Likewise, the review of urban containment policies undertaken by Pendall, Martin and Fulton (2002) found urban containment policies can have the following negative outcomes:

- significantly raised land prices, although if boundaries encompass sufficient land to accommodate future growth there may not be an inflationary effect.
- “leap frog” development in suburban communities outside the greenbelt if the UGB area is too small, or if conflicting policies prevent increased density inside the boundary or limit overall population size. This is especially a problem if individual cities’ urban containment policies are not integrated into a regional growth strategy.
- an increase in low-density urban development (such as hobby farms) and a continued loss of productive land outside the boundary unless rules governing “rural” development in these areas are strong.
- development encouraged in environmentally sensitive areas that have slack infrastructure capacity (if based on APFOs).

Pendall, Martin and Fulton (2002) also note that the political realities of project approval in terms of opposition to higher densities can prevent UGBs from being effective.

These points are supported by the review of growth management mechanisms undertaken by the ARGF (1999, p.32) which found that “unless metropolitan limits hold and release of future development is tightly staged, [the] intensification part of the strategy will be undermined by [the]



amount of “cheaper” land at the periphery”. This is because the costs of infrastructure provision are less on greenfields sites than infrastructure upgrades on brownfields. Furthermore, price mechanisms will result in greenfields sites being developed at lower densities.

The use of greenbelts is not specifically provided for by any legislation in New Zealand. Nonetheless, several cities, including Wellington and Dunedin, have been developed with greenbelts although these are more of an amenity feature rather than a containment policy. Christchurch has had a green belt policy for 50 years, though with limited success in controlling development (ARGF, 1997).

More specific urban containment policies based on land use zoning and rules are being used to manage growth in the Auckland and Christchurch metropolitan areas as well as the rapidly growing, more dispersed settlements in the Queenstown Lakes District.

In Auckland, the idea of an “urban fence” was first considered in the 1951 regional planning scheme and later included in the Proposed Auckland Regional Policy Statement (RPS 1995). Though initially challenged by the North Shore City Council, the ARC’s ability to set urban limits to control or manage the effects of development was ruled *intra vires* by the Court (North Shore City Council v Auckland Regional Council A070/94 PT 1/9/94). Since then, through a collaborative approach between the councils in the region, the use of a negotiated Metropolitan Urban Limit (MUL) has become an important part of the Auckland Regional Growth Strategy and will be part of an updated RPS. The Auckland MUL has not been without controversy and some have argued that this policy may be contributing to the housing affordability problems in Auckland (Grimes and Aitken, 2005).

The Christchurch City Council (CCC) is also pursuing a policy of consolidation within the existing urban boundary by increasing the permitted density in parts of the city. However, they are also looking at the development of a satellite city in Rolleston, as well as increasing density in other satellite settlements, such as Halswell and Styx.

7.5 Growth caps and moratoria

A more extreme measure to contain urban growth is the use of [growth caps and moratoria](#), which can be in the form of population caps, residential and commercial building permits caps, or temporary moratoria on the issuing of new permits. These measures are usually only used in extreme circumstances where continued growth cannot be accommodated, or the pace of growth has exceeded the ability to service it.

The ability to implement such measures in New Zealand under the RMA has not been tested in the courts and is not available under the Building Act (2004), which is focused primarily on health and safety.

7.6 Urban villages and planned communities

[Planned communities](#) have a long history in the field of urban planning, from Howard’s [Garden City](#) movement (started in 1898) to the more recent New Urbanism movement. New Urbanists promote the idea of communities being designed according to the fundamental principles of accessibility,



community, and self-sufficiency. They promote neighbourhood design that includes the use of medium density, mixed use, mixed tenure, and traffic calming as part of linked mass-transit and pedestrian-oriented nodes of development. Another key principle in the New Urbanism movement is that these communities should be planned in a participatory rather than top-down manner. Planned communities also have the potential to be designed to be more sustainable by incorporating energy efficiency measures, water and waste recycling, and energy and food production (ARGF, 1997).

Planned communities (sometimes referred to as **urban villages**) can be developed within existing urban areas on brown-field sites or on green-field peri-urban sites. They are generally developed either through master plans or structure plans, described below.

At a lower level, plans can also be developed for smaller parts of settlements such as precinct, open space, or streetscape plans. These plans are used to set out specific development objectives for a distinct area (town centre, public space) or street. They can include policies, design guidelines, and / or a plan for the physical configuration of buildings, other structures, and open spaces.

7.6.1 Master plans

Master plans are used by public and private developers to outline their intentions for development on large sites and guide site development. Master plans include information on settlement form, including the physical configuration and phasing of buildings, infrastructure and public / open spaces and, to varying degrees, settlement design. Master plans can be developed for sites ranging in size from a neighbourhood / subdivision to an entire new town.

An example of a master planned community in New Zealand is the new town of Pegasus, north of Christchurch.

7.6.2 Structure plans

Structure plans are a planning tool used by local authorities to outline specific planning objectives for a defined area, which is likely to be in multiple ownership. Like master plans, structure plans are detailed spatial plans that are used to guide the development of particular sites. They are generally made up of a series of maps, plans and / or drawings that detail elements of the proposed plan for development on the site. They usually include the locations, staging, and, sometimes, design of different land uses (including type and density), roads, infrastructure, transportation links, and areas designated for community facilities and open space. Structure plans may also provide background information on different landscape, amenity, cultural, or ecological values on the site that need to be protected, as well as information related to natural hazards or contaminated sites. Structure plans may also have information on how infrastructure is to be funded through developer contributions (www.qualityplanning.co.nz).

Structure plans are typically used to provide a framework for integrated and strategic planning and management in defined areas. They can be used to address particular objectives, for example to manage urban growth and land availability, address the need for inner city revitalisation, or manage development in areas of significant environmental, cultural, social values or natural hazards.



According to the Quality Planning website, structure plans have a number of benefits including their ability to:

- “ensure co-ordinated and compatible patterns and intensities of development in order to manage the effects of development across parcels of land in different ownerships, and between existing and proposed areas of development and redevelopment
- provide a co-ordinated approach to infrastructure provision and other services across land parcels in different ownerships, or over different LA or regional council boundaries
- provide higher levels of certainty to developers, the council, the public and affected parties regarding the layout, character and costs of development in an area earmarked for growth or redevelopment
- ensure that new development achieves quality urban design by defining the layout, pattern and density of new development and transportation linkages” (www.qualityplanning.co.nz).

The use of structure plans is not prescribed in any New Zealand legislation; however, they are accepted by the Court¹² as a technique that can be integrated into the planning functions of councils under sections 30 and 31 of the RMA (1991). As a result, in order to have statutory effect they need to be integrated into the district plan or else they may also be considered as an “other matter” when assessing a resource consent application (www.qualityplanning.co.nz).

Other ways that elements of structure plans can be actioned include the use of covenants on property titles, such as New Zealand Historic Places Trust Heritage Covenants or QEII National Trust open space covenants.

A number of examples of structure plans in New Zealand are provided on the Quality Planning website (www.qualityplanning.co.nz).

7.7 Integrated catchment management plans

An [integrated catchment management plan](#) (ICMP) is another tool being promoted to ensure a more coordinated and strategic approach to planning new development, based on ensuring a catchment-wide approach to storm water management.

There is no statutory requirement to prepare an ICMP in New Zealand; nonetheless, this tool is strongly promoted by the ARC, who provide financial assistance to complete these plans for territorial authorities in their region. The ARC define an ICMP as “a planning tool which investigates a full range of catchment wide effects and risks from storm water discharges to the receiving environment, and recommends options for the management of those effects.” (<http://www.arc.govt.nz>). Used in conjunction with structure plans, ICMPs consider the potential effects of conversion of land on storm

¹² see, for example, *P & K Mitchell and Ors v Waitakere City Council* A21/2000; or *Omokoroa Ratepayers Association v Western Bay of Plenty District Council and the Bay of Plenty Regional Council* (A102/2004).



water run-off, including the loss of permeability and recharge capacity, as well as the effects of storm water discharge.

7.8 Urban design strategies

Urban design strategies are policy documents that set out a comprehensive and high-level vision for developing a neighbourhood, town, or city. They generally include the overall design direction and principles, and the means of implementation. Urban design strategies are used as the basis for shaping more specific policies and design initiatives and are implemented through urban design frameworks, or other instruments such as district plan policies and rules (MfE, 2006).

Urban design strategies have been developed by a number of councils in New Zealand, including Western Bay of Plenty, Wellington CC, Auckland CC and Hastings District Council (see Section 9 for further resources).

7.8.1 Urban design frameworks

Between an urban design strategy and a master plan is an **urban design framework**. Urban design frameworks set out the design vision and general direction for a specific area and are usually used to guide complex projects that are implemented over time, often with both public and private interests (MfE, 2006). Examples of design frameworks in New Zealand include: the Wellington Waterfront Framework, and Tauranga Waterfront and CBD Urban Design Framework (see Section 9 for further resources).

7.9 Design guidelines

Design guides focus on encouraging developers to improve environmental and liveability outcomes by providing design advice on such things as reducing resource consumption, improving building performance, improving residential or town centre amenity, and designing roads to prioritise pedestrians, cycling and public transport.

At the neighbourhood level, design guides are commonly used in New **Urbanist** developments to improve amenity. For example in the New Urbanist town of Celebration, the “Celebration Pattern Book” provides information on building design elements and construction methods to ensure developments fit in with the overall vision for the town (Dudley, 2003).

Local authorities in New Zealand are increasingly using design guidelines as one tool for achieving objectives associated with increased densities and transport-oriented development. Table 11 provides examples of some of these guidelines as well as useful design guides that have been developed internationally. Design guidelines can either be voluntary industry standards or incorporated into district plan performance standards. For example, the proposed Plan Change 2 to the Auckland District Plan sets requirements for minimum apartment sizes and outlook spaces between buildings. The QLDC’s Plan Change 10 also incorporates urban design elements.



Table 11. Examples of guidelines

Name	Description	Access Details
Ministry for the Environment (2002) People, Places, Spaces: A design guide for urban New Zealand.	Outlines both urban design and process principles to achieve good urban outcomes and support sustainable development.	http://www.mfe.govt.nz/publications/rma/people-places-spaces-mar02/index.html Email: publications@mfe.govt.nz Ph: (04) 917 7493.
Ministry for the Environment (2005) Urban Design Protocol	Provides a platform to make New Zealand towns and cities more successful through quality urban design. Part of the Government's Sustainable Development Programme of Action and Urban Affairs portfolio.	http://www.mfe.govt.nz
Auckland City Council (2001) Residential Design Guide for Developments in Residential Zones in Strategic Growth Management Areas	A design guide in response to concerns expressed by the community that future growth, through intensification, will lead to a loss of neighbourhood amenity.	Email: lcstrategy@aucklandcity.govt.nz
Auckland Regional Council (2000) Urban Area Intensification: Regional Practice and Resource Guide	Implementation issues and guidance aimed at improving practice and results of higher density housing.	Email: library@arc.govt.nz Ph: Enviroline 0800 80 60 40 (AK only), or (09) 366 2070.
Auckland Regional Council (2000) Low impact design manual	A leading edge guideline on low impact development practice.	Email: publications@arc.govt.nz
North Shore City Council (2001, 2007) Good Solutions Guide Also: Mixed use development in town centres (2005) Apartments (2007)	A 24-page booklet that provides non-statutory guidelines for property developers and their designers on best practice solutions and designs for intensive housing.	http://www.nsc.govt.nz/
Christchurch City Council (2001) Design Opportunities	Discusses the design perspective behind the planning of central Christchurch.	http://www.ccc.govt.nz/Environment/UrbanDesign/Guides/
Examples of NZ Urban design frameworks	Examples from Wellington City Council, Auckland City Council, and Tauranga City Council	http://www.wellington.govt.nz/plans/policies/waterfront/pdfs/framework.pdf http://www.aucklandcity.govt.nz/council/documents/newmarket/ http://council.tauranga.govt.nz/cm/waterfront/2004/StratigiceDevelopmentFramework.pdf



7.10 Urban design panels

Urban design panels are review panels made up of design experts that provide advice and / or formal assessment of design proposals for significant projects, generally based on design guidelines.

In New Zealand, the ACC has had a design panel since 2002 which includes members from the urban design, architecture, landscape architecture, and property developer professions who are nominated by their various professional organisations (<http://www.aucklandcity.govt.nz>). Manukau City has also recently launched an urban design panel to provide professional advice and expertise for a range of development projects within the city, including civic works, concept plans, and policies affecting the physical environment.

7.11 Advantages and disadvantages of urban planning instruments

Table 12. Advantages and disadvantages of urban planning instruments

Instrument	Advantages	Disadvantages / Cautions
7.1 Zoning	<ul style="list-style-type: none"> separates activities that are likely to conflict 	<ul style="list-style-type: none"> may concentrate negative effects (pollution) in small areas endangering workers in those areas² can lead to increased speculation in the land market²
7.2 Standards and rules	<ul style="list-style-type: none"> a common and generally accepted method that is well-catered for in legislation and planning processes can provide certainty in terms of environmental outcomes 	<ul style="list-style-type: none"> can involve significant monitoring and enforcement costs⁴ 'impact' standards may be hard to quantify for many environmental values, such as amenity and landscape^{4,1} uniform national, or regional standards can be too generous for some cities and too severe for others rules designed to address one issue (for examples, rules on distances between residential dwellings to reduce noise nuisance or protect access to light) can create negative side-effects in the form of low-density urban sprawl² can result in cities pursuing "beggar-thy-neighbour" policies by relaxing their standards in comparison to other cities to attract more industry and employment²



Instrument	Advantages	Disadvantages / Cautions
7.3 Planning incentives	<ul style="list-style-type: none"> enables local government to secure public and environmental benefits without spending public funds⁶ more likely to have support of building industry⁶ 	<ul style="list-style-type: none"> difficult to find balance where incentives are attractive enough to developers but do not result in unacceptable adverse effects on amenity and environmental values⁶
7.4 Urban containment policies	<ul style="list-style-type: none"> are effective at increasing densities¹ have been shown to increase regional amenity levels¹ maintain separation between towns⁴ can be used to maintain agricultural land close to cities⁴ easily communicated to the public⁴ can be used to increase housing density⁴ promote efficient use of infrastructure and transport and reduce cost of infrastructure provision⁴ 	<ul style="list-style-type: none"> can raise land prices¹ can lead to “leap frog” development¹ need strong rules governing “rural” development outside of boundary¹ can be costly to local authorities if they are required to purchase land⁴ best if UGBs are only extended when there is a real need for more land³ can be seen as inequitable, leading to an unfair distribution of windfalls and losses work best if part of a national (as in England and Korea) or regional growth strategy^{3,4} work best in conjunction with other policy instruments (zoning, standards) that aim to increase density inside the boundary⁴
7.5 Growth caps and moratoria	<ul style="list-style-type: none"> can be used to match population and facilities / services⁴ can provide clear justification for approval or denial or projects⁴ 	<ul style="list-style-type: none"> Can be costly to developers⁴ Can encourage developers to build large costly housing and thereby increase property prices, although policies exempting affordable housing projects can be used to overcome⁴ can have negative effect on surrounding communities⁴ potential ‘exclusionary effect’⁴



Instrument	Advantages	Disadvantages / Cautions
7.6 Planned communities	<ul style="list-style-type: none"> • proactive rather than reactive⁴ • potential to achieve a number of planning objectives, including increased densities, support for public transit, walkability, amenity 	<ul style="list-style-type: none"> • requires a high degree of design input⁴ • possible market resistance to prescriptive approach⁴ • potential hostility to increased densities within the community⁴ • needs coordination across territorial authority boundaries⁴ • potential for plans based on voluntary agreements to be ignored⁵ • need buy-in from all relevant stakeholders including landowners and service / infrastructure providers
7.7 Integrated catchment management plans	<ul style="list-style-type: none"> • takes a strategic catchment level approach to storm water management 	<ul style="list-style-type: none"> • may require coordination and cooperation across jurisdictional boundaries
7.8 Urban design strategies and frameworks	<ul style="list-style-type: none"> • sets out a clear design vision and direction 	<ul style="list-style-type: none"> • dependent on the quality of the vision • needs to respect local differences and still allow for individual creativity and innovation
7.9 Design guidelines	<ul style="list-style-type: none"> • provide useful guidance that can be used by developers, decision-makers and the public alike • can be adapted to suit local circumstances 	<ul style="list-style-type: none"> • may be ignored unless mandatory.
7.10 Urban design panels	<ul style="list-style-type: none"> • bring together experts who can help developers ensure major developments follow good urban design principles. 	<ul style="list-style-type: none"> • important to get the right mix of members who can work with developers to ensure good outcomes in a way that does not discourage investment.

Table References: ¹ Pendall, Martin and Fulton (2002); ² Button and Pearce (1989); ³Knaap and Hopkins (2001); ⁴Auckland Regional Growth Forum (1997); ⁵www.qualityplanning.co.nz; ⁶ Paetz and Pinto-Delas (2007)



8 Concluding remarks

The purpose of this document has been to introduce a range of methods and tools (public policy instruments) that can be used to promote the sustainable management of settlement form, including examples from overseas and New Zealand. This report is not meant to be an exhaustive list of all tools and there are numerous other examples of tools in practice that have not been included here.

As was emphasised at the start of this document, encouraging sustainable urban form generally requires not just one, but a package of instruments. Furthermore, it is the mix of instruments and the way in which they are applied that will determine the outcomes in terms of sustainable urban form. Delivering a package of instruments successfully requires integration both vertically and horizontally within and between local and regional authorities, central government, other authorities (particularly transport and infrastructure), and community services.

For example, one of the major issues facing New Zealand is the lack of 'affordable housing'. In order to address this issue, the Minister of Housing Chris Carter in 2006 suggested the use of a package of instruments including:

- inclusionary zoning - where a district plan requires affordable housing in new developments, typically 10 to 15%
- financial contributions - where a developer who does not wish to include affordable housing in a development pays a levy instead that goes into a fund to provide affordable housing
- density bonuses - which reward developers for the provision of affordable housing by permitting more intensive development than they might otherwise be allowed
- linkage fees - where levies are collected from non-residential and sometimes 'market rate' residential developments for use in building lower cost homes
- fast-tracking consents - waiving resource and building consent fees, and concessions on LA rates for developers committing to building affordable housing.

As another example, if a major outcome is to encourage a modal shift away from private vehicles to public transportation and non-motorised transportation, a package of instruments might include:

- urban growth boundaries to encouraged increased density within the UGB
- zoning for more intensive and mixed development near transit stations (including higher residential densities, employment, commercial, and retail)
- performance standards to require major activity centres to be located near transit
- subdivision design guidance or rules to ensure good road connectivity, walking / cycling friendly street design, and integration of residential areas with existing or new transit stops
- rules restricting on parking supplies in the CBD to discourage trips to the CBD by car



- ensuring transportation funding is prioritised for projects designed to increase public transit, ridesharing, and non-motorised travel
- design guides for areas around transit stations, for example requiring parking at the rear of buildings, retail on the ground floor, and facades oriented to transit corridors
- investing in improved public transit infrastructure including bus shelters, train stations, or quiet gas-powered buses
- rules limiting the amount of parking in government buildings
- siting public facilities such as government offices, convention centres, museums, and libraries near major transit stations as 'anchor' tenants
- using development corporations or public-private partnerships to guide development of major station areas
- locating community-assisted housing near transit.

If an objective is to encourage infill development and / or redevelopment of particular urban areas, a package might include:

- a waiver or discount of resource and / or building consent fees in the target areas or for redevelopment of historic or underutilised buildings
- rates relief for intensive uses
- grants or loans
- assistance with consent process and / or consents 'fast tracking'
- changes to district plan policies, objectives, and rules (small lot size, intensive uses, mixed use, height and distances from boundaries)
- investment in infrastructure and public services and amenities
- expanded subsidised public transportation programmes.

In conclusion, in order to move to a more sustainable urban form, the challenge to urban planners and others is to:

- Think outside the square.
- Recognise that you can not act alone. Any actions to manage urban form must be designed and implemented through a collaborative and regional approach that involves all areas of local government, key government and private service providers, transportation agencies and providers, and major developers.



- Rather than reinvent the wheel, learn from the ideas tried in other cities (both successes and failures), but also recognise that tools developed overseas might not work in the same way in the New Zealand context.
- Collaborate nationally to share ideas and monitor trends in New Zealand, including evaluating the effects of different policy interventions on urban form and design.



9 References and further resources

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9.2 Further resources

9.2.1 General resources

Name	Description	Access Details
Sustainability Databases New Zealand	A comprehensive list of sustainability-oriented information, including information on urban form and design. Includes links to web-accessible information. Last updated in 2004.	http://www.sustainable.wellington.net.nz/Sustain_DB/index.html
UK Office of the Deputy Prime Minister: Sustainable Communities Website	Provides information on actions in the UK to promote sustainable communities	http://www.odpm.gov.uk
Smart Growth on-line	A website developed by the Smart Growth Network that has information about Smart Growth principles and design guides.	http://www.smartgrowth.org
International Institute on Sustainable Development	A Canada based organisation, founded in 1990 that provides information and policy recommendations on sustainability, including natural resource management and measurement issues.	http://www.iisd.org
Smart Communities Network	US-based, Smart Growth-oriented site, which provides resources, tools, links to articles and publications, and community success stories on a variety of topics including: community energy, green development, sustainable business, and land use planning.	http://www.iso14000-iso14001-environmental-management.com/iso14000.htm
The Sustainable Communities Network	A US-based site with information on methods and tools for achieving sustainability as well as links to case studies in the US.	http://www.sustainable.org/information/aboutsuscom.html
EcolQ.com: The Ecogateway Anthologies	Provides links to papers and other web-based information on Sustainable and Livable communities	http://www.ecolq.com/onlineresources/anthologies/sustainable/communities/
California Energy Commission Place ³ s site	PLACE ³ S, an acronym for Planning for Community Energy, Economic and Environmental Sustainability, is an innovative planning method that fully integrates focused public participation, community development and design, and computer-assisted quantification tools (GIS) to help communities produce plans that retain money in the local economy, save energy, attract jobs and development, reduce pollution and traffic congestion and conserve open space.	http://www.energy.ca.gov/places/



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Name	Description	Access Details
	PLACE ³ S creates an information base that functions as a common yardstick, empowering a community to compare components of each plan	
United States EPA Green Communities	Provides information on undertaking a visioning process including the development of community action plans	http://www.epa.gov/greenkit/
Centre for Livable Communities	A US-based LG partnership which developed and advocates a set of principles for development of sustainable and livable communities. Site offers an number of resources on land-use, energy, transport, waste reduction and participatory planning	http://www.lgc.org/center/about/center.html
Building Better Communities Network	US-based site with links to information on planning and design (with a particular emphasis on inclusive policies and affordable housing), as well as information on community building and conflict resolution.	http://www.bettercommunities.org
Local Government Commission	A site with a range of information on liveable communities, energy efficiency, green building, solid waste and many other sustainability topics	http://www.lgc.org/
Canada Mortgage and Housing Corporation	A useful site with information on a range of sustainability related topics including: case studies of residential intensification, brownfield redevelopment guidelines, design guidelines and participatory techniques (some documents are available for sale only)	http://www.cmhc-schl.gc.ca



9.2.2 Strategic policy development and planning

Name	Description	Access Details
Australian ACT Office of Sustainability	This site provides access to the ACT government's sustainability policy, and first sustainability report, and the <i>Canberra Plan</i> , which outlines the Government's vision for Canberra.	http://www.sustainability.act.gov.au/
Government of Western Australia	Provides information on Western Australia's state-wide sustainability strategy.	www.sustainability.dpc.wa.gov.au
UK Office of the Deputy Prime Minister (ODPM) site for Planning Guidance	This site contains government guidance for local and regional planning in Britain, plus information about the Sustainable Communities programme and sustainability appraisal of the new 'Local Development Framework' approach to planning at a local level.	http://www.odpm.gov.uk

9.2.3 Community involvement, collaboration and partnerships

Name	Description	Access Details
Citizen Science Toolbox	An electronic toolbox of public participation tools by the Australian Coastal Crown Research Centre	http://www.coastal.crc.org.au/toolbox/index.asp
The Community Planning website – Royal Town Planning Institute and Office of Deputy Prime Minister (UK)	Comprehensive website detailing principles, methods and examples of international best practice for community planning. Aimed at residents, policy makers, and development professionals.	http://www.communityplanning.net/index.htm
Participatory Planning Monitoring and Evaluation – Managing and Learning for Impact in Rural Development	Website owned by Wageningen International. Site explains theories, methods and approaches to participatory planning.	http://portals.wdi.wur.nl/ppme/
Local e-democracy – National government funded UK project	Explores how new technologies can change the way councils engage and work with their citizens e.g. e-consultation, electronic petitions, web-blogs, online councillor surgeries, etc.	http://www.e-democracy.gov.uk/knowledgepool/



Name	Description	Access Details
Queensland Government's "Get involved" site	Information about community engagement in Queensland, including Queensland's Community Engagement Improvement Strategy, evaluation methods and examples of key engagement initiatives utilised.	http://www.getinvolved.qld.gov.au/share_our_knowledge/improvement/strategy/engaging.html
Participation Works! (New Economics Foundation and UK Community Participation Network)	Details 21 techniques of community participation and explores this issue and the need for community participation in detail.	www.dundeecity.gov.uk/ce/participation.pdf
Placematters website (US)	Dynamic database site containing resources for better community design and decision making. For use by planners, public agencies, and residents.	http://www.smartgrowthtools.org/index.php
Research Highlights paper (Socio-Economic series)	Paper 'Sustainable Community Planning and Development: Design Charrette Planning Guide'	http://www.cmhc-schl.gc.ca/publications/en/rh-pr/socio/socio103-e.pdf
MfE Urban Design Toolkit	Explanation of public-private partnerships and town centres programmes with useful links to public-partnership websites in US, Canada, UK and United Nations.	http://www.mfe.govt.nz/publications/

9.2.4 Impact assessment

Name	Description	Access Details
Sustainability options on-line conference	Australian online conference (2005) on sustainability assessment	http://www.naf-forum.org.au/papers.asp
Western Australia's Sustainability Website	Contains information on sustainability and WA's strategy, policies, and programmes and actions to address	http://www.sustainability.dpc.wa.gov.au/

9.2.5 Monitoring

Name	Description	Access Details
International Institute on Sustainable Development	Compendium of sustainability indicator initiatives	http://www.iisd.org/measure/compendium/



Name	Description	Access Details
Sustainable Measures	A website by Maureen Hart ,a consultant who works with community indicators	http://www.sustainablemeasures.com/
Canadian Sustainability Indicators Network	A site for indicator practitioners to exchange information and insights	http://www.csin-rcid.ca/main_e.htm
British Columbia Sprawl Report	An example of a set of indicators of urban sustainability based around an urban form index, liveability index, and economic vitality index.	http://www.smartgrowth.bc.ca
Global Reporting Initiative (GRI)	GRI is a multi-stakeholder process and independent institution linked with the UN Environment Programme. Its mission is to develop and disseminate globally applicable sustainability reporting guidelines for reporting on economic, environmental, and social well-being.	www.globalreporting.org
Ministry for the Environment: Tools and guidelines for monitoring the environment	The website of the MfE has comprehensive information and links relating to State of the Environment monitoring in New Zealand.	http://www.mfe.govt.nz/state/monitoring/index.html

9.2.6 Modelling

Name	Description	Access Details
EMPACT (environmental monitoring for public access and community tracking) site	Reviews a number of models including: METROPILUS, California Urban Futures (CUF-1) (CUF-2); What if? Model, SmartPlaces, TRANUS, and UrbanSim	http://gis.kent.edu/gis/empact/lit_urb_home.htm
SimCentre	Site which provides links to a number of CAD, GIS, and modelling tools.	http://www.simcenter.org/Resources/Tools/tools.html
Orton Family Foundations	Smart Growth tools site contains an electronic toolbox of planning tools including several participation tools, mapping, and modelling tools.	http://www.smartgrowthtools.org/index.php
The International Environmental Modelling and Software Society	Includes proceedings from their 2002 and 2004 conferences	http://www.iemss.org/



Name	Description	Access Details
Lee <i>et al.</i> (1999) Literature review for urban growth modelling and environmental impact analysis	Review of various modelling systems	http://gis.kent.edu/gis/empact/filelib/review.pdf

9.2.7 Economic Instruments

Name	Description	Access Details
Economic instruments and environmental policy website	Non-technical website hosted by University College Dublin and supported by the EU. Contains definitions, details of use and performance of different economic instruments.	www.economicinstruments.com
Auckland Regional Growth Forum 'Key Mechanisms for Implementation'	Appendix III contains scope and application of economic instruments, including definitions and characteristics.	www.arc.govt.nz
Role of Economic Instruments in Managing the Environment	Australian Industry Commission staff research paper covering the range of economic instruments, their uses and limitations.	www.pc.gov.au
Economic instruments in environmental policy database	OECD and European Environment Agency developed database of market based instruments.	www1.oecd.org and www.europa.eu.int
Kirkpatrick (1999) Financial Contributions and the Law: An overview	An article which overviews the concept of financial contributions and the provisions under the RMA (1991).	http://www.qualityplanning.org.nz/pubs/3627.pdf

9.2.8 Urban Planning

Name	Description	Access Details
NZ Quality Planning website	Information and guidance for New Zealand planners on plan development, monitoring, consents, and other plan topics, includes specific information and guidance relating to structure planning in NZ.	http://www.qualityplanning.org.nz
Auckland Regional Council (2005) Structure Planning: A regional practice and resource guide	A guideline on structure planning in NZ.	http://www.arc.govt.nz/arc/publications/technical-publications/structure-planning.cfm



Name	Description	Access Details
Ministry for the Environment (2005) Urban Design Case Studies – New Zealand Urban Design Protocol	Contains a number of examples of master planned communities	http://www.mfe.govt.nz
CABE (2004) Creating Successful Masterplans: A guide for clients	Provides general information about masterplans best practice as well as case studies	http://www.cabe.org.uk
Ministry for the Environment (2002) People + Places +Spaces: A design guide for urban New Zealand	Information about design principles and preparing an urban design strategy.	http://www.mfe.govt.nz
Various examples of NZ urban design strategies	Examples from Western Bay of Plenty, Wellington City Council, Auckland City Council, and Hastings District Council	http://www.rveny.gov/planning/Reports/Street%20Report%20Final.pdf http://www.wellington.govt.nz/plans/policies/urbandesign/ http://www.aucklandcity.govt.nz/council/documents/urbandesignstrategy/background.asp http://www.hastingsdc.govt.nz/policiesandplans/huds/
Armadale Redevelopment Authority	Examples of sustainable urban form used in the Armadale Redevelopment, including: use of rainwater tanks plumbed to toilets and cold water washing machine outlets, an implementation strategy for sustainability, and an online sustainability audit assessment tool.	http://www.landcorp.com
PETUS project	Internet site with information on a range of urban planning methods and tools	http://www.petus.eu.com/
Planetizen	A public-interest information exchange for the urban planning and development community. Urban planning and development news, job opportunities, commentary and events. Contains a comprehensive links section.	http://planetizen.com/



Name	Description	Access Details
UK Planning Portal	UK government's portal site for information on planning process and guidance for professional planners, for example best practice guidance on urban design	http://www.planningportal.gov.uk
Congress for New Urbanism	Site with links to information on New Urbanism	http://www.cnu.org/
Sipe and Gleeson (2004) Making a difference with metropolitan strategy: Overseas experience	A paper which reviews North American and European metropolitan planning in order to inform an Australian audience about policy options	http://www.gu.edu.au
Local Government Commission	Information on form based codes	http://www.lgc.org
Form-based codes alliance	Information on form based codes	http://www.formbasedcodes.org
Getting to Smart Growth: 100 policies for implementation	A guide to implementing the 10 principles of smart growth, aimed at policy makers who want to implement smart growth. Highlights and describes techniques for putting theory into practice.	www.smartgrowth.org
Western Australia's Liveable Neighbourhoods Design Code	An operational policy for design and assessment of subdivisions and structure plans.	www.wapc.wa.gov.au
Southface: green building design specifications	Site with information on green building design	www.southface.org
Building Research Association of New Zealand, Fletcher Challenge, and Forest Research (2000)	An introduction to Smart Growth, including the critical success factors for Smart Growth in the NZ context.	Email: rachelhargreaves@branz.co.nz Ph: (04) 237 1170.
Gow (2000) Curbing the sprawl: Urban growth management in the United States - lessons for New Zealand.	A review of case studies of approaches to managing growth from a study tour to the US	http://www.mfe.govt.nz



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