

Is policy leading to improved sustainability at the local urban scale?

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Abstract: *In New Zealand, urban growth strategies and environmental policies at national and regional levels are influencing urban transformations at the local scale. Intensified residential and mixed use developments are emerging at growth nodes as outcomes of the Auckland Regional Growth Strategy 2050. The New Zealand Urban Design Protocol identified significant influences from government legislation, strategies and policies on urban design and the built forms at local level. The national walking and cycling strategy indicates that supportive local-scale layout and design in both existing and new developments could significantly influence travel behaviour. One of the six goals of the National Energy Efficiency and Conservation Strategy is to reduce local environmental effects of energy production and use. The Urban Form Design and Development (UFDD) work, part of the “Auckland Sustainable Cities Programme” under the NZ Sustainable Development Programme of Action (NZSDPOA), focussed on policy mechanisms to drive sustainable urban form at the local scale in the Auckland Region. Using a case study-based approach, this paper investigates how national and regional policies influence the environmental sustainability of emerging local residential forms at this scale, especially in the Auckland Region. Three selected case studies are examined in terms of: applied urban design principles; design characteristics including street patterns, subdivision layouts and open space provisions; density of development; potential and actual renewable energy use and available transport options. A comparison of the New Zealand approach to sustainable urban forms with an international zero energy residential development is made. Results indicate the policies could influence emerging local-scale urban forms in varied manners generating significantly different contributions to environmental sustainability.*

1 Introduction

New Zealand is one of the most highly urbanised countries in the world, with 87% of the total population living in urban settlements (Ministry for the Environment (MfE), 2005a, p. 2). The Auckland Region, New Zealand’s largest urban area, is rich in cultural diversity, and reflects the economic performance of the country as a whole (Ministry of Economic Development and Auckland Regional Council, 2006, p.1). Almost one-third of the total population lives in this region, which is currently experiencing rapid population and urban growth. Urban sustainability and the sustainability of urban Auckland in particular, form part of a number of national and regional policies, programmes and strategies. Using a case study-based approach, this paper focuses on how these policies influence the environmental sustainability of emerging residential forms at local scale in the Auckland Region.

2 Current Urban Sustainability Policies

2.1 National Policies

In New Zealand, the Resource Management Act 1991 focuses on the sustainable management of resources and puts emphasis on the effects activities will have on the environment, rather than on the activities themselves (Parliamentary Counsel Office 2007a). New Zealand’s first National Energy Efficiency and Conservation Strategy focussed on promoting energy efficiency aims to reduce local environmental effects of energy use and to develop more efficient urban forms and systems (Ministry for the Environment (MfE), 2001, pp. 3–4). The New Zealand Transport Strategy, 2002, recognises transport systems as the key driver for urban development. Achieving long-term environmental sustainability in the transport sector is crucial. The national walking and cycling strategy indicates that supportive local-scale layout and design in existing and new developments, new subdivision standards and codes encouraging walking and cycling, and appropriate District Plan land-use and planning policies could all significantly influence travel behaviour (MoT, 2005). Use of

transport energy is being reduced and walking and cycling promoted in the Auckland Region by strengthening public transport links, upgrading railway stations (such as Papatoetoe and Glen Innes), providing park and ride facilities, revitalising town centres, designing pedestrian friendly neighbourhoods, creating walking and cycling tracks, and locating high density living close to public transport facilities. The Environmental Capacity Analysis (ECA) framework developed by Waitakere City Council with the MoT will help calculate how changes in any local urban environment will affect the specific amount of vehicle emissions (MoT, 2002, pp. 43–48). Investigations into more sustainable settlement form and the barriers to achieving this are already underway, for example, Low Impact Urban Design and Development (LIUDD) (Landcare Research, 2006), Learning Sustainability (Opus International Consultants Ltd *et al.*, 2006) projects and Beacon Pathway Ltd (Easton *et al.*, 2006). The Building Act 2004, a performance-based code, focuses on better, building and design practices and to provide greater assurance to all building owners and users that a building achieves compliance with the standards set out in the Building Code (Parliamentary Counsel Office 2007b). Under the Resource Management Act (RMA) 1991, all the local authorities have a responsibility to prepare and District Plans and regional authorities prepare regional plans and regional policy statements (Parliamentary Counsel Office 2007a). Under the Local Government Act 2002, all Councils require must have a Long Term Council Community Plan (LTCCP) (Parliamentary Counsel Office 2007c). These national and regional policies significantly shape local urban development and urban design characteristics in different areas of a region.

The NZ Sustainable Development Programme of Action (NZSDPOA), launched by the Government in 2003, focuses on four key issues: water quality and allocation; energy; sustainable cities; and child and youth development. Under this programme, Ministry for the Environment (MfE) initiatives, such as the “New Zealand Urban Design Protocol” and “Auckland Sustainable Cities Programme”, promote sustainability of urban settlements and have national and regional components. The New Zealand Urban Design Protocol identifies seven design qualities: context; character; choice; connections; creativity; custodianship; and collaboration. Together, it is said these will provide quality urban design for developing sustainable urban patterns (MfE, 2005a, pp. 4–9). The New Zealand Urban Design Protocol has initiated nation-wide urban design considerations for urban developments applicable at local scale, and different signatory organisations are taking the lead in formulating their organisation-specific action plans. The “Auckland Sustainable Cities Programme”, a pilot for sustainable development, was a partnership between the Auckland Region’s seven local councils, the regional council, a number of central government agencies, and local communities. Out of six ‘work-strands’, “Urban Form, Design and Development (UFDD)” and “Transport and Urban Form (TUF)” encompassed the physical form and functions of a city. The desired outcomes of UFDD included: sustainable building standards and practice; increased understanding for buy-in to sustainable urban form; connection of urban research and practice that encourages uptake; and evaluation of strategic public investment decisions.

2.2 Auckland Regional Policies

After extensive consultation with stakeholders and communities, the Auckland Regional Growth Strategy 2050 (ARGS) was adopted by the Regional Growth Forum (RGF), a body representing all 8 territorial local authorities, in 1999. To promote environmental sustainability, the strategy supports compact urban environments and sets a goal of containing 70% of growth to 2050 within existing urban areas (RGF, 1999, p. 38). It is a major policy document for the Auckland Region and is currently undergoing a further

review process. The ARGs specifies a range of housing choices based on dwelling types and density in urban areas: detached houses; terraces and townhouses; low-rise apartments, and high-rise apartments (ARC, 2003b; RGF, 1999, p. 40). The fastest growing dwelling type is flats or houses joined to a business or shop, a mixed use development; this type grew by 78% between 1991 and 2001 (ARC, 2003a, p. 3). Mixed-use developments contain different activities, residential, business, retail etc, sharing premises and within the same area (RGF, 1999, p.3). However, 78% of all permanent private dwellings in 2001 are detached houses, a situation that has not changed since 1991 (ARC, 2003a, p. 3). ARGs has promoted development of intensified and medium-density housing, specific built forms such as apartments, terrace houses and townhouses, and mixed use developments at growth nodes in suburban and inner city locations. 'The Unit Titles Act, 1972' is regarded as a forward-looking measure to lessen urban sprawl and encourage high-rise developments within city environments (Alston et al., 2000, quoted in RGF, 2003b, p. 11). The Auckland Regional Land Transport Strategy 2005 aims to support the ARGs by providing an integrated, safe, responsive and sustainable transport system to intensified and mixed use areas in nodal centres and corridors within existing urban areas; employment nodes and in future urban development areas (ARC, 2005).

The Auckland Regional Affordable Housing Strategy, 2003, is based on the premise that good housing is essential for strong communities. The strategy suggests that suitable and appropriate housing should be designed to be aesthetically pleasing, energy-efficient, private, of good quality construction materials, integrated into a safe neighbourhood, and adaptable to changing needs. It should also be suitable for the specific needs of the household and with access to passenger/public transport, work, school, shopping and community facilities. Affordable housing has a complex relationship with the implementation of the ARGs and focuses on the probable effects of intensification. There is concern that if housing is built at higher than 'normal densities' in inappropriate locations, the public may reject these developments. Future intensification within existing urban areas could create additional development pressures leading to increases in the house prices. These may force low income households to move to apartments, terrace houses and duplexes, which may be perceived as potential future urban slums (RGF, 2003a, pp. 8–10, 22). Planning mechanisms such as "inclusionary zoning" and difficulties of implementing incentive-based mechanisms such as "density bonuses" in Auckland may result in unacceptable environmental effects (RGF, 2003a, pp. 39- 40). 'Inclusionary zoning' is a mandatory technique where a certain proportion of housing is provided for low-income households as affordable housing in a new housing development or on another site or the contributions are made in cash or land (RGF, 2003a, p. 39). The 'Density bonus' is a common tool, where builders are allowed to build at a greater density than permitted in exchange for providing affordable housing in the development (RGF, 2003a, p. 40).

The above discussion (sections 2.1 and 2.2) suggests implementation of policies and strategies such as the Auckland Regional Growth Strategy 2050, New Zealand Urban Design Protocol, Auckland Regional Land Transport Strategy, 2005, Auckland Regional Affordable Housing Strategy, 2003, District Plans, Regional Plans and other relevant ones would be likely affect the sustainability and character of built forms and community structures at the local scale. The local scale is the building block of urban areas. This paper investigates three selected local-scale case studies from three different cities in the Auckland Region.

3 Sustainability at the Local Urban Scale

One way of categorising urban forms is through some kind of classification system. A recently developed urban taxonomy or settlement classification system provides a framework for categorising urban forms, both existing and emerging. It comprises five urban scales, identified in the New Zealand context: metropolitan/regional; sub-metropolitan/city; community/neighbourhood; residential block/local scale and houses/micro-scale (Ghosh & Vale, 2006). A community or neighbourhood may contain a population ranging from 5,000 to 10,000 people or 1,200 to 3,000 households (assuming an average household size of 2.9 for the Auckland Region). On the other hand, a local scale residential block may contain a population ranging from 150 to 650 people or 50 to 200 households (Ghosh, 2004, p. 226). The classification at this level considers density, zoning and residential form linked to the urban design scale. The different objective measures of urban design, for example, building height, width, height uniformity; set backs; historic building design; mix and enclosure provide a measure of building design while tree canopy, shade, topography, etc., provide a measure of the environmental context of residential form (Knaap et al., 2005). As a result of infill or high density developments, current development patterns at the residential local scale in the Auckland Region are often mixtures of one or more categories.

4 Case Studies

Many new forms of urban developments have been constructed in the Auckland Region since the Auckland Growth Strategy 2050 was adopted in 1999. This paper investigates emerging local residential urban forms built in recent years. Three case studies of varying densities, patterns and regional locations were selected from the Auckland Region. Two of the case studies are situated on suburban edges; one is in the central business district (CBD) of Auckland. The developments are:

- Greenwich Park, Grafton, Auckland City
- Addison, Takanini, Papakura District
- Earthsong Eco-Neighbourhood, Swanson, Waitakere City

These case studies were examined in terms of: applications of urban design principles; design characteristics, subdivision layouts and open space provisions; density of development; potential and actual renewable energy use and available transport options. These factors are chosen because urban design characteristics, subdivision layouts and open space provisions determine overall quality while potential and actual renewable energy use and available transport options are linked to sustainability of the built environment. Specific urban design applications and design characteristics investigated include: pedestrian connectivity; vehicular and pedestrian segregation; local street patterns; views; site planning; urban design characters creating distinctive urban forms; links with the surroundings; public and private spaces created within the built form and aesthetics. Potential and actual renewable energy use looked at the possible sustainability contributions of solar water heaters, photovoltaic modules and solar passive design in the case studies. Available transport options considered the locational efficiency of the case studies in using public transport for increased sustainability.

4.1 Greenwich Park, Grafton, Auckland

At the corner of Symonds Street and Khyber Pass Road, Greenwich Park is a mixed-use high-density, medium-rise, gated, two-level terraced residential development with 85

attached predominantly two-bedroom town houses. It has a calculated site area of approximately 1.53 hectares, dwelling density of 56 dwellings per hectare, lot sizes of approximately 300–350 m², and is located in a precinct adjacent to the SH1 motorway. It was developed by World Capital Partners and was completed in 2000 (World Capital Partners, 2006). Auckland City has a non-statutory code of urban subdivision and development for all categories of land uses within the central city and the Auckland isthmus (Auckland City Council, 1999a) and a statutory Operative Auckland City District Plan 1999 for the isthmus section (Auckland City Council, 1999b). Such local policies in addition to regional policies significantly shape local urban forms in the Auckland Region. In Greenwich Park, intensified development with attached townhouses in clusters and impervious areas devoted to car parking dominate the overall design. Some views of the Hauraki Gulf and Auckland CBD can be seen from the development. There are narrow strips of landscaped area in front of each house and each house has a private courtyard bounded by a high fence which acts as a visual barrier and segregates one house from the next. The front façades of the town houses are hidden, either behind a series of carports attached to the houses or behind high fences. The repetitive built forms with courtyards and the same colour scheme for all the buildings look monotonous. The built form and its immediate environments do not integrate appropriate urban design principles in site planning. For example, a pedestrian pathway is segregated from the houses as it runs through a rear alley between high fences.



The landscaping and open space areas are located along the boundary of the site. Although the open space along the motorway is designed to act as a noise buffer, the development is still subject to considerable motorway noise. The internal streets are designed to provide access to carports and houses. There are some pedestrian paths and alleys within the site for walking to the open space areas. Pedestrian pathways completely lack connectivity and do not

Fig 1: Site Plan, Greenwich Park,

Auckland promote walkability. There is no segregation of pedestrian and vehicular traffic within the site. The floor area of the typical two-bedroom, two-level town house is approximately 100 m².

In terms of sustainability of the built structures, the northern façades of the town houses have a significant amount of glazing, while southern façades have less glazing. The insulation is to the requirements of the NZ Building Code. The passive solar design of the development allows solar gain to the master bedroom and the living area on the north, and means the houses remain reasonably warm in winter. In the summer months the houses get overheated by the incoming solar radiation as there is no shading. The site can be accessed through Glenside Crescent off upper Symonds Street and through Burton Street off Grafton Road. It has very good access to public transport buses commuting to the central (Mt Roskill, Avondale), southern (Manukau), eastern (Howick, Pakuranga) and western (Henderson) suburbs of Auckland. It is a 5-minute walk from Boston Road railway station on the western line and 25 minutes walking distance from the downtown Britomart transport terminal. It is

close to shopping centres – approximately 1 km from Newmarket – and is at a strategic location in the region. In terms of the potential for improved sustainability outcomes, at present no renewable energy sources such as solar water heaters or photovoltaic (PV) modules are used in this development. However, all the town house roofs are oriented towards the north, which makes a significant portion of the roofs solar efficient. These roof areas or carports have potential to incorporate a solar water heater of 4 m² per household to supply a significant proportion (approx 50 to 70%, EECA, 2001) of domestic hot water demands. It would also be possible to install PV modules on the building roofs or carports to generate electricity. Water supply is from the reticulated city supply. The spaces around the houses and small paved courtyards are inadequate for installation of above ground rain tanks; however, research indicates houses with roof areas below 100 m² are not in any case able to collect an adequate amount of rain water from the roof (Vale & Ghosh, 2006).

4.2 Addison, Takanini, Papakura District

The Addison development is a “master-planned community” located adjacent to Bruce Pullman Park in Takanini, on the suburban edge, 30 minutes drive south of Auckland CBD in the Papakura commercial district. Master Planned Communities are large communities



and typically contain a variety of housing choices and styles at different price ranges, parks, recreational areas, schools and community shopping (Master Planned Communities, 2006). On approximately 80 ha of land, it will include around 1,500 homes with a range of different housing types. It was designed and is owned by the developer, McConnell Property Ltd (McConnell Property, 2006a). This project is partially completed and buildings are still under construction. It is an example of private developers working in

Fig 2: Site Plan, Addison, Takanini,

Papakura partnership with the District Council.

(Source: Mc Connell Property Ltd, 2006a)

It is a neighbourhood development based on “new urbanism” principles an outcome of the Regional Growth Strategy, as Papakura is identified as a growth node in the southern suburbs of the Auckland Region. Papakura District Plan contains rules for building, subdividing or undertaking a new type of activity in Papakura (Papakura District Council, 2007). Urban design applications such as well-designed pedestrian paths, landscaping, clustering of houses around courtyards, open-space areas, vehicular and pedestrian segregation, choice of harmonious colour schemes, street facades and creation of vistas provide an aesthetically pleasing modern residential environment. The streets are tree lined and pockets of open spaces or greens are created between the houses. The proximity to Bruce Pullman Park has been an advantage for the site, with increased amenity in the area and the urban design principles applied throughout the design. A village centre has been identified where cafés, daily shopping areas and apartments are to be located in future. There is a possibility this centre may be connected to a proposed new railway station in the area. The average density ranges from 16 dwellings to 23 dwellings per hectare, and lot sizes vary from 180 m² to 486 m². The development

consists of mixed housing types, all two-storeyed and comprising mainly four basic architectural styles: “grand elegance” – freestanding 4–5 bedroom family homes; “café style” – 4–5 bedroom, attached “designer terraces”; “traditional style” – 3 – 4 bedroom garden homes fronted onto garden commons; and “courtyard living” – 3 – 4 bedroom attached terraces around common courtyards to enhance community living (Mc Connell Property, 2006a). All garages have provision for two cars; for some housing types these garages are lined up at the rear of the houses accessed by a common driveway, while in others garages are fronted to the road. Some housing types have provisions for a studio unit on the upper floors of the double garages, detached from the main house and connected through an internal private landscaped courtyard. Environmental measures under a comprehensive sustainability framework for this project include: access to facilities; waste recycling and management; solar orientation and energy conservation; low-impact storm water management and biodiversity and planting (Mc Connell Property, 2006b). Currently rainwater tanks and renewable energy technologies are not applied leaving potential for improvement in sustainability performance.

4.3 Earthsong Eco-Neighbourhood, Swanson, Waitakere City

Earthsong Eco-Neighbourhood is an innovative urban housing development in Swanson Road, Waitakere City. Waitakere City, a suburban edge city in the Auckland Region, is also well known as an “eco city”. In Earthsong Eco-Neighbourhood, 32 homes have been constructed on 1.62 hectares of land in the middle of an organic orchard and area of native bush on the principles of permaculture and cohousing. Calculated approximate dwelling density is 20 dwellings per hectare, which is regarded as medium density housing in the New Zealand context. Stage Two began in 2004 and there is a resident community living in the constructed homes. Waitakere



Fig 3: Site Plan, Earthsong Waitakere City

(Source: Earthsong Eco neighbourhood, 2006c)

There are a variety of housing types such as 2–3-bedroom terrace units (87–102 m²), single-level, 2-bedroom “four plex” units (65–175 m²), studio (45 m²) or 1-bedroom (55 m²) units, and a ‘common house’ (350 m²) with dining, sitting rooms, library, children’s room, guest room, office, and laundry rooms (Earthsong Eco-Neighbourhood, 2006a). The buildings and neighbourhood are well integrated with the site planning. There are many informal gathering places, dwellings are arranged along common pathways and courtyards, car parks and carports are confined to one side of the site, and safe, pedestrian-friendly play areas are provided for children. These all demonstrate inclusion of sustainable urban design principles to create a unique “eco village” identity for the community. All buildings are oriented to the north and solar water heaters are used to provide the bulk of hot water needs.

Building materials and components are non-toxic and the rammed earth houses with macrocarpa timber joinery provide acoustic insulation and are said to require low maintenance. Rainwater collection is provided for household and garden use, and on-site stormwater and wastewater treatment are employed where possible.

The overall site design is based on permaculture principles and therefore has some edible landscaping for local food production. This should reduce energy used for transporting food. This neighbourhood is designed on the concept of increased self-sufficiency, with the application of low-impact urban design technology such as rain tanks, grass swales, permeable paving, use of renewable energy (solar water heaters), pedestrian priority and appropriate design of buildings and community to encourage residents to adhere to sustainable behaviour practices. Earthsong estimate that each dwelling saves \$265 per year on water charges, \$345 on wastewater and \$975 on electricity (Earthsong Eco-Neighbourhood, 2006b). However, analysis of the design (Wiharja, 2003) has suggested that the rammed earth construction of the houses is unlikely to have resulted in space-heating energy savings compared with the same design built using conventional techniques. The reported energy savings are more likely to be due to the use of solar water heating combined with the small size of the dwellings. The largest unit available has a floor area of only 102.4 m² (Earthsong Eco-Neighbourhood, 2006a). The site is linked to the CBD by the motorway as it is located on the edge of the urban area and is 16 km away from the main city centre. It is also at a moderate distance from the Swanson train station, a public transit route, well-connected with the central isthmus. There are many local shopping centres such as Henderson Mall and Westfield shopping centres close to the site. Earthsong is an example of a supportive community which is one of the visions of ARG (RGF, 1999, p.2)

5 Discussions

Three different types of recent residential developments were analysed for urban design principles, site design characteristics, dwelling density; potential energy efficiency; and transport use. The Grafton case is an example of the residential intensification in the inner city. This development helps achieve greater sustainability through orientation of the houses towards north to maximise solar access and through the potential for transport use reduction for the residents through walkability and access to public transport, given its strategic location. This development lacks appropriate site planning promoting urban design and residential sustainability. The two suburban case studies, Addison and Earthsong, apply concepts of sustainable design in completely different ways. Addison is focussed more on urban design provisions for pedestrian and vehicular segregation, varied lifestyles with different residential building types, and the creation of a suburban amenity through landscaped gardens, tree lined avenues and open spaces. Residential sustainability here is promoted through mixed housing types on smaller lots that intensify the suburban growth node with medium density. It does not consider local food production and renewable energy use options. It is anticipated the residents would use public transport, mainly train, to commute to the city.

Grafton and Addison are examples of how the Auckland Growth Strategy is driving more sustainable local urban *built* form in the Auckland Region. The Earthsong Eco-neighbourhood is focussed more on developing an interactive *community* committed to more sustainable behaviour. This is fundamental to achieve sustainability because the community will undertake the responsibility of minimising environmental impact through reduction of waste, reduced water use, using solar water heaters, producing food locally, maintaining

edible landscaping and rainwater use. The residents have homes in a pedestrian friendly environment, with safe children's play areas, bio-retention ponds and swales, and aesthetically pleasant site design well integrated with sustainable lifestyles. Urban developments such as this that include both built and community elements of sustainability have greater potential to achieve more in terms of social, cultural and environmental sustainability than the more conventional examples.

An international example of a sustainable residential development is the Beddington Zero Energy Development (BedZED), the largest carbon-neutral eco-community in the UK. BedZED is a mixed-use, mixed-tenure development that incorporates innovative approaches to energy conservation (Peabody Trust, 2006) and supports local authority policies towards sustainability. It has 82 well-insulated, affordable residential homes and offices which encourage alternatives to car use, thereby reducing transport energy use. The environmental designs include roof gardens, passive solar design, a small-scale combined heat and power plant (CHP) to supply hot water, low-energy lighting, energy-efficient appliances, and waste water recycling. However, research has shown that the sustainability benefits of living in a sustainable community like BedZED are only half as great as the benefits that can be made in a conventional community through changes in residents' behaviour (Vale & Dixon, 2005). It is not enough therefore to build communities of zero-energy, water-saving sustainable buildings; we must learn new ways of living in these communities.

6 Conclusions

Results indicate that current regional policies and strategies influence local-scale urban forms in various manners, generating significantly different environmental sustainability contributions. It is crucial for policy makers to understand how we might visualise future urban forms in New Zealand's urban areas. Different urban forms can have different potential to be sustainable (Ghosh & Vale, 2006). To achieve effective improvements in urban sustainability requires a combination of different site planning, different detailed design and different community behaviour. In urban situations, residential developments can be designed to have forms that promote visual attractiveness, environmental attributes and energy efficiency. A range of community lifestyles can be provided through a choice of varied housing types in large-scale developments. Community involvement and sustainable behaviour will play key roles in achieving sustainability in any residential development. Appropriate policy will play a very important role in guiding these future urban forms in New Zealand. Connecting sustainability research and environmental policy is essential for successful urban sustainability policy formulation and its subsequent implementation.

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