Designing Resilient Rural Communities -a Wairarapa case study

www.totarabank.com

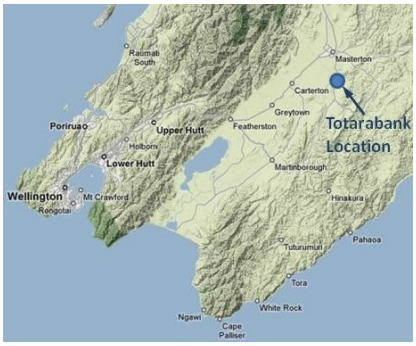

Figure 1 location plan

Introduction

In a changing world, there is an ever-increasing duty of care on developers and designers to provide infrastructure that provides for the ongoing wellbeing of its occupants. Wellbeing can be diminished by any number of climatic, political, and economic factors.

A community's resilience relates primarily to core requisites that sustain its inhabitants, namely the provision of;

- Warmth
- Food
- Refrigeration
- Light
- Shelter
- Safety
- Communication

The design of residential developments can have a significant influence on the ability of a community to meet these requirements under demanding external conditions. The Totarabank subdivision (fig. 1) is designed to provide an infrastructure capable of meeting these requirements to an extent not usually considered in land development.

Communities

The benefits of communities are simple: when acting as a group we have greater ability to shape our surroundings, mitigate threats, and provide an environment that fosters and nurtures our needs. Historically this advantage led humans to form communities, yet with the evolution of global society, cheaper/easier access to energy, and stable weather patterns, this need has gradually changed from a goal of survival to one of economic growth.

There are now however a number of criteria that can disturb the equilibrium that we have come to expect from our surroundings. On a global scale, it is clear to see that physical and political issues are today affecting the quality of life of millions of people, with more to come as climate change

effects increase. This could be through power cuts, water supply issues, wastewater disposal, food supply, storm/flood damage, or economic crisis situations.

The challenge facing land developers is this: to create an environment that provides a degree of resilience against factors that could jeopardise the needs of inhabitants, whilst meeting aesthetical, fiscal, legislative, and market requirements. At the same time, the development should aim to reduce its contribution to climate change. This is, in essence, the philosophy behind the Totarabank subdivision.

Enabling Resilience

1. **Land tenure** was the first issue addressed at Totarabank. There are significant benefits in adapting the development so that the land is used for the purpose for which it is best suited. For example, there may be soil variations, variations in access to wind, water, or solar energy, or suitability for crop growing. By choosing an appropriate form of land tenure, the use of the land can be optimised. Tenure options considered for Totarabank were; freehold, tenancy in common, cross lease, and unit title.

   Totarabank uses freehold titles for the eight building lots (1200 to 2000m^2), with a ninth lot (6Ha) being held in undivided shares between the eight (fig. 2). A resident's society is defined in the covenants, and this specifies the method of management of the common facilities, saving the need for the somewhat restrictive impositions of a body corporate. This choice enables mortgageable sections, the provision of common land, and a process by which communal decisions can be made.

Figure 2 Satellite photograph with subdivision components overlaid

2. ***Land use*** was the next consideration. The land tenure choice freed six of the seven hectares for non-building use. This area has been utilised based on the following criteria (fig. 1):

- Identification of soil conditions most suited to wastewater disposal. A common wastewater disposal area has been constructed (facilitating smaller building sections than would be possible if each required on individual site wastewater disposal).
- Land least suitable for building purposes has been planted in a coppicing firewood lot, to provide thermal energy for the development (fig. 2).
- Grazing land has been provided including cross grazing the firewood lot and apple orchard.
- Edible landscaping has been adopted throughout the common land, providing a non-invasive, permanent food supply. An olive grove, pine nut plantation, fruit trees, nut trees, wild berries and herbs make up part of the 'background' landscaping.

3. ***Electrical Energy.*** The most sustainable electrical load, is an avoided one. Thus the covenants on Totarabank facilitate houses with low thermal loads, and restricted peak electrical loads (by limiting the main circuit breaker capacity to 30Amps). By introducing minimum building thermal performance criteria (the new building code goes some way towards this, but not far enough by world standards), and providing thermal energy from the woodlot, the owners are guided towards lower electrical space heating loads. Similarly a

covenant requiring a percentage of the water heating load to be from renewable resources guides owners towards consideration of solar and wetback options.

There will however always be some non-displaceable electrical loads. In an attempt to increase resilience to energy issues, the electrical setup at Totarabank is as follows:

- One national grid connection, with an internal electricity grid owned in common (embedded network) (fig. 3). This has significant advantages over traditional individual connections (fig. 4) in reduced line charges, backup possibilities, and ability to achieve benefits of scale by acting communally.
- Facility for communally owned grid connected renewable generation. Specific sites have been set aside for wind generation, and the electrical infrastructure incorporated as part of the subdivision main construction phase. A communally owned 6kW wind turbine is included in the section price (installation triggered by the fifth title sale).
- Smart meters to allow individual properties to export to the local grid and to allow management of the system.
- A backup facility for grid-down situations: during times of failure of the national grid, energy generated anywhere on site can be used within the embedded network with some battery storage. During these times a signal will be sent from the backup unit to each lot, tripping electrical relays so that only essential circuits remain open, ensuring a sustainable rate of energy use.

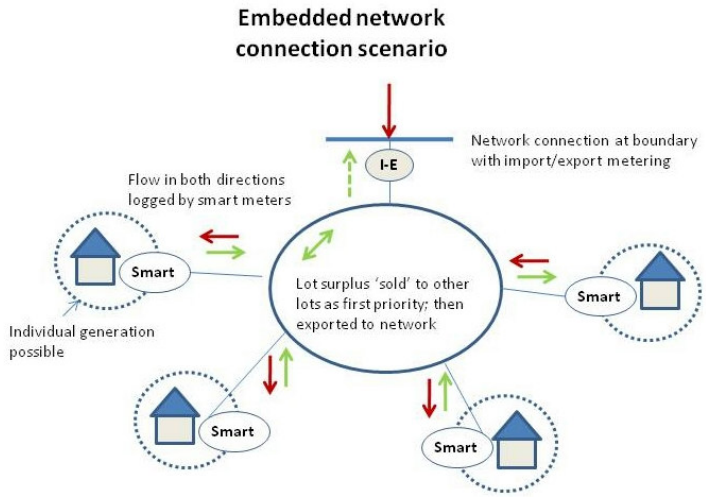

Figure 3 Embedded network connection

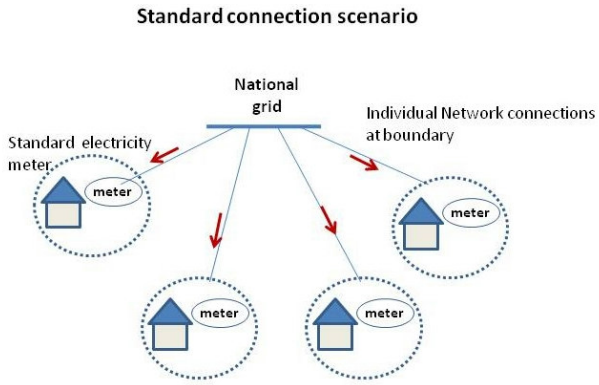

Figure 4 Traditional individual grid connection

The site

A number of fringe design criteria were adopted early in the decision process to lower construction, and longer-term impacts:

- ***Easements.*** There are no easements on the subdivision as all infrastructure facilities are located on common land (land equally owned by individual lot owners), negating the need.
- ***Road width*** was reduced with the introduction of passing bays. This reduces construction energy, imported materials, heat generation, stormwater runoff, and diverts focus away from being road dominated. Footpaths are widely used around the property. The road is constructed on the south side of the property, providing a large kid-safe area to the north of the house sites, the natural focus for outdoor living.
- ***Swales*** and a stormwater retention pond have been used to lessen stormwater impacts.
- ***Use of on-site materials.*** No material has been exported from the site, with excavation material from the road and lake being used to form landscaping mounds screen adjacent buildings and providing privacy between lots. Materials used on site were, wherever possible, sourced locally.
- ***Solar energy***. The lots have been oriented for solar energy capture, and arranged towards the south of the development, leaving a large open area of common land to the north. This allows ongoing solar access (see website for details of solar access contours).
- ***Ecological corridor***. Using the main stormwater channel as a basis, native vegetation has been planted to provide an ecological corridor between the river reserve to the west and the hill country to the east. Plant species selected were guided by Regional council information on the species that would have typically populated this locality. The benefits of this is already apparent (five years since initial planting), and the development is already home to resident Tui, Pukeko, Morepork, as well as a healthy frog population (fig. 4).
- ***A common building*** is included (on the ninth, common lot) in the lot price. With the average house size increasing, and the average family size decreasing, one intended use is to be that of the ‘spare room’, such that each owner has less need to build for peak occupation as guests can be housed on site, but in the common building.
- ***Transport.*** Until fully populated shared transport facilities are unlikely to materialise, however an electric vehicle powered by generation on site has been mooted. In the short term, there is broadband connectivity, the site is located on a school bus route, and Masterton is within cycling distance.

Barriers & Solutions

The development has a number of facets that are out of the ordinary, and this potentially poses barriers for Councils, electricity suppliers, and prospective purchasers.

Whilst individual local authorities may welcome attempts to incorporate holistic aspects to land development, (Waitakere springs to mind), each LGA around the country will have different views, and opposition may be encountered (as was the case with Totarabank). However, since conception in 2004, it is noticeable that there have been significant changes in political stance and in revision to New Zealand standards, for example, Helen Clark's climate Change speech, the new NZS4404, the Building Code revisions, and the new distributed generation standards. Each of these changes reduces the barriers to alternative land development, and paves the way for further advances in the way that we create new residential environments.

In terms of marketability, any major change from the ordinary can have the effect of either increasing or decreasing the target market. The desirability of land parcels is subjective and driven by perceptions. For example in the Wairarapa lifestyle sections of 3-4Ha underwent a boom during the middle of the decade. At the same time turnover of these titles was averaging 2 ½ years, indicating that the *perception* of desirability was different to the reality. Similarly the perception of risk (be it drought, flooding, food supply or power cuts) is dependent on the experiences and vision of the observer (i.e. don't ask someone from Fiordland the value of water, ask someone from Australia).

This poses questions as to the appropriate course of action for those working in the land development industry: to what extent should we supply purely what the market perceives as desirable, as opposed to what our experience tells us best provides for the needs of the community and environment?

Status

The physical works is substantially complete on Totarabank, roading, telecom, wastewater disposal area, non-potable water supply, and electricity all in place. Three of the eight lots were pre-sold, and one other in stage 1. After a consolidation period, stage 2 sales are about to commence – it will be interesting to see the market reception given the worldwide changing perception of values.

Discussion

Land development techniques and choices by necessity should be an ongoing evolution. The speed with which changes to the political or physical environment are adapted into the ethos of land development is a reflection of both the land development industry and market perceptions.

As climate change and political/financial uncertainty looms as factors that will increasingly dominate our lifestyles, could 'resilience' be a concept whose time has arrived?

Further information is available on Totarabank is available on the website www.totarabank.com