

Design of planting infrastructure

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The concept of infrastructure and its relevance to landscape architecture

In writing this paper, I have become aware that we are surrounded by infrastructures. It seems that there are as many infrastructures as there are subjects. From just a quick search of the keyword "infrastructure" on the web I came across the following terms: industrial infrastructure; power infrastructure; public transport infrastructure; roading infrastructure, and so on.

These are familiar to most of us. Others are less obvious but we might suspect their existence, e.g., communications infrastructure; information infrastructure; security infrastructure.

However, some are downright obscure, at least to the non-specialist. Consider: automation infrastructure; knowledge infrastructure; ontology infrastructure, and so on.

Every subject and activity seems to have an infrastructure associated with it except for planting. Even in landscape architecture and parks design the understanding of planting as infrastructure is strangely absent – why are walls, steps, railings, footpaths and benches considered essential infrastructure when planting is not?



Fig. 1 Land use plan for Chongming Island, near Shanghai, China.

However, the concept of a 'Green Infrastructure' is well established, at least in the environmental professions (see Sheladia, 1998, and many references to Green

Infrastructure made by Regional Councils and City Councils throughout New Zealand). Green Infrastructure includes urban forest, wetland networks, habitat networks and so on (Wolf, 2003). The structure plan for Chongming Island, near Shanghai, China (Fig. 1) illustrates a strongly developed green infrastructure that will determine the spatial character of future urban development within a matrix of organic agriculture and habitat areas.

Assuming that planting infrastructure is a subset of green infrastructure, what should it consist of and how can we promote it in our daily professional lives?

What is infrastructure?

First, let's step back and ask what is infrastructure anyway? It seems to be connected with the underlying patterns of things such as the planning and development of land. Typically, it is provided in advance and includes services and utilities, roads and public transport, and sometimes public space networks.



Fig. 2 Bilbao riverfront open space and transport infrastructure, Spain. Photo: Nick Robinson.

Fig. 2 shows the construction of a new tram and pedestrian walkway corridor combined with advance planting on the Bilbao riverfront in northern Spain. This public access

corridor was seen as essential to the transformation of the city's old heavy industry areas and serves major attractions such as the Guggenheim Museum.



Fig. 3 New apartment housing in Incheon, Seoul, Korea. Photo: Nick Robinson.

The importance of planting is illustrated in Fig. 3 by the substantial pedestrian parkways serving new apartment housing in Seoul, Korea and connecting them with larger parks and other facilities. Most of the trees were installed semi-mature and were already many metres tall.

The prefix *infra-* is from the Latin for below or underneath. So an infrastructure is the foundation upon which a successful system, whether of communication, transport, or habitat is built. This infrastructure then becomes a fundamental part of the large-scale pattern of the development, determining the locations and connections between parts of the whole and acting as the foundation upon which the new place is constructed.

The structure of public outdoor spaces is also planned in advance as part of a new development. This space network is a key part of the large-scale pattern of the changing environment because it forms the connections and relationships between areas and places and is the foundation of successful social spaces or people places.

Planting infrastructure

But what about planting? This is important because the vegetation, whether trees, shrubs or other plant associations, provides the basis of the plant and animal communities

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and ecosystems and because the form of the planting creates a system of spaces within which development and activities take place. The well established planting structure in the city of Stockholm, Sweden is shown in Fig. 4, and is a vivid example of how trees and shrubs can be a major player in the urban environment, creating spaces of different shapes and scales that become the setting of people's lives.



Fig. 4 Stockholm, Sweden. This form of planting beyond Arsta Bridge (Nya Årstabron) creates a system of varied spaces within which development and activities take place.

Even a single tree can dominate and generate a people space and define its identity and character (Fig. 5).



Fig. 5 Children's park in Stockholm, Sweden.

This planting infrastructure should be established in advance of development so that it can be well planned, well provided for and well established when the site comes into operation. Imagine, for example, new residential districts that are linked together not just by standardised, sterilised streets of tar-seal and shaven grass but woven into a fabric of diverse living landscapes of wetland, forest, scrub and flourishing grasslands. Imagine this in close proximity to intensely developed urban areas with homes, working places and cultural facilities all within walking distance of well planted community parks, forests, and wetlands.

A low rise, suburban example of a generosity of planting infrastructure is provided by the classic case of Warrington (designated a new town in 1968) in the north west of England. Fig. 6 shows low-cost housing benefiting from well established woodland infrastructure. The woodland and scrub in the figure is mostly planted, not simply retained from pre-existing woodland.



Fig. 6 Oakwood housing, Warrington, England. Photo: Nick Robinson.

Other third generation UK "new towns", including Milton Keynes (Fig. 7) and Runcorn, were similarly endowed with extensive, linked planting infrastructure.



Fig. 7 Milton Keynes, England. Photo: Nick Robinson.

These are a few cases in which planting was seen as fundamental to environment quality and was allowed to play an infrastructural role.



Fig. 8 Wellington City town belt plan 1840, New Zealand. Despite some encroachment it still defines the form and setting of the city centre to this day, in close relationship with the steep topography of the enclosing hills.

A good example in New Zealand is the Wellington Town Belt. It was envisaged in 1840 as a green frame to preserve the superb setting of

the city and was generously planted over the following decades. Fig. 8 shows Captain William Mein Smith's original plan for the belt. In comparison, what approaches to planting design are typical of current practice and how can we move forward to have a greater influence on the environment of our cities and towns in New Zealand?

Current approaches to planting design in New Zealand

This section briefly examines some current approaches to planting design in New Zealand and notes how they differ from the use of planting as infrastructure.

The decorative-pictorial approach

In its simplest form, this amounts to the collection and display of plants for their intrinsic and individual beauty (as practiced, for example, in the nineteenth century Gardenesque style of landscape design) and also for the addition of decorative value to a place that would otherwise be unattractive. This has been a popular approach from the earliest colonial period to present day cottage gardens and flower gardens. It is practiced in private gardens throughout the world, as well as in public landscapes and is also related to the collection and display of plants for educational and scientific purposes (Fig. 9).



Fig. 9 Beth Chatto Gravel Garden, Essex, England. The garden bed is planted to resemble a dried up riverbed, and is planted primarily for the visual effects of colour, texture and form. Photo: Steven Wooster.

The focus is on the plant or plant grouping and is concerned primarily with composition of landscape to create a picture or sequence of pictures. Very modern gardens can also be strongly pictorial. Take, for example, the careful positioning of sculptural succulents in some of Ted Smyth's gardens in New Zealand (Fig. 10). They create superb vistas from different angles and are added to or displayed within spaces that are primarily architectural.



Fig. 10 A Ted Smyth design for the Sander's garden in Auckland. Note the use of succulent plants as sculpture.

The pictorial approach may include apparently wild and sublime landscapes that reflect the Picturesque (rather than ecological) value of romantic nature – it may include the creation of features recalled from the wild places of New Zealand such as scree gardens and wetland gardens. This is quasi-ecological in that it recreates conditions similar to wild habitats but is usually done for visual or plant collection purposes (Fig. 11).



Fig. 11 The Wellington waterfront planting references to natural communities. Photo: Nick Robinson.

Symbolic-identity planting

This approach includes much of the New Zealand native planting carried out in gardens and urban areas. It is motivated by a desire to affirm a national identity and to conserve native plants, including species that are rare or endangered in the wild (e.g., Fig. 12). However,

it often has little connection with the existing or potential ecology of a place.



Fig. 12 Settler's Museum, Petone. Planting here focuses on natives, including rare species as an affirmation of national identity. Photo: Nick Robinson.

Current examples of the same sentiments include planting to represent more recently arrived cultures in New Zealand such as those from the Pacific islands. Planting is also used symbolically in traditional gardens of the Orient where, for example, Chinese classical gardens use species to stand for human virtues.

Functional planting

This is planting designed to achieve functional ends, and these may be quite limited such as screening and shelter or boundary barriers. Species are chosen and arranged in the way that most efficiently achieves the primary function of the planting. Examples include rows of cypress to screen a property from a busy road, and tree plantings of the right height on a golf course to stop potentially dangerous miss-hit balls, and agricultural shelter planting of the optimum permeability. In some cases functional planting creates a distinctive spatial pattern and over a large area can form a spatial infrastructure, such as the orchard areas of Nelson (Fig. 13) and the Bay of Plenty.



Fig. 13 Motueka orchards in the Nelson region. Photo: Nick Robinson.

Space and form in the landscape

Perhaps surprisingly, it can be difficult to find large scale examples of planting design by landscape

architects that display strong spatial or sculptural qualities. Much planting, even in large scale developments, is decorative and often lacking a clear spatial form or geometrical order. Extensive planting often takes the form of revegetation and, whilst this is invaluable in re-establishing native forest or shrubland, these plantings are rarely laid out with diversity of space and scale in mind.

However, there are notable exceptions such as Carl Sørensen's superb Geometric Garden on the plains of Denmark (Fig. 14). This kind of infrastructure planting creates large spatial patterns from a living landscape using forest and scrub as a sculptural medium.



Fig. 14 Carl Sørensen's Geometric Garden, Herning, Denmark.

There are other sources of inspiration and precedent in international landscape architecture, past and present. The principle of networks of connected plant communities to help create liveable, sustainable environments is being promoted by environmentalists and organisations in New Zealand including the Ministry for the Environment, and many city and regional councils such as Auckland Regional Council and the city councils in the area.

These principles have been put into practice in classic examples like the Dutch ecological planting of the 1970s and 1980s (well described by Ruff, 1979) and the third generation new town landscapes of the UK (see Tregay and Gustavsson, 1983).

This work was all about the scale and connectivity of plant and animal habitats that were often established on hostile brownfield

sites, by manipulating ground conditions and establishing pioneer plant communities. The result was a spatial mosaic of woodland, wetland, scrub and meadow that, to this day, creates a high quality living environment for the residents of these old industrial landscapes.



Fig. 15 Road planting in Singapore. Photo: Nick Robinson.



Fig. 16 Corner park in Hong Kong. Photo: Nick Robinson.



Fig. 17 Extensive roof gardens such as Sasaki Walker's Saitama Plaza in Tokyo are not unusual in Japan and form an essential part of the intensely urban fabric.

More recent examples can be found in the growth of densely populated Asian Cities such as Singapore (Fig. 15), Hong Kong (Fig. 16) and Tokyo (Fig. 17), where greenspace and is highly valued, generously planted and intensively used by the community.

Planting infrastructure has taken a major role in the last decade in the management of urban storm water. Kathryn Gustafson's Westergasfabriek Park in Amsterdam is a superb example of the value of this kind of connected greenspace (Fig. 18).



Fig. 18 Kathryn Gustafson's Westergasfabriek Park in Amsterdam, The Netherlands.

Potential of New Zealand plant communities for infrastructure planting

Indigenous New Zealand vegetation types offer a great opportunity to create distinctive spatial structures for parks, greenspace and other developments (Robinson, 1994).



Fig. 19 Waitakere bush – west coast New Zealand rain-forest. Photo: Nick Robinson.

The diverse nature of the forest, scrub and other vegetation communities in Aotearoa New Zealand comes not only from the species but also from the internal canopy structure of the forest, scrub or grasslands. Compare, for example, the dense multi-layered rainforest canopy of the west coastal areas (Fig. 19) with the open southern beech forest (Fig. 20), or with the multi-layered woodland typical of the later stages of kanuka regeneration (Fig. 21).



Fig. 20 Beech forest, Craigieburn, Canterbury. Photo: Nick Robinson.



Fig. 21 Ageing kanuka woodland at Orongorongo with forest species below. Photo: Nick Robinson.

These vegetation types can provide not only varied habitats for different plants and animals but also a valuable range of spatial structures that are suited to different human uses and are characteristic of different places. As planners and designers we do not make enough use of the distinctive vegetation structures we have available. Often we are too occupied by practical problems of site design and cost to allow for anything but the simplest canopy structures.

Agricultural idioms

We can also create distinctive spaces using planting arrangements developed from typical agricultural and horticultural practices such as orchards, olive groves, vineyards, meadows, tree training, and so forth. There is much scope for referring to distinctive New Zealand idioms such as kiwifruit and apple orchards (Fig. 22), vineyards, kumara stone gardens, taro gardens and so on, even perhaps pine plantations.



Fig. 22 Apple orchard, Lincoln, Canterbury. Photo: Nick Robinson.

Barriers to creating effective planting infrastructure

Plant knowledge

Many designers in landscape architecture and urban design and architecture have only superficial knowledge of plants and a poorly developed understanding of their potential. Infrastructure planting is quite different from the common design use of plants as 'material',

selected to perform a design function such as protect a surface or create a barrier, in the way that a paver or a fence is selected for its performance and visual qualities.

'They shouldn't need looking after'

There is a common misconception, that plants don't need care and space and good growing conditions, that they can be squeezed into small spaces left between the 'important bits'. I once saw a whole roadside planting scheme carried out by digging small holes in an asphalt footpath, planting a range of hebes etc. and leaving the asphalt surface.

'Doing tree planting properly costs too much'

There is also the old problem that, however much recognition there is that trees and planting is important, there remains a consistent failure to adequately provide for it in the planning and budgeting stages of development. Planting and the space for planting is the first thing to be lost when financial considerations such as site yield and return are considered. Too often, landscape architects seem unable to influence the key decisions made about the development of our environment. So planting remains, in most practice, the proverbial 'icing on the cake' to be applied in the spaces left over, and after the serious business has been settled.

'We've plenty of trees already'

The fact that New Zealand has (in some areas) many trees in gardens, parks and public spaces, and that there are large areas of exotic and native forest and scrub in rural areas and National Parks and scenic reserves supports the perception that the country is already sufficiently provided for, and that town developments and subdivisions are not the place for large or numerous trees. The recent fashion for planting cabbage trees and nikau palms in urban streets is a good example of trees that are too small and will never provide more than decorative amenity.

What if...?

What if we could begin to overcome the barriers in the way of large scale infrastructure planting? What opportunities are there to put this into practice and how might this be done? The following is a list of some primary opportunities for planting infrastructure.

- Car parks.
- Commercial and industrial developments.
- Focus on urban design in streets and squares.
- Neighbourhood parks and reserves.
- Regional parks.
- Residential expansion.
- Wetland reserves.

Conclusion

Planting can provide a spatial as well as a habitat infrastructure. This means that planting must be seen as a key part of land development. It deserves investment because of the environmental, aesthetic and social benefits it brings.

Infrastructure planting emphasises the spatial and environmental rather than the decorative or the functional roles, and should make use of the range of plant communities and assemblages that occur both in natural vegetation and in New Zealand horticulture and agriculture. There are great opportunities for exploring the use of some of these idioms in the design of landscape ranging from urban expansion zones to parks and reserves.

I conclude with a figure that illustrates the primary role of vegetation as a basic element of landscape (Fig. 23). This is a view of Ruapehu across the sacred healing waters of Lake Rotokura and shows three of the basic elements – or archetypes – of landscape: Mountain, Water, Forest.



Fig. 23 Ruapehu seen beyond Lake Rotokura and Rangataua forest. Photo: Nick Robinson.

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Nick Robinson is a landscape architect and lecturer with a portfolio of design and academic work in New Zealand, USA and UK. Nick has championed the role of planting, seeing it as fundamental to landscape design and environmental quality at all scales. His internationally acclaimed textbook, the *Planting Design Handbook* (now in its second, revised edition) has promoted this understanding to students and professionals. Nick has a landscape architecture practice in Titirangi, Auckland.