SUSTAINABILITY BY DESIGN – A LANDSCAPE PERSPECTIVE

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Introduction

The New Zealand landscape evolved in the absence of mammals and people. A short history of colonisation by two peoples - Maori (1200 years) and Pakeha/European (200 years) has severely disturbed that unique ecology with some irreversible changes. The façade of landscape intervention and modification now masks an inherently diverse landscape. That diversity is rooted in the varied physiological and ecological character of these Pacific islands.

Landscape architecture can assist in guiding a post colonial, landscape management response towards environmental and cultural benefits. Current land use necessities and a societal vision for an environmental sustainability need to be drawn together through the design and land management process.

Landscape experiences are based on the features, elements, processes and patterns which are informed by natural histories, past and present land use practices, and cultural attitudes both spatially and temporally.

In this sense, landscape is more than the visual experience - it deals with the ecological and physical processes, which underpin its existence, and includes the people who work and live within the landscape.

Landscape architecture is about making places that are "biologically wholesome, socially just and spiritually rewarding" (Benson & Roe, 2000) with high standards of "eco-system health, biotic integrity and cultural well-being" (Orr, 2002); in other words, the principal elements underpinning the elusive concepts and constructs of sustainable development and sustainable management (Part II RMA 1991).

Changes to legislation, planning analysis and land use judgements are a reflection of evolving cultural values as to how the landscape is perceived. The tendency of perceiving land as simply a provider for human needs and the increasing population worldwide are the reasons why so much environmental degradation exists today. The past decade has seen a refocusing of attitudes (post-Brundtland, Agenda 21 & RMA 1991), and new political focus with various organisations undertaking extensive research on a wide range of environmental, biological, agricultural and sustainability issues. This energy created the intellectual critical mass necessary to recognise the relationship between human action and the environment. No longer is the landscape regarded as something external to people, instead, people and their actions are recognised as a part of the landscape. An anthropocentric focus now rests within an ecocentric bias.

In recognition of this changing paradigm I coined the phrase "the new cultural landscape" to explain the move beyond previous land management practices to a more holistic appreciation of people within the environment.

Essentially, all environmental adverse effects have arisen from a lack of understanding and acknowledgement of complex environmental inter-relationships. Although it is not fully understood what precise energy and material transfers exist within functioning ecosystem, there is evidence of what can occur when some form of human interaction and modification occurs. Monocultural land use regimes imposed over complex natural systems is a case in point where the environmental degradation resulting from a single purpose end use not only affects environmental quality downstream but the viability of that end use itself is intrinsically threatened.

Professor Simon Swaffield from Lincoln University developed this theme for the New Zealand context in a paper delivered to the 1998 NZILA Conference in Wellington. He stated:

"...[New Zealand] originally had a high degree of endemism in its indigenous species but is now spatially dominated by a limited range of introduced species (Park, 1995).

The impact of this change has been reinforced by our recent cultural history in which indigenous and introduced species, and the landscapes they create, have been treated as separate and typically opposing realms - conceptually, spatially and in policy" (Swaffield, 1998).

The economy that this land use management regime produces is not fundamentally different to that of 100 years ago. New Zealand remains a rural trading economy. The trading partner may have changed from Britain to other global sectors, but essentially the land based economy of primary products underpins the economic development of New Zealand society. Professor Swaffield discussed this further in the following passage:

"The current dual focus of New Zealand policy and practice in sustainability reflects this relationship with overseas markets. On the one hand, conserving indigenous species diversity within the conservation estate, and on the other hand seeking to retain minimum levels of essential environmental resources (water and soil) within the production estate (environmental 'bottom lines'). Yet landscapes function as whole systems (Naveh and Lieberman, 1994). As Foreman highlights, it is the condition of the overall landscape matrix that determines its ecological health (1995). There is also increasing evidence that a critical factor in sustainability is the ability of cultures to preserve and manage their environments in an integrated way (Kim & Weaver, 1994). The evidence of the past few thousand years of human history suggests that whilst few, if any cultures, achieve a sustainable 'steady state', those production systems which have been able to operate, adapt and regenerate over extended periods are typically both diverse and highly integrated within their landscape settings" (Swaffield, 1998).

I believe it is the move towards these 'steady state' production systems that is shaping the 'new cultural landscape' – a blend of cultural activity using natural elements. These principles apply to the coastal environment as it sits within the broad landscape matrix from hill country to lowlands to the coastal edge.

The Landscape Matrix and the Coast

Much of the estimated 10 million hectares of land in pastoral agriculture exhibits limitations in relation to traditional livestock production practices; due to physical features of the landscape including factors such as topography, soil type and climate. The critical areas are our marginal pastoral hill country landscapes. These agro-ecosystems tend to be highly dissected, composed of diverse, sensitive elements and exhibit high spatial variability of landscape type (or unit). Extensive research has shown that these areas also exhibit significant environmental constraints leading to difficulties of maintenance of our natural capital (e.g. soil, vegetation, water). Consequential economic constraints arise which make already struggling rural communities vulnerable. Much of our coastal landscapes fall within this category of pastoral agro-ecosystem.

It is generally accepted that overcoming limitations by intensifying the pastoral agriculture in these areas through increased fertiliser application and pasture species improvement could raise productivity, leading to improved economic and social viability. However, overwhelming research has clearly shown that the continued broad scale mono-cultural farming practices and intensification of these landscapes is not environmentally sustainable. Current pastoral practices threaten the very maintenance of resource capital (such as the soils, vegetation and water).

Innovative land management strategies and land use options therefore need to be developed for marginal hill country landscapes (rural and coastal) exhibiting such inherent and biophysical limitations. Recognising opportunities for protection and enhancement of indigenous biodiversity throughout the private landscape matrix, maintenance of water quality, quantity, protection of recharge basins, together with the promotion of soil protection and the stabilisation of steep eroding hill slopes is the sustainable outcome. Strategies associated with vegetation management including the mix and type of land cover, become a central focus in the restructuring of these marginal landscapes. Land use strategies should also focus on conservation and recreation outcomes. However, within sensitive land capability units (Classes VII & VIII), alternative production strategies also need to be pursued as part of a diverse mix of land use matched to landscape capability and capacity. Some restructuring of landholdings may also be necessary to rationalise property ownership and associated land use activities. Some intensification of rural and coastal residential development will be part of a suite of options.

Fundamental to the success of any land use management changes in these landscapes, is the recognition and understanding of the spatial and temporal variability of the landscape matrix and our ability to understand and utilise these variations for positive environmental outcomes together with increased economic outcomes. This will require the application of a design approach that recognises the need for whole landscape management identifying the sensitivity and vulnerability of landscape elements and landscape types, and assigning appropriate uses to selected areas. That is, the design process would encourage conservation, land use in the more sensitive landscape elements and components, and maximising production or use within the more robust landscape types and units. This approach is fundamental to the integrated catchment management technique.

Part of the pattern within the landscape matrix is the network of public conservation estate (DoC/Regional/local authority reserves). These reserves are not in themselves sustainable entities. They often lack the connections to give advantage for biodiversity and fauna corridors. The development process can create linkages to achieve such enhancements.

Nature conservation and bio-diversity enhancement in the wider landscape matrix of private land is now urgently required. Whole landscape management is a concept that must become understood by the land management and planning professions. It includes the concept of landscape restoration.

Restoration however, in this sense, is seen as a broad vision underpinning ecological landscape management and the enhancement of landscape/ecological functions and processes.

The concept of restoration is not seen as a return to the past, that is, to some landscape of historic, pristine, indigenous/endemic state – rather, it is part of a wider goal which seeks to establish a healthy relationship between people and the land, including:

- the maintenance, enhancement of natural capital such as soil, water, vegetation and fauna, that is, reinstating ecological functions and processes

- economic well-being derived from having a sustainable productive land base

- social equity emerging from a wealth base built on the productive land

The reality is that we cannot sustain the landscape. The character of that landscape will inevitably change. We are sustaining our interaction with that landscape and that is an important distinction. By weaving a conservation component throughout the landscape matrix we are recognising the process of ecological management. This is based on the accepted analysis that requires recognition of natural processes, the natural elements and the emerging patterns.

There is change in the way that people view their environment. Many coastal and rural landowners are keen to protect and enhance our remaining bio-diversity. The two difficulties usually faced are first, not being able to synthesise their observations and aspirations for their own land and secondly, often not understanding the ecological values of their land in an integrated way. All of this occurs while the landowner must keep on making a living off the land, and juggle the day to day decision-making of land management.

So how can politicians, researchers, commentators, landowners and the community come to an agreeable methodology which addresses these issues? Part of the answer lies with turning attention to the coastal and rural landscape itself and the natural systems occurring within it rather than focusing on the activities carried out upon it. Focusing on natural systems instead of activities, recognises that naturally occurring environmental dynamics are the primary agents that determine the ultimate productive potential of the land resource. This is the dynamic that links across the landscape matrix from the hill country to the coast.

Because the natural environment by and large operates in a systems-wide manner, irrespective of cadastral boundaries, it seems appropriate to plan for and design within this natural constraint. Indeed this was our ancient understanding of rural life where the types and locations of productive uses of the land were largely determined by the natural constraints such as soil, topography and climate. Imposing land use activities across a landscape without respecting these critical natural constraints will often lead to disruption of the natural systems. This can be seen in numerous regions in New Zealand, which are adversely affected by large scale erosion, loss of water quality and degradation of the soil structure.

The challenge is to how to start recognising and planning around these natural constraints to maximise the productive potential of the land, while minimising the

adverse effects inside and outside the boundary fence. An effective planning and design tool is the "Integrated Catchment Management" approach. This approach provides a sustainable design process that suits the coastal development decision making framework.

Integrated Catchment Management Methodology

The ICM technique is one that identifies catchments as logical landscape compartments; that is, it compartmentalises any particular region, district or property into units which are easy to work with in planning, design and management terms. The approach is highly suitable to the coastal environment.

Catchments are not only physical entities, but they are also units that communities, consciously or otherwise, identify with. Catchment analysis is a technique that can be applied from the large-scale analysis of a broad area, down to sub-catchment analysis of individual properties.

A systems view of catchments is essential, one in which the links between systems are emphasised. Within any catchment there are major interrelated systems of water, soil, flora and fauna communities and human communities.

The main elements of any catchment's external environment are climate and weather; cultural and economic influences and the effects of management practices in adjacent catchments.

The essence of the technique is to identify and analyse these elements so that an understanding of the interrelationships between them can be assessed against the likely impacts that any particular use may have. The desired outcome of this assessment is to provide the basis for sustainable land use management practices.

The objectives of sustainable catchment management are to:

1. Encourage land uses which facilitate good drainage.

2. Conserve soil.

3. Efficiently allocate available water resources and to maintain water quality standards so that no particular use is irreversibly lost.

4. Preserve viable representative samples of natural ecosystems.

5. Manage the introduction of exotic species, flora and fauna in a way that does not compromise other objectives.

6. Manage the harvesting of flora and fauna in recognition of the critical importance of regeneration rates.

7. Protect the long term assimilative capacity of natural waste receiving systems.

8. Identify areas of land appropriate for a variety of human uses.

To achieve these objectives, limits must be recognised, e.g. maximum permissible levels of toxins in groundwater; minimum in-stream flows to sustain aquatic habitats; water abstraction rates from underground aquifers; rates of soil loss.

These limits are revised as we discover more about the resilience, productivity and vulnerability of the systems. This sustainability objective should be seen as the focus of a wide range of options within the natural management and development process.

Indicators of Unsustainable Practice

The systems within catchments are dynamic. Indicators of unsustainability therefore usually relate to rate phenomena of some sort. Some common examples are:

1. Excessive fluctuations of water flows; e.g. very low flows leading to loss of in-stream habitat, or very high flows eroding river margins and causing flooding.

2. Long term persistent change in water bodies; such as an increase or decrease in aquifer levels leading to soil salination in coastal areas or depletion of water supplies and increasing contamination; e.g.

degradation of wetlands or nitrate, phosphate, and silt build-up in streams.

3. Depletion of the soil base; e.g. soil erosion and soil slumping resulting from over-grazing, deforestation, misplaced cultivation or careless siting and construction of development projects, roads and access tracks.

4. The disturbance of natural regenerative processes; as a result of introduced exotic species, e.g. animal grazing of native vegetation or weed rampancy, e.g. tobacco weed, wild ginger, etc.

The systems of water, soil and flora and fauna are connected dramatically, which means that development impacts in one part of the catchment can cause impacts elsewhere and after some time delay.

Biophysical systems are susceptible to irreversible change. For this reason the catchment assessment technique is one of identifying those natural elements and identifying the likely impacts and the likely consequences of those impacts in any particular catchment.

The essence of the technique therefore is to identify the critical landscape elements within any catchment that may require protection and enhancement. The values that relate to these critical elements include: scenic protection, vegetation conservation, erosion control, water quality, quantity management and habitat protection.

Examples of critical landscape elements therefore comprise of:

1. Existing stands of remnant and regenerating indigenous forest.

2. Steep erosion prone slopes and gullies.

3. Riparian areas and wetlands.

4. Estuarine and coastal margins.

5. Heritage & significant cultural features.

The protection and enhancement of these critical landscape elements will provide the permanent, indigenous management framework and therefore the basis of landscape character and community identity.

Put simply, the technique identifies these elements and a line is drawn around them. A pattern emerges that is continuous in nature, containing and enclosing areas of land suited to human activities and development.

The result is to divide the landscape into two distinct areas – one "highly" protected and one allowing for appropriate levels of "development"; such as intensive agriculture, rural and residential housing, tourist development and commercial and industrial uses.

In those areas needing high protection, appropriate cover must be retained. That cover (or vegetation) must be determined by the nature of each of the unique components of the landscape which can be identified; e.g. wetlands have different vegetation to forested hills and perform different physical management functions. The important benefits and uses of these areas include: visual amenity, active recreation, walkways, water supply, pollution control and shelter. Limited development could occur in these areas but only in appropriate locations and only under strict control.

Overall a consistent analysis framework emerges which has applicability from the regional strategic level down to the individual property. There is relevance at the district plan level, the catchment or the subcatchment. The underpinning techniques have a valued consistency irrespective of space, scale or time.

Conclusion

Design in the coastal and rural environments will require more people and resources on the land. Investment, skills and labour are the important resources for the successful transition of the present coastal and rural environments to a sustainable productive future. It is important to stimulate and foster the transfer of other sectoral capital to the rural economy. This can occur through transferred investments and reinvested profits from urban enterprises. For some communities, "sponsored" investment including subsidies, grants, funds and community action plans will be important. The support and expansion of current voluntary activities such as the recent Ministry for the Environment's sustainable management fund initiatives in

collaboration with Land Care Trust on integrated catchment management community initiatives are of real value.

The second generation of district plans gives the chance to reassess the planning methodologies and to inject into the s.32 cost benefit background, a sustainable design framework. This paper analyses the contents of that framework and sets out the important landscape and biophysical elements that require attention. Unless these elements are addressed through the objectives, policies and rules, there is no realistic hope of the plan producing a sustainable environment.

The priority of s.5 RMA is to promote the use of the natural and physical resources in a sustainable manner. Investment and ongoing development is a conduit to the sustainable future using the model outlined in this paper.

Hanging our hopes of the second order RMA issues that arise from s.s.6&7, such as outstanding landscapes, and the natural character of the coastal environment, does not produce the sustainable outcome unless S.5 issues are addressed.

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