The ecologies of liveability — biodiversity foundations for cities

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ABSTRACT

On the southern plateau of Brazil is a 310-year-old city, Curitiba, that has focused sharply on liveability for its citizens for more than 35 years. A core element of the city's 1960s vision was for Curitiba to be the 'Ecological Capital of Brazil'. This vision translated, as the city started to grow rapidly, into a huge park acquisition programme, protection of heritage buildings and associated vegetation and prioritisation of pedestrians over cars. The ecologies of quarries have been restored and the city's green 'lungs' fully flexed. It appears Curitiba civic leaders knew in the 1960s that a 'green' city is a healthy, prosperous and highly liveable city. In an effort to understand the motivations for the focus on ecologies, 20 New Zealanders visited Curitiba in April 2002.

Three decades after Curitiba overtly focused on 'greenness', cities and towns in Aotearoa-New Zealand are once more (we did in the past — per our Hagley Parks and green belts) focusing on the values and value of a vegetated biologically diverse city — on a macro and micro scale.

The Parliamentary Commissioner for the Environment and his team have carried out a number of studies on aspects of New Zealand's desire to protect or enhance urban and peri-urban biodiversity. Over the years, they have examined the management of amenity values; the sustainable development of cities; the management of vegetation in North Shore City; the development of peri-urban lands of high natural value; and the development of icon landscapes in three other countries.

Drawing from international and national experience, this paper discusses societal, legislative and institutional arrangements and capacities which are considered major 'shapers' of the ecologies of liveability. These include such matters as the scope and context of environmental learnings in our communities, councils and business worlds; the understanding of how a city's biology is part of its wealth and the capacity of the Resource Management Act 1991 to manage cumulative effects.

INTRODUCTION

There is an extraordinarily rich body of experience and intellect gathered at this conference who are authorities on managing biodiversity in the urban environment. The conference venue, Christchurch City, has certainly benefited from this work — as have many other regions of New Zealand. In addition to the New Zealand contingent, there are also contributors from further abroad, as far as the UK.

With this audience in mind, this paper outlines some of the studies and conclusions made concerning biodiversity and environmental sustainability in a broad context. In my role as the Parliamentary Commissioner for the Environment, I regularly share my perspectives with a wide range of audiences in New Zealand, and also with our Australian colleagues. This paper aims to set the scene and to provide a useful contribution to the rest of the conference.

THEMES

There are several key aspects for advancing sustainability in an environmental context. First and foremost, the *human dimension* is critical. Without *passion* and *commitment* we cannot hope to lower our footprint by improving our environment through maintaining and enhancing its biological diversity.

Planning is also a vital component, and this planning is often long-range. When you plant trees, as exemplified by Christchurch City with places like Hagley Park, they can be there for a long time, so are inter-generational. Therefore, planning considers *space, place* and *time*.

The ecologies of liveability are also about *knowledge*, and its application to gain an understanding of the dynamic fabric of the city environment. *Wealth* also plays an important part, because maintaining and enhancing the vegetative component is dependant on elements of wealth of a community, the wealth of a city, but also an understanding of all the other elements and tensions of how we accumulate wealth.

Lastly, the ecologies of liveability revolve around the whole concept of what it means to be more *sustainable* — for the human species to walk more lightly on the planet and interrelate better with other species. Clarifying what it is that we mean by sustainability allows us to perceive future challenges.

Based upon this preamble, four main themes are discussed in this paper:

1. Understanding sustainability: framing the challenge
2. Biodiversity in cities abroad: learning from others
3. Implementing sustainability: areas for focus in cities
4. Sustainability leadership: where should the focus be?

As part of understanding sustainability in the New Zealand context, examples of biodiversity initiatives in cities abroad are examined for ideas that we can follow in this country. In New Zealand, there are areas for implementing sustainability that need sharp focus, and have been highlighted by some of the work of the Parliamentary Commission for the Environment (PCE). Leadership in sustainability, in terms of where I think real leadership direction needs to be, is also discussed.

The PCE has published many reports over the years that are relevant to the themes of this conference. My team and I examined the urban environment in *The cities and their people* (PCE 1998a), and investigated the peri-urban areas in a report entitled *Managing change in paradise* (PCE 2001a) — places that New Zealanders seek out to escape town and enjoy isolation from city life. Following on from this is another report, *Superb or suburb*? (PCE 2003a), where we examined this peri-urban area in other countries.

In *Creating our future* (PCE 2002a), we compared New Zealand 10 years on from the 1992 United Nations Conference on Environment and Development (The Earth Summit) in Rio de Janeiro, Brazil, and assessed our progress on sustainable development during the intervening decade.

Further afield, we visited the South American city of Curitiba to examine how another culture have led the way despite their economic challenges (PCE 2002b). Returning to New Zealand, we have also evaluated the role of native plants on private land (PCE 2001b).

A context: Kiwi's are…?
Re-examining ourselves as New Zealanders raises questions on our national identity and culture. Simon Upton has encapsulated this rather well in the following quote:

> '*Uniquely New Zealand appears to be a haven of Celtic rurality, Nordic efficiency and Californian hedonism parked at the bottom of the earth*.' Simon Upton, Building in Distant Seas, the Leadership Forum, Auckland, February 2003.

There is a deep human context to all facets of urban biodiversity, and we must gain an understanding of our motivators, our drivers, our shapers, both in terms of our multi-culturalism, our Polynesian and Māori roots, and what actually shapes us. We are all immigrants from somewhere in a historical sense because none of our ancestors have been here for more than about 1000 years.

1. UNDERSTANDING SUSTAINABILITY: FRAMING THE CHALLENGE

What are we trying to sustain in the long term?

There is at times debate about what it is that we are actually trying to sustain. These elements can be summarised as:

- Primary natural capital — fresh waters, clean air, biodiversity, soils, seas etc.
- Landscape and cultural heritage — space and place
- Liveability — human habitat quality
- Wealth-creation capacity
- Democratic capabilities
- Social capital.

The first point is self-explanatory — the need to sustain all of our primary natural capitals, our biodiversity and so forth. Then we progress to the landscape and our cultural heritage, in other words, our space and place, which is an integral facet of cities.

There is also a more esoteric dimension associated with space and place. The term 'liveability' seems rather loose, but its meaning is nevertheless clear; some places have a nicer 'feel' and better 'habitability' than others.

Sustaining wealth-creating capacities is a core part of how we, as a species, prosper. Democratic capabilities are absolutely key to improving the fabric of a city, where so much is public space and place. As such, there can be little progress without strong democratic institutions and community participation.

The final point concerns social capital, in other words, building competencies. All of the above-listed elements are, in my opinion, those that we need to sustain in an effort to build a world that is truly environmentally and ecologically sustainable.

A necessary evolution

Sustainability necessitates getting beyond environmentalism. This statement needs further explanation. I consider that there is a transition occurring, and that *environmentalism* is what we have been practising for perhaps the last 50 to 60 years. In particular, dealing with the messes that humanity is making which has, in turn, led to a very effects-based approach. This is certainly a necessary phase, and one that will continue for a long time yet. So, environmentalism could be considered 'activism to protect nature from the ravages of human activity'. Enforcement can create a lot of tension when translated into environmental policy such as, dare I say it, the Resource Management Act 1991 (RMA).

Sustainability on the other hand is fundamentally different, and is 'redesigning the processes that deliver human needs and wants' so we do not make a mess in the first place. Although this may seem a bit subtle to some, it actually is a very different place and space for the head and heart.

To summarise, *environmentalism* is a reaction against pollution and related issues while *sustainability* is a movement towards new actions and behaviours; it concerns living on the planets interest and getting more from fewer resources. Sustainability is positive because it encourages innovation and opportunity, and touches on the passion aspect previously mentioned. Dealing with environmental issues should not be seen in a negative light, as a problem and a cost, as it often has been in New Zealand and other countries.

Sustainability at a systems level — stocks and flows

Another productive avenue to explore when developing sustainability actions are the distinctions between *stocks* and *flows* of resources. Stocks are the big, slow-moving variables:

- Population
- Housing/accommodation
- Roading/rail
- Water / sewage systems
- Generation systems
- Public amenities
- Natural resources — biodiversity
- Superannuation.

Stocks then include population and natural resources, but also the constructs of society such as superannuation. Because these stocks have a long continuity, they need to be very future focussed. Management of stock items frequently require government involvement in protection mechanisms and defining of property rights. Heritage buildings, for example, are easily lost if there are weak protection mechanisms. Biodiversity, the green heart and fabric of a city, is also one of the stock items.

Flows on the other hand, are the faster moving variables that move rapidly through our society and economy. These include:

- Immigration
- Tourists
- Materials — water, energy, manufactured goods
- Finance
- Food
- Services
- Entertainment.

Flows are more here-and-now orientated and can usually be managed by markets, although some resource 'flows' may be initially undervalued such as oil and fresh water.

These distinctions appear to be poorly understood in many Government and business circles leading to sustainability needs being poorly addressed by markets, policy, legislation and/or international treaties. In New Zealand, a topical example is provided by changes in the electricity industry (PCE 2003b, 2004a). I consider that there is a real muddle resulting from the lack of adequately distinguishing between stocks and flows. This confusion is detrimentally affecting the construction of markets and legislation. On the other hand, there is some very good work being undertaken by the CSIRO in Australia that attempts to tease out these elements, an example that New Zealand should follow.

Sustainability — how do we see the relationships?
Fig. 1 is presented as a discussion point for readers to ask, 'What is the relationship here?' and 'What subsumes to what?'

This is a model of strong sustainability, and recognises that the economy is a subset of society, and that they sit in the natural world, totally dependent, ultimately, on the natural capital. Although environmentally aware groups understand this, others dispute the model quite strongly.

This conceptual model can be expanded to include all the elements of sustainability and liveability (Fig. 2). These are divided into three groups. The first is the physical and ecological group. A second group constitutes the community interests. Thirdly, we have the economic elements, including aspects such as reliable employment.

These sustainability elements are all part of the fabric that contributes to *quality of life*. This is a key point — it's not about whether we are in the top half of the OECD league table, or if we achieved 4% GDP on a particular year. The *end game*, and I think it is important to clearly emphasise that the end game is quality of life, the product of weaving together a social fabric, an economic instrument fabric, and all the physical qualities of the environment.

Sustainability — how are we going?
In one study, *Creating our future* (PCE 2002a), we brought together data about how New Zealand is fairing in the sustainability context. We used a set of meta-indicators to indicate whether New Zealanders, as a collection of four million people, are in fact becoming more or less sustainable (Table 1; Fig. 3).
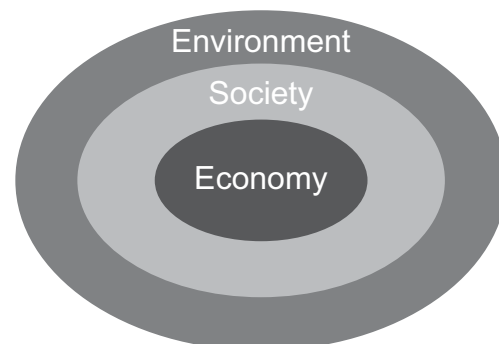

Fig. 1 Sustainability: how do we see the relationships? (From PCE 2002a, p. 7 & 35).

Community
• safety/security; physical health
• cohesiveness of caring
• access to - health
  - education
  - housing
• law and order
• participatory democracy

Physical/ecological
• secure substrate/earthquake/floods
• potable water
• sewage/waste water management
• solid waste management
• breathable air
• shelter/housing
• secure food supplies
• amenities, a desirable habitat for living, recreation, working
• spaces for movement

Economy
• reliable employment
• incomes that will sustain a fair quality of life
• just wealth distribution
• economic opportunities/diversity
• corruption free investment systems

Fig. 2 Sustainability elements — for quality of life.

Over a 20-year span (1981–2001), New Zealand had a population increase of about 19%, but other parameters such as total consumer energy increased about 61%, the number of dwellings increased by 35%, and the number of cars increased by 67%. Worse still, I think Auckland hold an OECD record for solid waste increases.

The key question these crude indicators are attempting to answer is, on a per capita basis, are we living on more or are we living on less per capita? Unfortunately, all parameters have increased per capita and our demands are climbing steeply. These increases greatly outpace the population growth, so we must address the demand curve if we are serious about being more sustainable.

Strategic linkages
Another aspect that we need to consider seriously is strategies. As a nation, New Zealand is coming together and thinking much more about strategic positions on a wide range of topics.

We studied all of the recent strategies, as part of our examination of the 10 years since The Earth Summit in Rio de Janeiro (PCE 2002a). These included the key strategies that emerged from the last four to five years of government, the education strategies like 'learning to care', right down to the social development, health, employment, and tourism strategies. We then evaluated all to determine whether there was strong evidence of connections being built into those strategies with action plans to cross-link them (Fig. 4). In some cases, we found a glaring lack of linkages. For example, there were no linkages between biodiversity and tourism. Neither were there any linkages between employment and regional development, industry development and biodiversity, or even energy efficiency and conservation.

If New Zealand is going to actually become more sustainable, if we are going to use these core strategies to help us do that (and they are a good instruments in their own right), then we must start intermeshing them. The theme of

Table 1 Percentage change in National Parameters 1980–1996, and 1981–2001 (from PCE 2002a).

National Parameters	Increase from 1980 to 1996	Increase from 1981 to 2001
GDP	37%	54.7%
Total consumer energy	44%	60.8%
Area of urban land	78%	–
Number of dwellings	28%	35.2%
Number of cars	31%	66.9%
Solid waste disposal (Auckland Region only)	95%	130.5%
Population	15.5%	18.9%

this conference is biodiversity in the city, but how does it relate to the other elements of a city being pursued by other interests? A lot more work is needed to effectively achieve this.

Sustainability 'glue' and societal engagement
Community engagement is of vital importance, and provides the 'glue' to facilitate sustainability initiatives. Engagement with our community must be fully realised, and I am not sure that we always do so effectively. Cohesiveness elements are important. There are many different statistics that can be compared; local government voter turnout provides but one example (Fig. 5).

The disconnection from family, friends, neighbours, and our democratic structures — and how we may reconnect are examined in depth in a fascinating book by Robert Putnam entitled *Bowling Alone* (Putnam 2000). This phenomenon is important because it affects how well communities achieve in the public good commons realm, much of which is directly relevant to the greening of cities theme.

However, while some forms of civic engagement may be declining, environmental 'activism' against, for example, stream water quality or GM crops that are perceived to be a risk to health or recreation pursuits is certainly not amongst them!

All forms of civic engagement are really fundamental to holding together a wide range of initiatives, including urban greening, biodiversity, and revegetation projects.

There are some interesting patterns emerging from studies on community engagement from around the world. One case study features a community of 2.6 million people from the Fraser River basin, north of Vancouver, Canada. This community has come together and formed a council. It's a diverse group of government, non-government organisations, businesses, first peoples and so on, that have constructed a list of sustainability indicators (see http://www.fraserbasin.bc.ca/). This demonstrates what can be achieved through strongly-engaged societies.

2. BIODIVERSITY IN CITIES ABROAD: LEARNING FROM OTHERS

International case studies in the management of icon landscapes
Several years ago, my team and I investigated peri-urban pressures here in New Zealand, published in our report *Managing Change in Paradise* (PCE 2001a). We examined six regions:

1. The Wakatipu Basin
2. Waiheke Island
3. The Waitakere Ranges
4. Long Bay – Okura
5. Banks Peninsula
6. Pauatahanui Inlet and Catchment.

Our studies of these areas revealed that the Resource Management Act 1991 (RMA) provides inadequate protection, and that landscape qualities in the broadest sense are in fact not being sustained that well.

As a consequence, we asked, 'Well okay, what's going on in some other parts of the world?' and undertook three case studies:

1. Oak Ridges Moraine, Ontario, Canada
2. Cape Peninsula, South Africa
3. Peak District, United Kingdom.

These studies were published recently in a report entitled *Superb or suburb*? (PCE 2003a), and will not be discussed in depth here. However, the Oak Ridges Moraine case study is an interesting one. This study showed that the elements in that landscape, including the green spaces that were being encroached by urban development, would only retain their integrity if there was a much stronger framework of protection. This framework could not be an effects-based one — which was what they had. In a remarkable change of approach, Oak Ridges Moraine is now managed through area-specific legislation, which establishes a Moraine-wide conservation plan and clearly defines the valuable qualities of each area (e.g., form, function, shape and the vegetative cover). Consequently, there has been a reversal of

the core legislation in Ontario from one that was more like our RMA to one that is more prescriptive with areas and environmental (i.e., effects-based) attributes being clearly defined and protected.

So there are indeed lessons that can be learnt by following the examples provided by other countries. In all those cases, the core elements that people wanted sustained have been sustained via a strong, prescriptive, legislative framework, and not through a broad effects-based mechanism. However, well-crafted legislation alone is insufficient; strong, hands-on support from central and local governments, research organisations and other interest groups is also essential.

Curitiba

Another place that we found interesting is Curitiba, a city in southern Brazil (PCE 2002b). One of the reasons that the city came to our attention was that it is located in a 'second world' country. I dislike that term, because I consider that Brazil is a country that is extraordinarily rich in human capital. Brazil is a diverse nation of 177 million and has an enormous amount of horsepower in the people sense.

Although Curitiba is more than 300 years old, it has recently undergone rapid population growth, from 0.5 million in 1960, to 1.6 million today. Despite this expansion, the city now offers some of the best living conditions in Brazil.

This transformation has been possible through maintaining two key values. One was very good planning and leadership. The other was focussing on the city's natural and human capital. They called themselves 'Capital Ecologica' back in 1972 before others even considered that sort of phrasing. Other key ingredients include:

- A design mentality
- Quality of life — access to the ingredients for all citizens
- Public-private partnerships
- Action orientated
- Future focused.

Jaime Lerner is credited with initiating this movement. He was originally an architect and planner by profession, and could see that those ingredients were where the core of the health of a city lay. Before becoming Mayor and then Governor of the State of Paraná, Lerner was the first leader of the Institute for Research and Urban Planning of Curitiba (IPPUC) established in 1965. The Institute now has more than 200 workers and is a powerhouse of creative thinking and innovative social and infrastructure design. They have crafted the shape of the city from a master plan since 1966 (Fig. 6A,B). This has all been possible through the aid of an enlightened political system with similar values that reward the long view.

In Curitiba, they integrated their land-use thinking with street networks and public transport systems (Fig. 7). From the beginning, they also looked beyond the periphery of the city and Curitiba has put an enormous amount of protection on their peri-urban green spaces (Fig. 8). They have also come back into the city and created little pocket gardens (and in fact Christchurch has also had similar thinking and initiatives over many years).

This focus ensured that, as the city grew they did not lose their primary vegetative natural capital. It has been maintained throughout the city, from the downtown metropolitan area where Curitiba has kept their large heritage trees (Fig. 9), to restoration of their inner parks and quarries (Fig. 10), as we are doing in parts of New Zealand. I think that one of the most interesting things is that Curitiba, a city comprised of Portuguese, Germans, Italians, Poles, Ukrainians and more recently Japanese, have invited each of the ethnic groups to essentially adopt one of the major parklands (e.g., Fig. 11).

So Curitiba are celebrating cultural diversity by linking this diversity to the fabric of the new land. I believe that this provides a powerful message about how we could relate to our green spaces through cultural connection. Curitiba also does it through the way they have implanted their opera house into an old quarry site surrounded by extensive plantings

(Fig. 12), and placing their Open University for the Environment (an environment training and research centre) into another old quarry using recycled materials (Fig. 13). These examples are placing the concept of advancing the greenness of a city back into its cultural context.

Australia
Recently, there was an enquiry conducted through the Australian federal parliament looking into sustainable cities. The background papers include paragraphs along the following lines:

"*The sustainable city of the future will integrate the built and natural environment.* ***The sustainable city will assist in retaining the biodiversity of Australia****, have a developed infrastructure that gives efficient and equitable access to services and utilities, preserve the essentials of the 'Australian lifestyle' and contribute to the economic wealth of the nation. This future vision will not be achieved without planning and without a clearly articulated strategy*". House of Representatives Standing Committee on Environment and Heritage (2003), p. 4 (emphasis added).

It is clear that the federal enquiry at the select committee level is placing a sharp focus on biodiversity in the cities. In their visioning, the preservation of bushlands, significant heritage and urban green zones are ranked number one. This focus has wide implications for Australian urban areas.

3. IMPLEMENTING SUSTAINABILITY: AREAS FOR FOCUS IN CITIES

Building citizen capacity
In order to implement sustainability in cities, it is vital to know what areas to target. The following are identified for building citizen capacity:

- Fostering leadership
- Improving understanding of issues and options facing settlement evolution — particularly mobility
- Increasing understanding of the ingredients of well-being / quality of life
- Increasing community capacities to contribute to the planning processes (e.g., RMA/LGA)
- Developing good indicators.

Fostering effective leadership is first and foremost for sustainability initiatives to be effective. Inspired leadership binds all of the sustainability elements and thinking together, and creates an improved understanding of the options.

Cities are notoriously complex systems and there tends to be tension between the different elements; mobility for example is particularly topical and discussed later.

There needs to be an improved understanding of the components that actually define quality of life that has people wanting to remain in a particular urban or peri-urban area. And it is not just whether you have employment. There is good evidence indicating that employment

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The sustainable Australian city of the future should:

1. **Preserve bushland, significant heritage and urban green zones**
2. Ensure equitable access to and efficient use of energy, including renewable energy sources
3. Establish an integrated sustainable water and stormwater management system addressing capture, consumption, treatment and re-use opportunities
4. Manage and minimise domestic and industrial waste
5. Develop sustainable transport networks, nodal complementarity and logistics
6. Incorporate eco-efficiency principles into new buildings and housing
7. Provide urban plans that accommodate lifestyle and business opportunities.

Source: House of Representatives Standing Committee on Environment and Heritage (2003), p. 4 (emphasis added).

status is not the prime factor; there are many other aspects that attract people.

Increasing community capacities to contribute to planning is essential in relation to the recent Local Government Act 2002 (LGA). Significant effort must be spent by central government in supporting local government and community initiatives; unlike the way that I feel they distanced themselves from the Resource Management Act 1991 (RMA).

The final item for building citizen capacity is developing good indicators, and these must be indicators that are relevant to groups and individual communities. They should not emerge from a strict science framework; or from a higher authority. The best indicators of these sustainability elements emerge from within communities.

Returning to mobility demands — there is no question that these demands continue to shape our settlement qualities and that they create extraordinary tensions. One of the greatest challenges over the next 20 to 30 years is how we manage our use of private motor vehicles. The qualities of urban life encompass the space between the buildings that we occupy, and not the space that we devote to cars. That is an absolutely fundamental aspect that makes for a successful city habitat, and biodiversity is also a key player in urban space quality.

I think that the tide is turning, because in Wellington, for example, the City Council are reclaiming pedestrian space by increasing footpath size along Lambton Quay. The Wellington City Council is also creating new bus lanes, and eroding the stronghold that the car has by installing good bus shelters. You can now travel all the way from the railway station, or the bus station, right through the centre of the city essentially under shelter. These seemingly simple measures can have a large impact as they are aimed at increasing the habitat for people on streets.

So how are the various cities in New Zealand performing with regard to implementing sustainability? A recent report entitled *Quality of life in New Zealand's eight largest cities 2003* (North Shore City Council et al. 2003) evaluated eight of New Zealand's cities, a follow-on from a previous report evaluating six cities (Auckland City Council et al. 2001). I think that Christchurch should be congratulated, along with Waitakere, as they are the two that performed best. Table 2 summarises a series of conservation and biodiversity questions, such as:

- Are the biodiversity resources of this city well mapped?
- Are there mechanisms in place to protect and prevent its loss?
- Is there pest control in it?
- Have they got any marine reserves?
- Are there some specific fishing areas?

Table 2 Position of each city in conservation and sustainable management of biodiversity (from North Shore City Council et al. 2003, p.104). ✔ = Yes; ✗ = No; N/A = Not Applicable. Data source: Information from city councils, regional councils, Department of Conservation, and Ministry of Fisheries. Reviewed by Ecological Foundation, June 2003.

Questions	City							
	North Shore	Waitakere	Auckland	Manukau	Hamilton	Wellington	Christchurch	Dunedin
Survey/ mapping	✔	✔	✔	✗	✔	✔	✔	✗
Protect and prevent	✗	✔	✗	✗	✗	✗	✔	✔
Pest control	✔	✔	✗	✗	✗	✔	✔	✗
Marine reserve	✔	✔	✔	✔	N/A	✔	✔	✗
Fishing	✗	✗	✗	✗	✗	✗	✗	✔

Although the methodology may not be that robust, bringing together and comparing the positions of each city was a useful exercise.

Building knowledge capacity — a 'Citizens Cities Research Ltd'
Research capacity is the second area for implementing sustainability; one that I consider New Zealand to be poorly served by at the present time. This country has some talented individuals and multi-disciplinary teams in several organisations that are investigating all the elements of the fabric of design, growth, shaping of cities, and so forth, but we lack a major national research focus. Fortunately, the Foundation for Research, Science and Technology is beginning to ramp up this area of research. Such investment will eventually provide some of the needed knowledge for creative policies and innovative solutions to urban design, systems and infrastructure needs.

Success stories are already provided by the urban research institute of Curitiba in Brazil that has led the way for about 40 years, and has been a knowledge powerhouse for a succession of councils and their constituent community. Similarly, co-operative research centres are beginning to emerge in Australia.

A city's relationship with its hinterland — the land and sea
A third area for implementing sustainability is how cities relate to their hinterland — their land and sea.

Land uses will define regional wealth and health, and so the recent urban sprawl out over first class soils of Canterbury is an example of a worrying trend. Fresh and salt water habitats are often important elements of a city's biodiversity, so it is fundamental how a city sits in this relationship as well.

Focusing on the heart of the sustainability challenge
The final area of focus is on the whole way that we have constructed our society — our taxes, subsidies, regulations, and so forth. What follows is a quote of Maurice Strong, who in fact

was the driving force and leader of The Earth Summit in Rio de Janeiro in 1992:

'*Most of the changes we must make are in our economic life. The system of taxes, subsidies, regulations and policies through which governments motivate the behaviour of individuals and corporations continues to incent unsustainable behaviours.*' Maurice Strong, July 24th 2002 — addressing the US Senate Environment Treaty Implementation Review.

There are still many aspects associated with our economic and tax constructs that encourage unsustainable behaviours and conflict with biodiversity values.

4. SUSTAINABILITY LEADERSHIP: WHERE SHOULD THE FOCUS BE?
I consider that leadership should concentrate on the major transition from 'environmentalism' to 'sustainability', as discussed earlier. I am not convinced that New Zealand is there at the moment, but there are promising signs of change.

In addition, the whole area of education for sustainable living, businesses and society, to create a sustainability literacy, is absolutely fundamental. We have recently completed a 'think-piece' to raise the level of debate about education for sustainability, and to stimulate effective action so that New Zealanders can learn to live in sustainable ways (PCE 2004b). This report highlights how education, in its broadest sense, needs to bring about a transformation for the better, and will require a shift in perception and understanding among many people and organisations in New Zealand today.

It is important to quantify what really counts when it comes to sustaining a nations wealth, in other words, having good measures of natural capital and quality of life.

New Zealand's leaders should also be focussing on the urban environment in a multitude of ways, for example a city's:

- Eco-efficiency
- Lifecycle of infrastructures
- Biodiversity
- Energy efficiency
- Mobility systems
- Land-use evolution
- Cultural context.

We need to have a much sharper focus and leadership in resource matters; the stocks and flows of key components of natural capital — water, land, biodiversity, and so forth. They are important because we have constructed quite a few models of management that have been far from successful. We have also confused where there are strengths in market models, and where there are weaknesses.

Biosecurity is essential for a biotic nation like New Zealand with unique ecologies. One of the challenges to maintaining our biodiversity is active exclusion of the numerous undesirable insects, bacteria, and plants. Auckland has been described as the 'weed capital of New Zealand' and many weed species have escaped from that city.

Climate change is included because I believe that it is one of the major indicators of man's growing impact on planet Earth; we need to constantly remind ourselves of the impacts that we are causing and how we can address them. It's not just within the terms of the Kyoto Protocol; it is also about our attitudes towards building a robust fabric into our cities.

The final focus is on human capital, and all the areas that we require for building up businesses, politics and institutions, and particularly the research capacities in sciences, technologies, and humanities to advance sustainability knowledge.

CONCLUSION AND QUOTES
I will finish this paper with three quotes. The first is from Joe Walding, who was at the time Minister for the Environment:

'*The Government can make laws and set up the administrative framework to maintain a healthy and productive environment, but without the sensitivity of individual New Zealanders to environmental values and their willingness to act where necessary to protect them, we can achieve little*.' Hon J. A. Walding, Minister for the Environment, as a Foreword in *The New Zealand Conservation Handbook* (Morrison 1974).

So, ultimately it is up to all of us, a point that has been made many times. And I like this quote too:

'*The kind of thinking that has got us into this situation is not the kind of thinking that will get us out of it*.' Albert Einstein.

That is absolutely true when dealing with sustainability issues — the solutions are to be found by thinking about it differently.

I will close with a final quote, to make it absolutely clear where I think the order is, and what is subservient to which:

'*The economy is a wholly owned subsidiary of the natural ecosystem*.' Paul Hawken (1993). From The *Ecology of Commerce*.

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[1]Editor's note: most of the publications referenced here from the Parliamentary Commissioner for the Environment are available on their website at http://www.pce.govt.nz/.

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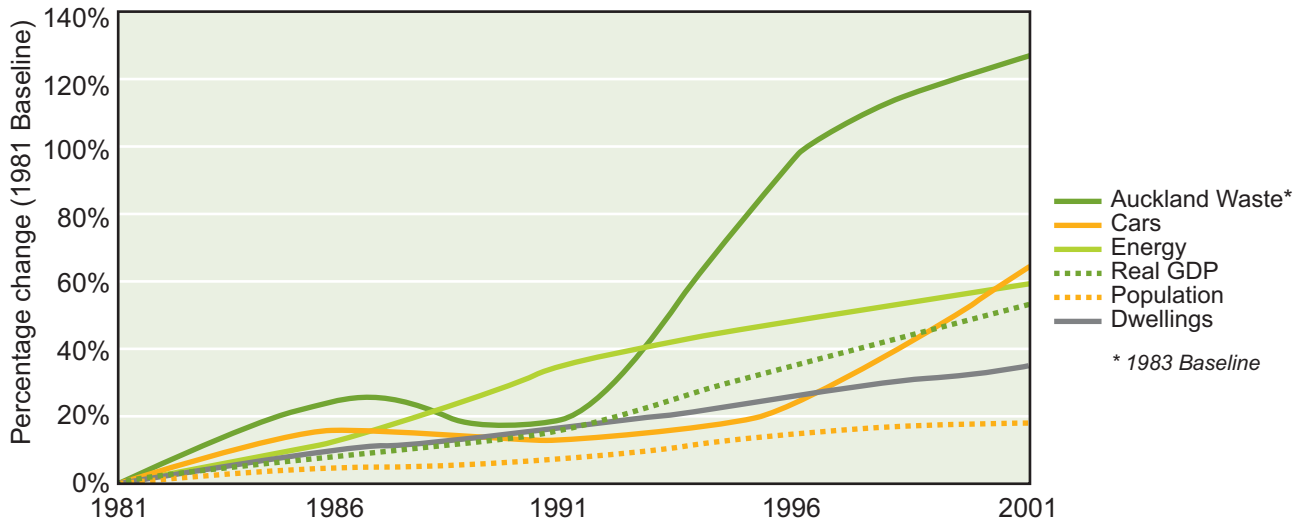Putnam, R. D. 2000: Bowling alone: the collapse and revival of American community. New York, Simon & Schuster. 541 p.

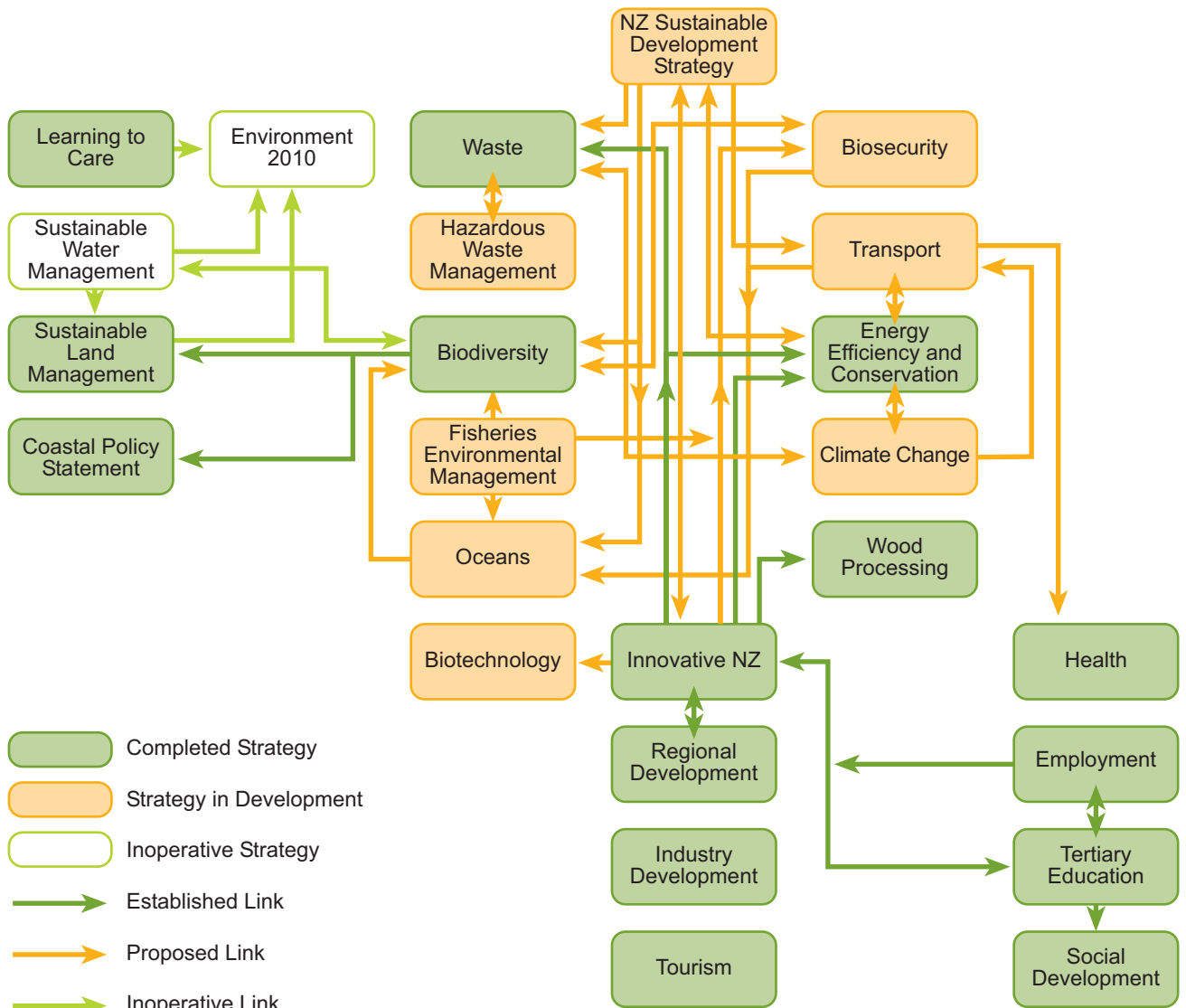**Fig. 3** Percentage Change in National Parameters 1981–2001 (from PCE 2002a, p. 63).

Fig. 4 Are we making needed connections? Flow diagram of linkages for strategic planning. (From PCE 2002a, p. 14 & 101).
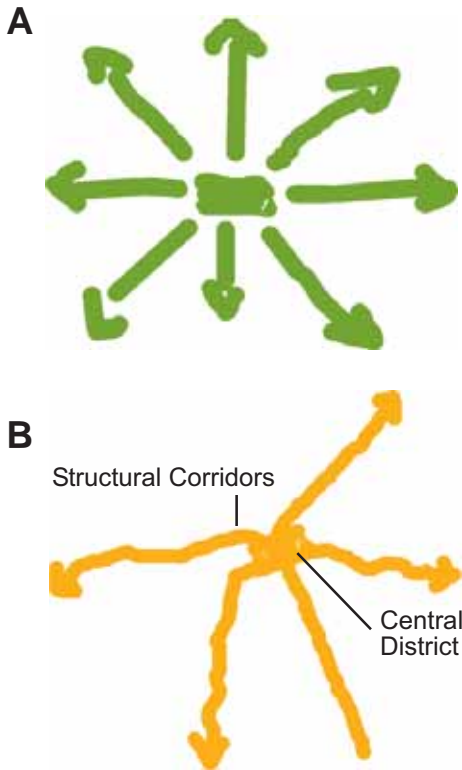
Fig. 5 Local Government voter turnout, 1992 and 1998.

A

B

Structural Corridors

Central District

Fig. 6 The 1966 Master Plan: changing growth patterns. **A**, radial growth; **B**, linear growth.

Land Use

Street Network

Public Transportation
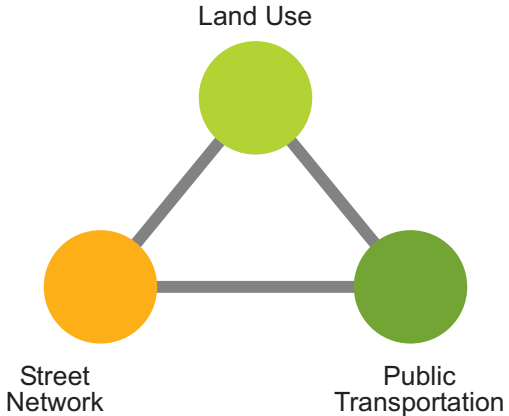
Fig. 7 The land use, connectivity, mobility triangle considered the centre-piece of settlement planning.

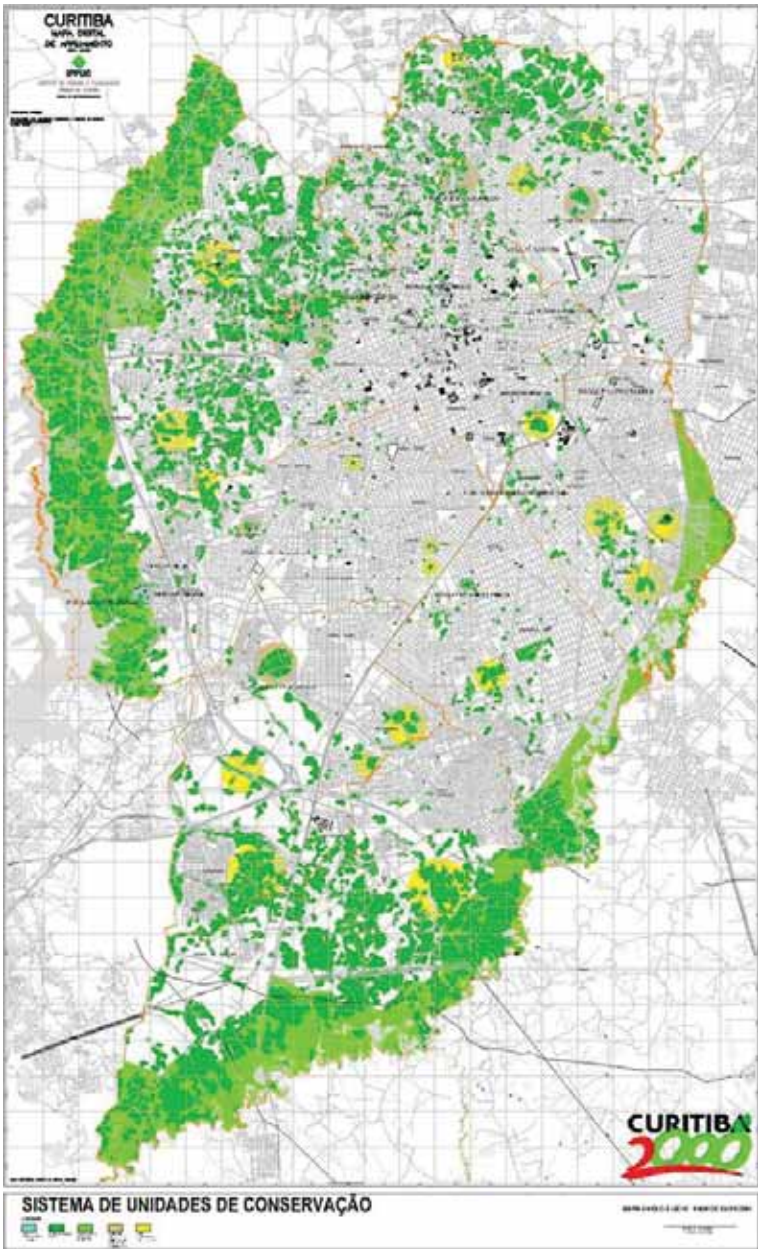
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Fig. 8 Green spaces to cherish; given priority in the early 1970s.

Fig. 9 Heritage trees and spaces.

Fig. 10 A 'Capital Ecologica'. Inner city park lands, recycled quarries — all part of basic city design.

Fig. 11 German Woods: celebrating cultural diversity.

Fig. 12 Building cultural and natural capital — inventive placement of an opera house and great use of an old quarry.

Fig. 13 Open University for the Environment — sustainability education: a focus on natural capital.