Manaaki Whenua
Landcare Research

Landcare Research
DISCOVERY

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What's Inside:

Johannesburg and beyond

As we go to press the World Summit on Sustainable Development has just ended in Johannesburg. Articles in this edition reflect work we are doing with urban, rural, and business communities to promote sustainable development.

Leaders from 160 nations, meeting at Johannesburg, assessed progress made since the landmark 1992 Summit in Rio de Janeiro. The major output of that summit, Agenda-21, provided a framework for social, environmental, and economic action at the local level to address global problems. New Zealand has implemented several issue-based strategies (e.g. biodiversity, energy efficiency, waste, health, and social development), and an over-arching national strategy for sustainable development is in preparation.

The Parliamentary Commissioner for the Environment, in his report *Creating Our Future*, describes New Zealand's post-Rio performance as patchy, and he shares further thoughts on p8. Consumption has outstripped population growth; pollution and waste have exceeded economic growth. These trends are sustainable only if we are willing and able to pay the economic, social, and environmental price, now and in future, for such things as more landfills, sewage outfalls, power stations, imported fuel, congested streets and drinking water taken from polluted rivers.

We should instead leave our children a legacy of *increasing* social, cultural, human, natural, and economic capital, protecting those qualities of life that we value. A positive example includes the Christchurch Waterways and Wetlands programme where effective partnerships, an inter-generational perspective and integrated thinking about the different types of capital are making an impact.

Robert Lamberts

Partnership is one of the World Summit themes. Landcare Research's Enviro-Mark (p5), is a partnership, with businesses and government, through which they improve their environmental, health and safety performance. The Kyoto Protocol is still centre-stage, and our Emissions-Biodiversity Exchange (EBEX21®, p4) is helping many organisations measure, manage, and mitigate their greenhouse gas emissions.

Issues regarding indigenous peoples are also prominent, and so we describe our work with Māori groups writing sustainable development strategies based on traditional stewardship of land and cultural resources held in trust for future generations (p6). We also describe the work of our International Business Group (p6) in a major agricultural and poverty alleviation programme in China.

Agricultural productivity is a major theme linked to health and education. We describe our research on the productive use of soil, with maps as a guide to wise land use (p2). An Ecological Footprint provides a measure of our environmental impact on land resources (p3).

Sustainable development demands understanding and partnerships across traditional boundaries to implement a long-term vision through practical steps. Landcare Research aims to foster each step of this process.

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Photo credits: left to right, Harley Betts 1, 2, 6, 8, Dave Morgan 3, Landcare Research Slide Collection 4, 5, Peter Buchanan 7.

New system maps out risks for land users

A new system used by Landcare Research combines complex information about soils and environmental features to produce easily understood maps as a guide to wise land use.

Most of New Zealand's exports are agricultural products that are highly dependent on the quality of the soil. Some soils can withstand intensive cultivation, while others rapidly deteriorate under even modest cultivation. To avoid depleting our soil resources, we need to identify the soils and the land management practices where there is a risk of soil degradation, or other environmental problems like nitrate leaching and sediment run-off.

EnSus (Environmental Sustainability) explicitly identifies where such problems occur, and displays this information in map form. The maps can be on any scale, from a single farm to the entire nation, provided appropriate data are available.

EnSus spokesman Peter Stephens says as part of the development of EnSus, scientists devised an index to rank soils' susceptibility to compaction and degradation from various land uses, as well as their inherent susceptibility to erosion. They also determined the impact of various land uses on soil quality. Seven chemical, physical and biological indicators of soil quality were established after analysing data from more than 500 sites nationwide.

This information is stored in a database linked to a geographical information system (GIS). To create maps of the type shown, information on the impacts of a range of land uses (e.g., arable cropping, dairying, forestry), is entered into the system along with the known environmental hazards in the area of study (e.g., soil compaction, erosion, and nitrate in groundwater). Maps are then produced for a range of land use scenarios.

Mr Stephens says land use pressures on New Zealand soils are less intense than in many other countries, but in recent years economic pressures have led to more intensive cropping and dairying, increasing the risk of soil degradation. "New Zealand is now facing a variety of environmental issues, such as hill country erosion, organic matter decline, and soil and water contamination.

"In future EnSus will include maps showing the impacts of economic pressures to intensify land use, and the potential negative effects this could have on farms themselves and surrounding areas."

Mr Stephens says many Regional Councils have already shown keen interest in getting EnSus maps compiled, and the maps will be equally useful to district and city councils, and to central government.

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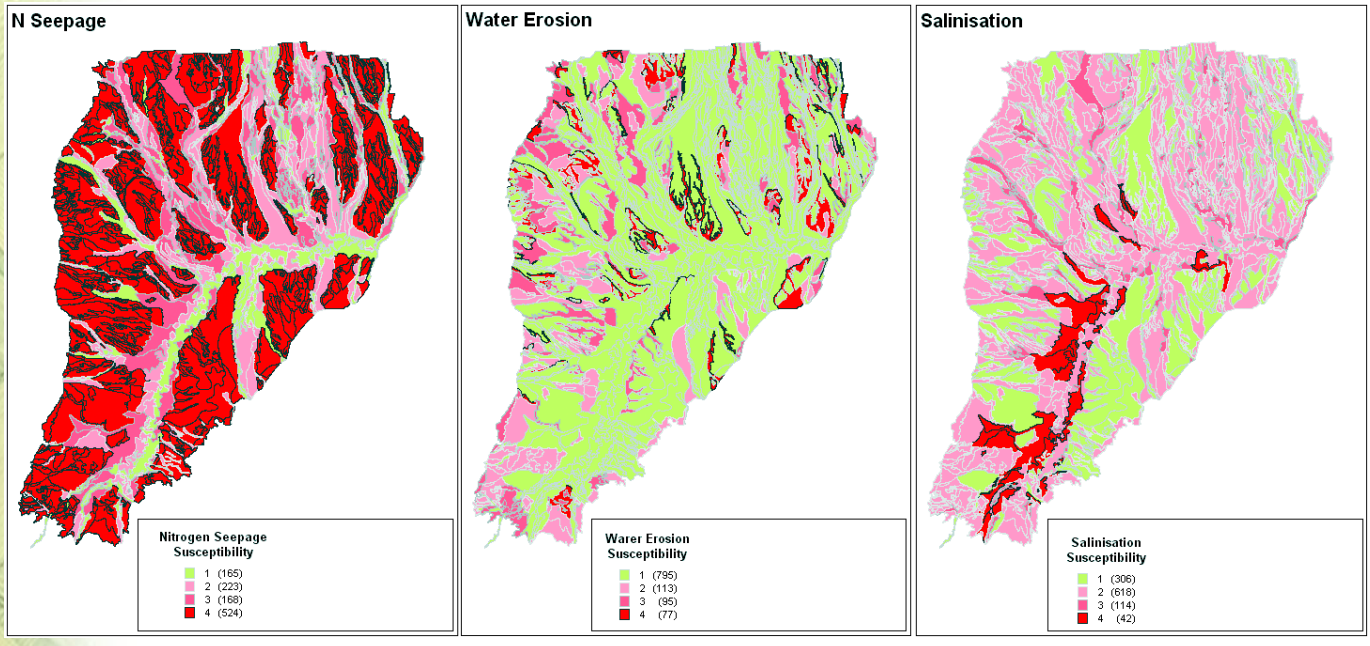


These EnSus maps of the Maniatoto Plain in Central Otago show some of the areas of risk for a likely dairy farm development. Susceptibility to damage increases from the low of Class 1 (light green) to the high of Class 4 (red). The area of land in each class is shown in hectares.

The maps are from work undertaken for the Otago Regional Council.

‘Footprints’ show regional sustainability

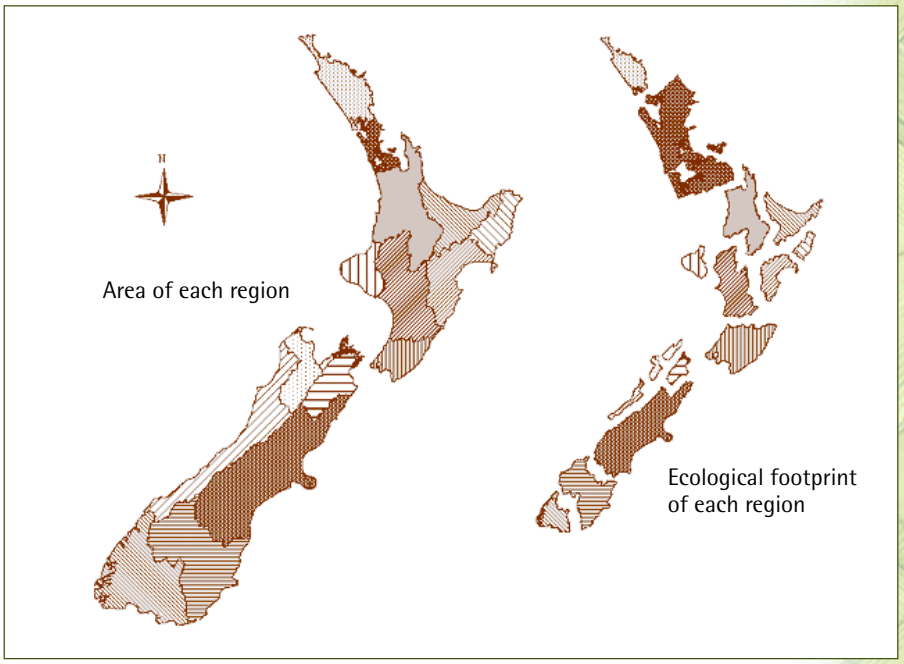
While individual Aucklanders may not have especially big feet, a new study shows that Auckland has the biggest regional ‘Ecological Footprint’.

Ecological Footprints (EFs) have been calculated for many countries and regions[1]. They raise awareness about society’s impact on the environment and can be used to help set goals for sustainable development. EFs measure the land area required to support economic activity, including land under buildings and roads, land in agriculture and commercial forestry, and the land area required to absorb wastes and greenhouse gas emissions.

Alarmingly, in most countries the EF exceeds the productive land area. New Zealand is one of the few developed countries with a footprint smaller than its land area. However, a new study shows that the Auckland region goes against the national trend.

Landcare Research scientist Garry McDonald, together with Murray Patterson at Massey University, has calculated EFs for New Zealand’s 16 regional council areas, and the nation as a whole. Using data from sources including Statistics New Zealand, Quotable Value New Zealand and the Ministry of Agriculture and Forestry, they found that the Auckland region’s EF is 2.3 million ha, about four times larger than the region itself, and at least 50% more than the region with the second largest footprint, Canterbury. Auckland’s EF per person is 2 ha. However, Otago’s EF per person is 5.4 ha reflecting its low population density.

“What we see in these areas is a direct effect of concentrating many people, services and businesses on relatively small land area in Auckland, compared to the small population and extensive farming on relatively unproductive land in Otago,” Mr McDonald says. “However, when you multiply the EF per person by the population, there is no prize for guessing which region has the largest overall EF.



New Zealand’s 16 regional council areas.

Only about a quarter of Auckland’s EF can be attributed to land use within the region.

“Looking at the flow of goods and services across Auckland’s boundaries, we discovered that 35% comes from overseas — that’s land required in other countries to produce the goods and services for Auckland’s imports. Land appropriated from other New Zealand regions accounts for 38%.”

Mr McDonald says this EF information can help each region set goals for sustainable development. “As we have seen, regions with a high imported EF export many of their impacts on the environment. As part of their strategy for sustainable development, they should set goals to ease the environmental pressure they impose both within their own region and elsewhere.

“Setting appropriate purchasing policies is one option. This may involve buying goods from suppliers who use a greater proportion of local producers, or a higher percentage of renewable energy and recycled materials. Fostering industries with high economic value and low land-use is another good option. Residents can also play their part by reducing fossil fuel use and supporting local producers.”

Both central and local government are looking for indicators such as EF for their sustainable development strategies. The Waikato and Canterbury regional councils and the Christchurch City Council have already indicated their interest in using EF information in these plans.

[1] Because of different local conditions, the EFs calculated here cannot be readily compared with other countries.

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Exciting future for environmental project

A Landcare Research initiative to combat greenhouse gas emissions has attracted enthusiasm from government, businesses and landowners. The project is now set to play a significant role in New Zealand's response to climate change and the Kyoto Protocol, which aims to reduce the production of insulating gases that surround the Earth, trapping heat and causing global warming.

The Emissions-Biodiversity Exchange (EBEX21®) is run by Landcare Research. It enables its users to measure the use of electricity and fossil fuels by themselves and/or their suppliers, the tonnage of carbon dioxide (CO_2) produced by this, and the area of native bush required to absorb the associated carbon. Potential reductions in energy use and emissions, and hence cost savings, can be identified. Emissions that cannot be eliminated are offset through partnerships with landowners who agree to regenerate native forest on their land. This makes it a win-win situation for organisations, landowners and the environment.

If the government ratifies the Kyoto Protocol, New Zealand must aim to reduce its greenhouse gas emissions to 1990 levels between 2008–2112. EBEX21® executive officer Ian Turney says the Government wants to encourage businesses to see positive opportunities in this, including cost savings and marketing clean, green products. Mr Turney says a starting point for businesses is to understand their **present** energy use and emissions, so that they can evaluate their future options.

"Since the launch of EBEX21® late last year, more than 30 government and business organisations have used the system to calculate their greenhouse gas emissions, and many more have registered interest in it," Mr Turney says. "Businesses want to not only comply with any New Zealand standards, but they are concerned about how greenhouse gas issues could affect exports. For example, those trading in Europe are concerned poor performance in this area will make them less attractive suppliers.

"EBEX21® has worked with Lincoln University to help the Tourism Industry Association, providing an understanding of the current and predicted energy use in the sector, and the implications for future competitiveness.

Ian Turney

This is a prime example of land suitable for EBEX21®— land where scrub quickly reinvades pasture when grazing stock are excluded. Land such as this will be crucial in future for locking up CO_2 ,which makes up 40% of New Zealand's net greenhouse gas emissions.

"We have also been working with the New Zealand Business Council for Sustainable Development on ideas for new clean, green business opportunities, and retaining access to markets."

Mr Turney says just as EBEX21® has been attracting interest from business, there has also been no shortage of farmers and other landowners offering land to establish native forests that will not be cut down. Several of these sites come to EBEX21® through the Queen Elizabeth II National Trust (QEII) with a QEII covenant already giving them long-term protection.

The type of land suitable for EBEX21® projects is low productivity land that is costing landowners money to keep from reverting to scrubland, and may even include gorse and broom. This land can regenerate into native forest, without the need for expensive plantings.

"The focus on native species rather than exotic is crucial. They not only store more carbon in the long term than pine trees which are harvested. Native forests also provide for greater diversity of native insects and birds."

Mr Turney says EBEX21® is set to play an increasingly important role in New Zealand's response to the Kyoto challenge because it deals with both aspects of mitigation: reducing emissions at source, **and** soaking them up. It is set to grow in financial importance. "The potential of native forest regeneration as a 'sink' for CO_2 is worth around $100 million per year in future carbon trading." Mr Turney says. "I would urge any forward-thinking organisation to start considering this now."

Funding: Retained Landcare Research investment

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Enviro-Mark NZ™ – partnerships in action

A programme that helps organisations meet environmental standards and save money in the process is attracting a strong following, as businesses and local bodies work to improve both their own practices and those of their suppliers and partners.

Enviro-Mark originated in the United Kingdom and was adapted for use in New Zealand by Landcare Research. It is an internet-based tool to help businesses put in-house procedures in place to comply with this country's health, safety and environmental (HSE) legislation.

Since its launch in January this year about 40 organisations have joined up with Enviro-Mark, including Fletcher Steel, HortResearch, Formway Furniture and the Wellington Regional Council's Landcare division.

Enviro-Mark's project manager Jim Watt says the business community is increasingly expected to provide evidence of responsible environmental and social performance. "This trend is being driven at home and abroad by consumers, government policy makers, and large and small companies."

"We find that many businesses and organisations with Enviro-Mark certifications are encouraging their suppliers and partners to join up as well," Mr Watt says. "For example, The Warehouse supports its New Zealand suppliers undertaking Enviro-Mark certification, and Ngāi Tahu Seafood is implementing the system at six of its processing plants. Also, two city councils are evaluating the use of Enviro-Mark as a way of supporting local businesses."

Enviro-Mark has five levels of certification. Users work at their own pace through the successive levels, and stop at whichever level is the most appropriate for their needs. Each level asks a business to take specific actions based on its size, activities, and any potential adverse impacts on the environment by either the business itself or its suppliers. The process and any resulting corrective actions are externally audited and a certificate is awarded for each level gained.

"New Zealand's HSE legislation sets the minimum standard for occupational safety and sound environmental practices, but in reality, many businesses find it difficult to prove they meet those standards," Mr Watt says. "Enviro-Mark helps businesses interpret and comply with the legislation, and gain market recognition for doing so."

Enviro-Mark also helps save money on the day-to-day running of a business. "We should be able to save organisations with a turnover of half a million dollars or more up to half a percent of turnover a year, simply by getting them to take a critical look at their use of electricity, raw materials, packaging, vehicle fuel and transport," Mr Watt says.

"As well as this, Enviro-Mark provides practical help along the route to obtaining discounts on ACC premiums, and it creates the potential for preferred supplier status with major purchasers."

But perhaps most importantly, Enviro-Mark is getting top marks from its customers. "The support provided by the Enviro-Mark team was exactly what we needed for our Environmental Management Strategy," says Wayne Power from CSP Galvanising.

"Because Enviro-Mark is split up into digestible phases, we can work through it at our own pace with the resources we have available," says Tessa Mills from HortResearch.

"We found Enviro-Mark to be a straightforward, step by step system," Philippa Crisp from the Wellington Regional Council's Landcare division says. "The various levels made sense in terms of progress."

For further information, see Enviro-Mark's website: www.enviro-mark.com

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Towards sustainable development – a Māori perspective

What do Māori regard as sustainable development in the 21st century? What is the way forward?

Landcare Research scientist Garth Harmsworth has been helping to find out, and helping Māori groups build frameworks for achieving their sustainable development goals.

Mr Harmsworth has just completed a four-year project, "Māori Sustainable Development in Te Puku o Te Ika," (the centre of the North Island) along with the University of Waikato's School of Māori and Pacific development. The bulk of the work involved participatory research with four iwi organisations: the Tauranga Moana Māori Trust Board, Te Arawa Māori Trust Board, the Raukawa Trust Board, and Te Rūnanga o Ngāti Porou. Many other Māori organisations and individuals were consulted throughout the North and South Islands.

Through a series of workshops, focus groups, interviews and marae visits, Mr Harmsworth and his collaborators gathered information on Māori views of sustainable development. "For Māori, the aim of sustainable development is holistic, and includes the concept of Māori self determination.

"This means that Māori want to advance and strengthen their standing as a people, to benefit their children and their children's children. And of course, the concept of sustainable development includes the idea of protecting and enhancing the environment for future generations.

"For Māori, as for Pākehā, there is no one point of view of what constitutes a clean, green New Zealand. Like everyone else, Māori are trying to balance social, environmental, cultural and economic goals."

However, Mr Harmsworth says Māori definitions of what is clean and green are often stricter than what most people accept, because of the intimate spiritual and cultural connection Māori have with natural resources. "Māori see native birds, forests, soil, land, water resources, and fisheries as resources or taonga that should be sustainably managed according to kaitiakitanga (guardianship) and tikanga (custom and practice)."

Mr Harmsworth and his team helped iwi members develop frameworks for sustainable development as a basis for defining mission statements and strategic objectives. This included developing resource inventories of natural resources, cultural sites such as marae, people, skills and economic assets.

"This stocktake included land, forests, soils and water, which are essential for planning and sustainably managing activities such as horticulture, organic farming, pastoral farming, forestry, and tourism," Mr Harmsworth says. "The stocktake also identified sites with cultural values that Māori believe should be off-limits or restricted for use."

Mr Harmsworth says using these new frameworks, Māori can build strong relationships with local and central government, improve communication, and bring a new cultural approach to planning sustainable development.

"Overall, the project has resulted in clearer directions for individual iwi and hapū authorities regarding what they must do to advance. Also, it is being used by Māori and non-Māori wanting to increase their work for Māori organisations in the area of sustainable development.

"Additionally, it has been a useful way to preserve some of the traditional knowledge held by elders about aspects of the environment including sustainable use of resources, cultural sites, place names, and plant uses. As public awareness of the need for sustainability generally increases, this knowledge is being seen as more and more relevant."

Funding: FRST (Foundation for Research, Science and Technology)

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Multi-sectoral approach eases poverty in rural China

An innovative approach to reducing poverty in inland China is having big pay-offs for the health and wealth of local people and the state of their environment.

Landcare Research's International Business Group (IBG) uses methodologies developed in New Zealand in international aid programmes in Asian and South Pacific countries. One of many projects underway at present is based in China's Yunnan province in Zhongdian, a snow-swept and barren district 3,500 metres above sea level on the Tibetan plateau.

The Zhongdian Integrated Rural Development (ZIRD) project, which began in 1998, applies a comprehensive, multi-faceted attack on poverty. IBG manager Bruce Trangmar, who is leading the New Zealand Agency for International Development-funded project, describes the people in Zhongdian as "desperately poor, and living in a very harsh environment."

Dr Trangmar says tackling poverty on several fronts was clearly the only approach that would work.

"Tradionally, aid programmes often tended to focus solely on a single sector such as livestock production, health or infrastructure. But the causes of rural poverty and environmental degradation are many and interact with each other, so we

Bruce Trangmar

Bruce Trangmar

(Left) Success in the field: the result of using an improved variety of barley, and better pest control. (Right) Farmer's delight in their first-ever convenient, uncontaminated water source. The plastic bag is for insulation, to stop the pipes freezing.

must make improvements in many areas for the results to be lasting."

Dr Trangmar's first priority was to try to gain the trust of local people with projects he knew would get immediate results. "Initially we focussed on drinking water quality. Women used to walk long distances to get water from a section of a stream that was polluted with animal manure. We piped in water from a clean part of the stream to key points in the villages. Soon there were fewer health problems such as gastro-enteritis.

"We also focussed on introducing better strains of potato, barley and canola seeds, and we introduced new planting methods. Previously, people laboriously hoed the soil and scattered seeds randomly. We introduced simple tilling machines that created less soil disturbance, and laid seeds in straight lines. These machines are now being made by Zhongdian people. We also showed people how to make simple plastic greenhouses, so they could grow green vegetables for the first time ever."

With the trust of the local people sealed through a third achievement – the building of a school, Dr Trangmar and his team set about tackling a cultural issue that was making the poverty worse. "Pasture land was communally owned, and although everybody used it, nobody managed it. We encouraged people to grow hedges to fence off livestock for better pasture and livestock management, and to stop the animals getting into streams and polluting the water.

"Traditionally, very large numbers of underfed animals were kept to compensate for high mortality, but through the introduction of veterinary services the project encouraged farmers to keep smaller herds of healthier, more productive animals, and to grow more winter feed such as oats.

"Also, around the time the project began the government banned people depleting forests by using wood for fuel. We set up nurseries of fast-growing timber species for fuel and fencing."

Eco-tourism ventures in the pristine alpine forests were an important local money-earner, but they were degrading the very environment they celebrated.

"Ponies carrying tourists were allowed to trample all over fragile upland meadows, killing delicate plants. Litter was strewn along tracks. We brought local conservation officials to national parks in New Zealand to show them features like boardwalks and rubbish bins."

The ZIRD project runs until the end of next year. The International Business Group is involved in several other multi-sectoral aid projects for poverty reduction and environmental management, including NZAID, Asian Development Bank and World Bank projects in China and Vietnam.

"Rural poverty and environmental degradation are usually closely linked, and often one causes the other," Dr Trangmar says. "We are finding that if we can address environmental issues in ways that fit with the culture and values of a people, we can help to raise their standard of living significantly, just as we are doing in Zhongdian."

Funding: NZAID

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Sustaining 'Sustainability'

Dr J Morgan Williams
Parliamentary Commissioner for the Environment

With more than 60,000 delegates attending the World Summit on Sustainable Development in Johannesburg, one can but hope that they all contributed in some way to enhancing the collective understanding of what sustainability for the human race entails, and what we must do to shift our current course onto a more enduring development pathway.

For New Zealand, I believe there is room for real optimism. We have many of the necessary ingredients; innovative people, a robust democracy, a developed economy, abundant environmental resources, a love of 'team play' and a growing sense of who we are — and there are less than four million of us.

Sustainability necessitates getting beyond environmentalism. Put simply, environmentalism can be considered activism to protect nature from the ravages of human economic activity, while sustainable development is about redesigning the way we meet society's needs and wants. Environmentalism is a movement against such things as pollution, while sustainability is a movement towards new actions and behaviours to maintain and enhance people's qualities of life.

So where should New Zealand focus?

- On the fact that a sustainable family, business, community or economy is one that goes about its activities **without** increasing impacts on life-supporting ecosystems.

- On governance arrangements, both local and central. We need policies, economic instruments and legislation that increase our quality of life without increased waste and energy consumption. Economic instruments such as environmental taxes (which can replace taxes on labour and/or capital) can be an important driver of resource-use efficiencies and environmental cleanup, as shown in countries including Germany, the Netherlands, Finland, Sweden and the United Kingdom.

- Advancing sustainability is a knowledge-demanding process. Much more research is needed on possible alternative institutional arrangements, economic strategies, taxation options and social policies as well as our physical world. We have to be able to link the many components of our physical, social and economic worlds in ways that enable us to test possible pathways to a more sustainable future.

- There needs to be a sharp focus on some of the specific areas that will be 'rocky roads' for sustainable development in New Zealand.

These include:

City and town development: the design and infrastructure for mobility, water and waste, citizens' safety and amenity values

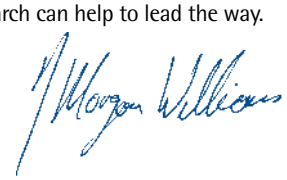
Dr J Morgan Williams

Waters: Maintenance of freshwater quality and the ecological health of our oceans

Energy efficiency and models: New Zealand is a relatively inefficient user of energy, renewable or non-renewable

Societal values and culture: As an increasingly multicultural society derived from peoples who over 1000 years have had the will to journey and be pioneering and independent, it is essential to understand the cultural context of sustainability.

So can New Zealand make the transition to an environmentally sustainable nation? Yes, provided we accept that it requires much more than 'business as usual'. What is now needed is political will and leadership in all sectors of society to support innovative individuals, businesses and community groups who are showing the way. Research institutions such as Landcare Research can help to lead the way.



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