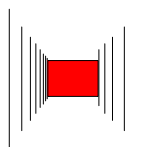


# The State of Deconstruction in New Zealand 2003 - Synopsis



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**Centre for  
Building  
Performance  
Research**

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## THE STATE OF DECONSTRUCTION IN NEW ZEALAND INTRODUCTION

This report is a summary of the 'State of Deconstruction in New Zealand' report prepared by Victoria University's Centre for Building Performance Research in May 2003.

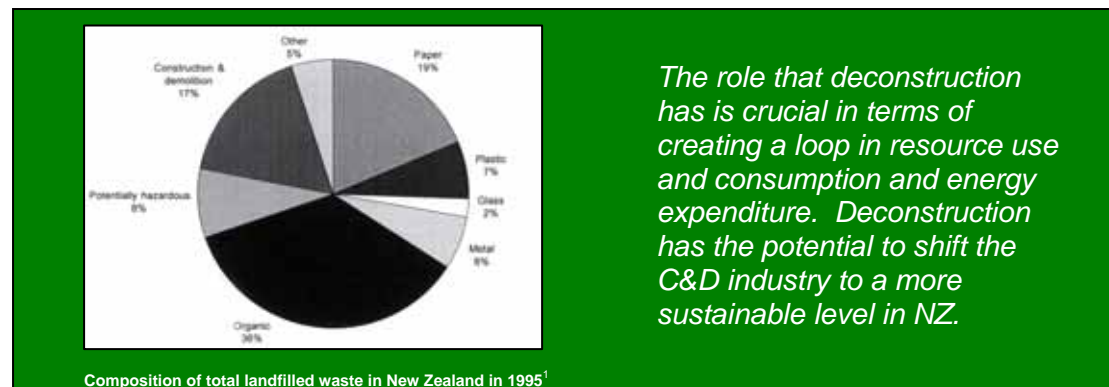
### What is Deconstruction?

Deconstruction is the systematic dismantling and recovery of construction materials from a structure at the end of a building's life. It is an alternative to traditional demolition where virtually all materials end up in a landfill.

### Deconstruction and Sustainability

The key document relating to the potential for widespread implementation of deconstruction and other materials reuse strategies is the Government's recently published strategy document 'The New Zealand Waste Strategy – Towards Zero Waste and a Sustainable New Zealand' of 2002, which sets the nation a target of reducing construction and demolition waste going to landfills by 50% of the 2005 figure by 2008. Half of the Territorial Authorities in New Zealand have set themselves the even more ambitious target of zero waste by 2015.

Although the signs are positive with regard to waste minimisation in New Zealand, the linkages to deconstruction and the opportunities for resource conservation through material and component recovery, which are implicit in deconstruction strategies, do not seem to have yet been widely recognised.



### Benefits of Deconstruction in the NZ Context

Deconstruction seeks to close the resource loop, so that existing materials are kept in use for as long as possible and the deployment of new resources in construction projects is diminished.

Environmental benefits of deconstruction are essentially two fold. Primary, resource use is reduced through a decreased demand on new materials for building. This means that climate change gas emissions, environmental impact, pollution (air, land and water) and energy use are all reduced. Deconstruction also means that less waste goes to landfill because materials are salvaged for reuse. This means fewer new landfills or incinerators need to be built which reduces the environmental and social impact of such facilities, and environmental impact of existing landfills is reduced.

Deconstruction also has significant social benefits. Deconstruction provides training for the construction industry and also has the potential to create more jobs in both the demolition and the associated recovered materials industry. It is estimated that there are 20% more jobs in the recycling industry than in landfilling in NZ.<sup>2</sup>

<sup>1</sup> Ministry for the Environment, *National Waste Data Report*, Ministry for the Environment, Wellington, NZ, 1997

<sup>2</sup> Snow, Warren, *Full Employment in Five Years — Sustainable community economic development*, The Jobs Letter No.135 / 1 December, NZ, 2000. <http://www.jobsletter.org.nz/jbl13510.htm>

Of direct relevance to deconstruction is Article 2 of Te Tiriti O Waitangi where Taonga (treasures – including biodiversity, native ecosystems, language, culture etc) are guaranteed to Tangata Whenua. Better waste minimisation schemes, of which deconstruction could be a major component, are therefore part of Pākehā / Tauīwi<sup>3</sup> honorable kawanatanga (governorship) in NZ.

Deconstruction could provide low cost materials to low income communities in NZ. It is estimated that about 18.5% of people live in low income or poverty situations in NZ.<sup>4</sup>

<b>Benefits of Deconstruction</b>
<b>Environmental</b>
Reduced primary resource use
Reduced waste to landfill
Increased opportunities for recycling
Site impacts caused by demolition such as compaction, dust etc is minimised
<b>Economic</b>
Profits increased taking into account on-sale of salvaged goods and reduced landfill costs
Promotion of NZ's 'clean green' image has spin off in tourism and exports
Increased local market potentials for the salvage and recycling industry.
Export opportunities for deconstruction related machinery and consulting.
Recycled goods may be of a higher quality and be of a more durable nature than new goods.
<b>Social</b>
More jobs are created in deconstruction.
Deconstruction trains workers for the construction industry
Deconstruction is a component of Pākehā / Tauīwi honorable kawanatanga
Cultural and spiritual values of the role of kaitiaki, or stewards, of natural resources expressed tangibly through deconstruction.
Deconstruction could provide low cost materials to low income communities.
Increased networking needed to make deconstruction has the potential to make stronger communities through greater communication.
<b>Health</b>
Off-gassing characteristic of old materials are better than that of new.
Deconstruction means less new waste facilities.
<b>Legislative</b>
Contributes to meeting Local Authority and Central Government obligations for waste targets, zero waste, Kyoto targets and Energy Efficiency targets.

### **Waste Impact of the Construction Industry in NZ**

It is widely accepted that there is a lack of coordination in C&D waste minimisation in NZ<sup>5</sup> and that there is limited information on the size and nature of the waste stream. Statistics on amounts of resources that are reused and recycled are also lacking on a national scale.

Although the often quoted figure for construction and demolition waste in New Zealand is 17%<sup>6</sup> of total landfilled waste, these figures do not include C&D waste taken to privately owned 'cleanfill' dumps or illegal dumping of C&D waste. There are currently no accurate figures for C&D waste, but realistically it could be as high as 33% of total solid waste in NZ.

Dumping charges vary widely from region to region and often cleanfill dump rates are very much cheaper than municipal landfill rates. Although NZ is still a sparsely populated country relative to other 'developed nations', it is becoming difficult in some areas to find land for new landfills that are acceptable to the public, are economic, or environmentally adequate. Increased deconstruction in NZ will divert materials from entering landfills in NZ.

<sup>3</sup> Tauīwi is one term given to all NZers / tourists / immigrants who are non-Māori.

<sup>4</sup> The NZ Poverty Measurement Project, Waldgrave, Stephens and Frater, 1996

<sup>5</sup> Ministry for the Environment, 'The New Zealand Waste Strategy', Ministry for the Environment, Wellington 2002. pp32

<sup>6</sup> Ministry for the Environment, *National Waste Data Report, May 1997*, Ministry for the Environment, Wellington, New Zealand, 1997, pp26

# DEMOLITION AND DECONSTRUCTION TECHNIQUES, MACHINERY AND TOOLS

## Introduction

There is an enormous range of approaches to demolition in New Zealand. Some of the larger demolition firms have resource recovery initiatives in place and continue to actively increase recovery rates. This is because they can make greater profits from deconstruction and recycling than from landfilling. Two of the largest demolition contractors in the country already refer to much of their work as deconstruction rather than demolition.

Other demolition companies, particularly those outside the Auckland Region salvage selected and usually small amounts of high value, easy to extract materials, in a process which is normally referred to as 'cherry-picking'.

Most of the nationwide deconstruction that does occur is the recovery of native timber and components from old domestic dwellings. In some domestic buildings close to 100% recovery rates have been achieved. With the widespread use of less durable materials in new houses, many demolition contractors see a reduction rather than an increase in opportunities to recover materials in the future.

*Most demolition projects in NZ can already be regarded as hybrids of demolition and deconstruction offering opportunities for resource recovery and the need for some measure of landfilling / disposal.*



Jarrah flooring recovered for reuse from St Joseph's Church

## Planning Issues for Demolition and Deconstruction

Most demolition projects in NZ can already be regarded as hybrids of demolition and deconstruction involving both resource recovery and the need for some measure of landfilling / disposal. Deconstruction in general involves more people, more time and more dealings with other businesses, but can result in a greater profit if carefully planned and executed.

## Demolition Techniques, Methods and Machinery

Anecdotal evidence suggests that demolition is becoming much more complex in New Zealand, with new techniques and machinery being employed and higher standards strived for. A general lack of skill base in the demolition industry means optimal recovery of potentially valuable materials is not always occurring, and the industry is therefore rather less profitable than it might be.

A lack of understanding of how to make the most of resource recovery opportunities, to the financial and environmental detriment of all parties involved, abounds and re-emphasises the need for education of operatives in deconstruction ideas, practices and opportunities and the financial benefits that can accrue.

Deconstruction uses predominantly the same tools as demolition, but has more of an emphasis on manual rather than mechanical labour. Some NZ contractors have developed special machinery and hand tools to assist in deconstruction and export various items with some success.

Demolition is an intensely competitive field in New Zealand and it is becoming increasingly clear that deconstruction maximises profitability. The national trend is towards increased resource recovery, but the timescale for implementing resource recovery strategies varies widely in different parts of the country.

## WHOLE BUILDING AND COMPONENT REUSE

### Introduction

Whole building reuse and moving existing buildings to new sites for reuse are common practices in New Zealand. Moving buildings, in most cases is not driven by environmental concerns but rather by economic considerations. Component reuse is common in New Zealand in domestic alteration and extension, but is less common in new domestic buildings and the whole of the non-domestic market.



House leaving site on the back of a truck<sup>1</sup>

*Approximately 3,000 buildings, mostly houses, are relocated each year in NZ. The typical New Zealand house with its light timber frame, timber weatherboard cladding, raised timber floor sitting on piles and corrugated steel roof is well suited for removal.*

### Moving Buildings to a New Site for Reuse

Domestic dwellings are much more likely to be moved to a new site than commercial buildings. Council requirements for the legal removal, moving and re-siting of a building vary throughout New Zealand.

It has been suggested that the main reasons people purchase houses to move are building character, construction quality issues and lower building costs. However site redevelopment is often the catalyst for house removal from a seller's perspective.

Building removal for reuse is not entirely confined to houses. NZ has an established practice of using relocatable prefabricated classrooms in schools and other larger light-weight structures have also been moved and reused successfully. Rather more rarely, large buildings, such as the Museum Hotel are moved.

### Benefits of Component Reuse

The majority of component reuse in the New Zealand context is of timber based components and plumbing fittings at the residential scale. Some Territorial Authorities in NZ are encouraging reuse of building components, particularly through specifications for their own projects. They have recognised the potential to reduce landfill demands with this and other recycling strategies.

### Component Recertification Requirements

There is no certifying regime for building components in NZ, which particularly affects to reuse of structural timber components. The opportunity to reuse components does exist within the regulatory regime however, determining the capability of a recycled component to meet the objectives set out in the Building Code is difficult. Nevertheless the reuse of building components appears to have a strong market condition, with a stable base in the domestic scale of building. The potential for substantially greater reuse of components exists within the building industry.

### Design for Component Reuse:

There are a small but growing number of architects in New Zealand who deliberately incorporate ideas of reuse into their designs.

<sup>1</sup> Photo courtesy of Britton House Movers.

## ENHANCING MATERIALS RECYCLABILITY:

### Introduction

In a preliminary scoping study of the NZ recycling industry<sup>1</sup>, Zero Waste NZ identified that NZ exports over \$NZ100 million of recycling related commodities, products, technologies and consultancy per annum.

The recycling industry in NZ is recognised as complex and variable and currently has little practical support from central government. It is characterised by medium to small businesses and individuals. Exact numbers and sizes of businesses are not available.

### General Issues of Materials Recycling in NZ

General recycling issues such as contamination of materials to be processed, high volume low value materials, economic viability and resource depleting down-cycling all apply to NZ. Most major recycling processors are in the Auckland region. This has economic and environmental implications for the viability of recycling for other regions, particularly the South Island.

Landfill charges which do not reflect the true cost of dumping, combined with low cleanfill charges in some areas, also undermine the viability of the recycling industry in NZ<sup>2</sup>. However, there are moves to more stringently regulate which materials are permitted to go to cleanfills and introduce more realistic costing of landfilling by Territorial Authorities in some parts of the country.

*Landfill charges which do not reflect the true cost of dumping, combined with low cleanfill charges in some areas undermine the viability of the recycling industry in NZ.*



Crane loading concrete crusher<sup>3</sup>

### Deconstruction as a Method for Increasing Materials Recyclability

One of the key factors in optimising resource recovery is the careful sorting of materials at the site. This means that materials are more easily recycled because some contaminants are prevented from entering the sorted waste stream. Interest in site sorting on construction sites seems to be increasing in NZ.

Deconstruction enables greater recycling and reuse because large fabricated sections or components are less likely to be damaged or broken up into pieces, which means they are more easily reused. Provision of appropriate storage is essential for deconstructed items to avoid deterioration or contamination or in some cases to attract potential buyers.

<sup>1</sup> Zero Waste NZ, Recycling in New Zealand: A \$100 Million + Export Industry – Preliminary Scoping Study, Zero Waste NZ Trust, Auckland, NZ, 2001.

<sup>2</sup> New Zealand Institute of Economic Research and Woodward Clyde (NZ)Ltd, *The Economics of Waste Management and Recycling in New Zealand*, NZ Institute of Economic Research, Wellington, NZ, 1999.

<sup>3</sup> Photo courtesy of Nikau Deconstruction Engineering Specialists

## ENVIRONMENT HEALTH AND SAFETY

### Introduction

The demolition industry in New Zealand is currently unregulated. Anyone can call themselves a demolition contractor and undertake demolition work of any scale. This situation applies to the whole of the building industry and has resulted in serious down-skilling of personnel and the development of a number of undesirable practices, centred on inappropriate cost cutting. The NZ Demolition Contractors Association (NZDCA) is currently working on measures to professionalise the demolition industry, by developing New Zealand Qualifications Authority (NZQA) recognised qualifications for demolition contractors.



Barrels of potentially hazardous waste<sup>1</sup>

*Approximately 282 000 tonnes of hazardous waste are landfilled in New Zealand each year and 70 000 tonnes are accepted at treatment facilities. There are no known statistics on what proportion of this is attributable to C&D related activities.*

### Worker Training and Safety

OSH has released guidelines and publications relating to worker safety in the demolition and construction industries in compliance with the HSE Act. There are however no deconstruction specific codes or guidelines.

### Hazardous Materials

Approximately 282 000 tonnes of hazardous waste are landfilled in New Zealand each year and 70 000 tonnes are accepted at treatment facilities<sup>2</sup>. There are no known statistics on what proportion of this is attributable to C&D related activities.

The main hazardous materials dealt with by the demolition or renovation industry in NZ are: asbestos, lead based paint, toxic fumes and substances, synthetic mineral fibres, PCPs, and treated timber, PCBs, dust, CFCs and HCFCs and increasingly toxic molds and fungi.

OSH and the MfE have various guides, regulations and approved codes of practices in place to deal with safety and health while removing, handling and disposing of hazardous materials.

<sup>1</sup> Photo courtesy of The Ministry for the Environment <http://www.mfe.govt.nz/issues/waste/content.php?id=16>

<sup>2</sup> Ministry for the Environment, *The New Zealand Waste Strategy*, Ministry for the Environment, Wellington, 2002, pp 10

## ECONOMICS OF DECONSTRUCTION AND MARKETING OF USED MATERIALS

### Introduction

The economic framework within which architecture, construction and deconstruction currently operates in the commercial sector, is one that is based largely on first-cost considerations and cost related time pressures. Buildings are expected to be designed, built and demolished as quickly as possible with a view to maximise profit. Central Government is however beginning to move to a whole life costing regime for buildings.

### Building Salvaged Materials Markets

One of the key economic factors affecting deconstruction is the economic sustainability or profitability of associated salvaged building materials markets. There are a number of different market sectors in building salvage in NZ.; Domestic, one off, antique or high value items; Low value, large volume materials; Complete building systems from the commercial sector; and specialist equipment and machinery. Industry opinion suggests that domestic, high value items have the highest individual payback and quickest turnover but that the turnover and volume of commercial or lower value products is larger and ultimately generates more profit.

There seems to be no collective voice from building recyclers advocating new standards and grading systems for recycled components or the resolution of liability and safety issues in the specification of recycled materials, as a way to increase market stability and profitability.

*Internationally New Zealand has a 'clean and green' image. It would be in the national economic interest to put in place effective waste reduction methods which might not only have long term economic benefits for the country but may also bolster the country's 'clean green image.'*



NZIA  
Life  
Cycle  
Impact  
Chart

### Waste Management Framework

Local authorities are responsible for waste management in NZ. And all have different levies, incentives and charges related to resource use and waste minimisation. The effect is to create market uncertainty, even market chaos, as the 'rules' change in response to fluctuating political agendas.

Privately owned cleanfills often set their fees below those of municipal landfills. These low charges make it even more difficult to establish economically viable recycling markets. Indeed cleanfill operators generally have a financial incentive to encourage disposal rather than recycling. However, some cleanfill operators are beginning to operate their own resource recovery systems, yet another sign that there is profit to be made in resource recovery.

### Deconstruction Assessment Tools and Life-cycle Costing of Deconstruction

Many financial modeling tools for use in deconstruction planning have been developed in other countries. These, however do not appear to be in use in New Zealand. There is only a minimal level of use of formal life-cycle analysis tools in New Zealand but it is increasing, primarily due to the development of the New Zealand Waste Strategy, New Zealand's recent ratification of the Kyoto Protocol,<sup>1</sup> and recent government moves to place increasing stress on life-cycle performance in building regulations.

<sup>1</sup> Jaques, Roman, BRANZ, *General Activity of LCA in New Zealand*, AIST Workshop, Tsukuba, 2002.



## POLICY, REGULATIONS, STANDARDS, LIABILITY

### Introduction

There are a number of acts and policies which implicitly support the principles of deconstruction in NZ legislation. Only the NZ Waste Strategy of 2002 actually mentions it explicitly however<sup>1</sup>. Deconstruction could contribute in a positive way to the Government's 'National Energy Efficiency and Conservation Strategy' of 2001. It is acknowledged by both strategies that they are inherently linked to each other. Deconstruction also fits the objectives of the Climate Change Response Act of 2002 and NZ's recent ratification of the Kyoto Protocol. At present NZ does not have comprehensive legislation relating to waste minimisation. A number of different acts are relied on as the framework for waste management.

Although the implementation of waste minimisation policies is the responsibility of local government in New Zealand rather than the direct responsibility of Central Government, roles in waste minimisation in NZ, particularly in the C&D area, remain unclear due to uncoordinated and sometimes confusing information, data and legislation.

*'The New Zealand Waste Strategy' sets the nation a target of reducing construction and demolition waste going to landfills by 50% of the 2005 figure by 2008. While this is not yet a legally enforceable target and is a target that remains a secondary priority according to the government, it nevertheless signals that central government is taking an active interest in C&D waste reduction.*



### Non Governmental Agencies

Much of the waste minimisation and resource conservation activity which is directly related to deconstruction in NZ is carried out by or supported by Territorial Authorities and non-governmental agencies.

#### NZ Non-Governmental Agencies Related to Deconstruction

New Zealand Institute of Architects

[www.nzia.co.nz](http://www.nzia.co.nz)

Building Research Institute of New Zealand

[www.branz.org.nz](http://www.branz.org.nz)

NZ Demolition Contractors Association

[www.nikau.org](http://www.nikau.org)

Resource Efficiency in the Building and Related Industries Programme

[www.rebri.org.nz](http://www.rebri.org.nz)

Recycling Operators of NZ

[www.ronz.org.nz](http://www.ronz.org.nz)

Waste Management Institute of New Zealand

[www.wasteminz.org.nz](http://www.wasteminz.org.nz)

Zero Waste NZ

[www.zerowaste.co.nz](http://www.zerowaste.co.nz)

<sup>1</sup> Ministry for the Environment, 'The New Zealand Waste Strategy', Ministry for the Environment, Wellington 2002.

## BARRIERS TO DECONSTRUCTION

### Introduction:

In addition to the general lack of awareness of the overall benefits of deconstruction there are significant barriers to the widespread adoption of deconstruction strategies in New Zealand, although none are insurmountable given the current governmental and local authority interest and support for waste minimisation in general.

Barriers to Deconstruction in NZ
<b>Perception and Education</b>
Designer/public/builder attitude: 'new is better' or 'new is easier'.
Lack of resources for education on deconstruction.
Lack of research into deconstruction.
Lack of information and tools to implement deconstruction.
<b>Design for Deconstruction</b>
Design for deconstruction in new buildings is not considered.
Existing buildings are not designed to be deconstructed.
Lack of education about design for deconstruction.
Lack of understanding of the benefits and opportunities associated with deconstruction.
Lack of understanding and use of LCA tools or concepts.
Lack of NZ specific case studies or examples.
<b>Market Development</b>
NZ's small, dispersed population and geographic isolation inhibits market growth.
The high cost of transport and storage of recycled components and materials.
Uses for some salvaged materials are undeveloped.
Guaranteed quality/quantities of reused materials are difficult.
<b>Economics</b>
Low cost of some new raw materials.
The tightening up of Health and Safety legislation.
Low tipping rates (including cleanfill).
Deconstruction needs a more skilled workforce than demolition.
The benefits of deconstruction are long term and collective but a first cost focus is dominant.
Market pressures - the current climate of 'as fast as possible'.
<b>C + D Industry:</b>
Unregulated industry.
Lack of communication and networking in the C&D industry and with waste minimisation organisations. There is no formal umbrella group to distribute information.
Demolition is generally a low profit margin industry.
Financial benefits of deconstruction over demolition are not understood.
<b>Liability</b>
Current standard specifications imply new materials should be used.
Lack of a grading system for reused, especially structural components.
Liability in certification or avocation of reused components or materials not clear.
<b>Legislation</b>
C&D waste minimisation is not a priority for some local councils / central government.
Confusion as to what Government legislation is, relating to environmental responsibility.
Inconsistent units of measurement in local waste data, very limited national data.
Waste management is a local council responsibility, with no mandatory regulation.
Adherence to the targets and goals in the NZ Waste Strategy is voluntary only.
<b>Technical Issues</b>
Lack of documentation on existing buildings to plan for deconstruction.
Some new materials are subsidised, creating unfair competition with reused materials.
Increased use of non-reversible technology, systems, construction, chemical bonds and plastic sealants etc.
NZ is in a high seismic activity region which makes design for disassembly more difficult.
New construction systems make recovery more difficult and less financially rewarding.

## CONCLUSION:

'The New Zealand Waste Strategy – Towards Zero Waste and a Sustainable New Zealand 2002'<sup>1</sup> sets the nation a target of reducing construction and demolition waste going to landfills by 50% of the 2005 figure by 2008. While this document provides no suggestions for how this target could be met and the target is not yet legally enforceable, it nevertheless signals that central government is taking an active interest in waste reduction.

The waste strategy document has created a great deal of discussion and a significant amount of action by some Local Authorities. Deconstruction is seen as one way in which considerable amounts of resources could be recovered for reuse. This would reduce pressure on landfills. Half of the Territorial Authorities in New Zealand have in fact set themselves the ambitious target of zero waste by 2015. It is mainly these and other local councils, along with waste minimisation groups such as Zero Waste NZ, REBRI, RONZ and WasteMINZ as well as academic institutions such as Victoria University of Wellington, that are driving current and proposed waste minimisation and materials reuse initiatives and research in the construction and demolition area.



St Joseph's Church deconstruction in Wellington

*Deconstruction is very much in its infancy in NZ and education and research is needed to raise its profile, to provide usable information and actively promote deconstruction as a worthwhile and viable option to make a real and significant contribution to achieving the government's resource recovery targets.*

Widespread adoption of deconstruction techniques in the demolition industry will have the both economic and environmental benefits by increased resource recovery and reduced pressure on landfills. Deconstruction will also increase employment in the building sector, both in the deconstruction process itself and in the marketing and on-sale of recovered components and materials.

Deconstruction is becoming accepted practice in the Auckland region, where Territorial Authority policies and the volume of materials involved have resulted in many demolition companies making better profits from deconstruction than from demolition. Elsewhere in the country adoption of deconstruction practices lags behind, even in the lucrative and nationwide recovery of native hardwoods from old domestic dwellings.

A small but growing number of architects, consultants and engineers are designing for disassembly and designing with reused materials in New Zealand. This is reflective of changing attitudes and a growing awareness of the construction and demolition waste problem in New Zealand.

**It is clear from the research so far carried out that deconstruction could make a significant contribution to the realisation of the C&D targets set by Central Government. Further research needs to be carried out to develop deconstruction as a profitable alternative option to demolition and to improve education and knowledge of the opportunities implicit in deconstruction. Further research also needs to be carried out to develop market demand for pre-used materials and to educate designers in techniques to enable them to design for deconstruction and so make future resource recovery easier and the closing of the resource loop much more feasible.**

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<sup>1</sup> Ministry for the Environment, *The New Zealand Waste Strategy, Towards zero waste and a sustainable New Zealand*. Ministry for the Environment, Wellington, New Zealand, 2002.

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