



Zero Waste New Zealand: Profile of a National Campaign

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1 The National Zero Waste Pilot Project

The Zero Waste philosophy has arisen out of the realisation that the wastefulness of our industrial society is compromising the ability of nature to sustain our needs and the needs of future generations. The current system of “take, make, and waste” is leading to an exhaustion of natural resources and leaving behind a legacy of toxic landfills.

Zero Waste is a whole system approach that aims for massive change in the way materials flow through human society. The goal is an industrial system that is directed toward material recovery rather than material extraction. Zero Waste is an end of pipe solution, a basket of disposal technologies competing directly with landfilling and incineration, and a guiding design philosophy.

Zero Waste promises a solution to three pressing issues:

- The environmental costs of extracting virgin resources
- The need to create more employment without imposing further burdens on the environment
- The problem of landfills.

Eliminating the need for further landfills is the most obvious benefit of eliminating the need for disposal. The recent difficulties encountered in finding new landfill sites in the South Island show the opposition of New Zealand’s citizens to further facilities.

The second element in the equation is the production of new jobs and business opportunities, particularly in regions of high unemployment. Collecting, processing, and manufacturing with recyclable materials creates many times the number of jobs than does transporting and landfilling waste. Unlike resource extraction jobs, recycling jobs occur where people already live. Much of the recycling industry is labour-intensive and provides entry-level jobs where they are needed the most at a cost that all communities can afford. Higher skilled jobs are created when manufacturing businesses are established to take advantage of the recycled material being collected and processed.

The third goal of Zero Waste is the conservation of resources. The recovering and recycling of materials closes the loop and reduces the need for virgin material and activities such as strip mining and forest clearfelling. Recycling materials also reduces the pollution and energy consumption that result from producing materials from virgin sources. Using recovered materials requires less energy, produces less air and water pollution, and generates less process waste than virgin materials.¹

The Zero Waste New Zealand Trust was established by the Tindall Foundation in 1997 to help develop breakthrough strategies that deal with New Zealand’s growing waste problem. The ultimate goal of Zero Waste is to create a closed loop materials economy; one where products are made to be reused, repaired and recycled, an economy that minimises and ultimately eliminates waste.

¹ White House Task Force on Recycling (1998) Recycling for the future...Consider the benefits, Office of the Environmental Executive, Washington as quoted in GrassRoots Recycling Network (2000) Wasting and Recycling in the United States 2000, Institute for Local Self-Reliance, Washington D.C.

The Tindall Foundation was established in 1995 with the aim of funding projects supporting families in New Zealand. This objective was later amended to include support for projects that were endeavouring to generate employment by addressing environmental issues, particularly those dealing with waste.

Research into groups working in this area found that other funding providers were uneasy dealing with groups that straddled the boundary between the business and not-for-profit sectors, as many of these groups did. The research found that, as well as lacking funding sources, these groups needed co-ordination and the means for networking.

After a visit to Canberra, ACT, to see the effects of its Zero Waste initiatives, the decision was made to set up a separate trust, to be called the Zero Waste New Zealand Trust, to deal with waste issues separately to the Tindall Foundation. The objective of the trust was to assist New Zealand to become the first country in the world to adopt a national Zero Waste target.

The Trust decided to focus its efforts on encouraging district and city councils to adopt Zero Waste strategies. The Project offered support and financing to ten councils willing to set an objective of achieving Zero Waste by 2015, with a review date in 2010.

Opotoki was the first council to commit itself to achieving zero waste to landfill by 2015. Other councils soon followed. The response was so encouraging that the Zero Waste Trust approached the Ministry for the Environment and was successful in obtaining funding to allow a further ten councils to be included.

When the target of twenty councils was met, several councils were already well advanced in the process of declaring themselves Zero Waste councils. Further funding was released to include these councils, and the Pilot Project was complete with twenty-five councils involved. Despite the Project having its full complement of members, three further councils and one community have since dedicated themselves to achieving Zero Waste, and there is a continual stream of enquiries from other interested councils.

The first twenty councils which had joined the Zero Waste Pilot Project were surveyed to determine their motives for becoming involved. Five primary reasons were given for joining:

The Zero Waste philosophy – 10 out of the 20 councils cited the Zero Waste philosophy as being the main reason that convinced them to become Zero Waste councils.

The funding offered by the Trust – Six of the councils placed funding as their top reason for participating. These councils tended to be the smaller councils with smaller budgets.

Necessity – Five of the councils cited the necessity of finding alternatives to landfill disposal, particularly due to the imminent closure of local landfills.

Public support – Three of the councils joined because of public support for the philosophy and the Project.

To support existing waste reduction efforts – Three councils joined as they saw that becoming part of the Project would further their existing waste reduction efforts.

The importance of the power of individuals within an organisation to drive change cannot be overstated. Sixteen of the twenty councils surveyed recognised that key council staff members were the main impetus for driving Zero Waste policies through the council.

Nine of the councils named councillors as major supporters of the process, while two councils named the mayor or public support as being important factors. One council identified community groups as being a major influence.

The Zero Waste NZ Trust maintains an ongoing commitment and relationship to the councils involved in the project. Priority funding is released to projects within the councils' boundaries in addition to funds provided to councils to develop their Zero Waste strategies. An annual conference is held to network, share information, and provide a national focus for the campaign. Perhaps most importantly, the Trust provides technical assistance and networking facilities to assist councils to develop strategies and solutions that fit their own community's needs.

Working with these Zero Waste councils, the Trust is developing a strong, cohesive group of communities that are committed to achieving sustainability through eliminating waste.

2 Initiatives being taken by Zero Waste councils

As of September 2000, thirty councils were involved with the Zero Waste New Zealand Trust, twenty-five as members of the Zero Waste Pilot Project. Some of the councils have only recently become involved in waste reduction, and others had been involved for several years. Many of the councils involved are therefore at very different stages of development in their waste reduction planning.

Councils attempting to implement changes find they are unexpectedly entering into the field of social engineering. It is a major shift in public perception to view a waste item as a resource rather than as a reject.

Councils have, in many instances, taken on new leadership roles and begun to act in a proactive manner. Methods of providing incentives to encourage private enterprise to participate have been devised. Councils have begun to network with neighbouring councils to investigate synergies that could exist for collecting, processing, and marketing recyclables. In many areas, councils have realised that it is the community groups that have the expertise, and they have had to learn to make use of this.

Following are a sample of the waste reduction initiatives that have been undertaken by 11 of the councils since joining the project.

Kaikoura

- Elimination of regular council-funded refuse service
- Setting up of a joint venture company between Wastebusters Trust and Council to manage both the resource recovery centre and the landfill
- Continued operation of the resource recovery centre, which employs 5 full time employees, by the Wastebusters Trust with plans to create further employment opportunities over the next 5 years to staircase many unemployed back into the labour force
- Purchase by the Trust of a chipper to process greenwaste at resource recovery centre for mulch and compost
- Manufacture of a glass crusher to produce product for landscaping and sand blasting
- Ongoing relationship with high school to become the first Zero Waste high school in New Zealand
- Audit of the district's waste over a 3-month period that showed that the district is recovering almost 50% of its waste stream
- Continuation of a weekly kerbside collection of recyclable materials for residents and twice weekly pick-up for the commercial sector
- Plans to replace conventional refuse bins on esplanade with recycling bins

Gisborne District Council

- Introduction of kerbside recycling in September 2000
- Introduction of user-pays system for refuse collection
- Surveying of local residents regarding waste management options
- Public promotion and education regarding changes to waste management
- Increase of landfill fees to \$90 a tonne

As a result of these initiatives, local recyclers report an increase in tonnage handled and tonnes disposed of at the landfill have decreased from 40,000 to 25,000 in the last financial year, a reduction of 37%.

Nelson City Council

Nelson has developed a draft Zero Waste strategy, which includes the following components:

- Regular waste audits, to gain more comprehensive data on material disposed of to landfill and to monitor the effectiveness of waste reduction initiatives
- Landfill costs to be adjusted to reflect true costs
- Recycling to be expanded to include recycling of plastics and paper
- Improve environmental performance of council operations
- Waste education
- Working closely with the other two 'Top of the South' Councils: Marlborough District Council and Tasman District Council

Porirua City Council

- Performance of an internal waste audit across all council services
- Establishment of community facility for collection, storage, processing, and sale of reusable and recyclable materials
- Investigation of potential of processing recyclable materials locally into value added product
- Addition of a recycling and reuse component to inorganic collection
- Improvement of community liaison with a targeted education and promotion campaign
- Review and update of bylaws for better control of commercial waste and incentives to encourage increased waste reduction
- Removal of auto bodies from landfill stream, resulting in an immediate 6.5% reduction of waste to landfill

Timaru District Council

- Separation of 2,000 tonnes per year of garden waste at transfer stations
- Establishment of drop-off points for a wide range of recyclables
- Appointment of a waste minimisation co-ordinator to assist with waste minimisation initiatives.
- Adoption of a zero waste to landfill plans by several schools
- Launching of a waste exchange in 2000
- Introduction of a zero waste to landfill plan for the Council's main office

Whakatane

- Trialing of a compartmentalised recycling bin to increase recovery rates from kerbside recycling collection
- Investigation into the establishment of a resource recovery facility to replace the proposed new landfill
- Involvement of 30 schools in waste education programme
- Establishment of a joint working party with the Opotiki and Kawerau District Councils to co-ordinate combined approaches to Zero Waste policies
- Rewards programme as part of recycling promotions
- Employment of additional landfill staff to promote waste separation/minimisation at the tip face
- Establishment of a used paint/oil storage facility at the local landfill
- Establishment of resource recovery facility at local landfill

Central Otago

- Establishment of Central Otago Wastebusters and employment of a manager
- Selection of site for recycling has been completed and agreement in principle has been reached for its provision by council
- Organisation of first public event by Wastebusters Education Committee
- Educational displays organised for Blossom Festival in late September 2000
- Waste minimisation funding arrangements are being finalised with the Central Otago District Council

Far North District Council

The Council has completed development of a Waste Management Strategy including the following new initiatives:

- Establishment of three resource recovery centres
- Introduction of user charges for refuse disposal
- Improved recycling facilities at existing transfer stations
- Provision of a district-wide greenwaste shredder service
- Inclusion in waste management contracts of incentives to promote waste reduction

The Kaitaia Transfer Station has achieved a 50% reduction in waste to landfill through recycling.

Kawerau

- Creation of new position at landfill to strip items of value from vehicles being dumped
- Introduction of worms for composting at schools
- Introduction of recycling facilities at refuse disposal site
- Establishment of shop for resale of items recovered from waste stream at landfill
- Introduction of separate greenwaste disposal facility

Ashburton

- An operative Solid Waste Management Plan which clearly targets reduction, reuse and recycling as the prime drivers for waste reduction
- Provision of support, resources and funds to facilitate the aims of the plan
- An intensive education programme in schools and in the community at large which focuses on these imperatives
- Closure of landfills and construction of resource recovery parks to improve the diversion and reuse of materials
- Encouragement of direct community involvement in the operation of these facilities
- Active consideration of composting options to deal with household/commercial organic material as well as greenwaste
- Consideration of kerbside recycling
- Imposition of pricing regimes which support the polluter pays principle and fund waste reduction measures

Selwyn

- Employment of the Mid-Canterbury Waste Busters to present waste minimisation to all schools in district
- Investigation of a three-stream waste collection including mixed garden and kitchen organics
- Investigation of a resource recovery park including an in-vessel composting unit

3 The role of community groups in waste reduction

A sign of growing community support for waste reduction is the number of local groups becoming involved. Some of these groups are volunteer organisations formed in response to a single local issue, such as the siting of a new landfill in the region. Others are existing not-for profit organisations that see the employment opportunities available in waste reduction and recycling as being beneficial to their community.

Individuals become involved with these groups for a variety of reasons. Many have strong environmental views and see solving the waste problem as fundamental to addressing many of society's environmental concerns. For others, waste reduction is seen as the best chance to address social concerns by creating employment opportunities in disadvantaged regions. Still others become involved in waste issues as part of a continuing personal involvement with local affairs and the political process.

Whatever their motivation, more and more individuals are becoming involved with the waste reduction issue and are actively promoting solutions. Perhaps one of the most important contributions made by these groups and individuals has been their political lobbying that has helped establish the waste issue as a priority on many councils' agendas.

A representative sampling of the organisations and some of their activities are described below.

Community Business and Environment Centre – CBEC is a successful community enterprise that has been operating for over ten years in Northland. Founded in Kaitia, CBEC's first major success was with the establishment of the Kaitia Recycling Station, which provided an economically competitive option to landfill disposal.² CBEC has grown to such an extent that the recycling station now represents less than 20% of its income stream. The key to CBEC's success in this field is the interest of the shareholders and stakeholders in social and environmental outcomes, rather than simple return on investment.

WasteBusters Trust Canterbury was established in 1994. Since then, the Trust has developed a range of waste reduction initiatives for the Ashburton District. These initiatives include an award-winning waste reduction programme for schools, public presentations and composting demonstrations, a large worm farm, and three rural recycling depots.

The Trust's major focus is on public education to reduce the amount of organic waste and paper going to landfill, and to encourage all means of waste reuse and recycling. To this end, the REUSE Waste Exchange has been established, with the support of Environment Canterbury, to link up suppliers and users of waste materials.

² Waste Management Institute of New Zealand (2000) *Waste Awareness*, April/May 2000

The ReSource Trust is a not-for-profit charitable trust started in 1997 in Auckland's Eastern Suburbs. The Trust runs a number of projects in its community, both practical and educational.

The Beachlands/Maraetai ReSource Depot provides services to a 1500-household community. The Depot is a resource recovery project aiming to divert 85% of the local domestic waste from landfill by teaching permaculture techniques and providing a drop-off centre for recyclables and organic material.

The Trust also provides a range of educational programmes throughout the region. Courses are offered at the ReSource Depot on composting and permaculture techniques. The Trust operates an on-going school waste reduction programme aimed at establishing school composting operations to divert the organic and paper components of the school's waste.

The Amberley District Residents' Association, a 25-year old incorporated society, has for ten years run Hurunui Recycling. Through it, sustainable programmes for waste minimisation throughout the entire Hurunui District have been developed. In June 2000 the achievements of the Association were recognised by the Ministry for the Environment with the award of a Green Ribbon Certificate for Local Government – Community work in waste management.

The Association operates closely with the district council and manages recycling through all of the council's transfer stations and manages and operates a kerbside recycling collection for towns in the district. Hurunui Recycling employs six full-time and two part-time staff. The organisation is managed by a committee of volunteers.

Mana Community Enterprises is a Porirua-based organisation providing work rehabilitation for people with mental health problems. It is working on creating a recycling enterprise to be called Wastewise Porirua.

Wastewise Porirua aims to set up pilot projects for inorganic rubbish collection with the aim of establishing a range of recycling projects in the district. The projects will provide employment for people attending MCE and recycling services for district residents.

The following is a partial list of other community groups actively involved with waste reduction:

- Ahuriri Resource Trust - Otematata
- Canterbury Community Business Trust - Christchurch
- Central Otago WasteBusters - Alexandra
- Eco Action Network - Queenstown
- Enterprise Horowhenua - Levin
- Environmental Education for Resource Sustainability Trust - Tauranga
- Kaikoura WasteBusters Trust - Kaikoura
- Laughing Dog Skip Hire - Tasman
- Nga Tutukitanga O Taeri - Dunedin
- Northland Business Development Trust - Whangarei
- Runanga New Cooperative Inc. - Grey
- Second Time Recovery Park - Mangere
- Southland WasteBusters Trust - Invercargill
- Sustainable Whangarei - Whangarei
- Te Wharerangi Trust - Nelson
- Te Wero Nui Trust - Northland

- Waiheke Waste Resource Trust - Auckland
- Waitakere Special Needs Trust - Waitakere
- Wanaka WasteBusters - Wanaka
- X-treme Waste Incorporated - Raglan
- W.O.P.E.R. Recycling – Manawatu.

4 Emerging international trends supporting Zero Waste

The evolution of the environmental movement has seen the development of ever-more sophisticated tools to achieve its aims. Some of these, such as Cleaner Production, have been the result of commercial organisations seeking the means to adapt to a changing industrial environment.

Others, such as Industrial Ecology, have an academic origin and combine knowledge from a variety of disciplines to give new insights into the workings of industrial society. Environmental concerns have also found expression in the work of accountants and engineers, and these professions have developed their own tools for improving the environmental outcomes of their work.

Cleaner Production – The promise of cleaner production is that companies will both benefit the environment and receive economic rewards by pollution prevention. The process was originally developed in 1974 as a management tool by the American company 3M under the name “Pollution Prevention Pays”.

The USEPA adapted the process to assist with the minimisation of hazardous waste production. A model hazardous waste minimisation audit procedure was developed and tested in a number of industrial and defence facilities during 1986 and 1987. The success of the procedure has led to its application in a much wider range of institutions such as hospitals and universities.

Cleaner Production is an ongoing process involving the continual generation, implementation, and assessment of methods to reduce the environmental impact of an organisation’s activities. Basic to the process is an environmental audit that looks at all of the organisation’s activities and assesses their effects on the environment. Options to reduce those effects are generated and assessed in both environmental and economic terms. The best options are implemented and the results monitored. Regular environmental audits result in continual improvements being introduced.

Cleaner Production has received considerable backing from the New Zealand MfE. Through the Sustainable Management Fund, at least 17 projects received funding to develop and implement Cleaner Production programmes in various industrial organisations.

To counter the tendency for individual companies to lose enthusiasm for Cleaner Production over time, the SMF in 1997 funded the Target Zero project.³ The objective of the project was to catalyse the development of a regional, multi-company, long term approach to Cleaner Production. Involving many companies was seen as a way of both maintaining the momentum for the project and encouraging the companies to find ways to interact to achieve common objectives. The pilot project achieved annual savings of \$3.9m for an outlay of \$1.1m.⁴

³ Russell, P and Brown, G (1998) Target Zero: Taking Cleaner Production to the Masses, in WasteMINZ 1998 Conference Proceedings

⁴ Waste Management Institute of New Zealand (2000) Waste Awareness, December 1999/January 2000

BusinessCare has grown out of the Target Zero project. It aims to provide national co-ordination for cleaner production projects delivered by local agencies.

Industrial ecology – Industrial ecology takes the lessons of biological science about the complex interactions that occur between organisms in a natural ecosystem, and applies them to the industrial sector. It is part of the overall trend to examining issues in a more holistic manner, rather than focussing on the individual elements.

Using the biological analogy, IE describes industrial processes as a web of food chains, with every organisation both taking food (resources) from other organisation and supplying waste and products as resources for other organisations to feed off.

Industrial ecology is a framework for designing and operating industrial systems as living systems interdependent with natural systems. It seeks to balance environmental and economic performance with the growing awareness of environmental constraints.⁵

One significant outgrowth of the IE philosophy is the development of industrial eco-parks. The American President's Council on Sustainable Development defined these as:

“A community of businesses that co-operate with each other and with the local community to efficiently share resources (information, materials, water, energy, infrastructure and natural habitat), leading to economic gains, gains in environmental quality, and equitable enhancement of human resources for the business and local community.”

In New Zealand, plans are well advanced for at least two industrial eco-parks, one in Palmerston North, and the other in the Christchurch region.

Reverse logistics – Whereas logistics is concerned with the movement of material to the point of consumption, reverse logistics is the process of controlling the efficient flow of goods from the point of consumption back to the point of origin for the purpose of recapturing value or proper disposal.

The process has developed out of the realisation that the flow of goods in a supply chain does not end with the consumer. Some of the drivers for the increased use of the process are growing consumer concern about recycling and more stringent government regulations on waste disposal. As with other trends, the initial focus has been on hazardous goods and those that are problematic for landfill operators.

Increasingly, manufacturers and suppliers of goods such as motor oil, vehicle batteries, and tyres are being held responsible for their products once the consumer is done with them. Manufacturers are responding by beginning to build reusability into their products. This, in turn, requires the development of an infrastructure to handle the post-consumption phase of the product's life.

Many businesses have realised that as well as achieving regulatory compliance, a reverse logistics system can be used to gain competitive advantage. By taking

⁵ www.indigodev.com/IE browsed August 2000

responsibility for post-consumer waste, these businesses are aiming to generate further revenue or reduce manufacturing costs.

Many organisations are capitalising on the opportunities presented by reverse logistics. Companies such as Hewlett-Packard, which now refills printer toner cartridges, and Sears have implemented successful reuse and recycling programmes. These initiatives both reduce the amount of waste fed into the supply chain and to landfill and lower the operating costs of the companies.

New Zealand's largest appliance manufacturer, Fisher & Paykel, has a profitable stand alone business unit that disassembles old appliances. The Warehouse has a reverse logistics operation that collects reject goods and recyclable material and sorts, processes, and markets the material.

Design for Disassembly – An important element of several of these movements is the development of a trend towards designing products so that maximum use can be made of the materials at the end of the useful life of the product. Design for disassembly addresses the end disposal of a product as an opportunity to reuse the components and materials. It facilitates the separation of components and material to encourage reuse and recycling.

Key criteria for designing for disassembly are to:

- Use recyclable materials
- Reduce the number of different materials within an assembly
- Mark parts for simple material identification
- Use compatible materials within an assembly
- Make it easy to disassemble.

One surprising result of designing for disassembly is that manufacturing costs are often found to be lower.

The design for disassembly principle has been incorporated by Fisher & Paykel to facilitate the functioning of its whiteware disassembly plant in East Tamaki, Auckland.

Life cycle analysis – Life cycle analysis was developed as a tool for evaluating the total environmental impact of a product throughout its entire life cycle. Rather than just looking at a product in the context of the plant in which it was manufactured, LCA analyses all phases of its life. The analysis begins with the extraction of raw materials and includes the environmental effects of the manufacturing, consumption, and ultimate disposal of the product.

LCA has been used very publicly by competing manufacturers for comparing the environmental impact of products such as plastic bags to those of paper bags or disposable nappies to reusable cotton nappies. Often, both sides of an argument have been able to use LCA to prove that its own product is more environmentally friendly.

A lack of standardisation has prevented a widespread acceptance of LCA as a significant tool for environmental analysis. For a comparison between two products to be accurate, the analyses must recognise the same boundaries. For example, in comparing reusable and disposable nappies, should the adverse effects of irrigation used to grow the cotton be included? How should that be compared to the effects of clear-cutting forests to make disposables?

LCA is recognised as being useful for identifying the trade-offs involved when making a decision between two products. Disposable nappies may be preferred in areas prone to water shortages. Reusable nappies may have an advantage in a city running out of landfill space.

Another recognised use for LCA is comparing two relatively similar products. While comparing the environmental impacts of polystyrene cups vs. paper cups using LCA may be inconclusive, LCA might prove very useful for a manufacturer choosing between two processes for producing one sort of cup.

The NZ Ministry for the Environment is developing life-cycle analysis programme designed to assist local authorities with decision-making in regard to waste management and recycling options.

Design for the Environment – The USEPA has developed a Design for the Environment programme that works with industry sectors to design products, processes and technologies that combine competitiveness with environmental responsibility. It can be seen as the design element necessary for a Cleaner Production programme to successfully introduce improvements.⁶

The programme combined two emerging trends – manufacturers' ability to design specific qualities into a product and risk management strategies focusing on risk reduction through pollution prevention.

The DfE approach uses various tools such as LCA to evaluate the performance, costs, and environmental and human health impacts of competing technologies. The USEPA runs the programme through voluntary association with industry sectors and encourages wide dissemination of results and information. This spread of information should, ultimately, lead to more businesses including environmental concerns in the management process.

Environmental economics and Full Cost Accounting – Environmental accounting identifies, as one of its main tenets, the need for all environmental costs to be paid by the producer and not externalised onto other sectors of the community. Full cost accounting, using this principle, is a systematic method of identifying, summing, and reporting all of the costs incurred in providing solid waste management services to communities.⁷ By isolating and identifying all relevant costs, more accurate comparisons can be made between different waste management options.

In 1996, the MfE produced guidelines for full-cost accounting for landfills in New Zealand.⁸ Previously, landfill charges had traditionally been set with regard to only a small subset of costs accumulated over a short time period. Often, gate charges had been set by analysing only the actual costs of site development and site operating expenses.

The MfE guide is based upon a life cycle costing of landfill operations, with full capital development costs for environmental protection measures, rehabilitation, and post-closure costs included. The inclusion of monitoring and after-care costs for a thirty-year period after landfill closure is recommended.

⁶ www.epa.gov/opptintr/dfe/about, browsed August 2000

⁷ Florida Department of Environmental Protection (1997) Municipal Solid Waste management Full Cost Accounting Workbook for Local Governments in Florida

⁸ Ministry for the Environment (1996) Landfill full costing guide. Addition to NZ Landfill Guidelines

The result of the move towards full-cost accounting for landfills has been a sharp increase in many landfill gate charges. This has improved the economic viability of waste reduction and recycling initiatives.

5 International businesses and communities with Zero Waste goals

Innumerable businesses and communities have made an effort to reduce the solid waste they produce. Increasingly, however, major companies and a number of communities have recognised that to achieve waste reduction, they need to set concrete targets. Some of those that have publicly adopted Zero Waste targets are listed below.

Business organisations

Toyota has a stated objective to reduce to zero the output of solid waste from its plants in Japan by the end of 2003. This objective has been adopted by an ever-increasing number of other manufacturing concerns in Japan.

Hewlett-Packard in Roseville, California diverts 97% of its solid waste from landfill.

Southern California Edison in Los Angeles has adopted a Zero Waste goal and has achieved over a 90% diversion rate.

Kimberley Clarke has, in its Vision 2000, adopted a goal to reduce to zero the emissions from its manufacturing facilities. Currently, it has achieved an 80% diversion rate in its domestic plants.

SaskPower (Saskatchewan, Canada) initiated a Zero Waste policy in 1993 for its offices, power plants, switching stations, and transmission facilities.

Interface Inc., one of the world's largest interior furnishings companies, has set Zero Waste and zero-emission goals for its operations. A 40% reduction in waste to landfill in the first three years of the programme resulted in savings of \$US67 million.

3M is the originator of the Cleaner Production process, later adopted world-wide. The company has over the past 25 years reduced emissions of hazardous wastes by a total of 800,000 tons, largely by finding benign alternatives to the use of solvents, and in doing so has achieved \$US827 million in savings, counting only the first-year savings for each improvement.

The Warehouse Ltd is moving towards eliminating solid waste from its retail outlets by 2020. As of September 2000, five of its stores no longer had rubbish skips on their premises.

Governments

In August 2000 the **Government of Western Australia** released for public comment a draft waste reduction strategy titled "Towards Zero Waste by 2020". The proposed key actions include establishing a separate overarching body with the primary goal of driving the transition to Zero Waste.

Del Norte California adopted a waste management plan with a Zero Waste goal early in 2000.

In 1999, the **County of Santa Cruz** adopted a resolution encouraging a Zero Waste long-term goal for the county. The resolution *“encourages the pursuit of zero waste as a long-term goal in order to eliminate waste and pollution in the manufacture, use, storage, and recycling of materials. This goal can be achieved through action plans and measures that significantly reduce waste and pollution. These measures will include encouragement of residents, businesses and agencies to judiciously use, reuse, and recycle materials, and motivation of businesses to manufacture and market less toxic and more durable, repairable, reusable, recycled, and recyclable products.”*

Seattle's 1998 Solid Waste Plan adopted 'Zero Waste' as a guiding principle. *“This principle entails managing resources instead of waste; conserving natural resources through waste prevention and recycling; turning discarded resources into jobs and new products instead of trash; promoting products and materials that are durable unrecyclable; and discouraging products and materials that can only become trash after their use.”*

The **Carrboro, North Carolina** Board of Aldermen voted to *“support the creation of a Zero Waste Plan in order to eliminate waste and pollution in the manufacture, use, storage, and recycling of materials.”*

Eco-Cycle has launched a bold new educational programme aimed at turning **Boulder County, Colorado** into a Zero Waste community.

Canberra, ACT, adopted a waste management strategy to become a waste free society by 2010. The strategy states that: *“Improving current waste management practices will provide opportunities to develop new and innovative businesses with significant employment potential as well as establishing Canberra as a centre of excellence in sustainable resource management. Although ambitious, reaching no waste by 2010 is achievable with the willingness, co-operation, and participation of all sectors of the Canberra community.”*

Twenty-six local councils in **New Zealand**, representing 35% of the local authorities, have officially adopted Zero Waste targets.

The Zero Waste philosophy is increasingly being promoted around the world in communities such as **Wales** and **British Columbia**. Recently, an organisation has been formed with members from twelve **Asian and Pacific nations** for the promotion of cleaner production and a Zero Waste orientated society.

6 The problems with landfills

In New Zealand, the most common method of waste disposal is landfilling. Modern sanitary landfills are constructed to receive large volumes of mixed wastes over extended periods of time. They usually have appropriate impermeable liners, stormwater diversion and drainage systems, leachate collection and treatment facilities, and gas and odour control systems.

The quality of landfill engineering has improved markedly within the last few decades. The most significant driver in New Zealand has been the Resource Management Act 1991. To obtain a resource consent for a new landfill requires that all significant environmental effects be addressed.

There are over 200 operating landfills in New Zealand.⁹ Most of these were constructed prior to the introduction of the RMA and are of widely varying engineering standard. The previous standard practice for landfill siting was to use waste to recover unproductive land, such as estuaries or valleys, and this led to siting in locations that would be considered totally unacceptable by modern standards.

Landfill management and operational standards have also risen. A 1977 study found that many sites serving small communities were characterised by a notable lack of control and supervision that created unsatisfactory conditions, particularly nuisances and possible health risks.¹⁰ While standards have risen, the most recent survey found that:¹¹

- 50 landfills out of 221 were operating without the necessary resource consents
- one-third of landfills had breached their resource consents in the previous five years
- the management of hazardous wastes was particularly poor by some operators
- open burning had occurred at 24% of sites in the previous year.

Even with the best engineering and management systems, there are a range of social, environmental, and economic problems associated with landfilling.

Environmental concerns

Many of the environmental problems associated with landfilling arise from the compaction and decomposition of the organic waste stream. In modern landfills oxygen levels are depleted and moisture flow is restricted, resulting in anaerobic digestion. Under these conditions microorganisms cannot break down organic materials as quickly or completely as in the presence of oxygen.

This slowing of the decomposition process results in odorous gases being produced due to the formation of partially oxidised compounds. These compounds are phyto-toxic and contribute to the toxicity of the leachates. Methane gas is also produced as a result of the process.

⁹ Ministry for the Environment (2000) The 1998/1999 National Landfill Census Report

¹⁰ NZ Board of Health (1977) 1977 Grading of Solid Waste Disposal Sites in New Zealand, Wellington

¹¹ Ministry for the Environment (2000) The 1998/1999 National Landfill Census Report

Production of leachate occurs when liquid (such as stormwater) percolates through the solid waste, dissolving matter from the waste in the process. Leachate contains suspended solids, ammonia, organics, and heavy metals such as zinc and copper.

To avoid contamination of groundwater and surface water from leachate, landfills must be constructed with an impermeable base, typically layers of heavy plastic and compacted clay. Systems of pipes are installed to collect the leachate for treatment.

Leachate continues to be produced from a landfill even after it is closed and no longer accepting waste. Consequently, collection, treatment, and disposal of the leachate are required for extended periods after landfill closure.

Landfill gas production is also problematic. Biodegradation of landfill waste, and interaction with stormwater, produces landfill gases. . These gases must be gathered and treated prior to release into the atmosphere.

Landfill gas consists of roughly equal portions of methane and carbon dioxide, the two most important contributors to global warming, and many trace constituents, which are associated with odour problems. Landfills are the second highest source of greenhouse gas emissions in the United States, surpassed only by fossil fuel combustion.¹² Worldwide, emissions from landfills and open dumps have been estimated to contribute six per cent of total global methane emissions.¹³

Even the most efficient landfill gas recovery systems capture no more than 70% of the gas generated. Escaping gases can include toxic compounds originating from paint thinner, solvents, pesticides and other volatile organic compounds, many of them chlorinated.¹⁴

This escape of gases is believed to be responsible for adverse health effects being found in residents living in close proximity to landfills. Some studies have found high incidences of cancers of the bladder, stomach, lung, liver, prostate, and rectum to be linked to living near landfills.¹⁵

The behaviour of sanitary landfills over time is not well understood. Engineering standards have been continually improving and the composition of the waste stream changing. Mathematical modelling of their behaviour has produced widely varied results. Some studies suggest ecotoxic substances may be produced for several centuries after closure.¹⁶

¹² GrassRoots Recycling Network (2000) *Wasting and Recycling in the United States 2000*, Institute for Local Self-Reliance, Washington D.C.

¹³ *Warmer Bulletin* (2000) Landfill Information Sheet, Residua Publishing, North Yorkshire UK

¹⁴ GrassRoots Recycling Network (2000) *Wasting and Recycling in the United States 2000*, Institute for Local Self-Reliance, Washington D.C.

¹⁵ GrassRoots Recycling Network (2000) *Wasting and Recycling in the United States 2000*, Institute for Local Self-Reliance, Washington D.C.

¹⁶ Belevi, H and Baccini, P (1989) Long-term behaviour of municipal solid waste landfills, *Waste Management & Research* (1989) 7

Over the long-term, though, composite liner systems will ultimately fail. According to the USEPA:¹⁷

“Even the best liner and leachate collection system will ultimately fail due to natural deterioration, and recent improvement in municipal solid waste containment technologies suggest that releases may be delayed by many decades at some landfills.”

Social concerns

New landfills are becoming increasingly difficult to establish, particularly due to public opposition. Public protests in Canterbury and Southland over proposed new landfill facilities have received nation-wide publicity.

Public opposition is based upon a range of well-founded concerns. As well as the concerns of environmental impacts on groundwater and surface water, locals object to the odours, noise, and dust generated, the possibility of wind-blown trash, and the attraction of landfills to birds and vermin.

Landfills introduce high volumes of heavy traffic to rural areas where many residents have moved because of the serenity and seclusion. The proposed Hampton Downs facility, south of Auckland, would result in six hundred vehicle movements daily.

All of these effects, whether real or perceived, result in a depression of property values in areas surrounding landfill facilities. Inevitably, this results in divisions occurring within communities between those who will benefit from the landfill and those onto whom the costs are externalised.

Economic concerns

The economic environment in which landfills operate invariably affects the economic incentives for waste reduction. Establishing landfills is highly capital-intensive and, once operating, the marginal cost for landfilling waste is very low. This results in landfill owners, whether councils or private enterprise, producing the highest return on their investment by generating the greatest revenue possible in the short-term. This means setting gate charges at a level low enough to maximise disposal rates, which results in decreased incentives for waste reduction.

The trend to vertical integration of waste disposal, with single operators controlling both the collection and landfilling operations, provides economic disincentives for these operators to encourage waste reduction. This trend is evident in the revenue stream of Waste Management NZ Ltd. Ninety percent of the company's revenue in 1999 was derived from collection and disposal, only 6% from recovery and recycling.¹⁸ While the company is planning to increase the proportion of its revenue derived from recovery and recycling, it must do so within the constraints of maximising short-term returns to shareholders.

¹⁷ USEPA, (1988) Solid Waste Disposal Facility Criteria; Proposed Rule, Federal Register 53(168), 40 CFR Parts 257 and 258, pp.33314-33422 as quoted in ¹⁷ GrassRoots Recycling Network (2000) Wasting and Recycling in the United States 2000, Institute for Local Self-Reliance, Washington D.C.

¹⁸ Waste Management NZ Ltd (2000) Annual Report

The need of landfill operators to maintain steady, high-volume material flow results in competition for large, institutional customers, like city councils, by offering reduced gate charges. Small-scale users of landfill services end up subsidising the large users such as councils, who may be charged only 50-60% of the published gate charges.¹⁹ This reduces the incentive for councils to increase landfill diversion rates.

Long-term costs of landfilling may, inevitably, be externalised from the landfill owner onto the community. Monitoring, aftercare, and leachate treatment costs must be sustained over very long timeframes, and the potential risk of remedial action to repair damage must be considered. Although the posting of bonds as conditions of resource consents is becoming more common, there is no guarantee that this will remove all possibility of future liability being carried by the community.

¹⁹ Middleton, B (1999) Economic Evaluation of Selected Waste Management Options for Waiheke Island, unpublished thesis for UNITEC

7 Changing the rules – legislative and economic instruments to reduce waste

Governments vary widely in their views on intervening in the marketplace to encourage waste reduction. Recent New Zealand governments have adopted a laissez-faire approach to the issue, relying on the creation of a level playing field to send the appropriate signals to the marketplace.

There has been very little national leadership by the government on waste reduction. The waste reduction targets set in 1990 by the Labour government were eliminated by the National government in its 1992 Waste Management Policy. That Policy aimed to ensure that waste generators should meet the costs of the waste they produce and to encourage the implementation of the waste management hierarchy. The “generator pays” principle was meant to provide an economic incentive for waste generators to adopt less wasteful practices.

Few other governments in the developed world have taken such a hands-off approach to waste reduction as in New Zealand. Following is a compilation of some of the government interventions being undertaken overseas.

Landfill taxes and material bans

Many governments have tried to reduce dependency on landfilling by introducing taxes on their use. The British Government introduced a Landfill Tax in 1996, which reached \$NZ38 per tonne for active waste and \$NZ7 per tonne for inert waste in 2000.²⁰

Many countries ban certain materials, if untreated, from landfills. Virtually every American state or local authority operates bans, many of which are intended to divert hazardous materials away from landfills. California bans latex paint, white goods, automobiles, recyclable metals, lead-acid batteries, adhesives, automotive products such as anti-freeze and transmission fluid, cleaners, pesticides, mercury, solvents, used oil, whole tyres, and household batteries.²¹

Other American states ban materials such as greenwaste, paper, and containers to encourage recycling of these materials.²² Nearly half of the US population live in states with greenwaste bans.

Some of the German states have passed legislation levying a charge of up to 300 deutschmarks per tonne on hazardous waste.

The European Union Landfill Directive (1999/31/EC) provides for the progressive banning of municipal biodegradable waste from landfills, to 35% of 1995 levels by 2020.²³

²⁰ *Warmer Bulletin* (2000) Landfill Information Sheet

²¹ *Warmer Bulletin* (2000) Landfill Information Sheet

²² GrassRoots Recycling Network (2000) *Wasting and Recycling in the United States 2000*, Institute for Local Self-Reliance, Washington D.C.

²³ *Warmer Bulletin* (2000) Landfill Information Sheet

In France, as from July 2002, landfills can only dispose of “ultimate waste”, waste for which no reuse, recycling or energy recovery is possible.²⁴

In Germany, implementation is planned in 2005 for legislation requiring that municipal solid waste with an organic carbon content greater than 5% must be treated prior to landfilling and must be recycled if technically and economically feasible.

Austria limits land disposal of packaging and requires industry to pay all costs of collection.

The European Community has proposed a Directive that would require a list of items, including paints, resins, solvents, photo chemicals, medicines, aerosols, and pesticides to be collected separately and labelled prior to disposal. Disposal of these items can cost up to \$US2,300 per metric ton.

Mandatory recycling laws and extended producer responsibility laws

Extended producer responsibility laws are intended to ensure recovery of packaging and materials at the end of a product's life. These laws are common in Europe and are spreading to Asia and Latin America. At least 29 countries have these laws for packaging, 15 have them for batteries, and nine have takeback laws for electronics products.

The best known of these laws is the German Ordinance on the Avoidance of Packaging Waste of 1991. The law requires distributors to take back, at the point of sale, the packaging from packaged products. For some packages, such as drinks packaging and the packaging of janitorial supplies, deposits are obligatory.

The British waste strategy introduced in mid-2000 will expand on existing mandatory producer responsibility instruments in place for packaging, and voluntary schemes operating for batteries, vehicles, and electrical goods. The government will be targeting junk mail by working with trade associations.²⁵

In May 1998, the Japanese Diet passed the Consumer Electronics Recycling Law. The law is aimed at reducing waste from home appliances by requiring manufacturers to recycle parts made from copper, aluminium, iron, zinc, tin, and glass.

The European Union's Directive on Packaging and Packaging Waste requires that by July 2001 countries recover a minimum of 50% of their used packaging. Recovery includes recycling, composting, or incineration in waste-to-energy facilities.

The European Parliament has passed a directive that would require automakers in Europe to recycle their cars, starting in 2006.

Sweden enacted a law in 1996 that will require, after 2001, 90% recycling of aluminium, 70% of glass; 65% of cardboard, 30% of plastics and 15% of wood and other materials.

²⁴ Woodward-Clyde (NZ) Ltd (1999) Waste Incineration, Prepared for Canterbury Joint Standing Committee

²⁵ *Warmer Bulletin*, Journal for sustainable waste management, July 2000, number 73

The Japanese Packaging Recycling Law encourages businesses to use reusable packaging and containers, or materials that are more easily recyclable. If packaging materials are not readily recyclable, manufacturers are obliged to pay the costs of collecting and processing for the materials. All business enterprises manufacturing or utilising paper and plastic packaging will be responsible for recycling costs. Businesses must track the amount of recyclable materials they use for 1 year and retain records for 5 years. Based on their recorded usage, businesses must calculate the amount of their recyclables and will be charged accordingly for the cost of recycling.

Municipal governments in Japan are obliged to make separate collections of plastic and glass bottles discarded from residences and industries are required to recycle or reuse them in new products.

Brazil has a battery and tire takeback law and is moving on laws to require takeback of packaging and electronics.

Most European countries have container deposits, especially voluntary deposits on refillable glass beer containers, and refillable PET is becoming more widespread.

Ten American states have "bottle bills" that require deposits be paid for the return of beer and soft drink bottles. Containers covered by the bills are recycled at rates of 80-95%, twice the rate of states with no bottle bills. In states with no bottle bills, the containers represent twice the proportion of beach litter as in states with bottle bills. Many other states have tried to introduce bottle bills, but considerable money is spent in lobbying against them by opposing organisations. National polls in America show over 70% support for bottle bills.²⁶

Buy recycled programs

By establishing stable markets for products made using recycled materials, buy-recycled programs promote the production of recycled-content goods. By 1990, all 50 American states and 250 local jurisdictions had formal buy-recycled policies. These were backed up by USEPA guidelines for recycled-content product procurement. These guidelines have provided industry with a clear definition of products that are acceptable and have helped increase production of products that meet the standards.²⁷

The new waste strategy for England and Wales requires newsprint to contain 70% recycled content by 2006. The government plans to run pilot projects emulating the American procurement programme. The pilots will designate recycled content products that are available at an acceptable price. If the pilots are successful, government departments will be obliged to purchase these products wherever practicable.²⁸

In 1999 the European Commission drafted legislation that would impose a minimum recycled content of 15% for machine lubricating oils. The new law would dictate that 50% of oil sales would be collected for recycling. Only

²⁶ www.container-recycling.org website, browsed Sept 8, 2000

²⁷ GrassRoots Recycling Network (2000) Wasting and Recycling in the United States 2000, Institute for Local Self-Reliance, Washington D.C.

²⁸ *Warmer Bulletin*, Journal for sustainable waste management, July 2000, number 73

garages with the capacity to collect waste oils and to store them properly would be allowed to sell lubricants.

Tax incentives

A number of American states provide tax incentives for installation of recycling processing and manufacturing equipment. Arizona allows income tax credit for individuals and corporations equalling 10 percent of the installed cost of equipment for processing post-consumer recyclables. Iowa offers 100% sales tax exemption for purchases of industrial machinery used in the recycling or reprocessing of waste products.

The government of British Columbia levies all new tyre sales. The collected funds finance a transportation credit, designed to assist the movement of scrap tires from generators to registered processors; and a processing/end use credit, designed to assist manufacturers to purchase processed tire materials.

8 The economics of kerbside recycling

The economics of recycling, particularly kerbside recycling, has been perhaps the most contentious issue associated with waste minimisation. The perception of kerbside recycling schemes as an expensive add-on to conventional refuse collection services has been influential in the slow rate of introduction of this service by NZ territorial authorities.

As with many environmental issues, the economic benefits that accrue to kerbside recycling increase as a wider range of factors are included. This is part of the trend towards a more holistic viewpoint being used for environmental management. Unless a wide range of environmental benefits and costs are included, the “true” value of achieving high recycling targets cannot be assessed.

A 1994 research paper by the Tellus Institute and the Yale School of Forestry and Environmental Studies provided a framework for calculating the environmental benefits and costs of alternative solid waste handling methods. The research divided the costs into three categories:²⁹

1. “Conventional” collection and disposal system financial costs – These are the costs of trucks, labour, and disposal that are normally associated with operating a solid waste management system.
2. “Environmental costs” associated with collection, disposal and materials recovery activities – These costs include the environmental and human health impacts of the pollution, noise, etc., associated with the operations of collection vehicles, disposal facilities, and materials recovery facilities.
3. “Environmental costs” associated with producing products from virgin materials rather than recycled materials – These costs (or production impacts) include the environmental and human health impacts of the additional energy and toxic emissions associated with producing products from virgin rather than recycled materials.

The list of factors to be considered has been expanded in recent years beyond those proposed by the Tellus Institute. A full accounting of the costs and benefits of recycling might also include:³⁰

- Upstream subsidies for virgin resource extraction industries
- Downstream subsidies for landfills
- The local economic development benefits or reuse and recycling.

Economic analysis of recycling in New Zealand has tended to include only the “Conventional” costs. A recent report by Local Government New Zealand presents an analysis of kerbside recycling schemes based solely on those “Conventional” costs:³¹

“Recycling is economically unsustainable (it costs more to provide the service than any income generated from selling recyclables).”

²⁹ Seattle Solid Waste Utility (1994) Recycling Potential Assessment 1994 Volume 1

³⁰ GrassRoots Recycling Network (2000) Wasting and Recycling in the United States 2000, Institute for Local Self-Reliance, Washington D.C.

³¹ Local Government New Zealand (2000) Waste Minimisation in New Zealand

This analysis, it should be noted, is also true of refuse collection and disposal.

Even taking into account this narrow range of costs and benefits, the Local Government analysis is not true in all cases in New Zealand. Paper recycling collection services are provided free of charge in many centres by private operators. The income generated from the paper sales already does cover the collection costs.

For a more accurate economic comparison of the “Conventional” costs of recycling and conventional disposal systems, it would also be necessary to include the reduction in landfill charges and refuse collection costs resulting from recycling.

This is recognised in a report by the New Zealand Institute for Economic Research:

“The social benefit of recycling is not just the financial return earned, but also the saving it makes on landfill depletion.”³²

When this factor is considered, it is most important that Full Cost Accounting techniques be used to assess the true value of landfill space, especially taking into account the “user cost” of depleting a finite resource. Otherwise, this need to replace landfills falls as an externality on future users.³³

The economics of kerbside recycling is not static, and the factors change as a scheme matures and grows. Often overlooked are the cost savings that accrue to the waste collection system as recycling rates increase. Overseas experience has shown that, as recycling rates rise, the value of effectively marketed materials can significantly reduce the net costs of the waste budget, making recycling the preferred option using only the “Conventional” factors.

Several American communities have found that, once the industrial infrastructure for recycling materials is in place, net recycling costs per tonne are lower than general refuse collection and disposal costs.³⁴ Even using the most restricted economic evaluation, recycling can be the most economical option.

The best-documented example in New Zealand features the Kaitaia Recycle Station.³⁵ The Community Business and Environment Centre established a weekly recycling collection and rural drop-off points for the Far North District Council. The results were evaluated and compared to the costs to the Council of running its conventional waste disposal system.

Kaitaia is hundreds of kilometres from Whangarei and Auckland, the nearest markets for its collected recyclables. Despite this handicap, CBEC was able to collect, process, and deliver recyclables to Whangarei for a unit cost less than that for collecting and disposing of waste to landfill. The economic analysis only includes operational and maintenance costs and does not include avoided refuse disposal costs or any environmental or social benefits.

³² NZ Institute of Economic Research (1999) *The Economics of Waste Management and Recycling in New Zealand*, A Report for the Sustainable Management Fund

³³ NZ Institute of Economic Research (1999) *ibid*

³⁴ London Planning Advisory Committee (1998) *Re-Inventing Waste - Towards a London Waste Strategy*

³⁵ Colquhoun, C and Snow, W (1995) *Recyclanomics – A study comparing the economics of recycling and conventional waste disposal in the Far North*

9 Trends and drivers in waste management in NZ

a. Legislative effects on waste management

i. Council Waste Management Plans

Territorial Local Authorities have responsibility for management of solid waste within their jurisdictional boundaries. The Local Government Amendment Act (No. 4) 1996 requires councils to adopt a waste management plan. Councils are now required to encourage efficient waste management while giving regard to environmental and economic costs and benefits. A recent survey found that 44 of 69 councils contacted now have a plan or are in the process of developing one.³⁶ This requirement has helped focus attention on waste management issues and has required councils to adopt a more considered and planned approach that incorporates the waste management hierarchy.

ii. Closure of small landfills and increase in transfer stations and regional landfills

The tighter environmental controls arising from the Resource Management Act 1991 has meant that many small (particularly rural) landfills have been closed. It is often impractical or too costly to upgrade these landfills to meet the conditions of resource consents. The number of operating landfills has decreased from 327 to 221 since 1995.³⁷

The high capital cost of constructing and operating new landfills to meet resource consent conditions means that landfills now need to be much larger to be economically viable. Large landfill facilities that service whole regions, such as the Transwaste Canterbury Landfill or the EnviroWaste Hampton Downs landfill in the Waikato, are now seen as the answer. Many smaller and remote districts are now faced with transporting their waste long distances to a regional facility, or having to invest large amounts of capital to construct their own.

The move towards regional facilities has been accompanied by the development and construction of transfer station facilities. Transfer stations provide drop-off points for smaller loads of waste, which are then consolidated for transport to landfill. Many transfer stations now also provide drop-off facilities for recyclable and compostable material.

Concomitant with the move towards more highly engineered regional landfills is an increase in the cost of waste disposal. This is a result of both higher gate charges at landfills and higher transport costs associated with cartage to regional facilities.

³⁶ Zero Waste NZ Trust (2000) unpublished survey

³⁷ Ministry for the Environment (2000) The 1998/1999 National Landfill Census Report

Disposal costs in the Auckland region rose over 80% in the decade between 1988 and 1998, from \$39 per tonne to \$72 per tonne.³⁸ These increases occurred during the period when the Redvale regional facility was opened.

These cost increases are unevenly spread around the country. The disposal charge at a transfer station in Tauranga is \$95 per tonne. In Christchurch, the charge is \$42 per tonne, which includes a \$7 per tonne recycling levy.³⁹ This large differential is brought about by the relative age of the landfills being used for disposal. The Christchurch facility is older and close to the city. The Tauranga facility is new and 100 kilometres distant.

iii. Improved management of hazardous substances

Legislative pressures from the Resource Management Act 1991, the Health and Safety in Employment Act 1992, and the Hazardous Substances and New Organisms Act 1996 have resulted in improvements in the transport, storage, and disposal of hazardous wastes. This change has also been driven by a focus by the MfE on hazardous substances and contaminated site issues.

iv. Waste generation increasing

The improvements in waste management strategies have not been matched by any decrease in the quantity of waste being landfilled. National data gathering has not been standardised in the past and so quantities are difficult to estimate. Over the decade prior to 1995, the MfE estimated that quantities of landfilled waste increased by approximately 30%.⁴⁰

In the Auckland region, per capita waste generation over the period 1988-1998 rose by over 3% annually.⁴¹ This result has been duplicated in the most recent audit figures for North Shore City domestic refuse. A 3% annual increase in average household put out weight was recorded between 1997 and 2000.⁴²

b. Changes in the waste management industry

i. Privatisation of councils' waste management functions

Over the past two decades there has been a significant trend towards the contracting out of a wide range of council services. Part of this shift has been from council ownership and control over waste collection and landfills to the contracting out of waste services to private operators.

There now exist very few council works departments. Many councils have established Local Authority Trading Enterprises and business units to undertake these activities.

³⁸ Howell, P (1998) Regional Waste Quantities Compositions and Trends, a report to the Resource Policy and Planning Committee of the Auckland Regional Council, September, 1998

³⁹ NZ Institute of Economic Research (Inc) (1999) The Economics of Waste Management and Recycling in New Zealand, A Report for the Sustainable Management Fund

⁴⁰ Ministry for the Environment (1997) National Waste Data Report

⁴¹ Howell, P (1998) Regional Waste Quantities Compositions and Trends, a report to the Resource Policy and Planning Committee of the Auckland Regional Council, September, 1998

⁴² Waste Not Ltd (2000) Waste Analysis Protocol Audit of North Shore City Domestic Refuse Collection, prepared for North Shore City Council

The shift from council operations to private contractors has been mirrored in the growth in the number and size of private waste contractors. The forceful entry into the market of multi-national waste companies such as Waste Management NZ Ltd, Waste Care Ltd, and Onyx New Zealand Ltd increased the level of competition and professionalism in the waste management industry.

ii. Increasing vertical integration by waste companies

Waste companies are offering an increasing range of services to their clients. There is a move from being carriers of waste to providing a comprehensive management of the entire waste stream. As well as transporting waste, for example, Waste Management Ltd is involved in the collection and processing of recyclable material, the processing of organic material, and disposal of waste. The company refers to this as “maximising the internalisation of its waste stream”.⁴³

This trend is being driven by both increased competition in the marketplace and a recognition by the organisations that there is a trend towards recovery of materials.

iii. Increase in recycling activity and material recovery

The recycling industry appears to be entering a virtuous circle of events. The industry has previously been held back by a lack of stable markets for materials collected, difficulty in obtaining an economical and consistent supply of materials, and a lack of access to capital for smaller operators.⁴⁴ The supply problem has been alleviated somewhat by changes such as the increased council collection of recyclables. The availability of a steady supply of material has allowed for a variety of end markets to be developed which in turn creates a greater demand for collection.

New Zealand’s first council-wide kerbside recycling was established in North Shore City in the early 1990s. As of April 2000, kerbside recycling of plastics is provided by 9 out of 15 city councils. Of the 59 district councils, 20 provide kerbside recycling of plastics to at least some of their residents and another 14 provide drop-off points. Territorial authorities representing 69% of the country’s population provide access to either drop-off facilities or kerbside recycling.⁴⁵

More businesses as well are recycling waste materials instead of sending them to landfill. The increasing range of recycling collection services being offered, the increased competition for recyclable materials, and increased disposal costs are all driving this trend. The increase in recycling, particularly of basic commodities such as metal, cardboard, paper, and post-industrial plastics, may also reflect a drive for efficiency and a heightened environmental awareness by business leaders.

A trend toward increased recovery of organic materials from the waste stream is emerging. Higher disposal costs and the problems associated with the decomposition of organic material in landfills are two of the most important drivers. Many small rural councils are offering, or are planning to offer, greenwaste drop-off facilities at transfer stations and landfills.

⁴³ Waste Management NZ Ltd (2000) Annual Report 1999

⁴⁴ Waste Not Ltd (1998) Survey of Recycling Businesses in the Auckland Region

⁴⁵ Zero Waste New Zealand Trust (2000) unpublished survey on recycling

Urban councils are going further. A greenwaste ban in municipal refuse collections is already in place in at least one council and others are investigating the collection of household putrescibles.

A large composting facility for co-composting greenwaste and sewage sludge has been established in Wellington and another is being considered for Auckland.

Empirical data on the size of the recycling industry are scarce. A 1998 survey of recycling businesses in the Auckland Region found that most recycling businesses were growing and were considering further expansion.⁴⁶ The membership of the Recycling Operators of New Zealand, the industry organisation, has grown from 30 to 42 members in the first half of 2000.

c. Community and market trends

i. Corporate leadership emerging

The recent formation of groups such as the Business Council for Sustainable Development and Businesses for Social Responsibility indicates a new direction from New Zealand's corporate leaders. These leaders are beginning to follow the lead of their overseas counterparts in considering sustainability issues as a future driver in business development. There has been little tangible effect on the waste stream from these initiatives so far, but this is expected to change.

ii. Slowly increasing community awareness

Awareness among the community of the need for waste reduction has been growing, although the practical effects of this may be hard to measure. Community awareness has been driven by the growth of kerbside recycling programmes and school education programmes. Recycling programmes are viewed positively by the community, with 90% support for such schemes being commonly reported in surveys. A recent survey of the North Shore City kerbside recycling scheme found that 86% of households put out recyclables at least once during the 4 week survey period.⁴⁷

Green consumerism, however, is still to have any significant effects. Environmental criteria are still a minor element in most individuals' purchasing decisions. Purchasing decisions are influenced by a number of factors, and even when environmental issues are considered, consumers tend to be more interested in their personal well-being than in the wider environmental effects of production⁴⁸. The importance given to environmental issues is uneven and dependent upon the product under consideration.

Community groups and not-for-profits are beginning to emerge as significant influences in council decision making processes. Individuals concerned with either the environmental or social benefits of increased waste material recovery have created at least 25 groups involved with waste management. The Zero Waste New Zealand Trust has provided funding to 25 councils that have declared themselves as aiming to achieve zero waste to landfill by 2015.

⁴⁶ Waste Not Ltd (1998) Survey of Recycling Businesses in the Auckland Region

⁴⁷ Task Consultancy (2000) North Shore City Refuse & Recycling Participation Survey

⁴⁸ Woodward-Clyde (1999) Green Market Signals, Sustainable Management Fund Project 6117

iii. Goods not changing substantially

Lifting of import restrictions, increasing globalisation and international trade, and the growth of Asian manufacturing have led to a relative abundance of affordable consumer goods being available in domestic markets. As the cost of these items has gone down, their economic life has become shorter. This may be partly due to lower quality goods having shorter lifespans, partly due to items becoming less economic to repair, and partly to new technology creating obsolescence (for example with the personal computer markets).

The increase in the number of affordable second-hand Japanese cars entering the country has resulted in an increase in the turnover of vehicles on the road. The low cost of imports means vehicles reach the end of their economic life sooner, and are disposed of instead of being repaired. The majority of these vehicles are stripped, crushed and recycled. The trend towards more cars being recycled is also aided by increases in the cost and awareness of environmental issues associated with landfilling.⁴⁹

Consumption of packaging has increased 13% over the last 5 years. Despite this there has been a 17% decrease in packaging going to landfill. This is due to two factors: light-weighting of packaging (e.g. reduction in the thickness of packaging materials) and a substantial increase in the recycling rate for packaging - from 29% to 48% for the 1994-1998 period.⁵⁰ The increase is most likely due to the extension of kerbside collection schemes to a larger number of centres and the increase of collection services, such as cardboard recycling, to businesses.

⁴⁹ Sims Pacific Metals, personal communication 2000-09-05

⁵⁰ Waste Awareness, April/May 2000, WMINZ

10 The waste management industry infrastructure

The waste industry collects and landfills an estimated 3.2 million tonnes of solid waste per year. This figure does not include cleanfill, which, it is estimated, could make up an equivalent tonnage.⁵¹

There is no clear estimate of the amount of material processed nationally by the recycling industry. In a survey of Auckland recycling businesses, respondents estimated that they collected some 640,000 tonnes of material each year for processing. This would be equivalent to a 44% recycling rate for the region. The largest proportion of this was taken up by steel recycling. The packaging industry has estimated that nearly a quarter of a million tonnes of packaging material is collected and processed annually⁵². Over 30,000 tonnes of greenwaste is processed annually at the Living Earth facility in the Auckland region.

a. Refuse collection and disposal

It is commonly perceived that waste collection in New Zealand is dominated by a single operator – Waste Management NZ Limited. Commerce Commission figures suggest, however, that, although they are the largest waste collection company, their presence in the market varies from 4% to 40% according to the region,⁵³ and that sufficient competition exists in the market.

Nation-wide, the UBD website lists 241 companies involved in waste disposal. These range from skip services to speciality firms dealing in a single component of the waste stream such as waste oil or medical waste.

i. Domestic

Residential waste accounts for 45% of the total landfilled waste stream. The domestic bag and bin collection is about a third of this total.

Residential refuse is collected by private companies (such as skip companies) or council collections, or is transported to disposal facilities by the residents themselves.

The majority of council-funded residential refuse collection systems are based on rates-funded bag collections. These are collected by council operators, LATEs, and private contractors with no organisation dominating the market. Some councils encourage competition by splitting collection contracts between different companies.

⁵¹ Ministry for the Environment (1997), National Waste Data Report

⁵² Waste Awareness, April/May 2000

⁵³ Waste Management NZ Ltd, 1999, Annual report

ii. Commercial

Many companies are involved with both residential and commercial waste collection. There are a large number of competing companies in most markets in New Zealand.

In the Auckland Region there are over 50 companies offering waste collection services. The range of services offered range from Wheelie Bins to 3m³ skip bins to 30m³ compactors. These are emptied on a variety of pickup and on-demand collection schedules.

In Christchurch there are 28 companies offering waste disposal services.

iii. Kerbside and dropoff recycling collection

Council operated recycling schemes are available to the majority of New Zealand residents. As of April 2000, kerbside recycling is provided by 9 out of 15 city councils. Of the 59 district councils, 20 provide kerbside recycling to at least some of their resident and another 14 provide drop off facilities. Overall, territorial authorities representing 55% of the country's population provide kerbside recycling to at least some of their residents. Territorial authorities representing 69% of the country's population provide access to either drop of facilities or kerbside recycling.⁵⁴

As with many other council services, recycling collection is tendered out on the basis of competitive tenders. This has resulted in a wide range of companies being involved and none dominating. There are strong regional players, such as All Brite in Hawkes Bay, which collects and processes material from Tauranga, Napier, Palmerston North and Gisborne.

Some of the players are becoming vertically integrated, being collectors, processors, and exporters of recyclable materials.

iv. Commercial recycling

Commercial recyclers tend to be specialists, dealing in a limited range of materials. These firms are often both collectors and processors of material.

Around 20 companies in the Auckland region offer collection of recyclable materials from commercial premises. The types of materials collected include, paper, cardboard, glass, metals, plastics, office consumables, rags and solvents.

v. Hazardous and special wastes

Waste collection and processing services are offered for medical wastes, industrial process wastes, and hazardous wastes. Collection and treatment of these wastes is highly specialised, and competition within these niche markets is often limited due to the high costs of entry and small markets. Medical waste is processed by incineration at present, although one of the major players, Medical Waste Group, has announced their intentions to build an autoclave (steam sterilisation) processing facility.

⁵⁴ Zero Waste NZ Trust (2000) unpublished survey

vi. Transfer station operation

There are no national data available on the number and ownership of transfer stations. Councils are likely to own and operate the majority of transfer stations, particularly in rural areas. Several of the major waste management organisations have a nation-wide presence, such as Envirowaste Services, which has operations in Auckland, Waikato and Dunedin.

The trend towards regional landfills has resulted in the establishment of more transfer stations, particularly in urban locations. In line with the privatisation of waste management services it is suggested that the majority of new transfer stations are likely to be privately owned and operated. Competition is resulting in transfer stations being sited more closely together than previously. Resource consents have recently been notified for a transfer station in Wiri, Auckland, which will compete for business with others in East Tamaki and Papakura.

vii. Landfills

Landfills account for virtually all waste disposal in New Zealand. A small amount of medical and quarantine waste is incinerated.

Of the landfills identified by the MfE landfill census, over 60% are owned by councils.⁵⁵ The high capital cost of new landfills has resulted in joint ventures being formed for development, such as Canterbury Waste Services, a joint venture between Waste Management and EnviroWaste Services looking to establish a new regional landfill.

The MfE's 1998/1999 Landfill Census surveyed over two hundred operating landfills. Of those that responded to the MfE's questionnaire, half are operated by private organisations, including the Army, Carter Holt Harvey Forestry, Waste Management NZ Ltd, and private individuals. The other half are operated by local councils or are run jointly by local councils and contractors.

b. Recovered materials processing and manufacturing

A large proportion of recovered materials processing and manufacturing occurs in the North Island. Transportation costs result in most recovered materials being exported from the South Island.

Paper - The kerbside recycling collection of paper is self-supporting in many communities. The economics of collection and marketing are favourable enough that in some areas (Waitakere City) there exists competition between the official city collection contractor and private enterprise for the householders' used paper.

Recovered paper is both exported overseas and processed in New Zealand. High-grade paper is more frequently exported than the lower grades.

Carter Holt Harvey dominates the New Zealand paper recycling market. CHH operates through its Paperchase collection operation and its four manufacturing plants, all of which use a proportion of recovered material. The second largest

⁵⁵ Thorn, C, Ministry for the Environment, personal communication

paper collection company is Paper Reclaim, which handles approximately 20-25% of the paper collected in the country.⁵⁶

A large number of other organisations are also involved in paper recycling, most in the collection side but a small number in manufacturing from post-consumer paper.

Glass – The major processor of recovered glass is ACI Glass Packaging NZ Ltd in Auckland. The company uses cullet glass in the production of glass bottles. A few uses are being developed for recovered glass in markets outside of Auckland.

Plastic – Recovery and re-use of commercial process waste is well-established, but not practised by all manufacturers, depending on the scale of the operation.

Post-consumer plastic from kerbside collection schemes is both exported and recycled locally. While there are only a few major exporters, numerous enterprises manufacture products with a proportion of post-consumer material.

Non-ferrous metals – A number of companies participate in the recovery and processing of recovered non-ferrous metals. Some is re-manufactured locally, some is exported.

Aluminium is the highest-value material collected by kerbside recycling schemes. Most of the recovered material is exported.

Ferrous metals – A large number of companies are involved in the scrap metal industry. Process waste and post-consumer material can be processed locally. The largest processor of recovered material is Sims Pacific Steel in Auckland.

⁵⁶ NZ Institute of Economic Research (1999) The Economics of Waste Management and Recycling in New Zealand, A Report for the Sustainable Management Fund

11 Business and employment opportunities from recovered materials

Waste minimisation, through reduction, reuse, and recycling, can offer economic and social advantages as well as environmental benefits. When treated as a resource, rather than as waste, recovered materials represent opportunities for business expansion and employment growth. If the recovery and processing of materials can be accomplished at cost lower than that of primary production, it opens up a new chain of economic activity.

Although jobs involved with the collection and processing of recyclables may be the most obvious, only a small proportion of the jobs created actually arise from these activities. Even so, the employment advantages of recycling over landfilling are considerable. It is estimated that, on a per-tonne basis, the sorting and processing of recyclables sustains ten times more jobs than landfilling.⁵⁷

It is the manufacturing of new articles from recycled materials that creates the majority of the jobs. The jobs created require higher skills and pay better wages than the collecting and processing activities. Recycling-based manufacturers employ many times the number of people involved with the collection and processing. Estimates vary, but one study found that paper mills and plastic products manufacturers using recycled material can, on a per-tonne basis, employ 60 times more workers than landfills.⁵⁸

Empirical evidence of the wealth-creating power of waste reduction has been accumulating over the last decade. Several studies have aimed at quantifying the number of jobs that can be created by waste reduction.⁵⁹

- A study for the California Integrated Waste Management Board concluded that diverting 50% of the state's waste from landfills would create 40,000 new jobs in the state
- The city of San Jose estimated that 1 new job would be created for every 366 tonnes of material recycled
- A study of 10 states in the North Eastern USA estimated that nearly 3% of the manufacturing workforce are employed in firms processing or manufacturing from recyclables
- The recycling industry in Germany was found to support 150,000 jobs, more than either the steel or telecommunications industries⁶⁰
- An intensive recycling programme in the UK was estimated to have the potential for creating over 40,000 new jobs.⁶¹

A limited amount of research has been conducted in New Zealand on the size of the recycling industry. A 1998 survey of recycling businesses in Auckland found that:⁶²

⁵⁷ Platt, B and Morris, D (1993) *The Economic Benefits of Recycling*, Institute for Local Self-Reliance, Washington D.C.

⁵⁸ GrassRoots Recycling Network (2000) *Wasting and Recycling in the United States 2000*, Institute for Local Self-Reliance, Washington D.C.

⁵⁹ Makower, J (1995) *Good, Green Jobs*, California Department of Conservation, Sacramento

⁶⁰ Murray, R (1999) *Creating wealth from waste*, Demos, London

⁶¹ Murray, R (1999) *Creating wealth from waste*, Demos, London

⁶² Waste Not Ltd (1998) *Survey of Recycling Businesses in the Auckland Region*

- At least 1,700 employees are directly involved in recycling in the Auckland region. This figure is similar to that for the forestry, fishing and agriculture sector.
 - Over a quarter of these jobs had been created in the last 5 years
 - The industry was expecting to create 16% more jobs in the next three years
 - The average wage in the recycling industry is approximately \$12 per hour.
- The growth figures are impressive, given that manufacturing jobs as a whole in the Auckland region had only grown 6% in the previous three years.

There has also been considerable growth in recycling jobs in the Wellington region. A recent informal survey of the seven main companies involved in main stream recovery operations found nearly a 50% increase in jobs over the last two years.⁶³

Although no overall records are kept, the individual examples given below display the scale and extent of employment creation currently being seen in New Zealand.

- The Amberly Recycling Centre, situated in a town of 1,100 people, employs 6 full time staff, 3 part time staff and creates work for several volunteers that is readily taken up by many, including some with handicaps.
- Kerbside recycling in Wellington has created 30 jobs sorting and processing the 15,000 tonnes of recyclables collected annually.
- The recovery of paper and other material from businesses in Wellington has created 35-40 jobs.⁶⁴
- A firm producing plastic products from reprocessed material is one of the largest employers in Otaki
- IWK in Kaikoura employs 5 full time employees at the resource recovery centre
- Two independent contractors work full-time at the Constellation Drive Transfer Station in North Shore City removing valuable items from the waste stream
- Burgess Matting in Wanganui employs 25 full-time staff recycling tyres into matting
- Advanced Plastics in Auckland employ 14 staff processing domestic and industrial plastics, which are supplied to 15 other companies.

An additional advantage, in terms of local development, is that recycling collection and processing businesses tend to be small-scale, labour intensive, and locally owned. This is in contrast to the virgin material extraction industries, which are centralised and capital-intensive. The economies of proximity benefit local recycling activity because, by necessity, must it occur close to the point of consumption.⁶⁵ This leads to the creation of employment in existing communities.

While the collection of recovered material is necessarily local, and processing almost invariably so, manufacturing industries using recovered materials are more regional in size, relying as they do upon regional catchments for their resource supply. The size of catchment needed to supply an industry varies according to the material and the end product.

⁶³ Louisa Palmer, WOW Consultancy, personal communication

⁶⁴ Wellington Regional Council (???) Measuring up – The State of the Environment Report for the Wellington Region

⁶⁵ Murray, R (1999) Creating wealth from waste, Demos, London

For materials such as textiles, compost, and plastics, manufacturing operations can be relatively small and localised. Other materials, such as glass and paper, require much larger-scale operations and greater populations to support them. There is a trend, though, towards smaller scale manufacturing, for example the “mini” paper mills opening in the United States and England.

Despite this trend, the economies of distance often work against the conventional uses for recovered materials in rural areas or remote population centres. But this too, is often turned to a community’s advantage, and innovative small-scale uses are found for locally recovered material.

12 Investment in the recycling industry

One indicator of the growth potential of the recycling industry is the level of investment taking place. No statistics are available to show this on a national or even regional scale, however, anecdotal evidence suggests strongly that private investors as well as those in the industry, are realising the economic potential of this sector. Investment is taking place in both new and existing technologies. Some examples of this are given below.

Privately owned **All Brite** invested \$1m earlier this year in buying an existing recycling operation in Tauranga and plans to spend a further \$1m on improved facilities for kerbside and commercial recycling.

All Brite has invested a further \$1m in various recycling improvements in NZ in the past 2 years. This includes improved facilities for processing of waste paper in Wellington. This adds to its \$5m invested since 1993.

The company has plans to invest a further \$2m in waste reduction/recycling initiatives and downstream processing of recyclables over the next 2 years.

Another recycling collector/processor/exporter has recently invested \$1.5 million in plant and equipment, with \$200,000 being invested shortly in Stage One of a new Resource Recovery Facility.

A recycling processor with 6.5 staff doubled their throughput from September 1998. They are generating \$16,000 worth of returns per month. Their plant and equipment value is estimated at-\$400,000.

Christchurch City Council invests \$500,000 a year, a percentage of its landfill charges, into the development and support of the Recovered Materials Foundation. The Foundation provides seed money, grants, and business loans to enterprises in the recycling industry, as well as information and technical assistance services.

Venture capital firm **No. 8 Ventures** paid \$1.5m for a 25% stake in **Willson Brown Associates** in early 2000. The company has developed vertical composting units, which use a biomechanical process to rapidly break down and recycle organic waste. Hugh Fletcher, a member of the investment committee managing No. 8 Ventures, has become a director of Willson Brown Associates.⁶⁶

The **Tindall Foundation** has invested \$150,000 into the New Zealand Recovered Materials Enterprise Fund to lend to businesses in the recycling industry. Some of the investments of the NZRMEF include: **Ark Recycling**, which recovers and repairs computer equipment; **Reharvest**, which grinds up wood pallets into chips and colours the chips, using organic dyes, for landscaping; **Enviroplas**, which makes a light-weight concrete-like building material using 30% recycled plastic; **Ravenwood Recycling Systems**, a plastics manufacturer using recycled plastics to produce a recycling bin for use in households participating in kerbside collection; and **Prodevco**, a plastics manufacturer developing a three-stage composting unit made partially with recycled plastics.

⁶⁶ NZ Herald, 22 March, 2000 as quoted in *Waste Awareness*, April/May 2000

Wellington City Council has built a \$16.5m co-composting plant at the Happy Valley landfill site for composting greenwaste and sewage sludge from its wastewater treatment plants.

Global Vermiculture of New Plymouth, which produces worm-composting facilities for municipal and industrial waste, was purchased for \$3m by Des Ferrow and Brian Robbins of Tauranga.

13 Products and innovations using recovered materials

The recycling industry is ultimately dependent on there being a sustainable level of demand for materials collected and processed. International commodity markets, which take a large proportion of New Zealand's recyclable material, have been notoriously volatile. Although operators are becoming more skilled as traders and better able to ride out the cycles of the market, developing local uses for materials will assist in creating a more stable and viable local recycling industry. The following sections outline the major local consumers of recycled material and describe some of the smaller and more innovative operators.

a. Paper

Carter Holt Harvey dominates the New Zealand market by recycling an estimated 70-80% of the paper collected in New Zealand.⁶⁷ All four of CHH paper mills in New Zealand use some recycled paper. The Penrose mill uses 100% post-consumer paper for the manufacture of packaging paper.

Several smaller companies manufacture paper products from post-consumer paper. These include:

- Van Leer Moulded Fibre – packaging paper
- Gracefield Paper NZ Limited – tissues and paper towels
- Premium Packaging – egg trays
- Hawke pack – fruit trays.⁶⁸
- The PaperMill in Whangarei employs intellectually disabled people and long term unemployed to recycle paper and cloth into recycled paper products.

Other, innovative uses are being found for recovered paper. Kiwi Green Environmental Control Ltd produces the Retainomat. This is a pre-seeded organic mat constructed from a hessian outer and an inner of dried wood pulp fibre (from recycled newspapers), grass seed and fertiliser. It contains sufficient fertiliser for rapid re-vegetation of sites while at the same time controlling erosion and protecting waterways, drains etc. Fully biodegradable, the mat simply degrades into humus avoiding the need for costly follow up visits.

EcoCover is a similar product being produced in Waitakere City. EcoCover is a mulch mat produced from 75% recycled paper. The product has all of the advantages of conventional polyethylene sheeting but is completely biodegradable.

b. Glass

Like paper, glass manufacture from recovered material is dominated by a few organisations. Some of the largest of these are:

- ACI Glass Packaging NZ Ltd in Auckland is the country's largest user of cullet glass, using it for the production of glass bottles.

⁶⁷ NZ Institute of Economic Research (1999) The Economics of Waste Management and Recycling in New Zealand, A Report for the Sustainable Management Fund

⁶⁸ NZ Institute of Economic Research (1999) The Economics of Waste Management and Recycling in New Zealand, A Report for the Sustainable Management Fund

- Tasman Insulation, also in Auckland, uses a substantial proportion of recovered window glass in the manufacture of its Pink Batts fibreglass insulation.

Economies of scale play an important part in other uses being found for recovered glass outside of Auckland. Less capital-intensive uses are being developed by the Recovered Materials Foundation in Christchurch.

Crushed and screened glass is being marketed as an alternative to sand for sand blasting. In 1998/99 over 650 tonnes were sold for a variety of sandblasting applications. Crushed glass is also being trialed as a filler in both concrete and asphalt. Should it prove to have superior qualities as an aggregate, initial reports indicate that up to 1500 tonnes a year could be used in Christchurch.⁶⁹ Trials are also being conducted using glass as a filter medium, architectural coating, and a hydroponic growing medium.

c. Plastic

Compared to glass and paper, the manufacturing of plastic products from recycled plastics within New Zealand is limited in scale. This is true particularly for post-consumer plastics, a large proportion of which is sorted and exported to overseas markets, mostly in Asia.

Some of the organisations producing plastic goods from recovered material are:

- Pacific Plastic Recyclers – damp course for construction, electrical ducting, industrial slipsheets, underground electrical cable cover, wastebins buckets
- Flomat NZ – drainage mats
- Auplex Industries – drainage pipes
- Convex Plastics in Hamilton manufactures re-formed films that contain recycled post-consumer waste
- Carter Holt Harvey Plastic Products – lightweight culvert pipe, compost bins, recycling bins, motor oil containers
- Petros Plastics – buckets, garden pots
- Rotoform Plastic – compost bins
- Mala Manufacturing – recycles polystyrene cups (plastic #6) collected by Café Express to manufacture plastic coat hangers

A higher proportion of industrial plastic waste, originating from plastics manufacturers, is reprocessed for reuse by the same source. Companies such as Astron Plastics, in Auckland, play a major role in reprocessing factory waste for reuse.⁷⁰

A few organisations are developing innovative uses for recovered plastic. Enviropas (Plascrete) is producing what it describes as an environmentally friendly substitute for concrete. Recovered plastics are added to cement to create a lightweight concrete with a number of unique properties.

Investigations are currently under way by at least one major organisation to produce plastic wood products using post-consumer and contaminated plastics. The process is well established overseas, and has the potential to divert a

⁶⁹ The Recovered Materials Foundation (1999) Annual Report

⁷⁰ NZ Institute of Economic Research (1999) The Economics of Waste Management and Recycling in New Zealand, A Report for the Sustainable Management Fund

substantial proportion of mixed, contaminated and low-grade plastics from landfill. The process can mould mixed plastic into a variety of shapes, such as pallets, or produced a dimensioned product that can be used as a wood replacement for outdoor applications such as decking, marine timber for wharves, or highway bollards and posts.

d. Organic material

Producing compost and mulch is the most common and widespread use for organic material. The largest compost producer in New Zealand is The Living Earth Company. Living Earth was established in 1994 and its Auckland operation has achieved 10% annual growth since startup. In 1999 the company composted more than 100 tonnes a day at its Auckland facility.⁷¹

The country's single largest organic waste recovery operation has recently been completed. The project, funded by ratepayer funds, operated as a joint venture between Waste Management Ltd and Living Earth, is producing compost from a mixture of greenwaste and sewage sludge from Wellington's wastewater treatment facilities. Annual compost production is predicted to exceed 14,000 tonnes.⁷²

The Waitakere City Council Solid Waste Business has recently installed a vertical composting unit at its Refuse and Recycling Station in Henderson. The VCU will replace the existing windrow system of composting.

Many small ventures have begun to manufacture innovative products using the organic waste resource:

- The New Zealand Potato Plate Company manufactures disposable plates from potato starch, resulting in a disposable product that is biodegradable and compostable. The product was the winner of the 1999 New Zealand Environmental Packaging Award.
- Reharvest grinds pallets into wood chips for landscaping purposes and uses organic dyes to colour the product. The product range is sold at The Warehouse.
- Global Worm Management runs a network of contract worm growers who supply worms for the company's commercial waste processing operation. The company has developed a mechanised bed vermicomposting system. It runs a processing operation that composts waste from meatworks. The vermicasts and vermiliquid products are sold as soil amendments under the "Power Organics" brand.

e. Metals

Glucina Smelters Ltd recycles non-ferrous metals from industry and domestic recycling, a third of which is exported.

Slag Reduction Ltd processes by-products from the steel production process and turns it into a range of innovative products, such as aggregate for roading and material for filter beds and wetlands. They estimate that they process in the order of 200,000 tonnes of material annually.

⁷¹ Waste Management NZ Ltd (2000) Annual Report

⁷² Waste Management NZ Ltd (2000) Annual Report

Sims Pacific Metals is the region's largest trader in ferrous and non-ferrous metals. Sims processes a complete range of metals from car bodies to copper piping. Metals are sold on the commodities markets.

f. Other material

Ark Recycling Ltd is an Auckland-based company that recovers computers from industry, refurbishes them, and sells them at low cost to schools. Most of the computers that The Ark restores would otherwise have gone to landfill. Over the last three years the Ark has taken in over 8,000 computers and has yet to dispose of any parts. The company has put 3,000 refurbished units into schools, dismantled approximately 3,000 for parts, and has an inventory of about 2,000 in its warehouse. At 25-30kg per complete computer, the operation has diverted between 200 and 240 tonnes of potential waste from landfill. The Ark employs nine staff.

Serious Recycled Products is a Hamilton-based company that creates a range of high quality furniture and handcrafts from materials diverted from the landfill stream. A home network has recently been set up to enable these products to be manufactured by a network of self-employed people.

Many artisans, such as Foxground Furniture, produce furniture using recycled wood.

"The Bag Ladies" is a small business employing two part time staff. The business gathers waste from local businesses and factories and on-sell it from its warehouse to schools and families to be used in children's art projects.

J&J Loughton Shredding Services has imported tyre shredding plant to deal with tyres diverted from landfill. Rubber chips made from granulated tyres have found uses in a variety of applications, including as a surface for horse arenas and as backfill for drainage behind retaining walls. The separated sidewalls are used for silage piles by farmers and tree surrounds by horticulturists.

Burgess Matting in Wanganui has, for the last 50 years, been recycling tyres into a variety of products. These products include flooring tiles, insulation panels, playground safety mats, and horse float flooring.

Matman Safety Surfaces Ltd similarly uses recycled rubber from local tyre retreaders to produce rubber tiles for a variety of applications.

Firestone/Bridgestone NZ Ltd retreads tyres

Our Energy in Kaitiaia recycles hot water cylinders to create solar hot water heating systems for low-income families.

The Boiler Room in Auckland refurbishes industrial artefacts from New Zealand's past to be used in modern interiors.

Doonan's Cleaning Rag Service, based in Auckland, has 8 outlets throughout New Zealand selling cleaning rags to industry

14 Organic waste recovery

Organic waste is both the single largest component of the waste stream and the most reactive component of landfilled waste. It is easy to target for recovery and able to be made into compost products for which ready markets can be found. Organic waste is increasingly seen as the single component that provides the greatest potential diversion from landfill for the least effort.

The organic waste stream is composed of several individual waste streams:

- Household putrescibles – food preparation scraps, leftovers, and spoiled food originating in domestic residences – currently makes up over half of domestic waste collection in many centres
- Garden waste – collected by both the municipal waste collection and garden bag companies
- Commercial and industrial process waste – originates from all processing industries dealing with organic material
- Sewage sludge – improved wastewater treatment has resulted in greater volumes of sludge being produced that require disposal
- Restaurant and institutional waste – similar in composition to household waste but greater volumes from individual sources.

Different strategies are required for each of the waste streams. The marketplace has increasingly realised the value of organic waste and systems already exist to handle a significant portion of the organic waste generated.

Garden bag companies and compost producers in combination have been able, for many years, to collect, process, and market successfully in competition to the existing disposal system. Many processing operations reduce disposal costs by passing food waste on to piggeries for use as stock food. Sewage sludge is being used as a soil amendment in exotic forests near Rotorua and is being co-composted with greenwaste in Wellington.

There are several reasons why organic waste is considered to be one of the best candidates for reduction initiatives by many organisations, particularly councils.

Cost – Organic material comprises the single largest component of landfilled waste in New Zealand. In 1995, 36% of all landfilled waste was organic.⁷³ For municipally collected domestic waste the proportion is even higher. For example, audit results for both Auckland City and North Shore City show that 55% of the domestic waste stream is made up of organic material.⁷⁴ The cost to councils of disposing of this valuable resource is substantial.

Problems with landfilling – While many landfill constituents are relatively inert and change little over time, organic matter decomposes. The high moisture content of organic waste results in liquid filtering through the compressed waste and dissolving a wide variety of other substances. The resulting leachate constitutes a significant potential environmental hazard. The leachate must be gathered by a collection system and treated prior to its release into the environment. To ensure a high-quality effluent is released from the treatment

⁷³ Ministry for the Environment, (1997), National Waste Data Report, MfE, Wellington

⁷⁴ Waste Not Ltd, (2000), Waste Analysis Protocol Audit of North Shore City Domestic Refuse Collection, unpublished

process, treatment of the leachates for several centuries may be necessary according to some research.⁷⁵

The anaerobic decomposition of organic material also results in the release of various gases. Landfill gas consists of roughly equal portions of methane and carbon dioxide, the two most important contributors to global warming, and many trace constituents, which are associated with odour problems. These gases must be gathered and treated prior to release into the atmosphere.

Ready market for recovered material – One of the most common means of recycling recovered organic material is through composting. Commercial-scale composting facilities are common and can be run profitably by private enterprise. The profitability of greenwaste processors often depends upon the fees charged for disposal of the material.

Recent large scale investment in the composting industry, for example in Living Earth, Willson Brown Associates, and Global Vermiculture, testifies as to the significant potential that is seen to exist in the sector.

While there is currently a ready market for compost as a soil amendment, there is a question of when the market will be exhausted. The market for household sales is the most lucrative, but if larger volumes are produced it will be necessary to establish more markets in the commercial horticultural and agricultural sector.

A rapidly emerging market for greenwaste is for use as an amendment in the co-composting of sewage sludge. High disposal costs for sludge originating in wastewater treatment plants has resulted in an increase in co-composting of the sludge with greenwaste. Regular supplies of greenwaste are required for the process.

The strategies adopted by councils to deal with the organic waste issue vary greatly according to the circumstance of the council. Small rural councils have much different needs than urban authorities. The generally lower tipping fees in rural areas mean that councils must subsidise the costs of greenwaste recovery to a greater extent than in urban centres.

Rural councils, smaller city councils, and larger city councils each demonstrate different approaches to tackling the issue of organic waste recovery. Smaller rural councils have focused on promotion of home composting and the provision of greenwaste composting facilities. City councils have utilised somewhat more complex strategies that propose such things as education programmes, kerbside collections of organic waste, and differential charging regimes for greenwaste disposal. A number of councils in the Auckland region have gone a step further and have strategies that include banning greenwaste in council collections and the provision of vouchers that can be redeemed for garden waste collection, or purchase of compost bins etc. The differing strategies taken by various councils illustrate the importance of tailoring solutions to meet the requirements of individual waste management problems.

⁷⁵ Belevi, H and Baccini, P (1989) Long-term behaviour of municipal solid waste landfills, *Waste Management & Research* (1989) 7