Discarding the Idea of Waste:

The Need for a Zero Waste Policy Now

By Michael Jessen, BA, C.R.M.

September 2003

Discarding the Idea of Waste:

The Need for a Zero Waste Policy

Zero Waste Services
5635 Highway 3A
Nelson, BC V1L 6N7 Canada
Phone: 250-229-4621; Fax: 775-587-9838
E-mail: Michael@zerowaste.ca
Web Site: http://www.zerowaste.ca

Portions of this report were originally presented at the Talkin' Trash: Community Economic Development and Recycling conference held April 7 and 8, 2000 in Smithers, BC Canada and the Recycling Council of BC's Annual Waste Reduction Conference held May 10-12, 2000 at the Penticton Lakeside Resort, Penticton, BC Canada.

Some portions of the report were compiled during research for a Zero Waste Handling contract for the Regional District of Kootenay Boundary in 2002.

Note: Readers of this paper who have an electronic version in Word 97 format will be able to directly access web site URLs (underlined blue words) with an open internet connection.

"To achieve true sustainability, we must reduce our 'garbage index" - that which we permanently throw away into the environment that will not be naturally recycled for reuse - to near zero. Productive activities must be organized as closed systems. Minerals and other nonbiodegradable resources, once taken from the ground, must become a part of society's permanent capital stock and be recycled in perpetuity. Organic materials may be disposed into the natural ecosystems, but only in ways that assure that they are absorbed back into the natural production system."

- David Korten

TABLE OF CONTENTS

Preface

Humans are the only species on the planet that don't live by zero waste principles. Zero waste is a "call to action" that aims to bring an end to the current "take, make and waste" mentality of human society.

Zero waste is the pinnacle of the hierarchy of waste management. When there is no waste, we will have moved well beyond the "end-of-the-pipe" (compliance) and even "front-of-the-pipe" (eco-efficiency) in our approaches to environmental management. Instead, we will have what William McDonough calls a "no-pipe approach." Zero waste means swimming upstream to the sources of waste generation, rather than merely reducing the downstream impacts of waste.

"Zero waste is a breakthrough strategy that will achieve rapid and massive improvements in our resource efficiency," says Warren Snow, former Executive Director of Zero Waste New Zealand Trust. Zero waste is THE radical transformation required to achieve sustainability in the way humans manage resource inputs and outputs.

Zero waste is a way to create significant employment and economic development opportunities. Reducing, redesigning, revitalizing, reusing, refilling, regenerating, recycling, repairing, reclaiming, refurbishing, restoring, recharging, remanufacturing, reselling, deconstruction, and composting are the constituents of zero waste -- and all generate productive employment.

Zero Waste is a responsible government policy. Local authorities in New Zealand, the Australian capital territory of Canberra, Del Norte and Santa Cruz counties in California have established zero waste goals. Seattle's Solid Waste Plan supports zero waste as its guiding principle and the Town of Carrboro, North Carolina has adopted a resolution supporting the creation of a zero waste plan.

Zero waste is a sound business practice. Interface Inc., Kimberley Clarke, Hewlett-Packard, Herman Miller Inc., Xerox, Milliken & Company, and Du Pont in the United States, SaskPower and Bell Canada, along with Toyota, EBARA, Chichibu Onoda Cement, and Ogihara in Japan are committed to zero emissions and are reaping the financial benefits.

Zero waste envisages the complete redesign of the industrial system. We can no longer view nature as an endless supply of materials for us to use and discard to landfills or incinerators. All sectors of society: government, communities, and businesses, must re-envisage their purpose, so that they no longer base their viability on wasting the Earth's resources.

Zero waste is the next logical step beyond the short-term goals established for recycling. It is the cornerstone of a sustainable materials economy. Instead of managing waste, zero waste teaches us to manage resources and eliminate waste.

Zero waste is a policy, a path, a target. It is a process, a new way of thinking. Most of all it is a vision. It represents a new planning approach for the 21st Century encompassing the principles of conserving resources, minimizing pollution, maximizing employment opportunities, and providing the greatest degree of economic self-reliance.

Zero waste is no longer a theoretical exercise. Most of the processes already exist and we have more than enough case studies of community-based waste reduction, reuse, and recycling projects achieving spectacular results. There has been a dramatic shift in awareness; people no longer need convincing of the need to divert resources from the landfill. Society wants the 'how-to' so their communities can progress from environmental contamination and high disposal costs to job creation and economic development. Zero waste is an integral part of a green economy.

Zero waste is a quality concept. Quality means the elimination of waste. And the elimination of waste is the essence of the meaning of the word *economy*. Quality is also a key to competitive advantage in the global marketplace. Zero waste is excellence: to aim for quality rather than quantity.

North America is currently a "waste hiding" society that relies on the services of professional waste hiders. Instead of being exploited as assets, material resources are wasted in holes in the ground that become toxic dumps. Communities need to embrace every method that allows them to starve their landfills. Local government must nurture community support for waste reduction, reuse, and recycling in order to out-compete landfilling. Cities, towns, and villages need to invert the mindset that views recycling and reuse as expensive add-ons to a disposal service and substitute a system where landfills are the add-on to the elimination of waste and the resource recovery process.

In the final analysis, the challenge boils down to this: rather than settle for *reducing* waste, communities need to come as close as possible to *eliminating it completely*. Every community should implement model zero waste legislation and help create the climate in which policy changes produce positive feedback loops. As Jeffrey Hollender has said about zero waste: "Why on Earth would we do anything else?"

We must "obey the waste-equals-food principle and entirely eliminate waste from our industrial production. This not only saves resources outright, but it rearranges our relationship to resources from a linear to a cyclical one, greatly enhancing our ability to lead prosperous lives while reducing environmental degradation. Instead of organizing systems that efficiently dispose of or recycle our waste, we need to design systems of production that have little or no waste to begin with."

- Paul Hawken

Introduction

In Nature, everything is cyclical. Wastes don't accumulate and become problems in Nature's Economy. Instead, they decompose and become part of the raw materials for new growth. Humans must learn to mimic nature in dealing with waste if we are to have a sustainable future.

"What you must do to prosper in the emerging Natural Economy is to know waste like no one's ever known it before, so you'll know where there's inefficiency, and how to eliminate it." – David Stephenson

The State of Washington's "Beyond Waste Project" says waste is a term used to describe undesired items considered no longer useful or materials that are by-products of manufacturing processes. The word "waste" is associated with inefficiency and unnecessary expense. Waste is undesirable in most aspects of our daily work and personal lives. Hazardous wastes and non-hazardous wastes are no exception; more and more frequently, they are being viewed as inefficient and expensive uses of our economic and natural resources. Also, collecting, transporting, processing and disposing of these wastes can pose risks to workers, human health, and the environment. Solid waste is a frequently used term that actually includes both hazardous and non-hazardous wastes. The five general types of wastes that are included under the umbrella definition of solid waste and their definitions are described below:

Inert wastes include asphalt, masonry, concrete, and other similar materials. Disposal of these wastes poses very few environmental risks.
Non-hazardous wastes include more than residential wastes. Non-hazardous wastes are generated from many sources:

- Commercial and institutional wastes (includes garbage, landscaping, yard wastes and biomedical wastes)
- Industrial wastes (spent substances used to increase chemical reaction in production)
- Resource-use and extraction wastes (includes slash piles, agricultural wastes and drilling muds)
- Transfer wastes (vactor waste from storm sewers and petroleum-contaminated soils)

Moderate-risk wastes include household hazardous wastes and wastes generated in only small quantities during production. These wastes can be considered either hazardous or non-hazardous. Handling and disposal are governed by state law.

Hazardous wastes include wastes that are either listed under federal law as hazardous

or wastes that meet certain criteria under state regulations. Under Washington State law, hazardous wastes fall into two categories: dangerous wastes and extremely hazardous wastes.

The "environmental crisis" has happened because the human household or economy is in conflict at almost every point with the household of nature. We have built our household on the assumption that the natural household is simple and can be simply used. We have assumed increasingly over the last five hundred years that nature is merely a supply of "raw materials," and that we may safely possess those materials by taking them…. And so we will be wrong if we attempt to correct what we perceive as "environmental" problems without correcting the economic oversimplification that caused them. - Wendell Berry

In 1989, most North American provinces and states announced ambitious strategies to correct municipal solid and biomedical waste problems. British Columbia's policy is best summarized in the following goal:

To reduce the per capita amount of municipal solid waste requiring disposal to 50% of the 1990 level by the year 2000, with an interim goal of a 30% reduction by 1995.

Waste requiring disposal had been reduced by 29.7% by the year 2000 according to statistics compiled by the Recycling Council of BC for the BC Ministry of Water, Land and Air Protection (WLAP). In 2000 the provincial disposal rate was 0.618 tonnes per capita compared to the 1990 baseline for disposal of 0.879 tonnes per capita. The BC government has stopped compiling statistics on waste reduction efforts on a provincial level. Nova Scotia was the only Canadian province to reach the 50% waste reduction target.

After a decade of experience with the goal of 50% reduction in our per capita waste disposal, it is time to reassess the effectiveness of that goal and to contemplate the rationale for a new way of thinking about waste. For ten years, provinces, states, and local governments have evolved policies dealing with the management of waste. It is now time to consider initiatives to eliminate waste.

Given the immense and uncertain challenge that a 50% waste reduction goal posed in 1989, it was a laudable first step to reduce the amount of materials destined for landfills. But it is no longer defensible today when many communities are routinely reporting 65% waste reduction and many companies are announcing 90% waste reduction. Many communities and companies have even announced plans to achieve zero waste targets.

Zero waste is a desirable and visionary goal. It is based on the premise that significant environmental and economic benefits will accrue through sustainable and more efficient materials use and conservation, as opposed to disposal. Ancillary benefits of a zero waste strategy include the conservation of resources and energy,

reduction in emissions of greenhouse gases, and promotion of pollution prevention technologies and practices, resulting in increased job creation.

One definition of waste that became popular a few years ago was: **waste is a resource going in the wrong direction**. These "resources in disguise" can be utilized by others to create new products, eliminating the need for disposal and creating manufacturing jobs. Many businesses are discovering that waste equals inefficiency. The concept of industrial ecology has led to the development of industrial parks (like those in Burnside, Prince Edward Island, Ann Arbor, Michigan, and Kalundborg, Denmark) where one company's waste becomes another's raw material.

"The new industrial revolution will be driven by full integration of environmental concern into our economic life. It will involve the reshaping of our entire industrial system in which efficiency in the use of materials and energy and in recycling and disposing of waste will be the key to success in both environmental and economic terms." – Maurice Strong, former Secretary General UN Conference on Environment and Development and former Chairman of Ontario Hydro

It is clearly time to take a bolder look at how solid waste will be dealt with in the future. It is time to encourage communities to view the 21st century as an era of materials management rather than solid waste management. Our decade-old policy framework of integrated waste management has provided a solid foundation on which to build a new approach, one that looks beyond the perceived 50% waste reduction ceiling and creates a more sustainable interaction with our natural world. Now is the time to set our sights higher and start planning for the end to wasting resources and to our reliance on landfills, incinerators, and other waste facilities. Now is the time to work for a sustainable materials economy that treads lighter on the planet, one in which reuse and recovery are more convenient than disposal. Now is the time to stop thinking of waste as something that needs to be "reduced" and – instead – implement policies to eliminate the concept of waste. When we achieve zero waste, it will truly be possible to say that human activities are "natural".

The Tip of the “Wasteberg”

Waste is both a problem and an opportunity. Before we can realize the magnitude of opportunities our wastes present, we must come face to face with the enormity of our “wasteberg”.

The largest thing in the world made by humans is an old landfill. The Fresh Kills Landfill on Staten Island is bigger than the Great Wall of China. It covers 2,100 acres, and is so large it can be seen with the naked eye from space. First opened in 1947, Fresh Kills is unlined and leaches thousands of pounds of toxic chemicals and heavy metals into nearby estuaries each day. Its odor reaches into neighbourhoods on both sides of the Arthur Kill, which separates Staten Island from New Jersey. It will likely be a Superfund candidate for the next century.

Fresh Kills contained about 3 billion cubic feet of trash when it closed in the spring of 2001 and was the highest point on the U.S. Eastern seaboard. It became the repository for rubble from the World Trade Towers that were destroyed in the terrorist attacks on 9/11. Yet as massive as Fresh Kills is, it took only .02 percent of the waste generated in the U.S. Americans and American industry generate an additional 5,500 times as much solid waste daily. The U.S. Environmental Protection Agency estimates that American residents, businesses and institutions generate about 220 million tons of garbage every year, or an average of more than four pounds of waste per person every day. Most of the refuse is sent to landfills or incinerators, but about 30 percent is recycled, from paper to glass to aluminum to steel to plastic.

Although Americans are recycling in record numbers, waste continues to mount, according to a March 2000 report by the Institute for Local Self-Reliance. While recycling is a smashing success, it is dwarfed by wasting. The EPA calls recycling "one of the best environmental success stories of the late 20th century." But while the conservation potential is tremendous and recycling rates have nearly doubled in the past 15 years, there is plenty of room for improvement. Even today, paper and yard scraps, two highly recyclable materials, make up more than 50 percent of the waste in U.S. landfills. It is clear that policies to reduce waste generated from commercial and residential sources have only touched the tip of the “wasteberg.”

The Hidden History of Waste

There is the waste we see and then there is the waste we don't see. Everything is made from something – oil, wood, minerals, or natural gas – and this creates a hidden history of waste. Germans call this a product's "environmental rucksack." For instance, the amount of waste generated to make a semiconductor chip is over 100,000 times its weight; that of a laptop computer, close to 4,000 times its weight. Two quarts of gasoline and a thousand quarts of water are required to produce a quart of Florida orange juice. One ton of paper requires the use of 98 tons of various resources. Manufacturing a single PC can generate 139 pounds of waste and involves a witch's brew of chemicals linked to high rates of cancer and birth defects among workers and communities.

According to Paul Hawken, about 3,200 pounds of waste are generated for every 100 pounds of product manufactured in the U.S. Hawken is the author of **The Ecology of Commerce** and co-author with Amory and Hunter Lovins of the influential book **Natural Capitalism: Creating the Next Industrial Revolution.** Hawken says industry moves, mines, extracts, shovels, burns, wastes, pumps, and disposes of 4 million pounds of material in order to provide one average middle-class American family's needs for a year. In **Natural Capitalism**, the authors estimate the annual cost of wasting resources and people in the U.S at a staggering $2 trillion. Hawken concludes that Americans waste or cause to be wasted nearly one million pounds of materials per person per year.

Total annual wastes in the U.S., excluding wastewater, now exceed 50 trillion pounds a year. (A trillion is a very large number. It would take the entire lifetimes of 24,000 people to count to one trillion at the rate of one number per second.)

Robert Ayres, the inventor of the term "industrial metabolism," has carefully analyzed the flow of materials in the manufacturing process. His conclusion: 94 percent of the materials extracted for use in manufacturing becomes waste before the product is even made. And 80 percent of what's left becomes waste within six weeks of use.

"Only approximately ten percent of economic activity provides us with goods and services that are necessary for biological survival. The rest satisfies our desire for things we want but do not really need."

– Grant Copeland, "Acts of Balance," p. 49

Clearly, humans have a lot to learn about reducing waste. In addition, there is a lot of waste to propel a new economy – an economy based on reusing and reducing waste. A strategic materials policy to shift from resource extraction to materials reuse and recycling will create important economic opportunities for urban and rural regions

alike. Eliminating waste and cycling all of our used resources back into the economy will support community economic growth, create jobs, reduce pollution, and save natural resources. It is time to turn this challenge into an opportunity.

There is much work to be done as our waste reduction efforts are still not where they should be. Perhaps we should develop an ethic and moral foundation toward our use of resources. We can also be guided by asking fundamental questions like "Why are we doing this in the first place?"

"Although the next industrial revolution is about a transformation in our global business practices, sustainable development actually involves more than that. Most importantly, it is also about social justice. The inefficient use of resources is compounded by distributional inequity: the top population quintile, mostly in industrial countries, currently metabolizes 80-85 percent of the world's resources, leaving the balance for the remaining 4.7 billion. If the developing world were to share the same standard of living as the North, and if that living standard were to double over the next forty years, we would have to increase our resource use (and attendant waste) by a factor of sixteen. Publicly, governments, the United Nations, and commerce all work towards this end. Privately, no one believes we can increase industrial throughput by a factor of five, much less sixteen. It simply isn't physically possible. The reality is that we will clearly have to pursue other strategies in order to establish a supportable economic quality-of-life for the ten billion people who are expected to populate the planet by mid-century. This is a matter of basic arithmetic and equity."

- Paul Hawken

Why Zero Waste Now?

The planet and our pocketbooks are telling us it is time to eliminate waste. Numerous reports have verified that human consumption of resources has exceeded the capacity of the planet to regenerate those resources. If everyone on the planet lived the lifestyle of the average North American, an additional two planet Earths would be required. In addition, the world is spending billions of dollars to collect, transport, burn and landfill wasted materials.

The "Living Planet Report 2002" (www.wwfcanada.org/en/news_room/pdf/02_07_09_Living%20Planet%20Report.pdf) predicts that standards of living and human development will start to plummet by 2030 unless humans stop using more natural resources than the planet can replace. According to the report, humans are currently running a huge deficit with the Earth -- using over 20 percent more natural resources each year than can be regenerated -- and this figure is growing each year. Projections based on likely scenarios of population growth, economic development and technological change, show that by 2050, humans will consume between 180 percent and 220 percent of the Earth's biological capacity. The report says this means that unless governments take urgent action, by 2030, human welfare, as measured by average life expectancy, educational level, and world economic product will go into decline. The WWF believes that governments can reverse some of these negative trends and put humanity back on a path to sustainable development if they address some key issues such as improving the resource efficiency with which goods and services are produced.

The United Nations Environment Programme (UNEP) released the **Global Environmental Outlook 3 (GEO-3)** on May 22, 2002. The report sees a bleak outlook for the future unless radical action is taken now. Poverty and excessive consumption -- the twin evils of humankind that were highlighted in the previous two GEO reports -- continue to put enormous pressure on the environment. The unfortunate result is that sustainable development remains largely theoretical for the majority of the world's population of more than 6 billion people. The GEO-3 report can be found at the following web site: www.unep.org/GEO/geo3/index.htm.

Paul Harrison told a February 2001 meeting of the American Association for the Advancement of Science that half the planet has been systematically cleared, ploughed, grazed, or paved by humans. This "ecological footprint" of Homo sapiens has had an "incalculable" impact on the environment greater than that of all the other species of the planet combined, say the authors of the AAAS's "Atlas of Population and Environment." Harrison is one of the main authors of the new atlas that shows humankind's impact on the world and how we are stretching the planet's resources to the limit. Humanity is "overreaching itself " and "threatening the key resources on which we depend," Harrison said. Read about the atlas and order on-line on the association's web site at www.aaas.org/news/atlas2.html.

Zero Waste is not only about recycling and diversion from landfills. It is also about restructuring production and distribution methods to prevent waste from being manufactured in the first place. Whatever materials are still required in the new redesigned, resource efficient system will be recycled right back into production.

The volume of waste created by modern industrial societies is truly staggering. As stated by the GrassRoots Recycling Network in Green Paper #1:

> "Almost all materials we use to manufacture products start with natural resources. Far too many of our production systems still cause negative impacts, including mining, forestry and agricultural practices which create ecological damage and pollution, use too much energy and cause social dislocation; manufacturing processes that require virgin rather than recycled resources; distribution systems that increase waste and pollution; and disposal systems that waste the potential for continued use in discarded materials. Far too many of the refined products that flow through our economies end up concentrated in landfills, burned in incinerators, or wasted in other ways. Our worldwide manufacturing, distribution, and disposal systems have evolved with support from laws and practices over more than 150 years that encouraged the rapid conversion of natural resources into finished products. To some, the land appeared so vast it could absorb any amount of pollution while giving up its wealth endlessly. Today everyone knows this was an illusion."

There is also evidence it is time for a clearer vision of waste reduction. Cleaner production, the three Rs, eco-efficiency, industrial metabolism, factor 4/10, and a 50% reduction in landfilled waste are all great first steps. But we need to eliminate not manage waste. We need to aim for a zero waste society. Being satisfied with a 50% reduction target is like an athletic coach telling his team to be satisfied with winning half their games. We need to set the bar higher, to challenge ourselves to be the best we can be.

The complacency that can be generated by soft targets is amply demonstrated by the packaging industry. Most of their 50% reduction goal was reached by light-weighting their packaging instead of new innovative packaging methods. As a result, packaging which used to be made of easily recyclable materials like glass or paper is instead made with hard-to-recycle plastic. From 1990 to 1997, plastic packaging grew five times faster by weight than plastics recovered for recycling. One third of our waste is still packaging that is used for a few seconds after purchase and then thrown away.

Brenda Platt is the Director, Materials Recovery for the Institute for Local Self-Reliance, and co-author of the recent report "Wasting and Recycling in the United States 2000." In announcing the release of the report, she stated:

"We have been operating under this myth that taxpayers and local government are best equipped to take responsibility for trash. In reality, wasting is an unfunded

mandate on local government, which, with taxpayers, gets stuck with the $43.5 billion annual bill for collecting and disposing of municipal trash.

"We want manufacturers to share in the responsibility for the environmental impacts of their products and packaging. Manufactured goods make up three-quarters of municipal materials wasted. Indeed, manufacturers are best positioned to alter the way products are designed, manufactured, delivered, reused, and recycled throughout their lifecycle.

"The role of government can shift from picking up and disposing of trash to changing the rules."

"Efficiency is one of the hallmarks of the well-run business, and the gratuitous exploitation of natural resources is wildly inefficient. The modern industrial system is no more than one percent efficient when all material and energy inputs are considered."
– Paul Hawken

Benefits and Opportunities of Zero Waste

Zero Waste is a new approach to the flow of materials and energy in our society. It considers the life cycle of products, the design of buildings, infrastructure and industrial parks, and the reuse, recovery and recycling of resources in a manner that is cleaner, and more efficient. The approach recognizes the interconnectedness of materials, products, and infrastructure to ecological functions and services provided by the natural environment.

It is directed at:

- Finding cost savings and new revenues in existing operations;
- Creating new markets for existing goods and services;
- Developing new technologies, processes and products;
- Identifying new organizational, legal and economic innovations;
- Developing infrastructures which encourage exchange, reuse, and recycling;
- Addressing cumulative effects of production and consumption.

For Government, the benefits include:

- Enhancing the efficiency of resource use;
- Enhancing the recovery of materials from the consumption system;
- Reducing the cost of industrial infrastructure;
- Supporting the sustainability of communities;
- Identifying new economic development opportunities;
- Encouraging innovation in environmental management and regulation.

For companies, the technology development opportunities include:

- Chemical processes which produce toxic intermediates on demand and in smaller quantities;
- Catalysts which are readily recoverable;
- Bioengineered bacteria capable of decomposing complex materials;
- Low temperature production processes;
- Biopolymers for packaging, adhesives, absorbents, lubricants and other products;
- New recycling and recovery technologies;
- R&D into new materials composed of recycled resources.

Manufacturing Opportunities include:

- Material processing equipment;
- Companies altering by-products physically or chemically to meet customer specifications;
- Infrastructure built to efficiently separate and cycle flows of materials, water, heat within and between plants;
- Product remanufacturing Business Management Opportunities;
- Brokerage firms to handle sales or purchases of by-products;

- Management firms offering comprehensive investment recovery services redeploying, recovering or marketing idle, obsolete, unused equipment or materials;
- Ecosystem restoration firms;
- Organizational design consultants;
- Information management firms;
- Architects and designers of buildings, infrastructure products.

"As we search for new ways to control our impact on the world's environment, it is important to set ourselves demanding targets. While at first sight the goal of zero emissions … may seem beyond our reach, I believe it has importance in focusing our quest for solutions to a complex problem."
– Rodney Chase, Deputy Group Chief Executive, BP International Limited

Examples of Zero Waste

Zero Waste is being actively pursued around the world:

- In March 2002, the Ministry for the Environment of the government of New Zealand issued *The New Zealand Waste Strategy (*www.mfe.govt.nz/publications/waste/waste-strategy-mar02/*),* an action plan to minimize waste and manage it better. The stated goal of the strategy (which covers solid, liquid and gaseous waste) is to move towards zero waste and a sustainable New Zealand. Congratulations New Zealand on becoming the first country with a zero waste goal! Check out the web site www.reducerubbish.govt.nz to find out more about the government's reduce your rubbish campaign.
- Almost 50 percent of all territorial local authorities have now committed to an ambitious plan to make New Zealand the world leader in waste reduction, according to Zero Waste New Zealand Trust (www.zerowaste.co.nz). Coordinators of the Zero Waste movement have confirmed that 38 of New Zealand's 74 local authorities have joined a national pilot project -- originally designed for only ten -- and made a commitment to reducing waste to landfill to zero by 2015. Each council will receive $25,000 from the Zero Waste New Zealand Trust to research the best methods for reducing landfilling in its area. New sources of research funding are being sought to allow the pilot program to be expanded.
- Ray Anderson, CEO of **Interface Inc.** says "If we're successful, then we'll spend the rest of our days harvesting yesteryear's carpets and other petrochemically-derived products, and recycling them into new materials; and converting sunlight into energy; with zero scrap going to the landfill and zero emissions to the ecosystem. And we'll be doing well...very well...by doing good." Interface Flooring Systems saved over $90 million USD from 1995 to 1999 as a result of its in-house, zero waste initiative.
- The Australian Capital Territory of **Canberra** (population 330,000) has adopted a Waste Management Strategy (www.act.gov.au/nowaste/wastestrategy/index.htm) setting a vision of how they can become a waste free society by 2010. Graham Mannal, who is responsible for planning the 'No Waste by 2010' program, says "In ten years we have gone from almost zero recycling to over 60 percent. During this time 200 jobs have been created, costs for disposal have decreased, and the environment has benefited." Canberra's "No Waste by 2010" home page is www.act.gov.au/nowaste/. Resource recovery has quadrupled in the ten years since 1991-92 and landfilled waste has been halved. The Development Control Code for Best Practice Waste Management (www.act.gov.au/nowaste/pdf/wastedev.pdf) in the ACT directs professionals such as engineers, architects, planners and developers on how to ensure their applications comply with the best practice waste management requirements applicable for the demolition, refurbishment, construction and operational phases of projects. The intent of the code is to offer a performance-based approach to meeting waste management requirements by using performance criteria and measurable standards.
- In January 2001, the **Government of Western Australia** released a strategy and action plan committing WA to a target of zero waste by 2020. The plan *"Towards Zero Waste"* was developed by the Waste 2020 Taskforce and recommends 43 key

actions including increased support for waste education initiatives, researching and applying technological innovations, cleaner production and changes to packaging and management of waste.

- The **City of Manningham** in the Australian state of Victoria adopted a Greenprint in November 1998 based on the vision of becoming a totally sustainable community. The Greenprint includes the "stretch" goals of zero climate change, zero extinction, zero waste, zero soil degradation, and zero pollution. The Greenprint can be viewed at www.manningham.vic.gov.au/Strategies/Strategies/greenpri.pdf.
- **Del Norte County** and **Santa Cruz County** in California have adopted Zero Waste goals.
- **The California Integrated Waste Management Board** committed to the principle of zero waste in November 2001.
- Seattle's 1998 Solid Waste Plan adopts '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 and recyclable; and discouraging products and materials that can only become trash after their use.
- In British Columbia, Canada, the Town of Smithers (www.town.smithers.bc.ca) and the Regional Districts of Kootenay Boundary (RDKB) (www.rdkb.com/recover/zero_waste.html), Cowichan Valley (www.cvrd.bc.ca), and Nanaimo (www.rdn.bc.ca/garbage_recycle/garbage.asp) have embraced the concept of Zero Waste and adopted it as a policy. The RDKB endorsed the concept of zero waste in November 2000. The new strategy, called "*Bringing Zero Waste to Kootenay Boundary – A Strategy for a Waste Free Future*" provides a blueprint for moving from concept to implementation. It consists of eight initiatives to be pursued at the local level and ten initiatives involving local government efforts to influence change at the provincial level. The strategy is broad-based, targeting increased materials efficiencies in businesses, local economic development through "resource recovery" and public policy renewal to facilitate the development of a zero waste economy.
- Normandy Daniels wrote a paper for the Regional District of Nanaimo entitled *"Thinking for the Future: The Possibility of Zero Waste in the Regional District of Nanaimo"* in May 2001 which is available at www.cwma.bc.ca/articles/zero/zer0007.html.
- British Columbia has an active Zero Waste Working Group that is a committee of the Recycling Council of BC. (See www.rcbc.bc.ca/zerowaste/zerowaste.htm). The web site has a *Zero Waste Toolkit for Local Government* designed to assist local governments in evaluating the benefits and feasibility of using zero waste as a framework for resource management planning. There is also a discussion paper (*Zero Waste One Step at a Time - Benefits and Applications for Retail Businesses*) introducing the concept of zero waste as a tool to assist retail and other types of businesses to increase their economic efficiency and move towards long term sustainability.
- Information on how zero waste can benefit the local economy and provide new jobs is featured on the Zero waste North Website www.zerowastenorth.com.

- Mountain Equipment Co-op (Canada's leading supplier of quality outdoor gear and clothing) has embraced sustainable business practices and demonstrates leadership in social and environmental responsibility. The senior manager of MEC's distribution centre has created a number of reduce and re-use initiatives which has cut the amount of incoming plastic film by 95%, reduced paper use at DC by 75%, and changed packing tape and pricing labels to more environmentally friendly alternatives. (See www.mec.ca/).
- "Zero Waste 2005" is Annapolis Royal's low-tech, cost effective, locally managed and very successful waste management initiative. To achieve its waste-free goal, this Nova Scotia town implemented its "Only in your Backyard" project in 1999 to facilitate the on-site composting of waste. Using food/waste digesters (Green Cones), along with traditional backyard composting units and Earth Tubs, the majority of households can now dispose of all food and yard wastes on-site. This means Annapolis Royal is able to dispose of its organic wastes within the town's limits - an achievement that delivers significant cost savings to the community. The program won a Sustainable Community award from the Federation of Canadian Municipalities in 2001. (See www.annapolisroyal.com/zerowaste.htm)
- Toronto city council has adopted the following mission statement: The City of Toronto's Integrated Solid Waste Resource Management Process will be designed to be flexible enough to incorporate new, environmentally sustainable technologies that will move the city towards the ultimate goal of "zero waste." A proposed action plan would see zero waste to landfill achieved by 2010.
- The Québec Action Plan for Waste Management, 1998-2008 is a blueprint to shift from waste disposal to resource recovery over the decade and to target zero waste in order to conserve resources for the benefit of present and future generations. (See www.menv.gouv.qc.ca/matieres/mat_res-en/conclusion.htm.)
- The Zero Waste Action Team (www.zwat.org/) is a cross-section of Northwestern Ontario industries and institutions interested in reducing waste and environmental impact in Thunder Bay and the Lake Superior Basin, Ontario.
- Public Works and Government Services Canada (PWGSC) is phasing in a Zero Waste Program in all federal government facilities in the National Capital Area. The program began April 2, 2001 in the cafeteria at the 395 Wellington Street building in Ottawa. The Zero Waste Program encourages federal departments and agencies to reduce the quantity of non-hazardous solid waste being sent to landfill, thereby reducing the amount of greenhouse gas emissions from solid waste. In order to assist federal departments and agencies in setting-up and/or improving solid waste management programs, information, and expertise is provided in the areas of solid waste reduction, reuse, and recycling. (See www.fhio.gc.ca/text/solid_waste.htm).
- Milton Hydro in Milton, Ontario has a goal of zero waste and emissions (www.miltonhydro.com/corporate.html).
- The success of Bell Canada's Zero Waste program was given national exposure on CBC TV's "Nature of Things" and CTV's "W5" in 1993. The Environment Canada Eco-Action and the Ste. Foy Regional Chamber of Commerce presented Bell with awards for its program. In 1994, Bell's Zero Waste program earned two major awards - the "Mérite environnemental" award from the Québec Ministry of the Environment and the "Prix de reconnaissance du mérite environnemental" from the

Québec City Conseil régional de l'environnement. Bell's program is aimed at diverting non-hazardous residual materials, such as paper, cardboard, glass, steel, and aluminum used during administrative activities, from landfills. The company has actively promoted the application of the 3Rs principles to their employees. A data collection process is in place that enables Bell to track results on progress and the efficiency of the Zero Waste program in each location. Beyond recycling, Bell's efforts also encompass programs to reduce and reuse; the overall consumption of paper has been reduced by 38% since 1991. In 2000, more than 8,900 laser printer toner cartridges were returned to Bell's supplier to be refurbished.

- DuPont Canada has a goal of zero emissions and zero waste generation.
- The 1995 **Halifax G-7 Summit** had a zero waste program during the high-level meeting with a goal of diverting 85% of potential waste materials generated at the Media Centre and special event sites during the G-7.
- **SaskPower** launched a Zero Garbage (Zero G) program in 1993 at its offices, power plants, switching stations, and transmission facilities throughout Saskatchewan.
- **BC Shipper Supplies Ltd.** has a corrugated cardboard box plant in Delta that practices zero waste loss. All process trim is reused.
- **The East Prince area on Prince Edward Island** launched an aggressive source separation program in 1994. By 1997, diversion reached 65.5%. **Falls Church** in northern Virginia has reached a 65% landfill diversion level. A fairground in California is above 80% waste reduction. A supermarket chain in Seattle is not far behind. A furniture manufacturer in Michigan is recycling 96% of its waste.
- The Oregon Department of Environmental Quality's Strategic Plan (2000) states that in Oregon's future "Work is done with non-polluting technologies and with materials that are either fully recovered or fully returned to a natural state at the end of their product life cycle; there will be zero waste in our lives."
- Ricoh Electronics Inc., is part of the Ricoh Group, a diversified Japanese automated office, electronics, and photographic equipment company and one of the world's largest manufacturers of multi-function digital office automation equipment. Ricoh is trying to achieve a 100% resource recovery rate (zero waste) at all domestic and overseas business sites. As of June 2001, 20 business sites has achieved zero waste, a year ahead of the 2002 goal set in 1998. The Ricoh Aoyama Office, which is a model for company-wide environmental management systems, achieved zero waste in September 2000. Fukui Ricoh, a sales company in the Ricoh Group, also achieved zero waste as a part of its EMS activities. (See http://ext.ricoh.co.jp/ecology/e-/action/3.html). Ricoh also has a green procurement program, practices environmental accounting, has rainforest and waterfall environments in its buildings, and has developed re-writable compact discs that can be re-recorded up to 1,000 times.
- Output of solid waste from Toyota plants in Japan will stop completely by the end of 2003. And similar initiatives are under way at Toyota plants in other nations.
- More and more factories throughout Japan are pledging that they will not allow a single ounce of non-recyclable waste outside factory grounds. Nearly all these so-called zero-waste factories began their pledges as strategic attempts by businesses to improve their image, taking for granted that their attempts would increase costs. Now, however, serious efforts at environmental conservation have become an

essential element for gaining consumer trust. Moreover, the cost of zero-waste operations is becoming competitive with that of such traditional waste disposal methods as landfilling. Waste-free factories provide a glimpse at the recycling economy of the twenty-first century.

- All four major Japanese beer brewers (Kirin, Asahi, Suntory and Sapporo) are committed to reach the target of zero emissions by 2010.
- **Herman Miller, Inc.'s** (www.hermanmiller.com/) goal is Zero Waste diverted to landfill.
- **Vista Environmental Inc.** designed and implemented a "zero landfill" waste reduction program for Nortel Materials Recycling. In the first year of the program, scrap materials were reduced by 85% at a 76% cost reduction.
- The **City of Santa Cruz** in California has a Zero Waste Task Force meeting regularly to develop an aggressive long-term waste reduction strategic plan that will help the City towards a zero waste future.
- The Town of Carrboro, North Carolina adopted a resolution supporting the creation of a zero waste plan in September 1998.
- Collins Pine's plant in Klamath Falls adopted a zero waste policy after 600 employees received Natural Step training. "Zero waste" means the plant is committed to eliminating waste or putting it back into use. For Collins Pine, the strategy helped save $1 million the first year, said Duke Castle, a member of the executive committee for the Oregon Natural Step Network.
- **Hewlett-Packard** in Roseville, CA is reporting successfully diverting 97% of its solid waste.
- **Mad River Brewery** in Blue Lake, CA currently diverts 97% of its garbage from landfills from its 15,000 square foot facility.
- **Southern California Edison**, in Los Angeles adopted a Zero Waste goal and has achieved over 90% diversion.
- **Kimberly Clarke** has adopted in its Vision 2000 a goal to reduce to zero the emissions their manufacturing facilities send to disposal, either through recycling or other means. Currently they have achieved 80% diversion in their domestic plants.
- **Milliken Carpet's** environmental vision comes from parent company and environmental pioneer, Milliken & Company of Spartanburg, South Carolina, an international textile and chemical manufacturer. Milliken & Company launched an expansive environmental program in 1960 and adopted a goal of zero waste generation in 1990. Milliken & Company has reduced output to landfills at its 55 U.S. plants by 99 percent since 1989; eliminated waste at 47 plants; cut water usage by approximately half since 1991; recycled 100 percent of office paper since 1992; and decreased SARA chemicals by 88 percent since 1988. The company has an impressive employee environmental education program and has reached zero landfill levels with numerous commodities from coal ash to wooden pallets. The company operates over 33 textile and chemical manufacturing operations throughout South Carolina. Milliken starts at the beginning of each product by following a "precycling" program that emphasizes designing products to "minimize waste and maximize materials, with a strong commitment to recycling and reusable products." Milliken recycles its dye mixes and grinds carpet and carpet backings to

recycle them into new carpet tiles. The company has moved from an overall 47 percent of its solid waste going to landfill in 1989 to only 1 percent in 1999.

- With the help of The EnviroShare Team, **SKF** of Gainesville, Georgia, is on a mission to reach zero waste by the year 2000 and to comply with the SKF corporate 'Clean Policy' directive through point source reduction, recycling, and reuse. Grinding swarf, an oil saturated mixture of powdered steel and grinding abrasives is a large volume solid waste for SKF. The facility had previously been landfilling swarf at a rate of 25 tons per week. After exploring their options, the team found a recycling company that would accept swarf and eliminate hauling and landfill costs.
- WindRider's/Wilderness System's 113,000 square-foot boat manufacturing plant in North Carolina uses a no waste roto-molding process. Every bit of the material not part of the boat, such as cut-outs, shavings, etc. is reused in the next molding. The economical, "zero-waste" operation helps to keep the price down and the factory clean.
- The Canadian Urban Institute (CUI) in partnership with the Department of Tourism established the Canada-Philippines Cooperative Program on Sustainable Development for Boracay Island. William Trousdale, President of EcoPlan International, prepared *"Zero Waste Management: Towards a Sustainable Future for Boracay"* as part of an environmental management plan for sustainable development of Boracay. The zero waste management project has taken off and has broad participation of sectors, groups and communities on the island.
- The administration of Mayor Harmes S. Sembrano of Gerona, Philipines has pioneered the implementation of a zero waste management program. A Municipal Recycling and Composting Center was built in Barangay Tagumbao to compost biodegradable solid waste.
- The 2002 Winter Olympics held in Salt Lake City, Utah was a zero waste event. The 2002 BC Summer Games in Nanaimo was a zero waste venue. The People's Forum at the United Nations World Summit on Sustainable Development in Johannesburg, South Africa from August 26 to September 4, 2002 was a zero waste gathering and achieved about 85% waste reduction on the first try.

"Above all, we should question the consumer ethic, which uses up non-renewable resources, creates inequality and injustice, generates pollution, destroys other species and upsets the balance of nature. The consumer ethic not only defiles the environment by creating undesirable change in the biosphere but also corrupts the mind and body by defining pleasure in terms of ownership and absorption. Waste itself is a human concept; everything in nature is eventually used. If human beings carry on in their present ways, they will one day be recycled along with the dinosaurs."

- Peter Marshall

Zero Waste and Economic Development

While the environmental benefits of recycling have long been recognized, many communities are realizing that recycling generates significant economic benefits. The U.S. Office of the Federal Environmental Executive estimates that recycling and remanufacturing industries account for approximately one million manufacturing jobs and more than $100 billion in revenue. Recycling employs low-, medium-, and highly-skilled workers in a variety of jobs—from materials handling and processing to high-quality product manufacturing. The drive for efficient handling and use of recycled materials spurs innovation, a key to long-term economic growth. Investments in recycling equipment and the companies themselves also filter through the economy and contribute to economic growth. Of equal importance are the social and environmental benefits of recycling. Recycling promotes the sustainable use of our natural resources. Working together, recycling activities around the country promote community development while reducing the need for new landfills, preventing pollution, saving energy, and reducing greenhouse gas emissions.

From the collection, processing, and reuse of discarded materials, to the manufacture and marketing of products made with recycled materials, the potential for the recovered materials industry to expand local businesses and create jobs is vast, yet hardly realized. Some communities are expending efforts to collect and process this material, making it available to manufacturers for creation of new products. Currently, the vast majority of this material is shipped overseas, where it supports manufacturing jobs in other countries. This is a missed opportunity for North American communities to utilize this material for enterprise development and job creation on a local level. Recycling-based manufacturing can stabilize local market conditions of recyclable commodities as well as achieve locally based economic development.

RECYCLING IS WORKING

The *U.S. Recycling Economic Information (REI) Study* is an unprecedented study that demonstrates the importance of recycling and reuse to the U.S. economy. Commissioned by the U.S. Environmental Protection Agency and numerous states through a co-operative agreement with the National Recycling Coalition, the study clearly shows what many have known for a long time — that *"Recycling is Working"* . The 158-page report can be downloaded from www.epa.gov/jtr/econ/rei-rw/pdf/n_report.pdf. Among the findings of the study: the U.S. recycling and reuse industry supports more than 56,000 businesses and non-profit organizations that gross more than $236 billion in annual revenues and employ more than 1.1 million people with an annual payroll of nearly $37 billion. Recycling contributes 2.7 percent of the U.S. gross domestic product. Economic modeling estimated that nearly 1.4 million jobs are maintained in support businesses because of the recycling and reuse industry. These jobs have a payroll of $52 billion and produce $173 billion in receipts. Employees of the recycling and reuse industry (and employees in other businesses that support the industry) also support another round of economic activity when they spend their wages

in the economy. Economic modeling estimated that employee personal spending supports 1.5 million jobs with a payroll of $41 billion, and produces receipts of $146 billion.

The REI study found a noticeable distinction exists between the recycling sectors as a group (collection, processing, and manufacturing) and the reuse sector in terms of the size of establishments and average annual payroll. The recycling establishments have an average of 33 employees each, with an average annual payroll per employee of $36,000. Alternatively, the reuse sector is made up of smaller establishments – an average of 6 employees per establishment – with an average annual payroll of $16,000 per employee. Recycling manufacturing, which contributes heavily to the overall recycling statistics, generally requires employees of higher skill and training (who are thus paid more) than is normally required of employees of reuse establishments (who are thus paid less).

The study notes the economic size of the recycling manufacturing sector greatly exceeds that of the other recycling and reuse sectors. Upon closer examination, over half of the economic activity for the entire recycling and reuse industry is accounted for by the following four recycling manufacturing sector categories:

- Paper, paperboard, and deinked market pulp mills, which employ 139,375 people and gross nearly $49 billion in estimated annual receipts;
- Steel mills, which employ 118,544 people and gross $46 billion in estimated annual receipts;
- Plastics converters, which employ 178,700 people and gross nearly $28 billion in estimated annual receipts; and
- Iron and steel foundries, which employ 126,313 people and gross over $16 billion in annual estimated receipts.

These four categories alone account for 50 percent of all employees, 62 percent of wages, and 59 percent of total receipts.

The REI study concluded that the recycling and reuse industry is a significant contributor to the United States economy, providing large numbers of good jobs that pay well as shown by the following statistics:

- The average wage paid by the recycling and reuse industry is $32,700 – approximately $3,000 per year more than the national average wage.
- The recycling and reuse industry supports 3.1 percent of the paid jobs in the United States – 0.9 percent through direct employment, and 2.2 percent (contributed equally) by industry and employee spending in the economy.
- Some 2.7 percent of the US gross domestic product is attributable to the recycling and reuse industry, with 0.7 percent provided directly by the industry.

A list of REI contacts at state agencies, multi-state organizations, and at EPA headquarters and regional offices is available at www.nrc-recycle.org/resources/rei/docs/contactlist.pdf. The economic impacts of the recycling

and reuse industries in individual states participating in the REI study are detailed later in this chapter.

CREATING JOBS/BUILDING COMMUNITIES

The "Agenda for a New Millennium" states:

> "Reuse, composting and recycling conserve resources, create jobs and build communities. A principle impediment to increasing material recovery is unlimited, low cost disposal. Large, centralized disposal systems like landfills and incinerators are simpler for politicians to sell, governments to manage and insure, banks to finance, and businesses to make profitable. Decentralized systems are more local, more complex, and a greater challenge to manage as a public works project, but fundamentally more resilient to changes in the marketplace.
>
> "Research has shown that reuse and repair are not only a top priority in waste reduction, but also the best opportunities for creating jobs per ton of material recovered. Simply sorting and processing recyclables sustains 5 to 10 times more jobs than incineration or landfilling. Each step a community takes to add value to materials recovered from the stream of discards means more local jobs and more local self-reliance. Our businesses create jobs, use local materials, and help the environment. Unfortunately the entry capital costs and risks are high, and the profit margins are low. When we reach zero waste, the fees adequate to sustain these recovery businesses will be collected at the purchase counter, not at the gate of the landfill.
>
> "More zero waste jobs are found by swimming upstream to designers, analysts and code officials. We can support schools of design which emphasize life-cycle design, consumable, or reusable packaging, less toxic solvents and processes, designing for disassembly and recycling. Zero waste principles complement movements in architecture and urban planning toward natural building and regional landscaping techniques, integrated self-sufficient urban design with facilities, libraries and food banks for sharing resources within a community."

"JOBS THROUGH RECYCLING"

The U.S. Environmental Protection Agency's "Jobs Through Recycling" (JTR) program brings together the economic development and recycling communities through grants, networking, and information sharing. Through JTR, EPA supports projects designed to enhance business development, technical assistance, and financing efforts for recycling-related industries. The JTR Web site (http://www.epa.gov/jtr) provides recycling market development information for state and local officials, sources of technical and financial assistance for recycling businesses, grant information for

prospective JTR grantees, and general information for visitors interested in learning more about JTR. The financing and business assistance sections of this web site are especially useful sources of information for startup businesses or businesses seeking to expand.

PROMOTING ECONOMIC GROWTH

A majority of U.S. states have programs in place to promote economic growth and/or job creation through recycling. These programs vary greatly, ranging from financial incentives to siting assistance to marketing research. Kevin Greene, in an article for the Center for Neighborhood Technology in Chicago gives the following examples:

- The Portland Metropolitan Service District's recycling office offers financial and technical assistance to recycling businesses, promotes locally made recycled products and encourages the use of recycled materials.
- California offers low-interest loans and other incentives for recycling businesses willing to locate in special market development zones. Communities may qualify for special designation if they establish comprehensive plans to attract new or expanded recycling businesses and provide siting and other kinds of technical assistance.
- Wisconsin offers recycling rebates to new or expanding businesses that make products from waste to offset equipment costs and the cost differential between recycled and non-recycled feedstocks. This state also has a program that provides loans or grants of up to $250,000 to minority-owned recycling operations.
- The Oakland/Berkeley Recycling Market Development Zone services include site location, permit processing, feedstock and marketing information and local hiring assistance, in addition to financial aid.
- The cities of Washington, Richmond, and Baltimore are working together with recyclers, businesses, and financial institutions to increase economic activity through recycling in the National Capital Area.

ECONOMIC INCENTIVES FOR RECYCLING IN THE U.S.

There are economic benefits for using virgin materials in North America that distort the value/cost of these materials. For example, an advantage is given to virgin materials through depletion allowances in the tax code and tax credits for virgin materials. Many of these "perverse subsidies" are long past due for elimination in a world running low on resources. In the U.S., the mining, logging and other industries that compete directly with recycling received 15 federal tax and spending subsidies totaling $13 billion from 1992 to 1997, according to the report *"Welfare for Waste"* published in April 2000 by the GrassRoots Recycling Network.

Nearly half of all U.S. states offer some form of tax credits that can assist recycling. Property tax exemptions are provided for buying new recycling equipment in Indiana, Kentucky, North Carolina, Pennsylvania, and Wisconsin. Sales tax exemptions are given in Iowa, Illinois, New Jersey, and Wisconsin to help processors or manufacturers purchase new recycling equipment. Individuals and corporations in Oregon receive income tax credits for capital investments in recycling equipment and facilities; Arkansas, California, Maine, New Mexico, and Delaware also provide income tax credits. Tax-exempt bond financing for building processing and manufacturing facilities has been used by many local governments. Transportation tax credits or exemptions for carriers of recyclables are being used in Washington and Maine to help make hauling materials to market cost effective. Local governments can offer property tax exemptions to recycling-related businesses wanting to locate or expand locally. Another incentive is to sell or lease land or equipment to recyclers at no or low cost.

Approximately two-thirds of all states offer grants and loans to help improve recycling market economics. Rebate programs to reimburse companies for the recyclables they use or the money invested in recycling equipment can be very effective market stimulators. In Wisconsin, manufacturers who use secondary materials can qualify for rebates of several hundred thousand dollars. Utah pays tire recyclers $21 per ton for tires made into new products or energy.

Grants, loans, and loan guarantees provide new or existing businesses with necessary capital at no or low cost. These incentives are quite popular with private industry. For example, grant programs in Minnesota, Michigan, New York, and Wisconsin will fund demonstration projects or established technologies. Indiana gives priority to the recycling industry for state economic development grants. Loans and loan guarantees—used in Minnesota, New Jersey, New York, Pennsylvania, and Vermont—can provide low-interest capital for businesses. Such loans may be especially helpful for small and minority business enterprises.

NEW PARTNERSHIPS FORMING

Community development organizations and neighbourhood groups in urban areas are recognizing the tremendous potential for recycling and waste reduction activities to revitalize or diversify local economies. In recent years, the interest among community-based organizations and private businesses to form partnerships that promote new recycling ventures has been growing. The Institute for Local Self-Reliance has documented some of these activities. They include:

- The Natural Resources Council, the Banana Kelly Community Improvement Association, and two paper companies have formed a cooperative venture to create a paper recycling mill in the South Bronx. Banana Kelly will be an equity partner. In addition to new jobs, the new venture will provide other social services, including day care and health facilities. The Garfield Austin

Interfaith Network and the Midwest Center for Labour Research are pursuing a similar project on Chicago's West Side.

- Vision 5, a rural non-profit economic development organization in the Appalachian region, is working with the Tennessee Valley Authority to finance a recycled plastics manufacturing plant.
- Bethel New Life, a Chicago community development organization that is developing an industrial park, will make land available for recycling businesses at reduced costs in the Garfield Park area in exchange for equity shares in the new businesses.
- Webform Inc., a Pennsylvania textile fiber products manufacturer that uses recycled newsprint and phone books, is working on a number of joint venture proposals to build new plants in several states.
- The City of Los Angeles modified its contract guidelines to favor recycling processing firms that establish partnerships with community development corporations. As a result, 43 jobs were created for local residents through a joint venture between a national recycling company and a community-based enterprise in two areas.

MATERIALS FOR THE FUTURE FOUNDATION

The Materials for the Future Foundation (MFF - www.materials4future.org) is a nonprofit organization founded in 1992 by a group of San Francisco Bay Area funders and recycling advocates. Their mission is to support community-based initiatives that integrate the environmental goals of resource conservation through waste prevention, reuse, and recycling with the economic development goals of job creation/retention, enterprise development, and local empowerment. Their work focuses on low-income communities, communities of colour, and areas of high worker displacement, especially in the San Francisco Bay Area. They accomplish their goals through grant-making, operation of a loan fund, provision of business development and technical assistance, referral services, community education and awareness of opportunities in recovered materials enterprise creation.

According to the MFF, the concept of sustainability is the virtuous alternative to America's national vice of making waste. "Sustainable practices are those that simultaneously create economic prosperity, environmental protection, and social equity," the MFF indicates. "Sustainable enterprises value human labour, conserve natural resources, and contribute to strong, self-reliant communities. Professionals in community development have worked to reduce poverty while environmental advocates have worked to protect and restore the environment. Sustainability, however, requires a new collaboration between the two fields. Otherwise, independent achievements may occur, but true and total success will be elusive."

The success of the MFF's efforts is highlighted in a recent Recycling Economics Impact Study of Alameda County, which has a population of about 1.5 million. The study indicated $475 million in annual revenues for the recovered materials economy. Of that,

$302 million was generated by manufacturers, $110 million by material handlers, $28 million by reuse businesses, $25 million by appliance repairers, and $11 million by collection firms.

The study went on to show that of the 3,217 total direct jobs created, 1,325 or 41% were in manufacturing. Jobs created by the other sectors were as follows: materials handling - 910 jobs or 28% of the total; retail reuse - 660 jobs (21%); appliance repair - 191 jobs (6%); and collection - 131 jobs (4%).

New jobs are created at all points of the recycling loop: materials collection, processing, and manufacturing. Ranging from low and semi-skilled jobs in material sorting and processing to highly skilled jobs in the manufacturing sector, these jobs fulfill the diverse needs of different labour pools. Studies that show that the reuse and conservation of materials creates more jobs than other methods of materials handling. But as the above-cited study indicates, most revenues are generated and most jobs are created in the manufacturing sector.

INSTITUTE FOR LOCAL SELF-RELIANCE

The Institute for Local Self-Reliance (ILSR - www.ilsr.org) is a nonprofit research and educational organization that provides technical assistance and information on environmentally sound economic development strategies. Since 1974, ILSR has worked with citizen groups, governments, and private businesses in developing policies that extract the maximum value from local resources. According to ILSR, for every 15,000 tons of solid waste landfilled each year, one (1) job is created. For a similar amount composted, seven (7) jobs are created. If recycled, that material would generate nine (9) jobs in collection and processing alone. This does not include the number of jobs that can then be created or retained in manufacturing.

"Waste to Wealth" was one of ILSR's first programs, and for more than a quarter-century it has continued to provide timely, objective analyses of the latest waste reduction, reuse, recycling, and remanufacturing technologies, practices, and policies. The Waste to Wealth Program (www.ilsr.org/recycling/) offers research, information dissemination, policy development, technical assistance, and education, promotion, and training on waste reduction and recycling-based economic development.

Neil Seldman, President of the Institute for Local Self-Reliance, is bullish about the job creation possibilities inherent in waste reduction, reuse, and recycling. “Recycling is an economic development tool as well as an environmental tool,” he says. “Just sorting recyclables sustains 10 times as many jobs as wasting on a per-ton basis. But the largest economic payoff in the recycling loop is making new products from the old. Remanufacturing from recycled materials creates 25 times as many jobs as landfill disposal. Reuse can create 100 times more jobs. In the new field of deconstructing buildings to recover building materials and train workers, there is the potential for 100,000 new jobs and $1 billion per year of materials flowing back into the economy.”

The Institute for Local Self-Reliance publishes an extensive number of reports on reuse, recycling, solid waste management, and recycling-based economic development. A list can be viewed at www.ilsr.org/pubs/pubswtow.html.

THE NATIONAL RECYCLING COALITION

Founded in 1978, the National Recycling Coalition, Inc. (NRC www.nrc-recycle.org) is a nonprofit organization committed to the goal of maximizing recycling to achieve resource conservation, solid waste reduction, environmental protection, energy conservation, and social and economic development. Its 4,500 members include recycling and environmental organizations; large and small businesses; federal, state and local governments; and individuals. The coalition is based in Alexandria, Virginia, and provides technical education, disseminates public information on selected recycling issues, shapes public and private policy on recycling and operates programs that encourage recycling markets and economic development.

As well as coordinating the *Recycling Economic Information Study* referred at the beginning of this chapter, the NRC provides a number of online Internet resources to its members and the general public including small business assistance for recycling and remanufacturing initiatives. The ability of small and start-up recycling businesses to obtain financing is a critical factor in expanding end use manufacturing capacity for recycled materials and products. To address this need, the NRC developed (with funding primarily provided by the U.S. Environmental Protection Agency) a number of useful resources for the business, financial, investment, and market development communities on the web page www.nrc-recycle.org/resources/Financing/index.htm. While the National Recycling Financing Initiative (NRFI) is no longer an active NRC project, this web page contains many valuable resources produced during the project, much of which is still relevant today. While the NRFI was active, it:

- Researched, documented, and published information on successful capital information strategies for recycling businesses.
- Provided information and conducted outreach to targeted investors on successful financial deals and investment opportunities in the recycling industry.
- Provided state market development officials and business development specialists with a centralized source of information and training to assist recycling businesses in obtaining financing.

The NRC identified a number of challenges facing recycling enterprises in the financing arena. These challenges include:

- Improving recycling companies' business planning expertise and their familiarity with promising financing sources and strategies.
- Responding to investor concerns regarding market volatility, regulatory uncertainty, new technologies, past financial track record, and lack of credit history/collateral.
- Identifying and maximizing the use of nontraditional sources of capital and financing strategies such as community-based financial institutions, "angel" investors, venture

capitalists, asset-based lenders, and mergers and acquisitions to fill financing "gaps" not addressed by traditional sources of debt and equity financing.
- Promoting successful financial deals in the recycling industry to investors and the business community.
- Increasing the utilization of government loan and grant programs to leverage more private sector investment.
- Realizing the potential of investment forums and networks to assist recycling businesses in obtaining financing.

NRC's web page at www.nrc-recycle.org/resources/Financing/toolkit.htm offers a financing toolkit of resources/reports to assist small businesses in accessing financing for recycling/reuse/remanufacturing enterprises. Especially helpful is a 1998 briefing paper that reviews historical and current trends in financing recycling businesses and recent developments in small business and community-based financing. Written for NRC by Self-Reliance, Inc., the report includes results of a survey of community-development financial institutions (CDFI) that have financed recycling businesses along with contract information for more than 25 regional CDFIs interested in financing recycling businesses that create jobs and economic development opportunities in low-income communities. The report also includes recommendations for expanding the amount of capital available to the recycling industry and an extensive list of federal and state government programs that provide sources of grants or loans for recycling businesses. "Government and Community-Based Strategies and Sources for Financing Recycling Enterprises" can be downloaded from www.nrc-recycle.org/resources/Financing/ilsrfn.pdf.

Another helpful document in the financing toolkit is *"Beyond The Bank: A Primer on Non-Traditional Financing Strategies for the Recycling Industry."* Researched and written by the Environmental Capital Network under contract to NRC, this primer includes basic information on financing recycling businesses and alternative financing stratigies for companies seeking to expand their operations. The primer includes detailed information and contracts on asset-based financing, leasing options, partnership and government financing sources, and, includes Small Business Administration loan guarantee programs. The primer can be downloaded from www.nrc-recycle.org/resources/Financing/Beyond%20the%20Bank.pdf.

"Financing Strategies For Startup and Expanding Reuse and Recycling Enterprises" (**www.nrc-recycle.org/resources/Financing/Finance%20Strategies.pdf**) was developed by the Materials for the Future Foundation for the NRC in April 1999. This fact sheet includes information on the basic financing strategies and guidance for start-up and small businesses. It includes helpful hints and other resources and web sites to assist entrepreneurs in developing business plans and obtaining financing. "Financing the Recovered Materials Industry: An assessment of Targeted Financing Sources for the Recycling Industry" was also prepared by Materials for the Future Foundation as part of the NRFI initiative. This April 1999 report can be downloaded from www.nrc-recycle.org/resources/Financing/Financing%20Document.pdf.

THE PROOF IS IN. . . . . .

Besides diverting waste from landfills, recycling-based manufacturing can form the basis of a regional revitalization strategy for rural and urban areas alike. Rural areas experiencing job loss due to declines in core industries like timber can benefit from new manufacturing enterprises that utilize recycled materials collected in the region. Additionally, since secondary materials are generated in population centers, plants that use recycled feedstocks have incentives to locate in urban areas near both the material supply and the labour supply -- helping to address problems of urban unemployment. Studies show that the value added (the increase in the worth of raw materials as a result of labour and processing) to the economy can be in the hundreds of millions of dollars just from manufacturers using recycled feedstock.

A "local" economy based upon materials reuse can also create many types of ancillary jobs. At the front-end, research and development efforts provide employment to engineers, chemists, and other material specialists. At the back-end, construction workers, architects, and engineers are needed to design and construct the facilities to handle the new supply of discarded materials. In addition, jobs and dollars flow to other businesses in the communities such as retail outlets, real estate, and others. While employment in the U.S. grew only 2.1% annually between 1967 and 2000, the recycling industry saw 8.3% increase in employment, and 12.7% growth in annual sales.

Small business development and the growth of the recovered materials industry will happen hand in hand. New jobs in the recovered materials industry are expected to contrast greatly with competing traditional sectors, offering more potential benefits to local communities. While the recycling and reuse industry tends to be diverse and labour-intensive, the virgin materials extraction industry (timber, mining, drilling, etc.), and disposal industry (landfilling and incineration), tends to be highly centralized and capital intensive and provide fewer local job opportunities.

What follows are detailed descriptions of a number of U.S. state waste reduction incentives and/or specific state economic impact data gathered in the Recycling Economic Information process. The incentives and approaches are varied and innovative. States are listed alphabetically and order of listing does not imply any order of importance.

CALIFORNIA

California’s Integrated Waste Management Act requires jurisdictions to divert 50 percent of their waste in the year 2000. Jurisdictions select and implement the combination of waste prevention, reuse, recycling, and composting programs that best meet the needs of their residents while achieving the diversion requirements of the Act. By nearly all accounts, the state's 13-year experiment in waste stream diversion has been a resounding success. Over 230 million tons of materials have been diverted from landfills since 1990. Of the 72 million tons of waste generated annually in California, almost 35 tons (48%) are diverted from landfill.

A California Integrated Waste Management Board (www.ciwmb.ca.gov) news release dated June 2003 reported 63 percent of all reporting jurisdictions—279 out of 445—met the requirements of the diversion law in 2000. These jurisdictions either reached or exceeded the 50 percent diversion rate or made a "Good Faith Effort" to reach the goal. Of the 63 jurisdictions approved for "Good Faith" efforts, most had diversion rates above 45%. A few jurisdictions had their efforts approved by the board with an alternative diversion rate below 50%.

More impressive is the fact 54 of the 279 communities and counties reported diversion rates of 60% or higher, 16 reported diversion of 70% or higher, two reached 85% diversion, one attained 87% diversion, one achieved 88% diversion, and one jurisdiction reached 91% diversion. To achieve their high diversion rates, jurisdictions have tailored new waste handling infrastructures from options that include curbside recycling, material recovery facilities and composting operations that are supported by comprehensive waste prevention and public education efforts. The CIWMB's 2001 Strategic Plan (http://www.ciwmb.ca.gov/boardinfo/strategicplan/default.htm) included zero waste as one of the goals of the Board.

Public Resources Code section 41780—the Integrated Waste Management Act—requires every city and county in California to divert from landfill at least 50 percent of the waste generated within their jurisdiction in 2000. The Legislature amended this statute in 2000, requiring jurisdictions to sustain their waste diversion efforts into the future. Jurisdictions that did not meet the 50 percent diversion requirement in 2000 may petition the CIWMB for one or more time extensions, for a maximum of five years. No single extension can be for more than three years, and no extension may be effective beyond January 1, 2006. Alternatively, the Board can determine that a jurisdiction's "good faith efforts" to implement comprehensive diversion programs have satisfied the requirement even if diversion levels are below 50 percent. A jurisdiction that does not meet the 50 percent diversion requirement and does not receive a time extension, a "good faith effort" finding, or an alternative diversion goal will be placed on a compliance order and could be subject to fines. The Board can issue fines of up to $10,000 a day for noncompliance.

California still has a long way to go. An estimated 38 million tons of state-generated waste are still being disposed annually, only six percent of which is being converted into energy. In a speech to the BioCycle West Coast Conference in March 2002 (www.ciwmb.ca.gov/boardinfo/boardmembers/mpatterson/archive/biocycle2002.doc), Linda Moulton-Patterson, Chair of the California Integrated Waste Management Board, told her audience that 15 million tons of organic resources are still landfilled annually in the state. "By promoting zero waste – we accomplish the Board's primary objectives for organic materials management, that being - to find a home for all compostable organic materials," Moulton-Patterson said. She added that the Board is putting special emphasis on non-burn "conversion" technologies such as gasification and hydrolysis that take post-recycled materials currently going to landfills and use them to produce electricity and alternative sources of clean energy for transportation, such as ethanol. (See www.ciwmb.ca.gov/organics/conversion). Another significant component of the

organic waste stream is food scraps or residuals. "When talking about zero waste – this becomes an area of crucial concern, since food scraps comprise over 16% of the waste stream in California," said Moulton-Patterson. "Given its importance, the Board has dedicated several staff to the collection and distribution of information." (See www.ciwmb.ca.gov/foodwaste). Two of the California jurisdictions trying to reach zero waste -- the City of Burbank and Del Norte County -- both have aggressive organic waste diversion programs.

The City of Burbank, located in Los Angeles County, currently has a population of about 100,000, with about 5,000 businesses. The "Race to Zero Waste Program" has been the underlying driving force behind the Burbank Recycle Center since 1997. Burbank looks at all avenues to try to eliminate waste and achieve zero waste. For example, Recycling Coordinator Al Zorn, Recycling Specialist Hope Mc Aloon, and other public works staff members continue to search for ideas and programs on how to avoid waste. Their ideas include expanding the variety of recyclables collected and interesting more people in recycling and composting by educating them. One emphasis is on educating school children in hopes that the children will educate the adults in their life.

Burbank believes that the best way to reduce waste is not to create it in the first place and to continually educate the public to reduce, reuse, and recycle. By practicing these "3 Rs," the city achieves the results it is looking for, which include saving money (by lengthening the life of the city's landfill). For instance, the Burbank Recycle Center holds free composting workshops and gives a backyard composter to Burbank residents that attend. The idea is that if residents compost at home for three or more years, the cost of the workshops and composters will be paid for through savings the city realizes from not having to collect, transport, and process the green waste.

Burbank is fortunate to have large businesses that are environmentally conscious. Warner Bros. and the Walt Disney Company, for example, have been honored nationwide for their waste reduction practices. These businesses compost and even teach composting at times. Other waste reduction activities include:

- Since 1995, the city has been collecting and recycling tons of undelivered non-first class mail each month from the local U.S. Post Office.
- The city collects recyclables from multifamily complexes with over 700 units.
- Burbank schools have recycling bins, and a few of the schools recycle half their waste.

Some of Burbank's current efforts in educating residents, schools, and businesses about food waste diversion include handing out information at compost workshops, mailing brochures, including inserts in utility bills, and including announcements and articles in Burbank Public Works. Some examples are:

- Reminding residents that they can put fruit from their trees into the green waste container (to be composted off site) or in their backyard composter.

- Reminding residents that vegetables from their gardens can be put in their backyard composter.
- Educating residents and schools about worm composting (vermicomposting). Burbank Recycle Center also gives tours of its Learning Center to educate school children and adults about vermicomposting (about 1,500 children participate in these tours per year).
- Giving composters to a few small, local restaurants to compost food scraps (and yard trimmings) on site.
- Teaching a composting session at Burbank High School.

Burbank's future efforts in educating residents and businesses about food waste diversion may include:

- Offering vermicomposting programs for schools and residents.
- Featuring articles in Burbank Public Works on ways to divert food scraps.

Burbank received the "California League of Cities Helen Putnam Award for Excellence" in the category of land use and environmental quality for its zero waste program in 2000.

Del Norte County is a mostly rural, coastal county of about 1,001 square miles in size in the northwestern corner of California. The population of the jurisdictions within the Del Norte Solid Waste Management Authority is about 28,000, which includes approximately 3,300 prisoners at the Pelican State Prison. There are a combined total of about 1,000 businesses within the DNSWMA. The DNSWMA adopted the Del Norte Zero Waste Plan on February 15, 2000. The fact that the only landfill in Del Norte County will be closing within three years played an important role in the decision to adopt a zero waste plan. DNSWMA expects disposal fees to nearly double as waste is exported to other disposal facilities.

The Del Norte Zero Waste Plan addresses the needs of businesses and nonprofit organizations that want to create or expand businesses for recovering, processing, reselling, and manufacturing materials. It includes establishing partnerships to set up a commercial/industrial "resource recovery park." The park will function as an “incubator” for businesses (a facility in which fledgling businesses share resources such as loading docks, equipment, and office space). The resource recovery park will add value to discards by serving as a community drop-off center for reusable items and a retail outlet for reused, repaired, refurbished, and recycled products. "The Del Norte Zero Waste Plan will also be used as a touchstone guidance document for future updates and revisions of the Del Norte Countywide Integrated Waste Management Plan," states Tedd Ward, an analyst and planner with the DNSWMA.

Because DNSWMA recognizes that food waste makes up a large part of its disposed waste streams, food waste has been included in the Del Norte Zero Waste Plan as a planned food/paper composting program. DNSWMA will be implementing the

majority of the food waste programs outlined in its zero waste plan after the resource recovery park has been developed. Food waste programs include:

- Educating residents on backyard composting and promoting backyard composting programs.
- Expanding the existing workshops for backyard composting at the community garden.
- Establishing drop-off sites for residential compostables.
- Establishing a drop-off site for self-haul organics and food contaminated materials.
- Establishing a pilot program with restaurants and other institutional kitchens for on-site composting.
- Establishing a system for franchise hauler organics collection.
- Establishing a centralized community composting facility for food and paper composting.

"As a rural county which has achieved a 45 percent diversion rate in 1999, our zero waste plan provides a detailed guide for our future activities. This plan simply directs us down a path toward local self-sufficiency by reducing our reliance on out-of-county landfills," says Kevin Hendrick, director of the Del Norte Solid Waste Management Authority. In the year 2000, Del Norte County had residential curbside recyclable and greenwaste collections and a commercial on-site recyclable pickup. For additional information on the Del Norte Zero Waste Plan, contact Tedd Ward with the Del Norte Solid Waste Management Authority at (707) 465-1100 or at recycle@cc.northcoast.com. You can find information about the Del Norte Zero Waste Plan on the web at www.grrn.org/order/order.html#del_norte.

California's Recycling Market Development Zone (RMDZ - www.ciwmb.ca.gov/RMDZ/) program is one of the state's most successful economic development tools to eliminate waste. The program is a partnership of local governments and the California Integrated Waste Management Board, created to provide incentives to businesses that use secondary materials from the waste stream as feedstock for their manufacturing processes.

The RMDZs are geographic areas designated by the California Integrated Waste Management Board at the request of local governments. There are 40 zones in California, covering much of the state from the Oregon border to San Diego. RMDZs are set up similarly to the federally designated Enterprise Zones and provide State-sponsored support to recycling-based businesses in the form of low-interest loans, technical assistance, help with siting a plant or company, and access to materials for manufacturing feedstock, to name a few services. In return, the businesses create local jobs and help cities and counties to divert usable materials from the waste stream. Recycling is good for California's economy because it creates jobs, provides tax revenue, and conserves natural resources, while it reduces pollution and energy usage. In addition to loans, the CIWMB offers financial assistance, product marketing, and permitting assistance. Local government incentives include relaxed building codes and

zoning laws, streamlined local permit processes, reduced taxes and licensing, and increased and consistent secondary material feedstock supply.

RMDZs promote the development of markets for both recycled materials (as feedstocks for manufacturing) and products made from recycled-content materials. Market development activities result in the creation and purchase of new products made with recycled-content materials and that means California jobs, especially when the manufacturing occurs within the state. Recycling employs over 85,000 tax-paying Californians and generates almost $4 billion in wages, salaries and benefits; and over 5,300 recycling and reuse establishments do business in California with sales of over $10 billion. A showcase of recycled content products manufactured by companies located in California's RMDZs can be found on the web site www.ciwmb.ca.gov/Recyclestore/.

Two economic studies were recently completed with financial assistance from the California Integrated Waste Management Board. Researchers at the University of California, Berkeley (UCB) conducted one study*, "The Economic Impact of Waste Disposal and Diversion in California"* and the National Recycling Coalition, in association with R.W. Beck, prepared the other study, the *"California Recycling Economic Information Study".* A review of the two studies by CIWMB staff can be found at www.ciwmb.ca.gov/agendas/mtgdocs/2002/01/00007122.doc.

While the studies had different goals, their findings both clearly show the economic benefits of diversion:

- Solid waste diversion is a big business, comparable with other large industries in California.
- Diversion has a bigger impact per ton on the economy than disposal.
- The statewide economic impacts from diversion are nearly the same or higher than the impacts from disposal.

Both studies show that the “per ton” economic benefits of diversion far exceed those of disposal. Recycled materials stay in the economic mix longer and are handled in more economic sectors, while disposed waste often takes a relatively short one-way trip out of the economy and into a landfill. Diversion has a consistently higher economic benefit in the areas of sales/outlays, income, value-added and jobs. Averaging the results of the two diversion studies show that when material is diverted rather than disposed:

- Sales/Public Outlays more than double (212%),
- Income increases by more than half (165%),
- Value-added nearly doubles (177%), and
- Jobs nearly double (190%).

The CIWMB staff review concludes that the economic impacts associated with waste diversion will continue to grow as the state progresses toward the goal of zero waste.

The Los Angeles Recycling Economic Information (REI) Study was commissioned by the City of Los Angeles. It was conducted by R. W. Beck, Inc., under subcontract to SCS Engineers, with economic modeling provided by Iowa State University. The goal of the study was to document the size of the recycling and reuse industry and determine the direct economic information for each of twenty-six categories of recycling and reuse establishments. The study found Los Angeles hosts 601 recycling and reuse establishments that employ approximately 7,900 people, generate an annual payroll of $207 million, and gross $1.8 billion in annual revenues. The recycling industry in Los Angeles has 268 establishments, employs 5,762 people, with an annual payroll of $165,208,000, and estimated annual receipts of $1,579,613,000. The city's reuse industry has more establishments (333) but employs fewer people (2,132), with an annual payroll of $41,848,000, and estimated annual receipts of $253,761,000. A copy of the 93-page study can be found at www.ci.la.ca.us/SAN/reis-only.pdf.

The study determined that the recycling and reuse industry contributes significantly to the Los Angeles economy in the following ways:

- The recycling and reuse industry supports 1.7 percent of the paid jobs in Los Angeles – 0.8 percent through direct employment, and 0.9 percent by industry and employee spending in the economy.
- Some 1.6 percent of the total shipments, sales, and receipts generated in Los Angeles is attributable to the recycling and reuse industry, with 0.9 percent provided directly by the industry.

DELAWARE

The Delaware Economic Development Office (DEDO) and the Department of Natural Resources and Environmental Control (DNREC) established a Green Industries Program to promote the use of recycled materials and reduce waste generation within Delaware's business and industrial community. The Green Industries Program provides incentives to business and industry to use recycled materials in the manufacturing of new products or to collect and process such materials for use by other industries. Examples of the various types of companies that can qualify for the program include:

- Companies that significantly reduce waste generation in their manufacturing processes on a voluntary basis.
- Companies whose raw materials and/or components of production are composed of at least 25% recycled materials or materials removed from Delaware's solid waste stream.

- Companies engaged in the processing and/or recycling of materials removed from Delaware's solid waste stream for resale to manufacturers as a raw material or component of production.
- Companies engaged in the collection and distribution of recyclable materials which have been generated in Delaware.

According to the Northeast Recycling Council U.S. Recycling Economic Information Study (February 2000), approximately 172 Delaware companies are engaged in an economic activity that is directly related to the collection, consumption and/or processing of recyclable materials. These companies represent approximately 2,034 jobs with annual payroll of $55,428,000 and estimated receipts totaling $466,348,000.

Under the Green Industries Program, a number of technical assistance services are provided by DEDO and/or DNREC including financing, site selection, employee education, recruitment and training, priority permitting status and advocacy for other state and local approvals. The program provides financing for fixed assets as well as working capital. For eligible businesses, the State of Delaware provides corporate income tax credits and/or gross receipts tax reductions for existing Delaware firms and those choosing Delaware as a location for new operations. The type of financial assistance is dependent upon the category under which assistance is requested. (Detailed information can be found at www.state.de.us/dedo/departments/green/greenind.htm).

There are four categories of businesses that are eligible to participate in the program. Benefits vary depending on the type of business activity, the investment in capital and the creation of new jobs. The four categories are as follows:

CATEGORY A: Source Reduction

Companies will be eligible under Category A if they have voluntarily reduced the amount of waste they generate in their production processes by a minimum of:
20% for chemicals reported under the Toxics Release Inventory, or 50% for other wastes. To be eligible under this category, the waste reduction cannot be the result of any regulatory or legal requirements and must be documented in a source reduction plan. In addition, the reduction in waste must be a reduction in waste generation, not a reduction in waste disposal through recycling and/or waste utilization. Existing Delaware manufacturers that voluntarily reduce the amount of process waste they are generating by the appropriate minimum specified above will receive for each 10% increment in waste reduction corporate income tax credits in the amount of $400. The credits are provided over a 5-year period. For small business financing needs, the Green Industries Program provides direct loans from the State for up to 30% of a total loan package. In most cases, the interest rate for moneys loaned through this program are 70% of the prime interest rate.

CATEGORY B: Utilization of Recycled Materials as Inputs

Companies will be eligible under Category B if their production inputs are comprised of at least 25% (by weight) recycled materials or materials removed from Delaware's solid

waste stream. Category B businesses that choose to establish new facilities in the State or expand their existing Delaware operations will receive the maximum allowable tax credit under the Green Industries Program. With a minimum investment of $200,000 and the creation of at least five new jobs, these companies are eligible to receive $650 for each $100,000 invested and $650 for each new employee for which at least $40,000 has been invested. CATEGORY B businesses that choose to establish new facilities in the State or expand their existing Delaware operations, within a targeted census tract, are eligible for an expanded tax credit. With a minimum investment of $200,000 and the creation of at least five new jobs, these businesses are eligible to receive $900 for each $100,000 invested and $900 for each new job for which at least $40,000 has been invested. For these same firms,the gross receipts tax will be eliminated on products produced using recycled inputs for the first five years of operation after which the tax will be reduced on a declining scale over a ten year period ranging from a 90% reduction in the first year to a 10% reduction in the tenth and final year. As in Category A above, for small business financing needs, DEDO will provide direct loans from the State for up to 30% of a total loan package.

CATEGORY C: Processing of Materials

Companies are eligible under Category C if they are engaged in the processing of materials removed from Delaware's solid waste stream for resale as an input to manufacturers. Processing involves changing the structure or form of the material (e.g., tire shredding, pelletizing plastic, etc.). The same tax credits, tax credit enhancements for targeted census tracts, gross receipts tax exemption and financing programs outlined under category B apply to Category C.

CATEGORY D: Collection and Distribution of Materials

Companies will be eligible under Category D if they collect and distribute recycled materials, and/or materials prevented from entering Delaware's solid waste stream for the purpose of recycling. The same tax credits, tax credit enhancements for targeted census tracts, gross receipts tax exemption and financing programs outlined under Category B apply to Category D.

Delaware’s Green Industries program has helped to create 154 full-time and 40 part-time jobs since its inception in 1995 (A Course of Action to Increase Recycling in the State of Delaware, March 1, 2000, page 15). Recycling provides jobs in collecting, sorting, packaging, cleaning, processing, and reselling products based in whole or part on recycled material. On average, pay is better than for jobs involved in collecting, transporting and landfilling waste. For every 100 jobs created by recycling, only 13 jobs are lost in the solid waste collection and disposal and in virgin materials extraction.

FLORIDA

The results of the *Florida Recycling Economic Information (REI) Study* were released in September 2001, revealing the far-reaching financial benefits of the state's recycling and reuse industries. The report found the state's 3,700 recycling and reuse facilities employ 32,000 workers and generate annual revenues of $4.4 billion. Recycling and reuse establishments maintain an average payroll of $765 million, which is 10-times higher than that of Florida's convenience store industry. In addition, even though Florida's recycling and reuse industry employs only one-fifth the number of people employed by the fast food industry, its total payroll is more than half that of fast food restaurants. The recycling/reuse business also generates $62.7 million in state government revenues each year.

By converting waste into valuable raw materials, recycling builds more competitive manufacturing industries, cuts pollution, conserves natural resources, saves energy, and reduces greenhouse gas emissions. "The utilization of recycled materials -- used drywall, glass, and paper for example -- in our production process has far exceeded anyone's expectations," said Clayton H. Sembler, President CDS Manufacturing, Inc. "At current projections, we anticipate up to a 58% reduction in cost-of-goods-sold. In addition to these internal cost savings, our ability to now promote our products as 'green/sustainable' has opened numerous markets/customers opportunities that were previously closed to us or unknown."

ILLINOIS

In Illinois, the Department of Commerce and Community Affairs has an active division of recycling and waste reduction in the Bureau of Energy and Recycling. The web page http://illinoisbiz.biz/com/recycling/index.html provides information on some of the division's many programs. Of the roughly 50 million cubic yards of trash thrown away each year in Illinois, the majority is discarded in landfills. A significant amount, roughly one third, is recycled. Adding value to these recycled materials is the principal reason why Illinois is meeting and in some cases exceeding national recycling goals.

The Illinois Recycling Grants Program helps communities, businesses, and not-for-profit organizations collect and process materials for recycling. The goals of these programs are to divert large volumes of waste from landfill or incinerator disposal and to foster recycling markets in Illinois. Developing markets for recycled materials is the primary goal of the Recycling Market Development Program (http://illinoisbiz.biz/com/recycling/bus_program_market.html). Manufacturers can equip their facilities to use recycled commodities as feedstock, become more efficient and reduce waste, through the Recycling Industry Modernization Program (http://illinoisbiz.biz/com/recycling/bus_program_recycle.html). The Technologies and Practices Demonstration Program (http://illinoisbiz.biz/com/recycling/bus_program_tech.html) provides financial assistance to develop innovative ideas in recycling and waste reduction. Projects involving new methods and techniques may be supported from proof-of-concept through initial commercialization. The program also targets recycling of non-conventional materials,

such as electronics, appliances, fibreglass and organic wastes. The Used Tire Recycling Program (http://illinoisbiz.biz/com/recycling/bus_program_used.html) provides financial assistance to businesses, local governments and not-for-profit organizations to identify innovative and cost-effective alternatives to stockpiling and/or disposing of scrap tires in landfills. This program encourages development of a self-sustaining tire recycling industry. The Used Tire Recovery Program is funded by a portion of a $1 per tire surcharge to customers who purchase new tires in Illinois. Innovative projects funded through this program include athletic fields made with synthetic turf manufactured from scrap tire crumb rubber, and all weather running tracks made from tire-derived materials. DCCA's Recycling Division has funded nearly 500 projects totaling more than $17 million through this program.

The Illinois School Recycling and Waste Reduction Program (http://illinoisbiz.biz/com/recycling/school_recycling_grants.html) was created to provide technical and financial assistance to Illinois public and private schools to initiate recycling and waste reduction programs or aid schools in expansion of existing programs. Schools can apply for assistance to:

- Purchase recycling and waste reduction related containers, equipment, and educational materials,
- Implement or expand source reduction activities, and
- Incorporate recycling and waste reduction lessons into the regular teaching curriculum, which meet the goals established by the Illinois Learning Standards.

According to the recently published *Illinois Recycling Economic Information Study*, recycling offers widespread benefits to the Illinois economy. Commissioned by the Illinois Department of Commerce and Community Affairs (DCCA) and conducted by R.W. Beck, Inc. in association with the National Recycling Coalition, the landmark study satisfies a long-standing need for economic data that measures the important economic contribution of recycling and reuse. This new data adds economic benefits to the well-established environmental benefits of recycling and reuse, such as cutting pollution, conserving natural resources, saving energy, and reducing greenhouse gas emissions. Among the study's findings are:

- Illinois hosts more than 2,400 recycling and reuse establishments that employ about 56,000 people, generate an annual payroll of $1.8 billion, and earn $12 billion in annual revenues.
- More than half of the economic activity for the entire recycling and reuse industry in Illinois is accounted for by plastics converters, steel mills, recyclable material wholesalers, and iron and steel foundries.
- Indirect economic activity from support businesses such as recycling and reuse equipment manufacturers, consulting and engineering, transporters, and other indirect establishments i.e., office supply, accounting, legal, building and landscape maintenance firms, account for about $5.7 billion in annual sales receipts.
- The recycling and reuse industry contributes to the Illinois economy, providing large numbers of good jobs that pay well:

- the average wage paid by the industry is $32,900;
- the industry supports 2.2 percent of the paid jobs in Illinois - 0.9 percent through direct employment, and 1.3 percent by industry and employee spending in the economy;
- some 1.9 percent of the Illinois gross state product is attributable to the recycling and reuse industry, with 0.7 percent provided directly by the industry.

Recycling manufacturing establishments are critical to the strength of Illinois' recycling and reuse industry and the overall state economy. The industrial sector has a demand for more recovered materials than are reclaimed in the state - thus materials must be imported from other states and countries.

INDIANA

In Indiana, three departments of the state government have helped Indiana reach a waste diversion level of 35%. The Indiana Department of Environmental Management (IDEM) leads efforts to assists local recycling collection programs through equipment purchases and education. The Indiana Department of Commerce (IDOC) Recycling Market Development Program leads the effort in building markets for recyclables by assisting businesses in: using recyclables to make products or industrial feedstocks; implementing waste reduction; using recycled-content products; and finding markets for recyclable materials. The Indiana Department of Administration (IDOA) works on internal state government programs, including reuse efforts, recycling collection, and procurement of recycled-content products. The synergy of the three agencies has impacted the recycling sector of the state's economy. Indiana hosts 1,700 recycling and reuse establishments employing approximately 75,000 people generating an annual payroll of $3 billion and $19 billion in annual revenues. The recycling establishments have an average of 72 employees each, with an average annual payroll per employee of $43,000. Alternatively, the reuse sector is made up of smaller establishments (an average of 7 employees per establishment) with an average annual payroll of $15,000 per employee. (Recycling Economic Information Study, 2001- www.in.gov/doc/commercerecycles/publications/REI_Report.pdf)

IOWA

Based on a study conducted by R.W. Beck, for every 100 jobs created in Iowa's recycling industry, 72 additional jobs are created as a result within the state. The study objectives included the measurement of current economic impacts of Iowa’s recycling market infrastructure on employment, income and tax revenue, and the identification of specific recyclable material market development opportunities that maximize beneficial economic impacts upon the state’s economy. Among the important findings,

- For every dollar in total income created in the recycling processing industry, $1.03 of additional income is sustained in the Iowa economy.
- Direct manufacturing jobs in the recycling industry support typically high wages, averaging $47,691 per job.
- Recycling-related end-use manufacturing operations in Iowa sustain over 23,000 jobs and generate nearly $3.33 billion in total industrial output.
- The recycling equipment industry, one sector in the statewide recycling industry, provides more than $80 million in total industrial output and 725 jobs.

The *Economic Impacts of Recycling in Iowa* report is available at www.recycleiowa.org/impact/pdf/study2001.pdf.

MASSACHUSETTS

Reducing commercial waste is a major priority in the state's Beyond 2000 - Solid Waste Master Plan. In Massachusetts, businesses generate over 4.5 million tons of waste - more than half of all waste sent to landfills and combustion facilities in the Commonwealth each year. The state therefore supplies information to help companies reduce, reuse and recycle more waste and buy green products and services. It also provides a number of assistance programs and funding opportunities. (Complete details are available at www.state.ma.us/dep/recycle/business.htm#fin).

The assistance programs include WasteCap of Massachusetts, a statewide non-profit organization that assists businesses with implementing voluntary recycling, buy recycled, reuse, and source reduction programs. (617-236-7715 or www.wastecap.org). Resource Management (RM) contracts are designed to align customer and contractor objectives by providing opportunities for a contractor to profit from increased resource efficiency through prevention, recycling, and recovery of waste materials. DEP has initiated a project to test this concept through application in a number of Massachusetts businesses. The Tellus Institute, with assistance from WasteCap of Massachusetts, is coordinating the project. The Massachusetts Materials Exchange links businesses that have reusable materials with other businesses that can use them. Businesses can search for materials and list their byproducts, surplus, scrap materials, used equipment, and office furnishings on the program's fully interactive website. Sponsored in part by the DEP, this program is run by the Center for Ecological Technology (CET). (413-586-7350 or www.MaterialsExchange.org). The Chelsea Center for Recycling & Economic Development offers a range of technical and business assistance programs for manufacturers that use or are interested in using recovered materials in their products. The Chelsea Center also assists municipalities interested in developing or increasing a recycled product-manufacturing base. (617-887-2300 or www.chelseacenter.org/ProgramsServices0.asp).

Funding opportunities include Recycling Industries Reimbursement Credit grants that provide financial assistance to businesses to use or increase the use of difficult to recycle materials in their products. Grants of up to $50,000 are available to end users (recycling processors and manufacturers). Grants of up to $150,000 are available for

projects that target construction and demolition debris or organics in 2002. The Recycling Loan Fund (RLF) provides loans to Massachusetts recycling related businesses that may not be able to obtain loans from conventional sources. Loan amounts range from $50,000 to $300,000. The RLF is administered by the Massachusetts Business Development Corporation (MBDC). (617-350-8877 or www.mass-business.com/site/contecnt/recycling.asp). The Chelsea Center for Recycling and Economic Development has funding available for the development of recycling-based economic development programs. All Massachusetts' cities, towns and non-profit organizations are eligible to apply. Funding can cover such activities as updating the municipal economic development plan, identifying potential sources and uses of waste materials, starting up a small recycled products manufacturing business, and working with the community to determine recycled products manufacturers appropriate for the area. The CCRED also has a number of grant programs that assist manufacturers with using recycled materials in their products.

MICHIGAN

Recyclable materials processing has a significant impact on Michigan's economy according to a study released in November 2001. Resource economist Douglas Krieger calculated that the entire recyclable materials processing industry in Michigan had total annual revenues of over $1.9 billion, total employment of 5,028, and a total annual payroll of more than $137 million. The report is available at www.michiganrecycles.org/pdf/MRMPeconomics.pdf.

MINNESOTA

The 1997 report *Minnesota's Value-Added Recycling Manufacturing Industries: An Economic and Environmental Profile* studied the economic and environmental impacts of businesses that use recycled materials as feedstock in manufacturing processes. An estimated $1.5 billion in sales is added to the state economy annually by the state's recycling manufacturing industry. Highlights of the study (available as download from www.moea.state.mn.us/berc/valueadd.cfm) include:

- **Employment.** The industry employs 8,700 Minnesotans. Total direct, indirect and induced employment associated with recycling manufacturing involves 18,000 to 26,000 jobs.
- **Raw materials.** Recycling provides manufacturing industries with raw materials that are often less expensive than virgin sources.
- **Essential feedstock.** Recycled materials are important to Minnesota manufacturers. Survey information indicates that more than 3,000 jobs and $6 million in tax revenues could be lost if certain companies were unable to obtain recycled feedstock for production processes.

- **Materials consumed.** The 60% of known manufacturers that responded to the survey reported using about 2 million tons of recycled feedstock in 1996.
- **Capital investment.** Companies responding to the survey made capital investments surpassing $177 million from 1994 to 1996.

The Minnesota Office of Environmental Assistance (OEA) has helped Minnesota businesses create recycling manufacturing jobs and recycled-content products for over ten years. The market development staff at OEA maintains recycling industry expertise and a network of contacts that serve businesses, government, and non-profit organizations. Market development specialists provide information through fact sheets, directories, reports, conferences, presentations, and on-site visits. Included in the free assistance is:

- **Information** on recyclable materials including glass, plastic, paint, construction-related products, metals, paper and wood wastes.
- **Research** into recycling market conditions, manufacturing technology, and product testing. Listings of recyclers, material processors, and product manufacturers.
- **Data** on products made from recycled materials.
- **Referrals** for financing, business plan development, and facility siting.
- Minnesota recycling legislation and policy information.

Since 1988, the OEA has awarded nearly $4 million in financial assistance to businesses and other organizations. Over 50 projects have developed new recycled content products and markets. Recipients can apply for funding up to $75,000, and must provide a dollar-for-dollar match or in-kind donation. Each year the OEA awards a total of $1 million through this competitive grants program. Eligible projects are those which will develop or expand the use of recycled materials in manufacturing and stimulate demand for recycled-content products. Funded projects have:

- Increased processing and manufacturing capacity for waste paper and plastics.
- Created products and uses for plastics and glass.
- Increased recovery of hazardous materials, such as mercury from fluorescent lamps.

MISSOURI

The Missouri Market Development Program promotes the development of markets for recovered materials and recycled content products throughout the state by providing financial incentives, technical assistance, and information services to businesses, governments, and other organizations. Detailed information on services offered can be found on the Missouri Department of Natural Resources web page at www.dnr.state.mo.us/eiera/Missouri%20Market%20Development%20Program.htm.

Financial assistance is targeted towards developing and expanding manufacturing capacity in Missouri by assisting businesses with the purchase of

equipment needed to enable manufacturing facilities to use recovered materials. The program may fund up to 75% of specific equipment costs with a maximum funding level of $50,000. Eligible expenses include only the purchase of manufacturing equipment and machinery to manufacture products that contain recovered materials (other than internal or mill-broke). Equipment purchased for the final processing of recovered materials to be used by others in the manufacture of recycled content products is also eligible. The Missouri Market Development Program awarded $435,000 to nine Missouri establishments in its Fiscal Year 2001 Financial Assistance Projects. These projects propose to create 44 new full time Missouri jobs and divert over 15,000 tons annually from Missouri landfills. Missouri Market Development Program technical assistance is provided through Missouri Enterprise and is intended to increase the competitiveness of business through sales increase, cost savings, capital investment and jobs created or retained. Fiscal Year 2001 Technical Assistance projects were completed for 15 Missouri establishments, potentially creating over 22 new jobs and diverting over 2,105 tons of waste annually from Missouri landfills. Information on the Missouri Recycled Products Directory can be found at www.dnr.state.mo.us/eiera/MMDP%20Recycled%20Products%20Directory.htm.

NEBRASKA

The Nebraska Recycling Economic Information (REI) Study was commissioned by the Nebraska Department of Economic Development (DED). It was conducted by R.W. Beck, Inc. as part of the National Recycling Coalition's U. S. Recycling Economic Information (US REI) Study, and data from the Nebraska REI study was incorporated into the US REI Study results. The Nebraska REI study is available on the Nebraska One-Stop Recycling web site at http://reda.neded.org/. The report found Nebraska hosts over 400 recycling and reuse establishments employing approximately 4,300 people generating an annual payroll of $109 million and $683 million in annual revenues. Over half of the economic activity for the recycling and reuse industry is accounted for by the following four categories:

- Recyclable material wholesalers;
- Plastics converters;
- Steel mills; and
- Iron and steel foundries.

The report concluded that the recycling and reuse industry significantly contributes to the economy of Nebraska, providing large numbers of good jobs that pay on par with other jobs in the state. Some statistics are:

- The average wage paid by Nebraska's recycling and reuse industry is $25,300, approximately $700 per year more than the State's average wage.
- The recycling and reuse industry supports 1.2 percent of the jobs in Nebraska – 0.5 percent through direct employment, and 0.7 percent by industry and employee spending in the economy.
- Some 0.9 percent of Nebraska's gross state product is attributable to the recycling and reuse industry, with 0.4 percent provided directly by the industry.

The Nebraska Department of Economic Development, through its Recycling Economic Development Advocate office, is a recipient of a US Environmental Protection Agency (EPA) grant and has a Recycling Economic Development Advocate in place. This program focuses on business development, helping new and existing businesses incorporate recycled feedstock into their existing processes. The Recycling Economic Development Advocate can offer assistance with locating technical resources, financing opportunities, business plans and more. The executive summary of Nebraska's Blueprint for Action - Markets for Recyclables is available at http://reda.neded.org/blueprint_es.pdf.

NORTHEAST STATES

The *Recycling Economic Information Study* (www.nerc.org/adobe/NERC_Final_Report.pdf) prepared for the Northeast Recycling Council (NERC) in June 2000 found the region's recycling and re-use industry a key contributor to the region's economy. The study region was the ten states of Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. The key findings of the study for the NERC region are as follows:

- 13,000 recycling and reuse establishments.
- 206,000 employed in recycling and re-use industries. The categories that employ the majority of people are: recyclable material wholesalers; paper, paperboard, and de-inked market pulp mills; plastics converters; and steel mills.
- $6.8 billion in annual payroll and $44 billion in annual revenues. Of the two main industry sectors, recycling generally has larger establishments than reuse and remanufacturing firms and has higher average annual payrolls and receipts.
- Recycling reduces the region's greenhouse gas emissions by 1%, annually. By reducing the amount of energy used by industry, recycling reduces greenhouse gas emissions and helps stem the dangers of global climate change.
- The 32.4 million tons/year of material recycled in the region, saves 204.4 trillion BTUs (39% of the region's industrial energy use in one year). Saving energy is one of the most important environmental benefits of recycling. Manufacturers using recycled materials as feedstock typically consume less energy than those using virgin materials.
- Recycling prevents the annual emissions of 34.2 thousand tons of Nitrogen Oxide and 56.6 thousand tons of Sulfur Oxide emissions, two contributing ingredients in acid rain. This benefit accrues due to the reduction of needed fossil fuels in the manufacturing of recycled materials since they use less energy.
- By recycling, the region annually saves 5.7 million tons of iron ore, 3.2 million tons of coal and 274,000 tons of limestone from being mined and processed.

MACREDO <http://www.libertynet.org/macredo/> The Mid-Atlantic Consortium of Recycling and Economic Development Officials (MACREDO) is an organization of recycling and economic development interests of the states of Delaware, Maryland,

Pennsylvania, Virginia, West Virginia, and the District of Columbia. The organization's mission is to identify, promote, and implement projects and programs that enhance recycling and economic development opportunities on a regional basis.

OHIO

Ohio's recycling industry generates $22.5 billion in direct sales, employs more than 100,000 people and accounts for $650.6 million in state tax revenues, according to a report issued in March 2001 by the Ohio Department of Natural Resources (ODNR).

The report, authorized by ODNR's Division of Recycling & Litter Prevention in partnership with the U.S. Environmental Protection Agency and the National Recycling Coalition (NRC), provides a first-ever evaluation of the economic impact of Ohio's recycling industry and its supporting businesses. It will be included in a national recycling economic impact profile currently being developed by the NRC. The study assesses Ohio businesses involved in recycling collections, processing, and the use of recycled materials to manufacture products. Results found the state's recycling industry is successful, diverse and provides significant economic benefits through jobs, investment capital, and state government tax revenues.

Authors of the study looked at 26 recycling and reuse business categories identified through the North American Industry Classification System (NAICS). They analyzed the direct economic impact of recycling on these industries and estimated the indirect and induced impacts. They also estimated government revenues derived from the recycling and reuse industries.

According to the report, 3,177 Ohio businesses are directly involved in recycling activities while another 133 businesses support those industries in some indirect way. More than 98,000 Ohioans work directly in the recycling industry - sorting recyclables, operating machinery and manufacturing end products. While another 3,800 workers support their activities as accountants, attorneys, consultants and manufacturers.

Workers in Ohio's recycling industry earn a combined annual payroll of $3.6 billion with another $60 million going to people employed in supporting businesses. Recycling accounts for $22.5 billion in direct sales in Ohio and $625 million in indirect sales. State tax revenues from both direct and indirect recycling efforts total $650.6 million annually.

Among states completing the recycling economic impact study, Ohio is a leader in both employment and sales derived from the industry. The number of Ohio workers involved in recycling, 4.3 percent of the workforce, far exceeds neighboring states of Indiana, Pennsylvania and New York. And the salaries earned by Ohio recycling workers (an average of $36,600) also lead the salaries of their counterparts in those states.

OREGON

Oregon's Department of Environmental Quality (DEQ) offers a number of solid waste tax credits (see www.deq.state.or.us/wmc/solwaste/swtaxcredit.html). Recycling businesses in Oregon are eligible for the Pollution Control Facility Tax Credit, the Reclaimed Plastic Tax Credit, and the Oregon Business Energy Tax Credit. These tax credits were created by the Legislature to encourage investment in recycling and enhance the development of the infrastructure for recycling in Oregon. Since 1975, when the first recycling tax credit was enacted, the three programs have processed more than 1,500 applications and certified tax credits on equipment investments for more than $141 million dollars.

Solid waste recycling or material recovery facilities are eligible for the Pollution Control Facility Tax Credit Program, established by the 1967 Legislature to help compensate businesses responding to new environmental requirements. The program was later expanded to encourage businesses to invest in technologies and processes that prevent, control, or reduce significant amounts of pollution. Other eligible items include air and water pollution control devices, hazardous waste and used oil recycling or resource recovery facilities, and facilities reclaiming plastics products. This tax credit is available to owners or operators of equipment or facilities that take material that would otherwise be solid waste and reuse or recycle it as a product of economic value. The amount of credit is based on the portion of the value of the eligible claimed equipment that is allocable to recycling. The claimed equipment must have a principal purpose of meeting a state or federally mandated requirement or a sole purpose of recycling. The amount of tax credit allowed on an individual application may also be reduced in direct proportion to any non-recycling use of the equipment. In some cases, this provision will totally eliminate any credit. Facilities and equipment certified under this program include small equipment such as cardboard balers in commercial locations and collection bins for residential and commercial recycling. Large facilities that have received tax credits include paper mills, glass container plants, and a variety of large commercial recycling and processing facilities.

The intent of the Business Energy Tax Credit program, which provides tax credits for specific types of equipment used to process recyclable material, is to conserve energy by increasing recycling. These tax credits are now limited to the value of eligible equipment associated with projects that develop new markets or recycle materials not required by law.
Recycling equipment certified under this program includes small and medium-sized recycling transportation and processing equipment such as trucks, bins and balers, and large equipment associated with processing recyclable materials or manufacturing recycled products such as paper, metal, glass, and plastic. The Oregon Office of Energy promotes the program and provides technical assistant to applicants.

The Oregon Legislature established the Reclaimed Plastic Tax Credit Program in 1989 to encourage the recycling of plastic and the manufacture of reclaimed plastic

products. The program provides tax credits for equipment used to collect, transport, or process scrap plastic for recycling or equipment used to manufacture a product from reclaimed plastic, such as plastic molding and extrusion equipment, molds for specific products, and other handling and manufacturing equipment. The amount of credit is based on the value of the eligible claimed equipment. Recycling equipment certified under this program includes small and medium-sized recycling transportation and processing equipment such as trucks, bins, granulators, and washing systems.

In addition, DEQ has administered a solid waste grant program to support recycling and waste reduction projects that help Oregon meet its waste management and recovery goals. Since 1991, 179 solid waste grants totaling almost $3.3 million have been awarded to local governments in all parts of the state. In 2002, DEQ expects to have approximately $250,000 available for focus area (commercial waste prevention/reuse and programs) and general solid waste grants and approximately $150,000 for household hazardous waste (HHW) grants. A flier about the 2002 solid waste, recycling and HHW grant program is viewable at www.deq.state.or.us/wmc/solwaste/documents/GrantFlier-2002.pdf.

Oregon also provides a voluntary waste prevention incentive for wastesheds by providing a credit of 2% toward the wasteshed's recovery rate for each of three programs in waste prevention, reuse and residential composting. For each program implemented, the wasteshed receives a 2% "credit", with a possible total of 6% on its recovery rate for the year(s) in which the programs are implemented. In order to receive the credits, the country must report program activities to the DEQ.

In April 2002, the greater Portland metropolitan area (commonly known as Metro) began providing loans to businesses that either make products with recyclable material recovered within the Metro region or that are interested in developing new technologies to use recycled materials. (Details about the recycling business assistance loans can be found at www.metro.dst.or.us/metro/rem/rbl/recycling_loans.html). Loan funds could be used to replace all or part of virgin manufacturing feedstock with recycled material, to remanufacture or reuse items that normally would be disposed, or to expand market outlets for recycled-content products. The Metro loans will bear interest rates ranging from about 4 percent to 6 percent. The rates are pegged to 1 percent above U.S. Treasury Bonds that have the same duration. The maximum loan amount is $250,000. The loans must be secured and cannot be used to pay more than 80 percent of the project costs.

PENNSYLVANIA

In Pennsylvania, 3,247 recycling and reuse establishments employ 81,322 people, with a total annual payroll of nearly $2.9 billion. Total annual sales receipts for these industries were $18.4 billion. The employment, payroll, and sales numbers are more than any other state. Specifically, Pennsylvania leads in the glass, metals, paper, plastic, and rubber industries. In addition, Pennsylvania's recycling industries have an indirect effect on the economy, estimated at $1.8 billion, and have a direct impact on the

tax base, contributing $305 million. A recent study indicates that 3.5 percent of Pennsylvania's jobs can be attributed to the recycling and reuse industry.

The state's Department of Environmental Protection has a low-interest Recycling Market Development Loan Program to help businesses acquire new or used equipment needed to recycle source-separated recyclable materials. The program lowers the cost of capital for recyclers by offering a two-percent interest rate and no loan service fee. Loans can provide 50 percent of total project costs, up to a maximum of $500,000, for collection and processing of source-separated recyclable materials that would otherwise be disposed or processed as municipal waste. Loans can also support projects that manufacture products from these materials. The state also offers a number of other resources for recycling businesses, details of which can be found at www.dep.state.pa.us/dep/deputate/airwaste/wm/recycle/market/links.htm. The state also administers the Industrial Market Development Grant for Waste Tires providing reimbursement grants for entities processing, selling, or purchasing waste tires or products derived from waste tires.

UTAH

In 1996, the Utah Legislature created the Utah Recycling Market Development Zone Program that focuses on recycling as an economic development tool. The program assists businesses that collect, process, distribute, or use recycled materials in their manufacturing operations, or compost. (Details about the program can be found at www.dced.utah.gov/busdev/recycling.html). Communities and counties that currently have recycling development zones are Box Elder County, Brigham City, Richmond City, Logan City, Summit County, Hyrum City, Duchesne County, Carbon County, Iron City, and Myton City. Eligible recycling businesses that are located in designated Recycling Market Development Zones qualify for:

- 5% state tax credit on machinery and equipment;
- 20% state tax credit (up to $2,000) on eligible operating expenses;
- technical assistance from state recycling economic development professionals; and
- various local incentives.

In order to receive the Recycling Market Development Zone designation, communities and counties must offer businesses within the zone some incentives that could include but are not limited to:

- financing, such as loans or grants
- expedited permitting assistance
- infrastructure assistance
- competitive utility rates
- reduced business license fees
- zoning assistance

WASHINGTON

The State of Washington's Department of Ecology has created a Beyond Waste project (www.ecy.wa.gov/beyondwaste/) on behalf of both the Hazardous Waste and Toxics Reduction Program and the Solid Waste and Financial Assistance Program. The project's aim is to develop strategic plans for properly handling both hazardous and solid wastes. The Beyond Waste project includes strategic plans to reduce and eliminate hazardous and non-hazardous wastes, which include household garbage and yard debris, chemical and fertilizer wastes, construction debris, food-processing wastes, industrial solvents, medical wastes and commercial and retail business wastes. Today, these materials are transported, treated, stored, recycled, buried, and/or burned.

State law requires Ecology to develop statewide solid- (www.ecy.wa.gov/beyondwaste/swplan.html) and hazardous-waste (www.ecy.wa.gov/beyondwaste/hwplan.html) plans and to update them regularly. What it means to move "beyond waste" is captured in the shared vision statement for both plans: that we can transition to a society that views wastes as inefficient uses of resources and believes that most wastes can be eliminated. Eliminating wastes will contribute to environmental, economic and social vitality. Moving beyond waste to re-use and reduction of materials could take many years. In the short-term, the plans should position Washington to be more effective in reducing wastes through revised policies and programs, providing better service to the public, business, and government. The Beyond Waste project will help integrate efforts to protect the environment, human health, and the state's economic development. In the long-term, the Beyond Waste project will guide Washington in a new direction, from containing and managing wastes toward preventing wastes from being generated in the first place. Both the solid- and hazardous-waste strategic plans are scheduled to be completed in 2003.

A list of links to sustainability resources available on the web specifically for businesses can be found at www.ecy.wa.gov/beyondwaste/business.html.

WISCONSIN

The Recycling Loan (REC) program is designed to assist businesses that will create or expand markets for recovered materials from solid waste generated in Wisconsin. Since 1991 the Wisconsin Department of Commerce (Commerce) and the Recycling Market Development Board has made more than 50 awards in excess of $16 million. For further information, see www.commerce.state.wi.us/MT/MT-FAX-0827.html. The Recycling Technology Assistance (RTA) program was established to encourage Wisconsin businesses to research and develop innovative ways to utilize recovered materials that are generated in Wisconsin and that have the potential to provide significant benefit to the state. Since 1991 the Wisconsin Department of Commerce (Commerce) and the Recycling Market Development Board has made more than 18 awards in excess of $1.2 million. For further information, see www.commerce.state.wi.us/MT/MT-FAX-0818.html.

The Waste Reduction and Recycling Demonstration Grant program has been offering financial assistance to Wisconsin organizations since 1991. Administered by the Wisconsin Department of Natural Resources, the grant program funds innovative waste reduction and recycling projects on a pilot or demonstration scale.
The Program has $500,000 in funds available annually for projects. Since 1990, this fund has provided $10,066,623 million for 143 grants to private businesses, local and county governments, and others. Grants are available in two categories: Demonstration Grants intended to fund innovative ideas and Request for Proposal (RFP) Grants that target specific materials and strategies. (See www.dnr.state.wi.us/org/caer/cfa/Ef/recycle for more information.)

The State Legislature, through the Wisconsin State Biennial Budget for fiscal years 2001-2003, directed the Department of Natural Resources (DNR) to promulgate rules for two new programs -- a Recycling Efficiency Incentives Grants program and a Recycling Pilot Program for Alternative Method of Compliance. A process was designed and implemented to collect stakeholders' ideas prior to rule development. Listening sessions were held in November 2001 and public hearings were held June 13, 2002.

The Recycling Efficiency Incentive Grant Program was created to distribute $1.9 million dollars in efficiency grants to eligible Responsible Units (RUs). The funds are to be distributed between July 2002 and June 2003. This program would establish additional recycling grants to reward or encourage efficiency. Three examples of a possible grant program were developed for discussion purposes. A fourth example addressing research and studies was also proposed for discussion and would be funded from a portion of the new grant.

The Recycling Pilot Program for Alternative Materials would allow nine local units of government to experiment with alternative recyclable materials, specifically allowing greater flexibility in materials to be separated for recycling than that allowed under current law. No additional grants are associated with this program. The pilot program will end on December 31, 2005. The law specifies those rules for the program will:

- Set goals for amounts of materials to be recycled as a percentage of solid waste generated in the geographic area served by the Responsible Unit;

- Include a list of recyclable materials, including those identified under the current landfill bans and that a Responsible Unit may choose to require to be separated under its recycling program;
- Specify a procedure to identify alternative materials a Responsible Unit chooses to recycle; and
- Specify a procedure to determine whether a Responsible Unit has achieved its stated goals.

The DNR is directed to select nine RUs to participate in the pilot program: three shall have a population of less than 5,000, three shall have a population between 5,000

but less that 25,000, and three shall have a population greater than 25,000. An RU participating in the pilot program under this law will be considered to comply with the requirements for an effective recycling program. Further details on the two programs can be found at www.dnr.state.wi.us/org/aw/wm/recycle/final_report_40802.pdf. The two rules are expected to become effective January 1, 2003.

EUROPEAN EXAMPLES

Other countries are also detailing the economic impacts of recycling and reuse. Recent German studies estimate that country's waste and recycling industry has more than 1,000 firms employing an average of 150 people each, with a turnover of between 80-100 billion DM per year. This is larger than employment in either steel or telecommunications in Germany. Of these 150,000 German jobs, 17,000 have been created through packaging recycling alone. (Source: *Robin Murray, Creating wealth from waste, 1999*)

If not for economic reasons, then environmental ones constrain landfilling of waste. In 1995 the Dutch Government issued the 'Prohibition on Landfilling Wastes Decree' to reduce the amount of waste sent to landfill. This decree states that only waste that cannot be reused or recycled may be landfilled and prohibits the landfilling of 32 categories of household and industrial solid waste. The waste that may be landfilled consists mainly of contaminated soil that cannot be cleaned, non-reusable building and demolition wastes and waste from incinerators, ash from incinerated sludge and contaminated building materials. Only 4% of the waste produced in 2010 may be landfilled. In 2000 waste processors landfilled about six million tonnes of waste.

Since January 1, 1994 all Dutch municipalities are legally obliged to collect vegetable, garden and fruit (VGF) waste separately from other household waste. Composting this waste makes an important contribution to the overall goal of reusing waste as much as possible. The compost is returned to the soil, completing the natural cycle. About 80% of all Dutch households separate their VGF waste. Each year 1.5 million tonnes of VGF waste is collected in the Netherlands. This produces 0.5 million tonnes of clean compost.

From Concept to Implementation

The paper ***"Bringing Zero Waste to Kootenay Boundary: A Strategy for a Waste Free Future"*** begins:

On November 28, 2000, the Board of Directors of the Regional District of Kootenay Boundary endorsed the concept of Zero Waste. In doing so they stated that they believe that Zero Waste can be achieved and that they are willing to take the path to a waste free, resource-full future. This small step has great implications for the communities and residents of Kootenay Boundary. It holds out the promise of a day when there are no landfills with their associated social, environmental and financial costs. It opens the door to a multitude of possibilities for the community to transform what were once costs into benefits. But the question remains, "How do we move from concept to implementation?"

That question is what this section is attempting to answer.

Only those who will risk going too far can possibly find out how far one can go.
T.S. Eliot

After more than one hundred years of managing waste, communities are realizing that the generation of waste represents a loss of materials and energy. Excessive quantities of waste result from inefficient production processes, low durability of goods and unsustainable consumption patterns. Waste is finally being recognized as a resource going in the wrong direction.

Understanding that waste is a resource naturally leads to adding value, creating employment and new economic opportunities. If waste cannot be eliminated, it must be given new life. Therein lies the new task of communities -- to structure contracts, bylaws and incentives in a way that prevents the creation of waste.

The difficulty lies not in the new ideas, but in escaping the old ones.
John Maynard Keynes

Anyone Close to Zero Waste?

As of June 2003, 279 of 445 reporting jurisdictions in California had satisfied the requirement to divert from landfill at least 50 percent of their waste beginning in 2000. Even more impressive is the fact 54 of the 279 communities and counties reported diversion rates of 60% or higher and 16 reported diversion of 70% or higher. Two reached 85% diversion, one reached 87%, another reached 88%, and Blue Lake reached 91% diversion.

In November 1998 the Opotiki District Council was the first local authority in New Zealand to adopt a zero waste strategy. From a peak waste volume of 10,000 tonnes at that time, waste reduction measures and recycling initiatives reduced this to approximately 1,500 tonnes by July 2002 -- an 85% reduction since 1999. The district instituted curbside recycling, built three resource recovery centres, and doubled its landfill fee. The zero waste policy also created five full time jobs, four part-time jobs, and an additional two part-time jobs by persons running their own compost business in the 9,600 population district.

The City of Portland's Solid Waste and Recycling Division is committed to minimizing the amount of materials disposed of in landfills. In April 2001, the Division announced that it had met its latest goal: to recover 54% of residential and commercial waste. In July 2001, the division it was directing its future program initiatives to go beyond 60% diversion by 2005. The City requires Portland's 20,000 businesses, multifamily complexes, and most of its construction projects to recycle more than 50% of their waste material.

Since the release of the province's Solid Waste-Resource Management Strategy in 1996, Nova Scotian's are now sending 50% less waste to municipal disposal sites. Halifax went a step further with its recycling and diversion programs, diverting over 60 per cent of its waste. It achieved this by embarking on a "green bin" program whereby Halifax residents collect compostable household materials for biweekly collection. Over 100,000 households in Halifax were provided with a large green bin for curbside pickup, and a small green bucket to keep in their kitchen. Food waste such as fruits, vegetables, coffee grounds and even meat, as well as yard waste, paper towels, and wood shavings may be collected, something not possible in most recycling programs. The organic waste is transferred to a compost facility where it is "aged and cured" for a few months. The end product is rich brown mulch, ideal for lawns and gardens.

The City of Edmonton has developed a Waste Management Centre that incorporates the concepts of recycling, composting and limited use of landfill. It is unique in the world in that it features a wide range of leading edge waste management facilities in one location. This state-of-the-art facility uses the City's household waste and biosolids (sewage sludge) as resources to create compost. Together with established recycling programs it enables Edmonton to divert about 65% of its residential waste from landfill, more than any other major Canadian city.

Guelph, Ontario's innovative two-stream, wet-dry recycling program began in 1995. Residents and businesses that receive curbside collection service separate their waste into wet materials (which includes food scraps and other compostable wastes, such as diapers, pet litter and dryer lint) and dry materials (recyclables). In April 2002, Guelph started to co-collect wet-dry and wet-waste materials on alternating weeks. The waste component includes anything that is not recyclable, reusable, compostable, or hazardous. The city is achieving a 58% waste diversion with expectations the new improvements will reach higher levels.

Zero waste envisions we can transition to a society that views wastes as inefficient uses of resources and believes that most wastes can be eliminated. Zero waste understands eliminating wastes will contribute to environmental, economic and social vitality. Zero waste seeks to redesign the industrial system in order to create new employment and economic development opportunities from the resources that are currently wasted during extraction, production and consumption. Zero waste will use the tools of integrated waste management during this transition as well as encourage the discovery and utilization of new methods to eliminate waste.

The paper ***"Bringing Zero Waste to Kootenay Boundary: A Strategy for a Waste Free Future"*** states:

Kootenay Boundary has in fact already taken a number of significant steps on the Zero Waste path. Its policies banning recyclable paper products and refundable beverage containers from landfill, establishing Reuse Centres at the McKelvey Creek and Grand Forks Landfills, charging variable rate tipping fees and producing marketable compost from green waste are all Zero Waste initiatives. They qualify as true Zero Waste programs because they not only divert resources from landfill but also create economic activity at the local level. By expanding on these types of initiatives it will be easy to divert more resources from landfill and to generate additional benefits to our community.

A clever person solves a problem, a wise person avoids it.
Albert Einstein

Paying for Waste Collection

A literature search indicates that how people pay for waste collection influences both how much waste they generate and they amount of recycling they do. Increasingly, communities around the world are embracing a "pay-as-you-throw" (PAYT) policy to reduce waste sent to landfill and to increase the recycling and reusing of waste.

PAYT is also known as variable rate or unit based pricing since it charges customers based on the amount of solid waste they discard. This strategy for pricing local solid waste collection and disposal services is analogous to that used by local utilities for electricity, gas, water, and sanitary sewer services where customers pay for they use, except in this case, citizens pay for how much they throw away.

Among the more prominent advantages of PAYT policies described in the literature are the potential to:

- **Reduce solid waste collection and disposal costs for the community.**
- **Increase levels of solid waste recycling and composting.**

If residents set out less solid waste at the curb, there is the possibility that that a municipality could:

- **Extend the life of its landfill.**
- **Save money on tipping fees, transportation, and transfer costs.**
- **Reduce the size of its truck fleets.**
- **Cut back on the number of collection crews or crew sizes.**

The theory implicit in a market incentive such as quantity-based fees for waste disposal is that households are required to internalize the full costs of their consumption and waste disposal behaviours. By contrast, the largely "invisible" costs paid through local tax levies or flat fees may lead people to generate inefficiently high levels of waste because they face a zero price increment for using more collection services.

Lisa Skumatz of Skumatz Economic Research Associates Inc., has studied the effects of PAYT or variable rates for more than a decade. Her 1996 study suggested that variable rates helped to increase recycling by an average of eight to 11 percentage points. This U.S.-wide study also found that diversion rates were higher among cities with smaller populations, higher median incomes, and among those that offered curbside recycling. In a subsequent study in 2000, she estimated that between five to seven percent of municipal waste reduction was attributable to having a variable rate policy after accounting for the impacts of recycling and yard waste programs.

Per Bag Waste Charge Influences Recycling Case Study - Kaslo & Nakusp

- When the Village of Kaslo and the Town of Nakusp decided to charge residents for every bag of waste collected, statistics compiled by the Regional District of Central Kootenay showed these two communities consistently had the highest recycling diversion rates per household than other municipalities that had waste collection fees on residential tax bills.

Start by doing what is necessary; then do what's possible; and suddenly you are doing the impossible.

St. Francis of Assisi

Pay As You Throw Case Study - St. Albert, Alberta

- The City of St. Albert has implemented the first full user-pay system in Western Canada. St. Albert residents choose one of three options when they subscribe to the program. They may choose to use one, two or three cans for their refuse and pay the corresponding rate on their utility bill. In the second option, residents may use bags instead of cans, with two standard bags the equivalent of one can. Third, if they live in neighbourhoods serviced by a private contractor, residents may use garbage carts for automated curbside collection. The reduction in the amount of waste sent to landfill is on target and includes diversion of recyclables from the landfill waste stream.

How to Prevent Waste

Waste prevention can be accomplished in a variety of ways. One of the problems with waste prevention programs is that it is difficult to identify a generic approach that will work for everyone. Different types of tools can be classified in a general manner, however. The Organization for Economic Cooperation and Development (OECD) has identified four main types of waste prevention tools:

Voluntary plans and programs.

Voluntary programs may be sponsored by a variety of agencies and provide information services. Partners set their own waste reduction goals, that must include waste prevention actions such as establishing a recycling program and increasing the purchase of recycled goods. There are comprehensive information services (hotlines, brochures, personal representatives) to help with the process.

Mandatory Instruments.

Regulations can be adopted on the local, state, or federal levels that mandate or encourage reduced waste. They can take a variety of forms: requirements that businesses conduct waste audits and develop source reduction plans; labelling schemes that use consumers information to facilitate purchasing decisions that have less harmful effects on the environment; bans on the sale or disposal of specific materials or products; and legislation requiring manufactures to reduce packaging or to decrease the toxic constituents in products.

Economic Instruments

Generally utilized by provincial and local governments rather than at the federal level, economic instruments include variable waste disposal fees, advance disposal fees, taxes, tax credits, deposit/refund systems, and financial bonuses. Variable disposal fees create an incentive to reduce and recycle since the more garbage is generated, the more money is charged for disposal. Taxes and fees are designed to incorporate the cost of waste disposal into the price of the product or packages are called advance disposal fees. Tax credits can be granted to businesses and institutions that take steps to reduce waste at the source in the commercial sector. Pay-as-you-throw programs (also known as unit pricing or variable-rate pricing), is one type of economic instrument that is gaining popularity in the residential waste sector. Residents are charged for the collection of municipal solid waste—ordinary household trash—based on the amount they throw away. This creates a direct economic incentive to recycle more and to generate less waste.

Suassive Instruments (information dissemination)

Suassive instruments may take the form of workshops, demonstrations, public information hotlines, information clearinghouses and other information databases. They may be maintained by federal, provincial, municipal or industrial sources.

> When you've reached the edge of an abyss, the only move you can make is to turn around and step forward. **David R. Brower**

Curbside Recycling, the Next Generation

Millions of North Americans now have access to curbside recycling collection of a myriad of recyclable materials. The public and private sector have both invested hundreds of millions of dollars during the past decade in collection vehicles and processing facilities to make curbside recycling an everyday reality. However, the programs of the late 1980s and early to mid-1990s are starting to transform into the next generation of curbside recycling programs. The following information is taken from the report ***"Curbside Recycling, the Next Generation: A Model for Local Government Recycling and Waste Reduction."*** The report was prepared by Gary Liss and Associates, Skumatz Economic Research Associates, and the Institute for Local Self-Reliance. It was published by the California Integrated Waste Management Board in July 2002.

The next generation of programs is striving to collect ever more recyclable materials as efficiently as possible. That has led to a number of key developments:

- Pay-As-You-Throw programs that provide residents with incentives to recycle more and waste less.
- Larger, more sophisticated material recovery facilities (MRFs) that can process more materials, with little or no residues remaining after processing.
- Availability of recycling programs that accept more materials—particularly mixed paper, more types of plastics (despite continuing marketing problems), and corrugated cardboard boxes.
- Commingling of recyclable materials to collect more materials more quickly.
- Co-collection of garbage, recyclables, and/or organics in the same truck, but with different compartments.
- Collection of food discards and food-soiled paper with yard trimmings.
- Automated and semi-automated collection.
- Collection from single-family, multifamily, and small businesses in one truck.

Studies completed for the Solid Waste Association of North America (SWANA) in California and nationally provide reliable information on the impacts of demographics, program designs, and financial features on the performance of curbside recycling programs. The SWANA study results are “additive.” If recycling in a community is already at 12 percent, the effect of moving to commingled collection (using the California results) would be to add two to four percentage points of recycling. The new recycling total would be 14 to 16 percent. Adding multiple changes together will yield results that are close to (but not exactly) what would be expected.

Table 1: Estimated Impacts of Program Design Options on Recycling Diversion

Program Feature	National Estimated Recycling Impact	California Estimated Recycling Impact
Variable rate	+5 to 6% points	+3 to 4% points
Weekly recycling collection	+2 to 4% points	Not estimated
Add materials	+2 to 4% points	+3 to 5% points
Commingled Collection	+1 to 3% points	+2 to 4% points
Older programs		+3 to 5% points
No separate recycling charges		+2 to 4% points
Providing bins		+1 to 2% points

Sources: Lisa Skumatz, "Nationwide Diversion Rate Study," 1996; and Achieving 50% in California," 1999, SERA, Inc., http://www.ciwmb.ca.gov/lglibrary/Innovations/Curbside/, accessed on August 15, 2002.

The SWANA California study also examined which program features were associated with higher and lower program costs. Table 1 summarizes program changes that might be most cost-effective for a community. Changes to programs that add lots of tonnage (Table 1) and show reduced or very low costs (Table 2) present the most feasible options for communities. The combination of these findings suggest that the best ways for communities to most cost-effectively increase tonnage would be to:

Implement Pay-As-You-Throw or Variable rates
This approach would provide the largest increase in tonnages for recycling, and cost impacts are small. (Other studies have shown either no increases or decreases in costs when implementing Pay-As-You-Throw rates in most communities). Pay-As-You-Throw rates also increase yard waste recycling tonnages and encourage residents to think before they buy. This prevents waste generation (the cheapest waste management strategy).

Commingled collection
Commingling results in extra recycling tonnages and lower costs. However, this process requires suitable processing facilities to be successful.

Add materials
Adding more eligible materials to a recycling program will result in significant increases in the amount of recyclables recovered through your programs. This will add two to five percentage points (e.g., mixed/additional paper, more plastic types, cardboard, glass, metal cans).

Every-other-week collection
Lower frequency collection decreases costs dramatically and only leads to small decreases in recycling tonnage. The tonnage decrease could be offset by other

changes. Changes in frequency of collection require more user education to cover the recycling pickup schedule in their neighbourhood.

Table 2: Estimated Percentage Changes in Program Costs from Program Choices and Changes

Program Feature	Estimated Cost Impact
Commingled collection	20 to 35% lower
Less than weekly collection	20 to 40% lower
Mandatory recycling	10 to 25% lower
Older program	10 to 25% lower
Automating collection	5 to 15% higher
Adding variable rates	10 to 20% higher
Adding new materials	15 to 35% higher

Sources: Lisa Skumatz, "Nationwide Diversion Rate Study" and "Achieving 50% in California," SERA, Inc., http://www.ciwmb.ca.gov/lglibrary/Innovations/Curbside/, accessed on August 15, 2002.

The study concludes with eight tips for replication:

1. Implement Pay-As-You-Throw/"a can is a can" garbage rates, with recycling costs included in the rate.
2. Consider commingled collection if sufficient processing facilities are located in your area.
3. Phase in automated or semi-automated collection vehicle if program begins in mid-contract, or specify them for the beginning of a new contract.
4. Consider co-collecting two of the three primary materials (garbage, commingled recyclables and/or yard wastes) in the same vehicle.
5. Collect food discards (all types, if possible) and soiled paper with yard trimmings. The yard trimmings must be collected in rolling carts and a unified composting system must be present.
6. Collect recyclables from small businesses through curbside recycling programs.
7. Consider adding materials when you make other changes to improve collection efficiencies.
8. Use pilot programs to test new technologies and approaches. Use focus groups and other marketing techniques to scientifically evaluate the success of pilot programs.

The important thing is not to stop questioning. Albert Einstein

Another Study, Similar Results

A study of curbside recycling collection methods (***"A Comparative Analysis of Applied Recycling Collection Methods in Saint Paul"***) prepared by Eureka Recycling in May 2002 for the City of Saint Paul, Minnesota, identified a number of ways to improve the city's curbside recycling program. The investigation compared five different collection methods including two-stream collection using two 18-gallon (68 litre) blue bins and 35-gallon (132 litre) rolling carts, both with bi-weekly collection. The study made recommendations using three indicators:

- **Environmental Impacts**: Consider which collection method allows residents to recycle the most materials while having the least amount of materials that have to be thrown out. (Contaminated and damaged material has to be thrown out.) Consider the recycling collection method that gets the most recycled with the least pollution.

- **Cost**: Consider how much the different methods cost and how the cost of each impacts the residents' choice.

- **Convenience/Satisfaction**: Consider why, how and what do people want to recycle and what would make them recycle more.

After measuring and analyzing the costs, convenience and environmental impacts of the various collections the study concludes that in order to provide the greatest environmental benefits at a greater convenience and affordable costs to residents, Saint Paul's recycling program should:

- Move to a two-stream recycling sorting system: papers (including newspaper, cardboard, paper and mail) and rigid containers (a mix of glass, cans and plastic bottles).

- Add PET (#1) & HDPE (#2) plastic bottles to curbside collection.

- Provide 18-gallon recycling bins with weekly collection. Although recycling carts net a greater diversion, the cost of the carts is a barrier to this method. Blue bins collected weekly provide the same storage capacity as carts that are collected every other week.

- Work toward adding organics collection to its curbside program. The study results clearly indicate that the greatest potential for diversion of Saint Paul's waste can be achieved through organics collection.

If you have an apple and I have an apple and we exchange apples then you and I will still each have one apple. But if you have an idea and I have an idea and we exchange these ideas, then each of us will have two ideas.

George Bernard Shaw

Faster, Cheaper, Better

As confirmed in the previously cited studies, new residential waste collection strategies are having dramatic impacts on cost effectiveness, waste diversion, and the quality of service delivery. Using advanced technology and good business sense, these strategies are doing more with less, leading to a paradigm shift in collection methods, and taking advantage of a host of new practices and equipment. Programs employing these strategies are reporting combined waste reduction and diversion rates approaching 50 percent, while stabilizing costs, reducing worker injuries, and increasing customer services.

A study on dual-collection (***"A Citizen's Primer: Recycling and Dual-Collection in Philadelphia"***) was prepared in October 2001 by the Citizens For Pennsylvania's Future in cooperation with the Mid-Atlantic Consortium of Recycling and Economic Development Officials (MACREDO), the Clean Water Fund and Clean Air Council. Philadelphia launched a six-month pilot in 2001 to test semi-automated trash collection and recycling on the same truck. The report profiled the experiences of a number of communities that had already implemented such a system, analyzed the Philadelphia system and proposed some recommendations to evaluate the pilot program. The summary of documented collection efficiency strategies that comprise the state of the art in integrated waste collection are valuable lessons learned.

The study concludes:

Dual collection employing semi-automation or full automation works to reduce costs and increase collection efficiency, under specific conditions. The collection compartments on recycling trucks must be properly sized to match collection volumes. Tipping facilities for recyclables and trash must be within ten miles of each other. Streets must be large enough to accommodate the added length of collection vehicles or the reach of mechanized features. Routing, crew size, and public participation must also be considered. Ultimately, public works and municipal elected officials must be willing to plan for and endure some setbacks while developing approaches that work. The communities profiled had high implementation costs, but system operating costs were 20 to 40 percent lower than with the previous trash and recycling systems.

There is no such thing as a standard municipal recycling program. Replicating dual collection and other collection efficiency strategies requires consideration of local circumstances. All municipalities are unique, with differences in size, housing types,

configuration of streets, geography, demographics, and waste composition. Municipalities considering major changes in their waste and recycling programs should scrutinize their options and develop plans that take their own special circumstances into account.

The jurisdictions profiled in the study were motivated to automate trash collection because of the need to reduce costs, increase collection efficiency, and increase waste diversion. Each city was unique, but all engaged in similar planning processes, setting goals, adding materials to be collected, and launching pilots to test new methods, collection trucks, and containers. Ultimately each municipality called on residents to handle waste very differently than they had in the past. Lessons learned from profiled municipalities include:

- Municipalities chose to modernize in order to increase public participation; improve collection efficiency; reduce the cost of service, as well as worker injuries, street litter, and scavenging; and meet waste diversion targets.

- Continuing education and outreach are critical. Each city implemented extensive education and outreach programs along with distribution of containers for trash and recycling.

- "Pay-as-you-throw" (PAYT) policies are an effective incentive for residents to generate less trash and increase recycling. Dual-stream collection programs with PAYT achieved high recycling rates without enforcement when the policy was uniformly practiced citywide. Large containers and single-stream collection may encourage residents to avoid extra fees by "hiding" trash in containers dedicated to recycling. If private haulers are not held to the PAYT policy practiced by the municipality, residents will opt for the less expensive, more convenient option, recycling less and generating more trash.

- Materials added for collection included mixed paper, corrugated cardboard, and yard waste. The addition of yard waste and other organic materials was critical to reaching diversion rates above 35 percent.

- Selection of collection containers required testing to "fit" the container to the needs of the municipality. Containers must be large enough to hold available materials between collection but should not be obtrusive in the home or unwieldy in set-out or collection. They also must be compatible with the collection vehicle.

- Collection bins and carts are a significant capital investment at $4 each for bins and $35 to $52 each for carts, with one to three containers purchased for each household. Operating budgets must also provide for replacement of lost containers and ongoing cart repair.

- Specialized collection vehicles have been developed for manual, semi-automated, and fully automated collection of trash and recyclables, with separate compartments to accommodate dual-stream recycling systems. These vehicles cost $120,000 to $192,000. Municipal collection programs initially retrofitted existing vehicles, later purchasing new vehicles as part of their regular fleet replacement schedule. Many program administrators recommend that municipalities purchase new trucks in order to avoid higher maintenance costs.

- Collection systems are evolving toward trucks operated by a single worker and longer collection routes, with household collection rates increasing by 80 to 300 percent per scheduled crew hour.

- Workers have generally benefited from automation, with reductions in lifting-related injuries and improved working conditions. Unions have not opposed automation. Generally skeptical at first, they have been reassured by policies promising no automation-related layoffs. Cost reductions have been achieved by shifting workers to yard waste collection, by worker attrition, and by freezing new hires.

- Where recyclables are dual-collected with trash or collected commingled, contamination is increasing to levels of 20 percent or more. This issue is being studied by representatives of several California cities and MRF operators under the direction of the California Integrated Waste Management Board (CIWMB).

- MRFs are evolving toward single-stream systems, receiving commingled recyclables. This sets a trend that includes evolution to a single container, and a vehicle of the same model as that used to collect trash. This method shows great promise provided the contamination problem can be overcome.

Lowering Waste Management Costs Case Study - Dover, New Hampshire

- Dover, New Hampshire's residential waste reduction level increased from 3 percent to 52 percent after implementing per-bag trash fees and curbside recycling. Per household costs for solid waste management dropped from $122 to $73.

Commingled Collection Case Study - Bluewater Recycling Association, Ontario

The Bluewater Recycling Association (BRA), located in Huron Industrial Park in the Municipality of South Huron, near Exeter, Ontario, is the largest multi-municipal resource management organization in Canada. The 60 people employed by the association handle more than 31,000 tonnes of material yearly, which represents a substantial portion of the overall waste stream in its service area.

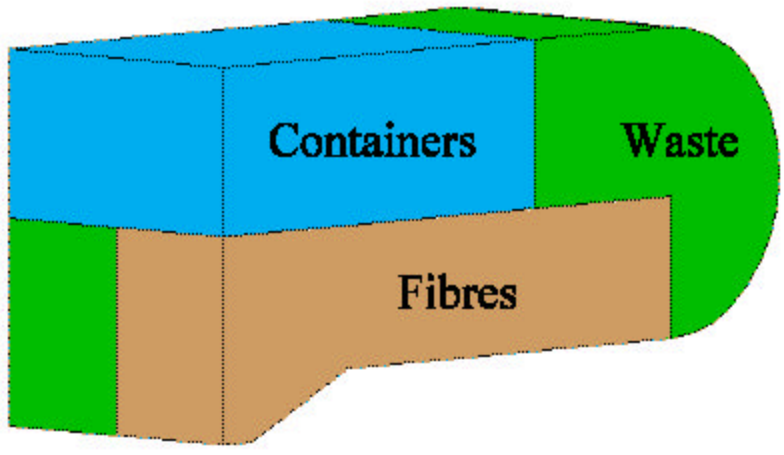
In 1995, the BRA developed a new vehicle that allows for the collection of garbage and recyclables at the same time. The association developed the new vehicle when a time and motion study revealed that the average driver was spending up to 85% of his time driving the vehicle rather than loading it.

The truck has three separate compartments: a 19-cubic yard waste compartment, an 8-cubic yard fibre compartment, and a 12.5-cubic yard container compartment. Proof of the economic and environmental advantages of the new collection system were evident when 13 more municipalities switched to co-collection in 1997.

The benefits of the truck include:

- Less fuel is burnt, conserving resources
- Less emissions are produced, reducing atmospheric pollution
- Noise pollution is reduced
- Impacts on fragile transportation infrastructure are decreased
- Public safety is increased
- All at a lower cost

The co-collection truck body looks like this:



Why not go out on a limb? That's where the fruit is. Will Rogers

Organics Collection

As mentioned already in the above noted studies, a great diversion of waste from landfill is possible if organic material is collected curbside. Audits of municipal solid waste streams in numerous communities has found that food waste comprises about 30 percent of the stream. The summer 2002 waste audit conducted by Becky Brown at the McKelvey Creek Landfill in Trail, BC indicated the organic content in the waste stream averaged 42%.

The City of Guelph, Ontario is a leader in innovative municipal waste management programs such as wet/dry recycling and digestion of organic wastes. In 1999, the taxpayer cost for wet, dry, bulky waste and yard waste debris collection was $78 per year per household (including all collection costs for all programs). Cost for waste operations, including wet-dry recycling, public drop-off services, landfill and the household hazardous waste depot was $8.32 per year per household (including all processing and disposal costs, net of revenues).

Organics Collection Case Study - Guelph, Ontario

- Guelph, Ontario's innovative two-stream, wet-dry recycling program began in 1995. Residents and businesses that receive curbside collection service separate their waste into wet materials (which includes food scraps and other compostable wastes, such as diapers, pet litter and dryer lint) and dry materials (recyclables). In April 2002, Guelph started to co-collect wet-dry and wet-waste materials on alternating weeks. The waste component includes anything that is not recyclable, reusable, compostable, or hazardous. The city is achieving a 58% waste diversion with expectations the new improvements will reach higher levels.

The old system created waste from wealth, now we need to create wealth from waste. Robin Murray

Designing Waste Collection Contracts

If a jurisdiction has a goal of attaining zero waste to landfill, then all initiatives associated with waste handling need to be aligned with that goal. One small step in

waste prevention yields a huge, permanent reduction in waste handling and operating costs. This is why economic instruments and carefully structured contracts can be useful policy tools to achieve environmental objectives in more cost-effective ways than traditional regulatory mechanisms.

San Jose, California's solid waste management system has been trying to meet California's mandated landfill diversion goal of 50 percent by the year 2000. Working with private contractors, the city provided residents with unlimited, manual curbside collection of source-separated recyclables and automated garbage collection in a choice of three cart sizes. When contracts were expiring on June 30, 2002, the city decided to redesign the program. The new contracts allowed San Jose to establish the service performance rules and methodology. In designing the contracts, the city considered:

- **Definitions**
  Properly defined terms are the heart of the contract, as they help to alleviate questions relating to service requirements, rate changes, etc. Contract terms that described services to be performed, service recipients, materials to be included, processes or locations were clearly defined.
- **Rate Adjustments**
  The city included specific rate adjustment methodology, with information about rate decreases and increases, detailing when and how adjustments could occur.
- **Quality of Performance and Administrative Charges**
  Specific service performance standards and administrative charges used to enforce standards were included. There were two administrative charges. The first would be levied if the collector failed to comply with contractual requirements, such as failing to keep office hours or to have properly licensed drivers. The second charge would be levied if the collector failed to correct problems in the required amount of time, such as failing to correct a missed collection within the specified contract time.
  San Jose wanted companies to recognize that they would not be charged for mistakes, such as missing a collection, but they would be charged for failing to correct the problem.
- **Required Items**
  Everything that was required of the service provider — from a review of financial data to employee uniforms — was included. The contract was designed as a stand-alone document, so anything not in the contract was not enforceable.
- **Flexibility**
  Provisions for program changes and unforeseen circumstances were contractually allowed to adapt to changing circumstances yet retain the city's control over the program. The city recognized that it is extremely likely that federal, state or local regulations would require program changes during the contract's life. Instances where the city intended to implement new programs during the contract life were defined in the document.

San Jose was thorough in developing its Request for Proposals (RFP) process as it was trying to create a program with better costs and more innovative services. One of the best ways to lower collection service costs is to give proposers the opportunity to obtain multiple services or service districts for a price. San Jose solicited proposals for three different service types:

- Single-family solid waste collection and recyclables collection and processing;
- Multi-family solid waste collection and recyclables collection and processing; and
- Yard trimming collection and processing and residential street sweeping.

To encourage high-quality service throughout the service contract terms, San Jose incorporated “carrots and sticks” in its contracts. These financial incentives and disincentives are based on performance. A contractor's failure to meet the contract's minimum requirements and/or the performance standards tie directly to potential term extensions.

Carrots for Diversion Case Study - San Jose, California

- Keeping in mind San Jose's recycling goals, the city set minimum diversion requirements in the single-family and multi-family solid waste and recycling contracts. For example, companies providing single-family service are required to achieve a minimum of 35 percent diversion from their service districts (not including yard waste), as specified in the RFP.
- The city also incorporated incentives (an annual bonus) for exceeding the minimum requirement. As part of their cost proposals, companies were asked to submit an annual per household incentive rate for achieving diversion rates of 40 percent, 42 percent, 44 percent and 46-plus percent. Achieving higher diversion rates earns the annual incentive payment.

The way San Jose structured its new contracts is an example of what is now called Resource Management (RM) Contracting. RM is a strategic alternative to disposal contracting that seeks to continually improve resource efficiency through enhanced source reduction, recycling, and recovery in addition to environmentally sound hauling and disposal. By tying incentives to the value of services that foster prevention, reuse, and recycling -- with disposal as the last resort -- RM encourages alignment of contractors' activities with the customers' in a new type of joint effort.

RM is based on the idea that contractors will pursue resource efficiency opportunities when offered proper financial incentives. RM contracts align waste generator and contractor incentives by constraining disposal compensation and providing opportunities for both the contractor and the generator to profit from resource efficiency innovations. Thus, if contractors identify cost-effective recycling markets for disposed materials, or techniques for preventing waste altogether, they receive a

portion of the savings resulting from the innovation. This arrangement enhances recovery of readily recyclable materials such as corrugated cardboard and wood pallets while promoting market development opportunities for difficult-to-recover materials such as paint sludge and solvents.

Potential of RM Case Study - Omaha Public Works Department

The Omaha Public Works Department (OPWD) executes multiple hauling, disposal, composting, and recycling contracts on behalf of 121,000 residential accounts. RM would establish a recycling performance benchmark, grant financial bonuses in excess of the benchmark, and levy liquidated damages if the benchmark is not achieved. It has been projected that such actions would result in a 50 percent increase in recycling and an 11 percent decrease in disposal, while slightly decreasing overall contract costs.

In addition to being rewarded for excellent performance in alignment with the customers' goal, contractors should be penalized for under performing. Again, an example from San Jose:

Sticks for Poor Performance Case Study - San Jose, California

- Failing to meet the minimum diversion rates results in the levy of an administrative charge based on the degree of deviation. For example, a $10,000 administrative charge would be assessed for a diversion shortfall of 0.001 percent to 2 percent, and a $25,000 administrative charge would be assessed for a diversion shortfall of 2 percent or greater.
- Administrative charges also will be levied if the contractor fails to meet the set performance standards.
- Contractor performance also has been tied directly to potential contract term extensions. San Jose's base contract term is five years. A contractor that meets the city's minimum diversion requirement and does not exceeded $100,000 in administrative charges in any of the calendar years will be offered an automatic three-year extension. Two three-year extensions are available through the structure of the contract, bringing the total potential contract term to 11 years.
- A contractor that fails to meet the minimum diversion requirement and exceeds $100,000 in administrative charges in any calendar year loses its right to term extension beyond the base five years. If the contractor fails to meet the minimum diversion requirement but does not exceed $100,000 in administrative charges in any of the years, the city can choose whether or not to offer an extension.

The discussion paper **"From Waste to Resource Management: Reinventing Waste Contracts and Services,"** was prepared by the WasteWise Program of the U.S. Environmental Protection Agency (May 4, 2001). It concludes:

In 1997, approximately 100 million tons of waste discarded in the United States was managed through contractual relationships. Experience to date suggests that up to half of these contracted discards (50 million tons) could be eliminated through RM contracting as a combined result of enhanced recovery of readily recyclable waste streams, recycled commodity market development, and source reduction.

The report goes on to say that this level of waste elimination would lead to a national diversion rate of 51 percent, well in excess of the EPA's national goal.

Summary Features of Traditional Contracts vs. RM Contracts

Features	Traditional Hauling & Disposal Contracts	RM Contracts
Contractor Compensation and Incentive Structure	• Unit price based on waste weight/volume or number of pick-ups. • Recycling often non-contractual "add-on" or "free" service provided by same contractor or other provider. **Contractor incentive:** Maximize waste service and volume; no integration with recycling/diversion/source reduction services.	• Capped fee for waste hauling/disposal services. Compensation tied to waste minimization. • Performance bonuses based on and financed from demonstrated resource efficiency savings from documented baseline. **Contractor Incentive:** Seek savings through recycling/ diversion and other resource efficiency innovations.
Waste Generator/Contractor Relationship	Minimal interface and collaboration between waste generator (including all stakeholders influencing waste) and contractor.	Strategic alliance: waste generator and contractor work together to derive value from resource efficiency.
Scope of Service	Container rental and maintenance, hauling, and disposal or processing. Contractor responsibilities begin at the dumpster and end at landfill or processing site.	Services addressed in traditional hauling and disposal contracts plus services that influence waste generation (i.e., product/ process design, material purchase, handling and use, internal storage, reporting).

Resource Recovery Parks

A **resource recovery park** is a new development in recycling and local economic development. In the broadest sense, a **resource recovery park** is the co-location of reuse, recycling, compost processing, manufacturing and retail businesses in a central facility. Also called integrated resource recovery facilities, serial recovery facilities, and discard malls, resource recovery parks provide a one-stop "drop and shop" location where the public can bring wastes and recoverable materials at one time.

Resource recovery parks enable local governments and their constituents to:

- Save money by reducing the amount of wastes going to landfills or incinerators;
- Realize value and revenue from the sale of recovered materials;
- Buy and sell items and materials from reuse, recycling, and composting vendors.

Resource recovery parks can be the core of a comprehensive strategy for local resource management. When combined with incentives for recycling, disincentives for wasting, and a commitment to gradually phase out reliance on waste facilities, such an arrangement can be the centerpiece of a Zero Waste community. These businesses seek competition on a level playing field with the historically-subsidized waste industry, on the undeniable premise that returning discards to commerce beats dumping, burying, and burning them. Developing resource recovery parks requires collaboration and planning by local government officials. Resource recovery parks can be privately financed, or local government can create an authority whose role is to secure the land, build the core facility and lease space to private entrepreneurs - as is frequently done for airports.

Resource Recovery Park Case Study - Opotiki, New Zealand

- In November 1998 the Opotiki District Council was the first local authority in New Zealand to adopt a zero waste strategy. From a peak waste volume of 10,000 tonnes at that time, waste reduction measures and recycling initiatives reduced this to approximately 1,500 tonnes by July 2002 -- an 85% reduction since 1999. The district instituted curbside recycling, built three resource recovery centres, and doubled its landfill fee. The zero waste policy also created five full time jobs, four part-time jobs, and an additional two part-time jobs by persons running their own compost business in the 9,600 population district.

Mandatory Recycling

Mandatory materials recovery programs are necessary to reach high participation rates and, in turn, high levels of recovery in municipal recycling programs. The investments made by municipalities in their own recycling infrastructure or in recycling collection contracts are too great to allow a significant portion of a community to opt out. In addition, the value of the recycled material, both as feedstock for new products and new economic enterprises, dictates that every effort must be made to divert this material from the waste stream. This conclusion has been reached by many studies in the literature, including the aforementioned ***"Cutting the Waste Stream in Half: Community Record-Setters Show How"*** and a 1991 companion study **"Beyond 40 Percent: Record-Setting Recycling and Composting Programs,"** also prepared by the Institute for Local Self-Reliance. In a mandatory recycling program, residents are required to segregate designated materials for recycling and to set them out at curbside or deliver them to a drop-off site. Both of the above-cited studies show that only mandatory programs achieve very high levels of recyclable material recovery.

Requiring businesses to recycle certain materials has contributed to high commercial recycling recovery rates. In addition to bylaws designating certain materials for mandatory recycling, the prohibition of certain wastes to landfill is becoming increasingly prevalent.

Mandatory Recycling Case Study - Portland, Oregon

- The City of Portland's Solid Waste and Recycling Division is committed to minimizing the amount of materials disposed of in landfills. In April 2001, the Division announced that it had met its latest goal: to recover 54% of residential and commercial waste. In July 2001, the division it was directing its future program initiatives to go beyond 60% diversion by 2005. The City requires Portland's 20,000 businesses, multifamily complexes, and most of its construction projects to recycle more than 50% of their waste material.

In Europe, the Netherlands is leading the way with a waste management policy focusing on tackling the problem at source by preventing waste from occurring in the first place. Some of the initiatives regarding residential waste management include:

- A landfill ban in effect on all residential waste.
- Organics recycling programs across the country.
- Plastic PET bottle deposit-refund program at participating retail outlets.
- Energy-from-waste -- virtually all waste that can't be recycled or composted is incinerated to generate electricity.
- Glass recycling in bins located on most main street corners.

- Green bins for organics waste, grey bags for other waste.

Education, Education, Education

The City of Seattle, Washington has been a leader in waste reduction since it began a voluntary curbside recycling program in February 1988. It was immediately obvious to Seattle Public Utilities that it could not achieve its 60% waste diversion goal without the awareness, participation, and support of community residents. Seattle's experience has been that the most important rule for promotions is clear and simple: the audience determines the message. In other words, communications must be tailored to the people they are targeting. It is easy to tell residents what they ought to do. It is another matter for residents to agree and comply. Listening to customers is what successful recycling promotion is all about.

Education Case Study - Seattle, Washington

To support its waste reduction efforts, the Seattle Public Utilities established an aggressive recycling promotion and education program with the following objectives:

- Achieve high participation, resulting in higher recycling tonnage and lower garbage tonnage;
- Minimize customer questions, thereby reducing telephone staff time;
- Establish the correct customer preparation of and reduce contamination of recyclables;
- Build a strong and influential support constituency for solid waste diversion programs.

Do not go where the path may lead, go instead where there is no path and leave a trail.
Ralph Waldo Emerson

The Approach From Down Under

Zero Waste New Zealand Trust was established in 1997 to support a growing network of groups working on waste minimization initiatives and to help develop breakthrough strategies to deal with New Zealand's growing waste problem. According to the Trust, 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. The Trust's mission statement

is **"To encourage and motivate all sectors of New Zealand society to work towards a target of zero waste."**

Five years after its formation, the Trust was instrumental in convincing New Zealand's Ministry for the Environment to launch a waste strategy of moving towards zero waste and a sustainable New Zealand. "The strategy sets ambitious new goals requiring us to be smarter about environmental protection, social wellbeing and economic development," said Environment Minister Marian Hobbs. "This challenge is also a wonderful opportunity to shift investment and resources from managing waste disposal, to more efficient use of materials and resource recovery." Since 1999, almost 50% of New Zealand's district councils have committed to a zero waste to landfill approach, most hoping to reach the goal by 2015.

In early 1999 Zero Waste New Zealand Trust offered all councils in New Zealand the opportunity to take part in a National Pilot Project with the aim of stimulating and supporting major waste reduction initiatives at local authority level. To be eligible to join the National Zero Waste Pilot Project Councils had to meet the following two conditions:

1. A minuted resolution from a full Council meeting confirms Council's commitment to a target of zero waste by 2015, with a review in 2010.

2. A commitment is made to full and open community consultation and ownership of a zero waste strategy involving community, Council and business sector partnerships.

To help Councils reach their targets the Zero Waste New Zealand Trust committed itself to:

- An ongoing relationship, with a three-year review period.
- Financial support to research and develop the strategy of up to $20,000 immediately and assistance in the levering of resources from other sources.

- Technical support and advice (relating to various intervention that will reduce waste) by approved Zero Waste consultants of up to $5,000.

- Ongoing advice on the development of a full zero waste strategy.

- Priority given to applications to the general Trust fund from initiatives originating in 'Zero Waste Councils'.

- International profile through Zero Waste New Zealand Trust links throughout the world including Green Tourism networks.

The Pilot Project was originally limited to ten Councils, but due to the high level of interest expressed by Councils, the Pilot Project was eventually expanded to include 25 Councils, assisted by funding from the Ministry for the Environment's Sustainable Management Fund. Although all positions within the Pilot Project are now officially filled,

Councils are still being encouraged to adopt targets of Zero Waste. To date another 11 Councils have done so, bringing the total number to 36. This is almost 49% of the total number of Local Authorities in New Zealand - representing more than 40% of the population.

As mentioned earlier, significant waste reduction outcomes are already being recorded by Zero Waste Councils and many new waste reduction initiatives and education programs have been launched. It is inevitable that even greater waste reductions will occur over the next two to three years, creating a momentum that will fuel new innovations, businesses, jobs and local economic development.

To help achieve a national goal of zero waste, Zero Waste New Zealand Trust focuses on three core areas:

1. Advocacy and Policy Development is a major function of the Trust - to promote the vision of a zero waste society where all materials are valued as resources through:

- Industrial designers designing products that can be reused, disassembled or recycled at the end of their lives.
- Manufacturers creating products with minimal waste and reducing packaging to a minimum.
- Retailers stocking products that are recyclable and repairable.
- Secondary materials handlers providing a high quality service that out-competes waste disposal services.
- Local Authorities providing the incentives and support infrastructure for recycling and resource recovery.
- Central Government creating policy that favours waste minimization and recycling over disposal to landfill.
- Consumers making responsible buying decisions, buying products with minimal packaging and made from recycled materials and recycling at home and work.

These concepts are being promoted primarily through the National Zero Waste Pilot Project that was established to encourage and assist the activities of Local Authorities.

2. Networking and Technology Transfer

To help communities achieve zero waste the Trust researches waste reduction technologies from around the world and assists local implementation. Often this involves third party advice from Zero Waste Advisors - experts in various aspects of waste stream diversion, including kerbside collection systems, organic waste processing and recovered materials manufacturing. The Advisor's main aim is to help clients including councils, recyclers, non-profit organisations and businesses achieve

massive and rapid waste reduction outcomes. Zero Waste New Zealand Trust also assists the networking of groups around the country and acts as an information exchange for businesses, schools, recyclers, universities and community groups.

3. Funding

The Trust also provides financial support to individuals and organisations working on waste reduction and recycling solutions in their communities. Grants can be used for a wide range of projects including research, policy development, technical support, equipment, trials, pilot projects, education and events. To date over $1,700,000 has been distributed around the country, helping to create significant employment and business opportunities - especially in communities and socio-economic groups that have been hard-hit economically over the last few years.

Whenever you find yourself on the side of the majority, it is time to pause and reflect. Mark Twain

The New Zealand Waste Strategy

Every year New Zealanders send 3.4 million tonnes of solid waste to landfill -- nearly a tonne a year for every man, woman and child in the country. The Ministry for the Environment and Local Government New Zealand developed in the strategy a vision and an action plan for reducing and better managing waste. The broad blueprint covers solid, liquid and gaseous wastes, and deals with waste from generation to disposal. It provides targets, guidelines, and economic incentives to reduce waste, and change wasteful behaviour.

While recognizing that moving towards zero waste and a sustainable New Zealand is a long-term challenge, the strategy has three core goals:

- Lowering the social costs and risks of waste.
- Reducing the damage to the environment from waste generation and disposal.
- Increasing economic benefits by more efficient use of materials.

The New Zealand Waste Strategy recognizes that waste policies have tended to focus on end of pipe solutions by dealing with disposal rather than prevention. It understands the direct link between waste produced and the rate of economic growth and sets out to break that link to achieve sustainable growth by learning how to use resources more efficiently -- to produce more with less. Five core policies form the basis for action:

A sound legislative basis for waste minimization and management
The strategy suggests changes necessary for an effective legal foundation, clarifies the function of key players, including central and local government, and recognizes the Crown's responsibilities under the Treaty of Waitangi.

Efficient pricing
Pricing policies that, as far as practicable, reflect the full costs of waste disposal are crucial. Progress is underway on more efficient pricing policies, but further development and application of those policies is a cornerstone of the strategy.

High environmental standards
High standards are essential to protect the environment and public health. Implementation and monitoring of environmental performance standards is a strategy priority.

Adequate and accessible information
Lack of good information hampers effective waste minimization and management. The strategy recognizes that information is vital, and that central government can set up national information systems and facilitate public information and education programs.

Efficient use of materials
More efficient use of materials will have the biggest long-term impact on waste reduction. Greater efficiency will not only reduce material use but offer more reuse and recycling options.

Our thinking is backwards: We shouldn't use more of what we have less of (natural capital) to use less of what we have more of (people). Paul Hawken

What Does a Zero Waste Plan Look Like?

Rodney District Council is the first council in New Zealand to adopt a comprehensive Draft Zero Waste Plan. The district is also typical of the New Zealand councils that want to achieve zero waste to landfill -- starting from square one with nothing but optimism. Within 12 months of the council being sworn into office, the Environment Committee and staff produced a draft zero waste strategy by December 2001. The plan then went to the Rodney District public for their comments via submission forms available at all council offices, libraries, and the Rodney web site at www.rodney.govt.nz. Opinions were solicited until May 20. On July 1, 2002, the Rodney council adopted their zero waste plan.

The council's optimism is derived from a waste analysis completed in 2001. The breakdown of the composition of domestic refuse in Rodney found that 45% was organic, 18.5% was paper, 13.3% was plastic, 9.4% was glass, 5.4% was metal, 4% was rubber and textiles, 2.3% was rubble, 1.4% was potentially hazardous, and 0.7% was timber. By taking out the organic and recyclable components, the council saw it could reduce domestic waste to landfill by a whopping 91.6% -- well on the way to the zero waste target the council wants to achieve in 2020.

Rodney District had a population of 76,200 in 2001. The District continues to be one of the fastest growing in New Zealand -- it gained 9,700 new residents between 1996 and 2001. The community is divided between rural and urban, from those on the busy Hibiscus Coast to others settled on farms, "lifestyle blocks", and small rural villages. In general, the nature of business in Rodney is changing from primary production activities like farming, towards manufacturing and other secondary and tertiary activities. In the Rodney Waste Analysis 2001, the annual commercial waste and residential waste tonnages were both at around 8,000 tonnes per annum.

A number of pressures have been combining to create a growing commitment to reducing waste to landfill in New Zealand. The Resource Management Act has created stricter standards for the construction and operation of landfills, which has raised and will continue to raise the cost and availability of landfill disposal. The Local Government Amendment Act requires local authorities to produce a waste management plan that incorporates the waste management hierarchy of Reduction, Reuse, Recycling, Recovery, Treatment and Disposal. There has also been a growing demand from the general population for recycling services due to increasing levels of environmental awareness.

The key principle of Rodney's Zero Waste vision is that it redefines "waste" as something that is simply not acceptable. This side-steps debate about what a "reasonable" level of waste is and instead puts the focus on steadily working towards a life without waste. The principle of Zero Waste is akin to such principles as "zero accidents" or "zero defects" in manufacturing. By setting an extreme target, new levels of innovation and efficiency are unleashed. Zero Waste in Rodney means a 100% resource efficient society where, as in nature, material flows are cyclical and everything is recycled or made ready for reuse in society or nature. Waste ceases to exist, says the Rodney Zero Waste Plan, because everything becomes a resource.

The Rodney Zero Waste Plan proposes to achieve this vision through a series of coordinated actions carried out in the various waste streams. Rodney Council considered a list of 49 possible zero waste initiatives and prioritized these for implementation into an 18-year program. In order to sort out all possible initiatives and work through them in a systematic way, the Council arranged the actions into Five Key Action Areas. Working in these Five Key Areas will help ensure a balanced program to successfully bring about long-term progress towards zero waste. The Council says it is essential that action occur in all five of the Five Key Action Areas to Zero Waste, as the five are mutually supportive of each other in the process of gradual change. The

division into these key areas helps order the zero waste initiatives and clarify their purpose.

A description of the Five Key Action Areas is given in the table below:

Key Area	Description	Examples
1. Take Direct Action	Initiatives that deal directly with the waste stream. Council identified 16 possible initiatives.	- Curbside Collections - Compost Operations - Cleaner Production - Recycling Facilities
2. Change the Rules	Legal and economic incentives and disincentives that will divert activity away from disposal and toward waste reduction. Council identified 14 possible initiatives.	- Extended Producer Responsibility - Landfill Bans - Landfill Levy - Purchasing Policies and Contracts - Polluter Pays - household bag levy
3. Foster New Ideas	Creation of structures and mechanisms to nurture the development and testing of new social, technical and economic solutions. Council identified 5 possible initiatives.	- Research and Development - Pilot Schemes - Awards for Waste Minimization - Educational Courses
4. Communicate and Educate	Actions that inform the community of the issues and provide opportunity for input and participation. Council identified 8 possible initiatives.	- Buy Recycled Campaign - Festivals and Events - Public Consultation - Education Material and Programs
5. Monitor and Feedback	Gathering of data and information on the characteristics of the waste stream and on the success of initiatives. Council identified 6 possible initiatives.	- Waste Analysis Data - Participation Rate Surveys - Interim Goals - Waste operator licensing and reporting

Sherl Mai, Rodney's Zero Waste Officer, says the council is currently dealing with a community group in Helensville, one of the smaller towns of the District. "The community group are working toward setting up a resource recovery centre in the town, as well as providing a curbside recycling service on contract to Council," Mai says in a personal e-mail (August 11, 2002) to this report's consultants. "They are going to coordinate their activities along with an established refuse collector who will operate a transfer station on the same site as the community group, and the whole facility will be supported (read subsidized) by Council in line with the initiatives as detailed in the Zero Waste Plan." Mai says the Council is also reviewing the Bylaw that relates to the removal and storage of waste, "to enable us to impose a levy (or user charge) for waste disposal to provide an incentive to reduce waste disposed."

We are not only responsible for what we do, but also for what we do not do.
Molière.

Some Other New Zealand Examples

Porirua City is 20 minutes north of Wellington on the North Island of New Zealand and is situated around a picturesque harbour. With a population of approximately 48,000 and residents hailing from many different cultures, Porirua City labels itself as "an exciting place full of life, colour and fun." In May 2000, Porirua City Council officially adopted a Zero Waste Policy as part of the new Solid Waste Management Plan. The Plan aims to move Council's focus over the next three years from providing waste disposal services to leading waste minimization and waste management in Porirua City.

Like Rodney, Porirua City has developed a series of Key Actions to achieve the objectives of their SWMP. Sixty different initiatives or methods are identified in nine Key Action areas. A priority has been allocated to each initiative of the Solid Waste Management Plan as follows:

PRIORITY 1	Underway or immediate implementation.
PRIORITY 2	Implementation as soon as possible.
PRIORITY 3	Supplementary methods.

For clarity, the Priority 1 Actions are shaded.

A time frame has been allocated for each initiative or method, for example -- 2000/2001, 2001/2002, and 2002/2003. These relate to financial years and are approximate only. As Key Actions are developed, more specific planning and implementation timeframes will be available. Nineteen of the 60 initiatives are given Priority 1. Another section of the SWMP details 26 policy areas and outlines issues, actions and outcomes for each initiative given in the plan. The level of detail augers well for Porirua City to achieve its first goal of a 20% reduction in the waste stream by 2005 and zero waste to landfill by 2015.

The City has begun a range of successful community promotions. Presentations have been made to community groups and waste minimization projects are being developed. Ten schools are establishing worm farms through the Waste-Wise Organics program. A community wide collection of phone books for recycling was held in October 2000. A BusinessCare cleaner production program is underway.

In September 1999, Nelson City Council adopted a Zero Waste policy and a long-term waste reduction strategy was developed with input from Council staff and councillors as well as representatives from the community. The initial aim of the strategy is to divert all reusable and recyclable waste to markets and end users by 2005. Five initiatives were identified to accomplish this goal:

- **Waste audits** - fortnightly audits of waste going to landfill and transfer station to establish what is being disposed of to landfill.

- **Landfill costs** - establishing comparable costs for landfill disposal and various recycling options to allow councillors and the community to be aware of the financial costs and benefits of any waste reduction projects.

- **Recycling and composting** - extending the current recycling service to include recycling of paper and plastics, and encouraging people to use the composting centre and to home compost, will raise awareness and reduce volumes to landfill.

- **Changes to Council's operation to reduce waste** - this could include reduced wastage of paper, use of recycled products, and where possible, amending contracts to include waste reduction considerations.

- **Waste education** - working with businesses, schools and the community to encourage them to reduce waste.

Nelson is also working towards integrating waste reduction with other environmental objectives such as air quality, energy efficiency and water conservation. A very successful reuse shop run the by the Nelson Recycling Centre (http://environmentcentre.nelson.org.nz/recycling) operates alongside the transfer station. Click on the web site and you'll see bicycles being refurbished.

Nelson's Zero Waste Strategy sets out the plan the Council will follow to reduce its waste stream as much as practicable. Implementation of the strategy has the potential to encourage business partnerships and new jobs that will provide a good 'step up' for the unemployed. In the strategy, each of the five initiatives are detailed with explanations, actions, targets, measurement criteria, budget allocation and benefits.

You do not do the things you do because others will necessarily join you in the doing of them, nor because they will ultimately be successful. You do the things you do because the things you do are right.

Archbishop Desmond Tutu

Strategies Used to Reduce the Costs of Recycling

A curbside recycling program must be customized to fit the community that it serves. There is no single strategy applicable to every situation to produce a cost-effective program with a high diversion rate. However, experience has taught recycling officials and community leaders a number of strategies that can often be implemented to reduce the costs of curbside recycling programs, which include:

1. Provide residents with large containers for their recyclables and educate them to put the containers out at the curb only when they are full. This will provide more efficient collection.

2. Consider picking up recyclables every other week (rather than weekly). Again, this will increase collection efficiency.

3. Substitute a recycling pickup for a garbage pickup. This costs less than adding a pickup day. With convenient recycling available, residents should generate less trash and should be able to get by with less frequent trash pickup.

4. Utilize compartmentalized trucks that can accommodate trash and recyclables at the same time. Picking up trash and recyclables in the same trip eliminates the need for multiple truck trips through the same community.

5. Use large trucks designed to lift containers mechanically and maximize the use of space. The maximum height (and consequently the volume) of non-mechanized vehicles is limited by the sanitation workers' ability to lift the trash or recyclables containers into the holding compartment. With mechanized lifting, the height of the truck is no longer limited in this way. A larger capacity truck means fewer trips with resulting cost savings.

6. Initially, collect only materials that have a high market value to help offset collection and processing costs (typically aluminum); and as feasible expand the program to include additional materials based on market conditions. In general, it is better to start with a few materials and expand the program as it is not a good idea to drop materials.

7. Find a place to stockpile recyclables. The ability to store materials enables the program take advantage of the most favorable markets.

8. Develop co-operative marketing agreements with neighboring communities. Combining forces with other recycling programs can broaden potential markets.

9. Implement Pay-As-You-Throw pricing for trash disposal. This system gives residents an incentive to reduce and recycle their waste. This translates into savings on disposal (if the municipality provides this service) and a higher recycling rate.

10. Provide drop-off centers in areas where curbside recycling is not practical or to augment curbside programs. Drop-off centers are less costly than curbside recycling. In rural areas or areas without curbside trash pickup, drop-off recycling may be the only reasonable strategy. Drop-off centers can also provide places for people to recycle materials that are not included in a curbside program.
11. Implement source reduction and reuse strategies. This will reduce the quantity of waste being disposed, therefore saving on tipping costs.

12. Develop local markets for targeted recyclables. This will not only save on transportation costs but will also facilitate the customization of the recycling program to ensure that the material being collected is what the end user needs.

13. Provide ongoing education and promotion programs. Continuous outreach is necessary to keep residents motivated and to educate new residents about the program.

14. Determine the number of materials to be collected and their separation method.

Yard Waste: Most high diversion municipalities and provinces have active collection and composting programs for yard waste. The advantages of a yard waste program appear to be lower overall collection and processing costs and an increase in the overall diversion rate.

Volume-based trash collection: A different approach to trash collection and payment is volume-based trash collection where a household pays a unit price based on its waste generation, i.e. by the number of bags or containers. Unit based pricing is prevalent in the commercial sector and has been used for years. In the residential sector, this is also known as Pay-As-You-Throw (PAYT) and is currently used by approximately 4,030 communities in the United States.

Although this is not recycling, it is a way to encourage households to directly manage their waste. Those who recycle, compost, or reduce the materials they buy can reduce their waste disposal costs. One of the advantages of PAYT is its versatility. Its effectiveness is not dependent on mandatory recycling or on curbside recycling so long as a means to recycle is available. It also is not dependent on any specific method of trash hauling. Collection by private hauler, pickup by a government entity, or self-hauling by the homeowner are all viable.

There are many ways of implementing PAYT. Some communities provide various sizes of trash cans whereas the homeowner pays one rate for the smallest can, a higher rate for a larger can, etc. Other programs involve the use of bags, which must be purchased by the residents. Still other communities require residents to purchase stickers which must be affixed to the bags of trash that are set out at the curb.

Many municipalities that provide trash services to their residents have found that implementing PAYT has resulted in significant savings by decreasing the amount of waste being disposed. Reductions of 25% to 45% have been reported. The costs involved in implementing a PAYT system are minimal as there will need to be little or no change in the way the trash is picked up.

As you start on the way, the way appears.
Rumi

Zero Waste and the Green Economy

A zero waste strategy is an integral component of a green economy. As human populations and material use increases, the natural systems that sustain us are suffering from accelerated degradation. Over the next few decades, our society will change in almost every way. Zero waste represents a new planning approach for the 21st Century. Zero waste defines the discipline required to create a more sustainable interaction with our natural world, including the principles of conserving resources, minimizing pollution, maximizing employment opportunities, and providing the greatest degree of local economic self-reliance.

The GrassRoots Recycling Network indicates that the following policies and actions will be needed to move us towards zero waste:

- **Manufacturer Responsibility.** Waste management is an unfunded mandate that falls almost entirely on taxpayers and local governments. Manufacturers and producers must share responsibility with consumers for recovering their products and ensuring that they are recycled and not wasted.
- **Minimum-Content Standards.** Manufacturers need to help 'close the loop' by using the materials collected in local recycling programs to manufacture new products.
- **Consumer Deposit Programs.** Jurisdictions that have enacted deposit programs have found them to be effective strategies to promote reuse and recycling. Deposit programs on other materials such as tires and batteries have also been proven successful.
- **Unit Pricing for Trash.** Residents and businesses need to be given the incentive to reduce waste and recycle through variable garbage rates. The public must have the opportunity to eliminate their garbage bill if they are to achieve zero waste.
- **Full-Cost Accounting and Life-Cycle Analysis.** The benefits of waste prevention and recycling should include a full accounting of the costs of resource depletion, remediation, and environmental degradation caused by the alternative: continued reliance on virgin materials and wasting.
- **End Subsidies for the Extraction of Virgin Resources.** The time has come to put an end to subsidies for the resource extraction industries.
- **End Cheap Waste Disposal.** Landfills and incinerators waste resources and produce pollution in our air, land, and water. The time has come to have strong environmental standards and to account for the true long-term cost of waste disposal facilities.
- **Invest in Jobs Through Reuse and Recycling.** Waste prevention and recycling provides tremendous opportunity to create jobs and initiate new business ventures.
- **Tax Shifting**. Instead of giving incentives for wasting, we should give tax credits and economic incentives for reducing waste and utilizing recovered materials.
- **Campaign Finance Reform.** Much of the resistance to changing resource policies comes from industries that profit from wasting.

- **Take Consumer Action against Wasteful Corporations.** The public must put pressure directly on corporations that profit from waste.

Such policies and actions would direct economic activity and tax benefits away from things we don't want, like acid rain, contaminated drinking water, topsoil erosion, damaged fisheries, toxic dumping and polluted rivers, so we can encourage things we do want, like jobs, services, clean water, renewable energy, quality long lasting products, and a healthy planet.

"With each passing day, it is becoming increasingly clear that the strategy of environmental exploitation that characterized the 20th century is reaching the end of its natural life. We are in the early stages of a transition from an attitude that, in Herman Daly's felicitous phrase, 'treats the Earth like a business in liquidation' to one that is committed to preserving the planet's 'natural capital.' The principle underlying this shift is really quite simple: if we want a high quality of life for ourselves and future generations - a high quality of life in all its senses - we cannot continue to degrade the quality of the natural systems of which we are a part."

- Carl Frankel

The Ripple Effect of Zero Waste

A better quality of life for future generations is the principal aim of a sustainable development strategy. Protecting the environment, a sustainable level of economic growth and employment, and social progress which meets the needs of everyone are key elements of such a strategy. But unless we humans learn a fourth component -- more prudent use the Earth's natural resources -- it is highly doubtful that the other three can be achieved.

The "take, make, and waste" mentality that has guided our economy for decades must be replaced by the desirable and visionary goal of Zero Waste. Our human economy is undeniably dependent on Nature's economy. Society cannot sensibly afford to continue wasting Nature's resources, many of which (particularly metals and oil-based materials such as plastic) are available in limited quantities in the environment, or are difficult or environmentally damaging to extract. Nature has been operating the longest running, most successful Zero Waste model of all. To achieve sustainability, humans will have to learn to "act naturally."

Recycling has been labeled the most successful environmental initiative in human history. Yet despite its success we are still making more waste. While government and private sector investment in recycling facilitated the establishment of a secondary materials economy, recycling is not sufficient to address the myriad of problems surrounding unsustainable growth in production, consumption, and waste.

It is time for a radically new approach. By adopting the goal of Zero Waste, the first thing we do is discard the idea of waste. Everything is made from resources and waste is a resource going in the wrong direction. To throw "away" resources is to be inefficient and uncompetitive. By changing the way resources flow through our society and communities, we can reap substantial environmental, economic, and social benefits. In effect, the very components of a sustainable development model. We save energy, water, resources, and landfill space. We reduce pollution of air, land, and water by using recycled materials. We find a host of new job opportunities that can benefit those in our society who face the greatest barriers to employment. Best of all, these positions are generated in local communities where livelihoods are created instead of landfills.

As Joel Makower and Ron Pernick, co-founders of Clean Edge, Inc., based in Oakland, California (www.cleanedge.com) have stated: "a real, and sustainable, new new economy is emerging. It is based not on ephemeral (and dubious) products and services, but on providing clean energy, clean transportation, clean water, and other goods and services that embody the principles of industrial ecology, resource productivity, and natural capitalism."

Zero Waste is an integral part of a new new economy that has many components. Reducing, redesigning, reusing, refilling, regenerating, recycling, repairing,

reclaiming, refurbishing, restoring, recharging, remanufacturing, reselling, deconstruction, and composting are some of the constituents of Zero Waste -- and all provide productive employment and economic development opportunities. By aligning our priorities with Zero Waste, we will also be merging with a number of international trends. One of the foremost is **Design for the Environment** (DfE), a new discipline initiated by designers that ensures all costs -- including the environment -- are internalized at the design stage. To get a flavor of its potential, check out the following web sites: Greener by design www.biothinking.com, McDonough Braungart Design Chemistry www.mbdc.com, o2-USA/A Greener World by Design www.o2-USA.org, and The EcoDesign Foundation www.edfc.edu.au. Design Sense (www.designmuseum.org/designsense/) is an international awards scheme established by the Design Museum in 1999 to recognize the importance of sustainability in design. The awards are sponsored by Corus and supported by the Rufford Foundation. Design Sense aims to reward, encourage and stimulate creativity in this area with a prize of GBP £40,000 (approx. EUR €63,000*), making it one of the largest awards of its kind. Additionally, the Design Sense Corporate Prize is awarded to the short-listed entry that shows evidence of environmental commitment, balancing economic development with social responsibility. The Centre for Sustainable Design at www.cfsd.org.uk/ also has a wealth of information.

Cleaner Production is an efficiency concept used mainly by business to reduce the impacts of production on the environment. Find out more at the web site of The Center for Clean Products and Clean Technologies http://eerc.ra.utk.edu/clean/. **De-materialization** is an expression used by Paul Hawken, The Natural Step founder Karl Henrik Robert, and Amory and Hunter Lovins to describe the concept of using less materials to create the same service. Read about de-materialization the book "Natural Capitalism" authored by Hawken and the Lovins or visit the Natural Capitalism web site at www.naturalcapitalism.com. **Design for Disassembly** is another design discipline aimed at ensuring products are designed for ease of disassembly so that the parts can be reintegrated into new models and materials can be recycled. One of the leading proponents of design for disassembly is Philip Crowther of the School of Architecture Interior and Industrial Design at the Queensland University of Technology in Brisbane, Australia. Check out his writing on the subject at www.aiid.bee.qut.edu.au/crowtherp/.

Other new trends toward Zero Waste include **Extended Producer Responsibility** where manufacturers take responsibility for the entire life cycle of products and packaging. One aim of EPR policies is to internalize the environmental costs of products into their price. Another is to shift the economic burden of managing products that have reached the end of their useful life from local government and taxpayers to product producers and consumers. The Institute for Local Self-Reliance has an excellent EPR resource and links list at www.ilsr.org/recycling/eprlinks.html. **Dynamic Modularity** is where products are made in modules, so that only some modules need to be replaced to lengthen product life, for example the 'skin' of a product. Using **Reverse Logistics,** retail chains use their distribution systems in reverse to have all broken and unsaleable merchandise returned to central locations for repair, reuse, or breaking down into components for recycling. Retailers report huge

economic saving from reverse logistics and it also helps in redesign as manufacturers get faster feedback about product failures. An excellent article about reverse logistics appeared in the April 12, 1999 edition of Information Week available online at www.informationweek.com/729/logistics.htm.

Interface, Inc. (www.interfaceinc.com) is one of the pioneers of a new way of doing business -- **selling service rather than product** -- through its Evergreen carpet lease program. Most photocopiers, some carpets, some computers, and now some washing machines are leased to clients rather than sold. As a result, the manufacturer has a vested interest in building higher quality, longer lasting products thereby helping society use fewer materials. In addition, there is a fast growing **simplicity movement** aimed at reducing the emphasis of materialism in return for a greater quality of life. The New Road Map Foundation www.newroadmap.org and the Simple Living Network at www.simpleliving.net have many resources on this topic.

With some of the trends listed above, the details are still coming in about the contribution each will make to a Zero Waste society. Not so with **Remanufacturing**, the process of returning a used, worn out product to as close to new as possible. The product is completely disassembled, cleaned, inspected, remachined, reassembled, and tested to insure functional quality. Remanufacturing is an ecologically and economically desirable form of recycling. It not only preserves the material constituents of durable products, but it also recaptures most of the energy, labour, and capital equipment contribution that went into the initial manufacture of the product. Remanufacturing can also bring industrial activity into inner-city communities with little or declining industry, creating local jobs with livable wages, diversifying the economy, and attracting investment. One of the champions of remanufacturing is Boston University Professor Robert Lund, author of the books "The Remanufacturing Industry: Hidden Giant" and "The American Edge: Leveraging Manufacturing's Hidden Assets." Visit the web site www.reman.org/ for more information.

So just how big is the total remanufacturing industry and what are its environmental benefits? The estimated total annual sales of 73,000 remanufacturers are $53 billion. That is on par with the American steel industry. The direct employment of these 73,000 firms is 500,000. There are many more indirect jobs in core suppliers, parts manufacturers, equipment suppliers, sales, and distribution. That's the economic side of remanufacturing. On the environmental side, studies performed at the Fraunhofer Institute in Stuttgart, Germany found energy savings by remanufacturing worldwide in a year equals the electricity generated by five nuclear power plants or 10,744,000 barrels of crude oil which corresponds to a fleet of 233 oil tankers. The Fraunhofer Institute also determined that raw materials saved by remanufacturing worldwide in a year would fill 155,000 railroad cars forming a train 1,100 miles long.

As the remanufacturing industry illustrates, we **CAN** reduce resource extraction and energy consumption, two of the main contributors to greenhouse gas emissions. By embracing the concept of Zero Waste and the emerging trends that are contributing to it, we can prevent the production of even more greenhouse gases. Instead of landfilling

solid waste, communities need to explore ways to use these resources to create new products, thereby saving landfill space, reducing transportation related costs and pollution, protecting the environment, and helping local economies. Zero Waste will put human society in harmony with Nature. What could be more natural?

A Model Zero Waste Resolution

WHEREAS

- The placement of materials in waste disposal facilities, such as landfills and incinerators, causes damage to human health, wastes natural resources and/or wrongly transfers liabilities to future generations, and
- Taxpayers are currently forced to assume the high financial cost of collecting, recycling, and disposing of materials, and
- Tax subsidies for waste and virgin materials send the wrong economic signals to both consumers and producers, and
- A resource recovery based economy will create and sustain more productive and meaningful jobs, and
- Increasingly, governments and organizations are adopting the policy that the financial responsibility of collecting, recycling, and disposing of materials belongs with producers, and
- Producers should design products to ensure that they can be safely reused or recycled back into the marketplace or nature, and
- Most types of waste streams can be easily eliminated through across-the-board minimum recycling content laws, the use of non-toxic alternatives in product design, and local composting facilities, and
- Recognizing that some materials are necessary for the public health and national security, in which case, storage is the only safe alternative, and
- Recognizing that voluntary recycling goals have not achieved waste elimination, and
- Government is ultimately responsible for establishing criteria needed to eliminate waste, so that manufacturers produce and businesses sell materials that can be safely recycled or composted,

THEREFORE, BE IT RESOLVED THAT

[City/ Province/ State/ Organization] supports the creation of a Zero Waste Plan in order to eliminate waste and pollution in the manufacture, use, storage, and recycling of materials.

12 Steps Towards Zero Waste to Landfill

The Zero Waste New Zealand Trust recommends the following strategies that can be implemented by community governments to move toward their zero waste to landfill target:

1. Align all waste policies with the zero waste goal.
2. Maintain community ownership (or at very least control) of the waste stream.
3. Write contracts that favour recycling and waste minimization over landfilling.
4. Keep the community informed – develop internal and external communication strategies.
5. Involve and support existing recycling businesses and community groups.
6. Tackle the easy projects first.
7. Build in maximum resource recovery opportunities at every waste disposal facility, e.g. transfer stations.
8. Raise tipping fees to realistic levels.
9. Use full cost accounting for recycling and landfill processes.
10. Where applicable use income from high value commodities to subsidize the low.
11. Monitor and report on progress continually.
12. Promote a community 'buy recycled' purchasing policy.

Suggested Zero Waste Initiatives

Establish a Zero Waste Task Force to help develop projects, milestones, and timelines, and to solicit public input to develop an aggressive long-term waste reduction strategic plan that will move your jurisdiction towards a zero waste future.

Establish a zero waste research centre to more fully develop policies and actions for a zero waste economy.

Establish an assistance program of grants and partial subsidies for training, plan development, research and development, and feasibility studies related to activities contributing to a zero waste economy.

Establish a low-interest loan program – perhaps administered through Community Development Corporations – to assist the establishment of businesses in the reuse, repair, remanufacturing, and recycling sectors.

Develop and implement a new materials policy that encourages conservation and resource recovery and eliminates unnecessary resource extraction and pollution.

Shift taxation from "goods" such as labour and capital to "bads" such as pollution and waste.

Eliminate tax credits for mining, extraction, and harvesting natural resources; exemptions from hazardous waste regulations for mining wastes; and energy subsidies that protect wasteful practices.

Promote and provide economic incentives for product designs that encourage repair, resale, reuse, durability, and recyclability.

Revise labeling standards to provide information on recycled and post-consumer content even if it is zero, as well as realistic instructions on how to dispose of products through reuse, recycling, and composting.

Ban products and materials that are unrecyclable unless their manufacturers can present acceptable alternative benefits such as longevity, durability, or long-term repairability. Banning can be accomplished through legislation, court action, or voluntary cutbacks.

Replace solid waste management with resource management.

Require the full costs of landfilling and incineration -- including decommissioning, and long-term security or cleanup -- be reflected in current tipping fees.

Continue educating the public about the damages caused by unnecessary overconsumption and waste.

Adopt “green” building practices that begin in the design phase and continue through to the construction phase. Construction materials should be selected based on recycled-content and life cycle impacts.

Invite central participants from industry, local authorities, consumers and environmental organizations to participate in a committee which will advise on the reduction of waste.

Examine the possibility of an increase and a change in the form of taxation on the final treatment of waste.

Assess the introduction of a materials tariff further encourage and direct the local authorities towards greater differentiation in sanitation fees and possibly assess the need to introduce a differentiation imposed by law.

Examine whether consideration for the environment can be established more successfully through regulations governing purchase.

Fund projects for environmentally friendly products, designs and the environmental "lighthouse" scheme.

“I challenge the very concept of the inevitability of waste. I want us to create a corporate culture in which there is no such thing as industrial waste. I believe anything that goes out of the waste pipes may well be something that can be recycled, reused or sold.”
- R.F.E. Warburton, former CEO, DuPont Australia

Web Sites

Alameda County Waste Management Authority – www.stopwaste.org/

The Alameda County Waste Management Authority has produced a video entitled "Taking Back Our Trash II: Putting Waste to Work." It is available--at no charge--to television stations, industry trade groups, schools, libraries, and community organizations.

California Resource Recovery Association – www.crra.com/

"The Agenda for the New Millennium is CRRA's working policy document describing where waste prevention, recycling, composting, and recycling market development need to move in the coming decades."

Canberra, Australia No Waste Strategy By 2010 – www.act.gov.au/nowaste/index.html

"**ACT NOWaste** is a business unit of the Department of Urban Services in the Australian Capital Territory that seeks to implement sustainable practices for the management of Canberra's wastes. The Waste Management Strategy for Canberra *No Waste by 2010* can be accessed here."

Center for Environmental Economic Development – www.ceedweb.org/

The Center for Environmental Economic Development (CEED) is a national non-profit organization, incorporated in 1993. CEED is based in Arcata, California, which is recognized as an environmentally and socially progressive community. CEED is working with the Del Norte Waste Management Authority on a regional project funded by the California Integrated Waste Management Board. This two year project involves developing model recycling-related projects in Del Norte and Humboldt Counties.

Center for Neighborhood Technology – www.cnt.org/

"Center for Neighborhood Technology is a non-profit organization that helps build prosperous, sustainable communities by linking economic and community development with ecological improvement. The Center's work in public policy, market development and community planning is grounded in the Chicago region and national in scope."

Chelsea Center for Recycling and Economic Development – www.chelseacenter.org/

"The Chelsea Center was launched by the Commonwealth of Massachusetts in 1995 to create jobs, support recycling efforts, and help the economy and the environment by working to increase the use of recyclables by manufacturers."

Christchurch, New Zealand - Zero Waste by 2020 Waste Management Plan - www.ccc.govt.nz/Waste/ManagementPlan/

The Waste Management Plan for Solid and Hazardous Wastes 1998 has a target of 65% minimum and 100% maximum of the per capita waste stream diverted from residual disposal by the year 2020.

Clean Production Action – www.cpa.most.org.pl/cpa.html

Clean Production Action (CPA) is an international non-profit network dedicated to the advancement of sustainable production and consumption, taking the concepts and tools of Cleaner Production beyond the present process modification and emissions reduction focus. CPA provides the information, training and technical assistance channel that enables environmental NGO's, citizens' and labour organisations, and local governments to promote this vision of sustainability.

Community Environmental Council – www.communityenvironmentalcouncil.org/

The Community Environmental Council is headquartered in the Gildea Resource Center in Santa Barbara, California. It is the author of "Discarding Solid Waste As We Know It: Managing Materials in the 21st Century."

Eco-Cycle – www.ecocycle.org/

"Eco-Cycle is Boulder County, Colorado's 25-year old community-based, non-profit recycling organization. It is the largest non-profit recycler in the USA with a national reputation as a pioneer and innovator." Eco-Cycle produces a Zero Waste Activity kit, a Waste Workout program for businesses, and its web site has many zero waste resources.

Environment Canterbury, Waste Not Want Not – www.ecan.govt.nz/Waste/waste-wastenotwantnot.html

Everyone knows we produce waste, yet no one enjoys living near a smelly landfill or enjoys pollution caused by throwing things away carelessly. There are many easy ways to reduce waste!

Garbage Reincarnation – www.garbage.org/

"Garbage Reincarnation Inc. is a grassroots, visionary, self-supporting, non-profit organization which is part of the local and planetary environmental movement. We are committed to conserving our natural environment by creating a sustainable resource economy."

Global Alliance for Incinerator Alternatives – www.no-burn.org/

"GAIA is an expanding international alliance of individuals, non-governmental organizations, community-based organizations, academics and others working to end the incineration of all forms of waste and to

promote sustainable waste prevention and discard management practices."

Global Recycling Council – www.crra.com/grc/grchome.htm

"The Global Recycling Council [of the California Resources Recovery Association] is organized to discuss and initiate the goals and objectives of the Agenda for the New Millenium. In a zero waste world, items which cannot be safely assimilated into the environment simply cannot be sold, but only leased. Local governments still collect materials to make compost, but the other materials remain the financial responsibility of those who aim to profit by their sale. At present, garbage is an unfunded mandate. Until the lifecycle costs of goods are fully incorporated into the purchase price, we must lead with a label to inform citizens about the extraction and processing impacts of the goods we use."

GrassRoots Recycling Network – www.grrn.org/

"GRRN is a network of community-based resource conservation and community development activists promoting the messages: Zero Waste; Create Jobs from Discards; and End Corporate Subsidies for Wasting. Our goal is to develop ways to hold corporations accountable for the waste they produce and to promote complete alternatives to waste facilities."

Institute for Local Self Reliance - www.ilsr.org/

"The Institute for Local Self-Reliance (ILSR) is a nonprofit research and educational organization that provides technical assistance and information on environmentally sound economic development strategies."

Jobs Through Recycling Program - www.epa.gov/jtr/

"The U.S. Environmental Protection Agency's Jobs Through Recycling program brings together the economic development and recycling communities through grants, networking, and information sharing. Through JTR, EPA supports projects designed to enhance business development, technical assistance, and financing efforts for recycling-related industries."

Lowell Center for Sustainable Production - www.uml.edu/centers/LCSP/

"The Lowell Center for Sustainable Production develops, studies, and promotes environmentally sound systems of production, healthy work environments, and economically viable work organizations. The Center is associated with the Department of Work Environment and the Toxics Use Reduction Institute at the University of Massachusetts Lowell."

Materials for the Future Foundation - www.materials4future.org/

"Our mission is to support community-based initiatives that integrate the

environmental goals of resource conservation through waste prevention, reuse, and recycling with the economic development goals of job creation/retention, enterprise development, and local empowerment."

Resource Revival – www.resourcerevival.com

"Resource Revival was founded in 1994 to find new uses for discarded materials (bicycle, automobile, and building parts). Our original designs reflect our commitment to creating products that are both functional and beautiful."

Reuse Development Organization – www.redo.org/

"The Reuse Development Organization, Inc. (ReDO) is a national non-profit organization dedicated to promoting reuse as an environmentally sound, socially beneficial, and economical means for managing surplus and discarded materials."

Sound Resource Management – www.zerowaste.com

"Sound Resource Management Group has worked ... with thousands businesses, governments, and non-profit organizations to plan, implement or enhance source reduction, reuse, recycling, composting, and other resource management programs."

Target Zero Canada – www.targetzerocanada.org/

Target Zero Canada is a network of more than 70 North American groups, companies, and organizations dedicated to zero waste operating under the umbrella of Earth Day Canada. Their web site contains a list of Canadian and International Zero Heroes and excellent Zero Waste resources and links.

Town of Carrboro, North Carolina, Resolution Supporting Creation of a Zero Waste Plan –

www.grrn.org/zerowaste/CZWRes.html

Waste Not Georgia – www.wastenotgeorgia.org/

"To move Georgia away from a disposal based society by calling public attention to the need for shared corporate and consumer responsibility for eliminating waste." Waste Not Georgia works to further it's mission through education, research, and advocacy of policies and programs, such as refundable
container deposits that encourage those who produce wasteful products and packaging to bear the costs of disposal.

Zero Emissions Research and Initiatives (ZERI) – www.zeri.org/

"Zero Emissions represents a shift in our concept of industry away from linear models in which wastes are considered the norm, to integrated systems in which everything has its use. It heralds the start of the next

industrial revolution in which industry mimics nature's sustainable cycles and humanity, rather than expecting the earth to produce more, learns to do more with what the earth produces."

Zero Waste Alliance – www.zerowaste.org/

"The Zero Waste Alliance is a non-profit organization of universities, government, businesses and other organizations working to investigate the use of Zero Waste as a strategy to obtain cost savings, competitive advantages and reduced environmental impacts. The ZWA approach combines the concepts and tools of industrial ecology and green chemistry."

Zero Waste America – www.zerowasteamerica.org/

"Founded by Lynn Landes in 1996, ZWA is an Internet-based information and advocacy resource for Zero Waste. We provide, at no charge, information on associated legislative, legal, technical, environmental, health, and consumer issues."

Zero Waste Communities of San Bernardino County

www.zerowastecommunities.org/

"The Zero Waste Communities of San Bernardino County are 15 cities/towns that have partnered with the County of San Bernardino, California to educate their residents and businesses on ways of zero waste living."

Zero Waste New Zealand Trust – www.zerowaste.co.nz/

"Zero Waste New Zealand Trust was established in 1997 to support a growing network of groups working on waste minimization initiatives and to help develop breakthrough strategies to 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 minimizes and ultimately eliminates waste."

Zero waste is a design principle for a society that makes products with a minimum investment of natural resources and energy, and in which the end-of-life options for those products are limited to reuse, recycle, repair, and compost. Zero waste implies that the goal of public policy should be to eliminate waste rather than manage it in waste facilities.

- Excerpt from "Wasting and Recycling in the United States 2000

Articles/Reports

“Agenda for the New Millennium,” by Tedd Ward, principal author, a policy of the California Resource Recovery Association, not dated (Available as download from www.crra.org/newmill.html)

"Beyond 60 Percent: Achieving the 2005 Solid Waste Recovery Goal and Future Program Direction," prepared by City of Portland, Office of Sustainable Development, Solid Waste and Recycling Division, July 2001 (Available as download from www.sustainableportland.org/2001_plan_draft4.pdf)

"Beyond the Bank: A Primer on Non-Traditional Financing Strategies for the Recycling Industry," prepared by Environmental Capital Network, September 1998 (Available as download from www.nrc-recycle.org/resources/Financing/Beyond%20the%20Bank.pdf

"Beyond the Bin: The Economics of Waste Management Options," A Final Report to Friends of the Earth, UK Waste, and Waste Watch, prepared by ECOTECH Research and Consulting Ltd., July 2001 (Available as download from www.foe.co.uk/resource/reports/economics_waste_options.pdf)

“**Citizen's Guide to Clean Production**,” by Beverley Thorpe, Clean Production Network, August 1999 (Available as download from www.uml.edu/centers/LCSP/)

“**Decision-Makers Guide to Solid Waste Management, Second Edition**,” by Office of Solid Waste, U.S. Environmental Protection Agency, Publication Number EPA530-R-95-023, August 1995 (Available as download from www.epa.gov/epaoswer/non-hw/muncpl/dmg2.htm)

"Development Control Code for Best Practice Waste Management in the ACT," by the Department of Urban Services, Australian Capital Territory, September 1999 (Available as download from www.act.gov.au/nowaste/pdf/wastedev.pdf.

“**Discarding Solid Waste As We Know It: Managing Materials in the 21st Century**,” by Paul Relis and Howard Levenson, ©Community Environmental Council, Gildea Resource Center, June 1998 (Available as download from www.grc.org/)

"Economic Impacts of Recycling in Iowa," by R.W. Beck, Inc., Ames Economic Associates, and Andrew Reamer and Associates August 2001 (Available as download from www.recycleiowa.org/impact/pdf/study2001.pdf)

"**Establishing Environmentally Sustainable and Economically Efficient Economies: From Waste Management Towards Zero Waste"** prepared by The Center for Watershed and Community Health, Hatfield School of Government, Portland

State University and Self Reliance Inc., October 1999 (Available as download from www.upa.pdx.edu/CWCH/ZeroWaste.htm)

"**Extended Producer Responsibility: A Materials Policy for the 21st Century**," by Bette K. Fishbein, John R. Ehrenfeld, and John E. Young, INFORM, Inc. (Available as download from www.informinc.org)

"Fostering Economic Growth through Recycling," by Kevin Greene, Center for Neighborhood Technology, 1995 (Available as download from www.cnt.org/sus_man/)

"Government and Community-Based Sources and Strategies for Financing Recycling Enterprises," prepared by Self Reliance Inc., October 1998 (Available as download from www.nrc-recycle.org/resources/Financing/ilsrfn.pdf)

"Government Response to Strategy Unit report Waste Not, Want Not," by Department of Food, Environment and Rural Affairs, 2003 (Available as download from www.defra.gov.uk/environment/waste/review/strategyunit_response.pdf)

"Green Paper on Integrated Product Policy," prepared by Commission of the European Communities, July 2001 (Available as download from http://europa.eu.int/eur-lex/en/com/gpr/2001/com2001_0068en01.pdf)

"**Illinois Recycling Economic Information Study**," by R.W. Beck, Inc. for the Illinois Department of Commerce and Community Affairs, December 2001 (Available as download from www.commerce.state.il.us/PDF/Final_Report_All.pdf)

"**Indiana Recycling Economic Information Study**," by the National Recycling Coalition with R.W. Beck, Inc., May 2001. (Available as download from www.in.gov/doc/commercerecycles/publications/REI_Report.pdf)

"**Industrial Waste Strategy, Zeroing in on Waste: Pathways to Cleaner Production for Victorian Industries**," by the Environment Protection Authority, State Government of Victoria, Australia, April 1998 (Available as download from www.epa.vic.gov.au)

"**Innovations in the Field of Waste Prevention: Exploring How Local Authorities Finance Waste Prevention**," prepared by Edward Cameron, Austrian Association of Cities and Towns, May 2001 (Available as download from http://admin2.logincee.org/flgr/library_full.asp?LD_ID=3000&TargetLangCode=EN)

"Jobs Through Reuse: A Guide for Creating and Linking Waste-Based Businesses, Housing and Conservation Within Economically Disadvantaged Communities," prepared by The Center for Watershed and Community Health, Inc., Oregon and the St. Vincent de Paul Society of Lane County, Oregon, May 1999 (Available as download from www.upa.pdx.edu/CWCH/cdc_handbook.pdf)

“Leasing: A Step Toward Producer Responsibility,” prepared by Bette K. Fishbein, Lorraine S. McGarry, and Patricia S. Dillon, INFORM, Inc., 2000. (Available as download from www.informinc.org/)

"Macroeconomic Importance of Recycling and Remanufacturing," prepared for the U.S. Environmental Protection Agency's Office of Solid Waste, October 1998. (Available as download from www.epa.gov/jtr/econ/econres.htm)

"Manufacturing with Reused and Recycled Materials: Fifty Small Business Opportunities," by The Materials for the Future Foundation, December 1998.
“**Michigan Recycling Measurement Project: The Economic Impact of Recycling**,” prepared by Douglas Krieger, November 2001. (Available as download from www.michiganrecycles.org/pdf/MRMPeconomics.pdf)

“**Minnesota's Value-Added Recycling Manufacturing Industries: An Economic and Environmental Profile**,” prepared by the Minnesota Office of Environmental Assistance, June 1997. (Available as download from www.moea.state.mn.us/berc/valueadd.cfm)

“Moving Toward Sustainability,” a WasteWise Update by the U.S. Environmental Protection Agency, March 2000. (Available as download from www.epa.gov/wastewise)

“Municipal Solid Waste in the United States: 1999 Facts and Figures,” by the U.S. Environmental Protection Agency, Publication No. EPA530-R-01-014, July 2001. (Available as download from www.epa.gov/epaoswer/non-hw/muncpl/mswfinal.pdf)

"Nebraska Recycling Economic Information Study," prepared by the National Recycling Coalition in association with R.W. Beck, Inc., March 2001. (Available as download from http://reda.neded.org/econinfostudy_fr.pdf)

“**Program for Participation**,” Municipal Solid & Biomedical Waste Branch, Environmental Protection Division, Ministry of Environment, Province of British Columbia, January 1991.

“**Recycling as Economic Development: Toward a Framework for Strategic Materials Planning**,” by Todd Goldman, Department of City and Regional Planning, University of California at Berkeley, January 1997. (Available as download from http://garnet.berkeley.edu/~tgoldman/)

"Recycling Economic Development Through Scrap-Based Manufacturing," by Michael Lewis, Institute for Local Self-Reliance, Washington, DC, 1994.

"Recycling Economic Information Study," prepared for the Northeast Recycling Council by R.W. Beck, Inc., June 2000. (Available as download from www.nerc.org/adobe/NERC_Final_Report.pdf)

"Recycling in Ohio - A $22.5 Billion Success Story," by the Ohio Department of Natural Resources, March 2001. (Available as download from www.dnr.state.oh.us/recycling/pages/reis_broch1.htm)
"The Economic Impact of Waste Disposal and Diversion in California," by George Goldman and Aya Ogishi, University of California, Berkeley, April 4, 2001. (Available as download from http://are.berkeley.edu/extension/EconImpWaste.pdf

"The End of Waste: Zero Waste by 2020," by the Zero Waste New Zealand Trust. (Available as download from www.zerowaste.co.nz/)

"The NEXT Industrial Revolution," by William McDonough and Michael Braungart, The Atlantic Monthly, October 1998. (Available as download from www.theatlantic.com/issues/98oct/industry.htm)
"The Next Step in the No Waste Strategy," Australian Capital Territory, 02/08/00. (Available as download from www.act.gov.au/nowaste/pdf/nextstep.pdf)

"The Weight of Nations – Material Outflows from Industrial Economies," by Emily Matthews, lead author, World Resources Institute, Washington, DC, 2000. (Available as download from www.wri.org/materials/weightofnations.html)

"Thinking for the Future: The Possibility of Zero Waste in the Regional District of Nanaimo," by Normandy Daniels, RDN Environmental Services, May 2001. (Available as download from www.cwma.bc.ca/articles/zero/zer0007.html)
"**Towards a Low Waste Europe - 10 Key Issues**," edited by John Hontelez, European Environmental Bureau, April 2001. (Available as download from www.eeb.org/)

"**Towards Zero Waste - WAste 2020, A Vision for the Future**," prepared by Western Australia WAste 2020 TaskForce, January 2001. (Available as download from www.environ.wa.gov.au/downloads/WAste_2020/Towards_zero_waste.pdf)

"U.S. Recycling Economic Information Study," prepared for The National Recycling Coalition by R.W. Beck, Inc., July 2001. The 158-page full report can be downloaded from www.nrc-recycle.org/Programs/rei/docs/fullreport.pdf and the executive summary from www.nrc-recycle.org/Programs/rei/docs/reiexecsum.pdf.

"**Waste Not: Garbage as an Economic Resource for the Northeast**," by Renee J. Robins, Kari Gardey, and Stephanie Pollack, Conservation Law Foundation of New England, Inc., December 1991.

"**Wasting and Recycling in the United States 2000**," prepared by Brenda Platt and Neil Seldman of the Institute for Local Self-Reliance, published by GrassRoots Recycling Network, March 2000 (Can be ordered on the web at www.grrn.org/)

"Welfare for Waste: How Federal Taxpayer Subsidies Waste Resources and Discourage Recycling," by GrassRoots Recycling Network, April 2000 (Available as download from www.grrn.org/)

"Zero Waste," by Robin Murray, Greenpeace Environmental Trust, February 2002 (Available as download from www.greenpeace.org.uk/MultimediaFiles/Live/FullReport/4527.pdf)

"Zero Waste: No Longer Content to Just Recycle Waste, Environmentalists Want Us to Reduce it to Nothing," by Jim Motavalli, E Magazine Volume XII, Number 2, March-April 2001 (Available as download from www.emagazine.com/march-april_2001/0301feat1.html)

Books

"Acts of Balance: Profits, People and Place," by Grant Copeland, New Society Publishers, 1999.

"Affluenza: The All-Consuming Epidemic," by John de Graaf, David Wann, and Thomas Naylor, Berrett-Koehler Publishers, Inc., 2001.

"**Biomimicry: Innovations Inspired by Nature,"** by Janine Benyus, William Morrow and Company, Inc., 1997.

"**cannibals with forks: the triple bottom line of 21st century business**," by John Elkington, New Society Publishers, 1998.

"Cool Companies: How the Best Businesses Boost Profits and Productivity by Cutting Greenhouse Gas Emissions," by Joseph J. Romm, Shearwater Books, 1999.

"Cradle to Cradle: Remaking the Way We Make Things," by William McDonough and Michael Braungart, North Point Press, 2002.

"**Creating Wealth from Waste**," by Robin Murray, published by Demos, August 1999. (Can be ordered by e-mail from mo@centralbooks.com**)**

"Design for Sustainability: A Sourcebook of Integrated Eco-logical Solutions" by Janis Birkeland, Earthscan Publications, 2002.

"Designing the Green Economy, The Postindustrial Alternative to Corporate Globalization," by Brian Milani, Rowman & Littlefield Publishers Inc., 2000.

"Eco-Economy: Building an Economy for the Earth," by Lester Brown, W.W. Norton & Co., 2001. See especially Chapter 6: Designing a New Materials Economy. (The book can be downloaded from www.earth-policy.org).

"Good to Great," by Jim Collins, Harper Business, 2001.

"**in Earth's Company: Business, Environment and the Challenge of Sustainability**," by Carl Frankel, New Society Publishers, 1998.

"**Lean Thinking: Banish Waste and Create Wealth in Your Corporation**," by James Womack and Daniel Jones, Simon and Schuster, 1996.

"**Materials Matter: Toward a Sustainable Materials Policy**," by Kenneth Geiser, foreword by Barry Commoner, MIT Press, 2001.

"**Mid-Course Correction, Toward a Sustainable Enterprise: The Interface Model**," by Ray C. Anderson, Chelsea Green Publishing Company, 1998.

"**Natural Capitalism: Creating the Next Industrial Revolution**," by Paul Hawken, Amory Lovins, and L. Hunter Lovins, Little, Brown and Company, 1999.

"**Perverse Subsidies: How Tax Dollars Can Undercut the Environment and the Economy**," by Norman Myers and Jennifer Kent, Island Press, 2001.

"**Sharing Nature's Interest: Ecological Footprints as an Indicator of Sustainability**," by Nicky Chambers, Craig Simmons, and Mathis Wackernagel, Earthscan, 2000.

"**Stormy Weather: 101 Solutions to Global Climate Change**," by Guy Dauncey with Patrick Mazza, New Society Publishers, 2001.

"**The Better World Handbook: From Good Intentions to Everyday Actions**," by Ellis Jones, Ross Haenfler, and Brett Johnson with Brian Klocke, New Society Publishers, 2001.

"**The Ecology of Commerce: A Declaration of Sustainability**," by Paul Hawken, HarperBusiness, 1993.

"**The Natural Step for Business: Wealth, Ecology and the Evolutionary Corporation**," by Brian Nattrass and Mary Altomare, New Society Publishers, 1999.

"**Toward Sustainable Communities: Resources for Citizens and their Governments**," by Mark Roseland, New Society Publishers, 1998.

"**UpSizing: The Road to Zero Emissions – More Jobs, More Income and No Pollution**," by Gunter Pauli, Greenleaf Publications, 2000 (paperback).

"**Why Do We Recycle? Markets, Values, and Public Policy,"** by Frank Ackerman, Island Press, 1997.

Video

"Zero Waste: Idealist Dream or Realistic Goal?" by Dr. Paul Connett. Can be ordered directly by e-mail from Grassroots and Global Video (*ggvideo@northnet.org*) or the GrassRoots Recycling Network for $25.00 U.S.

"Efficiency is one of the hallmarks of the well-run business, and the gratuitous exploitation of natural resources is wildly inefficient. The modern industrial system is no more than one percent efficient when all material and energy inputs are considered."

- Paul Hawken

About the author

Michael Jessen is a private consultant in Nelson, BC. His experience in waste management issues dates back to 1972 when he helped start Nelson's first recycling program. While Michael specializes in helping companies and communities profit from sustainable environmental leadership, he has extensive experience in waste management, including nine years as recycling coordinator for the Regional District of Central Kootenay. In this position, he successfully designed and implemented a multi-material recycling and reuse program that was a model for small, isolated rural communities.

He helped found the Recycling Council of British Columbia in 1974 and served two years as a city councilor in Nelson. He also has experience in the field of community development, more specifically, skills development programs for persons with disabilities, strategic and business planning, and feasibility studies. In addition he has an in depth understanding of the issues confronting regional areas both in terms of economic development and employment creation and the need to link them to social and ecological issues and strategies.

While he has worked as an economic consultant, provincial government employee, and restaurant owner, Michael began his working life as a journalist and he continues to write regularly. He is the author of more than 400 articles about waste management, sustainability, composting, waste reduction, and simple living. Many of his articles are archived on his company's web site at http://www.zerowaste.ca.

Michael was born in Denmark, immigrated to Canada at age four, and became a Canadian citizen in 1967. He was educated at the University of British Columbia and graduated in 1970 with a Bachelor of Arts in history and political science. A member of the Solid Waste Association of North America (SWANA), Michael is a graduate of SWANA's Certified Recycling Managers course. Michael is the author of an early history of Nelson, originally published in the city's Diamond Jubilee booklet and available on the www.discoverNelson.com web site. He received a Certificate of Merit from the BC Ministry of Environment in 1995 for his contributions to the protection of the environment.

"The goal is zero: zero accidents, zero waste, zero emissions."
– Edgar S. Woolard Jr., Former Chairman, DuPont