

Solid Waste Policy

REPORT

Waste management in Minnesota:
A transition to the 21st century



January 2000



Minnesota Office of Environmental Assistance

Authors and Contributors

Minnesota Office of Environmental Assistance

Sherry A. Enzler, Director
Arthur E. Dunn, Strategic Directions Manager
Julie Ketchum, Strategic Operations Manager
Felicity Fahy, Supervisor
Paul A. Smith, Project Manager

David Benke
Ann Bernstein
Ginny Black
Tricia Conroy
David Fawcett
Laurie Gustafson
Karen Harrington
Garth Hickle
Don Kyser
Bob Meier
Tim Nolan
Rick Patraw
Mark Rust

Assistance provided by the Minnesota Pollution Control Agency

Karen Studders, Commissioner
Lisa Thorvig, Deputy Commissioner
Tim Scherkenbach, Manager
Jim Warner, Manager
Cathy Moeger, Program Administrator
Sharon Meyer, Program Administrator
Jim Chiles
Gary Eddy
Anne Jackson
John Ikeda
Mike Lynn

Cost of the Policy Report

The total cost of the Minnesota Office of Environmental Assistance to prepare the *Solid Waste Policy Report* was \$96,600. This cost includes \$13,400 for data collection and analysis. This cost does not include the cost to prepare the *1999 SCORE Report*.

This report is printed on recycled paper.

Table of Contents

Executive Summary	1
I. Organization of the report.....	1
II. Purpose statement and principles.....	2
III. The future of waste management in Minnesota	2
IV. Summary of the current status of the solid waste system.....	4
V. Recommendations for establishing or modifying state solid waste policies, authorities and programs.....	6
Section One: Background	11
I. Solid waste authorities and responsibilities	11
II. Challenges facing the waste management system in the 21st century.....	12
III. Environmental and economic benefits of integrated waste systems	14
Table 1-1: 1996 Modeling results resource conservation and Minnesota's integrated MSW management (annual totals in short tons).....	16
Table 1-2: Total greenhouse gas emissions from MSW management metric tons of carbon equivalent (MTCE) per year	19
Table 1-3: Estimates of 1996 economic activity associated with Minnesota's value-added recycling manufacturers.....	20
IV. Analysis of the SCORE program.....	21
Table 1-4: Minnesota recycling rates, 1990–1998.....	22
Table 1-5: Materials collected for recycling, 1998 (tons).....	22
Section Two: Challenges to Minnesota's Integrated Waste Management System	25
I. Rapid growth of the waste stream.....	25
Table 2-1: Minnesota MSW generation, 1992-1998 (tons)	26
Table 2-2: Minnesota per capita MSW generation, 1992-1998 (tons)	26
Figure 2-1: Projected MSW generation in Minnesota: Three scenarios of future growth.....	27
Figure 2-2: Total MSW generated, 1998 and change in MSW generation, 1992-1998.....	28
II. The existing recycling, resource recovery and landfill system	29
Table 2-3: Resource recovery system, 1998 (tons).....	29
Section Three: Recommended Strategies for Minnesota	33
I. Strategy one: Transition from waste management system to resource efficient system	33
II. Strategy two: Encourage healthier, stronger communities.....	34
III. Strategy three: Research and articulate the benefits of an integrated waste system.....	35
IV. Strategy four: Increase the sense of responsibility for Minnesota's environment	36
V. Strategy five: Provide comprehensive environmental education	36
VI. Strategy six: Public entities and institutions as leaders.....	37
Section Four: Proposed Policy Initiatives	39
I. Policy initiative one: Eliminate the landfilling of unprocessed MSW	39
Figure 4-1: Environmental benefits of implementing no unprocessed MSW in 2008	41
II. Policy initiative two: Product stewardship	45
III. Policy initiative three: Develop markets for recycled content and reusable materials.....	47
IV. Policy initiative four: Educate businesses, consumers and waste generators.....	51
V. Policy initiative five: Revise SCORE	53
VI. Policy initiative six: Revise solid waste planning.....	56

Section Five: Research Needed To Move Minnesota Ahead 59

- I. Research initiative one: Evaluate economic proposals that maintain and improve the waste abatement infrastructure and services 59
- II. Research initiative two: Evaluate the environmental, economic, health and ecological effects of MSW management 63
- III. Research initiative three: Evaluate new ways to handle construction and demolition debris and industrial solid waste 63
 - Table 5-1: Materials in construction and demolition debris 64
- IV. Research initiative four: Evaluate virgin material subsidies and their impact on the solid waste system 66
- V. Research initiative five: Evaluate volume-based or weight-based pricing 67

Definitions 69

Appendix A: Review of Information on the Environmental and Economic Aspects of MSW Management Practices

Appendix B: Summary of the Public Review and Response

Executive Summary

*Treat the Earth well...
It was not given to us by our parents...
It was lent to us by our children.*

Kenyan Proverb

This is the sixth biennial *Solid Waste Policy Report (Policy Report)* to the Minnesota Legislature by the Office of Environmental Assistance (OEA). The Waste Management Act (WMA) requires the Director of the OEA to submit the report every two years to the Senate and House Environment and Natural Resources Committees. Minn. Stat. §115A.411 (1998). This report includes an analysis of the status of the state's solid waste system, and makes recommendations regarding state waste management policies, system improvements and research. In addition, the report includes a summary of the 1998 SCORE Programs and expenditures. The complete SCORE analysis and supporting data is published as a separate report¹

In the preparation of the *Policy Report*, the OEA held several meetings with stakeholders and members of the general public. The OEA held public meetings in five different regions of the state. Meetings were also held with representatives of Minnesota businesses, the solid waste industry, environmental associations, and counties and cities. The OEA's advisory councils for Solid Waste and Prevention, Reduction and Recycling also reviewed and commented on draft materials prepared for this *Policy Report*.

I. Organization of the report

The *Policy Report* is organized in the following sections and bound in two parts:

Part one

- Executive Summary
- Section One: Background
- Section Two: Challenges to Minnesota's Integrated Waste System
- Section Three: Recommended Strategies for Minnesota
- Section Four: Proposed Policy Initiatives
- Section Five: Research Needed to Move Minnesota Ahead
- Definitions

¹ Office of Environmental Assistance, *Report on 1998 SCORE Programs*, 1999.

Part two

- Appendix A: A Review of the Environmental and Economic Aspects of the MSW Management System
- Appendix B: Summary of the Public Review and Response

II. Purpose statement and principles

The purpose of this *Policy Report* is:

To articulate a vision for resource management through waste management in Minnesota based on principles of conservation and sustainability. It provides a policy framework for the discussions, planning and decisions that must occur, among public officials, businesses, waste management stakeholders and citizens, in order to meet our short- and long-term waste and resource management goals, many of which are articulated in this report.

This *Policy Report* advocates the transition to a new solid waste system, based on principles of sustainability and resource conservation. These principles reflect the work of well-known scholars and authors, such as Paul Hawken's *Natural Capitalism*; William McDonough's *Sustainable Design* and *The Next Industrial Revolution* and Ray Anderson's *Mid-Course Correction*.^{2,3,4} These principles challenge business and government to lead the way toward environmental sustainability and are premised on the belief that business strategies built around more productive use of natural resources can solve environmental problems at a profit.

These principles also reflect the priorities and principles set forth in the Ventura Administration's *The Big Plan*⁵ and *Budget Principles*.⁶

III. The future of waste management in Minnesota

It is imperative that we begin the transition now to a sustainable and resource conservation based solid waste system. If current trends continue we will generate 185 million tons of municipal solid waste (MSW) from 2000 through the end of 2020. By 2020, we will generate three times more MSW annually than we currently generate.⁷ Unless we reduce and reuse this waste, start new recycling programs, or build new resource recovery facilities, it is estimated that we will landfill more than 70 million tons of MSW through 2020, consuming approximately 1,200 acres of land. Moreover, regardless of how we do it, managing material as waste creates environmental releases. As we generate and manage more waste, particularly by landfilling, we will lose opportunities to decrease pollution and greenhouse gases, increase liability exposure, and create eyesores in our communities.

² Paul Hawken, Amory Lovins and Hunter Lovins, *Natural Capitalism*, New York: Little, Brown and Company, 1999.

³ William McDonough, *The Hanover Principles*, UVA Publications, 1992.

⁴ Ray Anderson, *Mid-Course Correction – Toward a Sustainable Future: The Interface Model*, 1998.

⁵ Office of the Governor, *The Big Plan – Strategic Directions of the Ventura Administration*, 1999.

⁶ Some of *The Big Plan* principles and *Budget Principles* reflected in this *Policy Report* include *Growing Smart in Minnesota*; *Improving the Competitive Position of Rural Minnesota*; *Commercialism of New Technology*; and *Job Development*.

⁷ Office of Environmental Assistance analysis of the *County SCORE Reports, 1992-1998*.

Landfilling has a tremendous impact on communities. Landfills emit air contaminants as landfill gas and water contaminants as leachate. The degree of contamination can range from slight to severe. Contaminants include substances such as heavy metals, organic compounds and disease-producing organisms. While properly designed and operated landfills generally manage these pollutants, even the best-designed and operated facilities can fail. Long-term assurances can not be given that well designed landfills will continue to protect the environment over time, and the costs of remedial actions can be enormous. Finally, landfills provide few jobs to the local economy, and can depress surrounding property values. Once a landfill closes, the land has limited use for future development, and may be of limited economic value to that community.

If we continue to landfill at our present rate, and out-of-state landfills receive the same proportion of Minnesota MSW as they do today, we will likely run out of landfill capacity in Minnesota by about 2010.⁸ Based on this scenario, it will be necessary to begin the costly and controversial search for new landfill sites by the year 2005. These sites will likely be in the rural, agricultural regions of the state.

Conversely, there are many environmental benefits and resource savings that may be realized if we reduce, reuse, recycle and recover our waste. Rather than following our current course of action, by implementing the strategies and policies recommended in this *Policy Report*, from 2000 through the end of 2020 the state will reduce the need for landfill space by about 1,000 acres; the generation of greenhouse gases by an estimated 16 to 26 million metric tons of carbon equivalent; and the emission of sulfur dioxide by an estimated 340,000 tons. In addition, we can avoid the emission of significant amounts of other criteria air pollutants and some water pollutants. Natural resource savings can also be considerable, including the avoided use of coal, natural gas, crude oil and iron ore. By integrating sustainable and resource conservation practices into our waste management practices, we can maximize the recovery of resources, prevent pollution, and minimize the economic liabilities associated with environmental degradation.

To accomplish these environmental benefits and resource savings, this *Policy Report* recommends eliminating the disposal of unprocessed MSW by January 1, 2008. The *Policy Report* also recommends that a Task Force, composed of citizens and stakeholders, meet to evaluate the barriers and strategies to implement this goal. The Task Force recommendations could include waste and toxicity reduction, end-of-life management, reuse, recycling, and resource recovery. Waste management methods should be sought that are innovative, give preference to voluntary non-regulatory actions, increase awareness of waste issues, involve long-term attitudinal changes, and include a feedback system to measure whether the 2008 goal is accomplished. Partnerships with citizens, government and businesses, commitments will be essential to accomplish the Task Force recommendations and goals.

Lastly, a primary objective of this *Policy Report* is to deal with our future. By acting now we can enhance our environment, avoid lost opportunities to save resources, and set a positive direction for our solid waste system. Although a crisis in waste management does not exist today, if we do nothing, we will begin to reach crisis proportions in the next five to ten years — waste generation and landfilling will continue to increase, new landfills will need to be sited, resources will be lost, and environmental risks will increase.

⁸ Based on total Minnesota landfill capacity available for MSW at the end of 1998 (discussions with the MPCA staff December 1999).

IV. Summary of the current status of the solid waste system

The WMA governs waste disposal in Minnesota and gives preference to the following order of waste management practices:

1. Waste reduction and reuse.
2. Waste recycling.
3. Composting of yard waste and food waste.
4. Resource recovery through mixed municipal solid waste composting or incineration.
5. Land disposal which produces no measurable methane gas or which involves the retrieval of methane gas as a fuel for the production of energy to be used on-site or for sale.
6. Land disposal which produces measurable methane and which does not involve the retrieval of methane gas as a fuel for the production of energy to be used on-site or for sale.

Minn. Stat. §115A.02 (1998).

Minnesota has a mature, integrated municipal solid waste system. This system developed as a result of the planning and implementing of new waste facilities and programs encouraged by the WMA; new landfill design and operating requirements; and the fear of costs related to the long-term liability from landfill contamination. Minnesotans can be proud of their integrated solid waste system. It is at or near the top of the nation in the amounts of waste recovered and diverted from landfills.

Despite this impressive progress, there are challenges that threaten Minnesota's MSW system's long-term viability including:

- Rapid growth of the waste stream.
- Successful court challenges to flow control ordinances by waste haulers.
- Resource recovery facility closures.
- Infrastructure maintenance needs and improvements.
- Waste management business consolidations.
- Increased waste going to landfills.

A. Solid waste generation and waste reduction

Minn. Stat. §115A.55, subd. 4 establishes a goal to reduce the state's per capita MSW generation that occurred in 1993 by a minimum of ten percent by the year 2000. From 1992 to 1998, however, the state's per capita MSW generation rate increased by 21 percent. Although waste reduction has had some impacts on per capita generation, it has been small to date, and will continue to be small, without major new strategies and education campaigns.

Compounding this problem is the increase in the quantity of MSW produced in Minnesota. The quantity of MSW generated has increased every year for which we have records. In 1998, approximately 5.3 million tons of mixed MSW were generated in Minnesota. This is a nearly six percent increase over 1997. Since 1992, MSW generation has increased statewide by 30 percent. If the trends continue, Minnesota's MSW generation will increase as much as three-fold by 2020.

MSW generation varies within the state because of regional demographic and economic differences. As expected, the largest MSW generation occurs in the urban areas. Generally, as specific areas of the state continue to experience economic growth, they will experience higher increases in waste generation. Waste characteristics may also vary within the state, depending on the type of businesses and industries in a particular locale or other demographic factors.

B. Recycling and resource recovery

In 1998, Minnesota's recycling rate was 46 percent. This figure is composed of a base recycling rate of 40 percent (tons collected for recycling divided by the tons of MSW generated), plus six-percent credit for county yard waste and waste reduction activities. This recycling rate has doubled since 1990. Minnesota's high recycling rate throughout the 1990s indicates that the state's investment in recycling resulted in increased use of recycling opportunities. Minnesota's recycling rate has not, however, increased over the last three years. This roadblock to increased recycling can be attributed to the greater effort required to remove additional recyclables from the MSW, poor market conditions, and increased MSW generation.

In 1998, Minnesota's MSW system had 16 resource recovery facilities. These facilities managed about 1.5 million tons or 27 percent of the total MSW generated in Minnesota. Over the past five years, however, Minnesota has lost over 15 percent of its resource recovery facility capacity. In addition, resource recovery projects throughout the nation and in Minnesota have been subject to substantial legal and financial risks resulting from recent court decisions banning local flow control.

C. Landfilling

In 1998, nearly 1.1 million tons of Minnesota's MSW went to 26 Minnesota landfills. In addition, another 445,000 tons of Minnesota's MSW went to nine out-of-state landfills located in Iowa, Wisconsin, North Dakota and South Dakota. The landfilling of Minnesota's MSW increased from 25 percent in 1995 to 29 percent in 1998. If waste generation continues to grow at this rate without increased waste reduction, recycling and resource recovery, landfilling will become Minnesota's predominant waste management method by 2013, assuming we can site additional landfills in the state.

If these land disposal trends continue, the available capacity at Minnesota landfills will be exhausted by about 2010. Unless existing landfills are expanded, a process to find new landfills must commence as early as 2005. Based on Minnesota's landfill siting history, this will be a costly and controversial process. For example, from 1980 to 1992, the Metropolitan Council and seven metropolitan counties conducted a \$20 million dollar search for candidate MSW landfill sites. Eight sites were eventually identified, ranging from 150 to 400 acres in size. All were located in rural, agricultural areas. Development moratoriums were imposed on these properties that lasted for years. For a number of reasons, this siting process was terminated by the state Legislature.

In 1998, the processing and recycling of MSW saved Minnesota about 62 acres of land, but the landfilling of MSW consumed about 19 acres of land. If this trend continues, Minnesota will face long-term environmental risks, lost opportunities to save resources, and a substantial reduction in its limited land resources. Research indicates that there are considerable resource savings and environmental and economic benefits from the reduction, reuse and recovery of solid waste. Despite this fact, landfilling continues to be an increasing method of disposal.

V. Recommendations for establishing or modifying state solid waste policies, authorities and programs

This *Policy Report* articulates a long-term vision for waste management in Minnesota as we move into the 21st century. To accomplish this vision, the *Policy Report* outlines several strategies, policies and research initiatives. The strategies outlined in this *Policy Report* are broad, overarching goals for the state in managing its MSW. The policy initiatives are specific courses of action that should be undertaken to achieve these goals. The research initiatives are issues requiring further research and analysis before a particular course of action can be recommended.

MSW generation varies within the state. Therefore, abatement activities that implement the strategies and policy initiatives contained in this *Policy Report* should be designed to reflect these regional differences. The SCORE and planning policy initiatives described below are particularly responsive to this issue.

A. Vision for waste management in Minnesota

The vision for waste management in Minnesota articulated in this *Policy Report* is based on the following:

- The amounts and toxicity of waste generated should be reduced.
- The amounts and toxicity of materials used in industrial processes and products should be reduced.
- The landfilling of unprocessed MSW should be eliminated.
- Governments and businesses should practice environmentally sound industrial and economic development.
- Citizens, businesses and governments should assume responsibility for the environmental impacts and costs of their decisions.
- Resource efficiency should be maximized through land-use patterns, building activities and infrastructure development that integrate sustainable design practices and methods.

B. Proposed strategies

The proposed strategies articulate overarching goals intended to transition MSW management into the 21st century.

Strategy one: Transition from a waste management system to a resource efficient system

Waste should be treated as a resource. Significant disposal costs could be avoided and additional value added to our economy if we managed waste as a resource.

Strategy two: Encourage healthier, stronger communities

Our MSW should be handled to protect and encourage healthy, vital communities. An essential part of a community's quality of life is a healthy environment. A healthy environment includes protection and enhancement of natural resources as well as the reduction of the waste and pollution that degrade air and water quality, which are associated with negative human health impacts.

Strategy three: Clearly research and articulate the benefits of an integrated waste system

The research conducted to date supports the management of waste according to the WMA hierarchy. This economic research supports the conclusion that landfilling is neither free nor cheap. The long-term costs of landfilling and the value of externalities of all waste management strategies should be considered when making waste management policies and choices.

Strategy four: Increase the sense of responsibility for Minnesota's environment

The state and the OEA should assist government, citizens and business in understanding the value of waste as a resource and the impact of their activities on the environment so we can together build healthier, stronger communities.

Strategy five: Provide comprehensive environmental education

Education plays a key role in the shift toward a sustainable waste system that conserves resources. Government, businesses, and waste industry officials should play a role in educating citizens and businesses on waste issues.

Strategy six: Public entities and institutions as leaders

All public entities and institutions should be leaders; they should practice resource conservation, toxicity and waste reduction, and recycling.

C. Proposed policy initiatives

These policy initiatives are intended to move the state toward implementation of the six strategies and to initiate dialogue.

Policy initiative one: Eliminate the landfilling of unprocessed MSW

The technology, methods and practices are available today to eliminate the landfilling of unprocessed MSW. The state, with assistance from stakeholders and its citizens, should take the necessary steps to assure that unprocessed MSW will not be disposed of in Minnesota landfills by the year 2008.

Policy initiative two: Product stewardship

Government's primary role should be to bring all stakeholders to the table to discuss how we will reduce unprocessed waste together; educate businesses and citizens about the benefits of product stewardship; encourage the implementation of product stewardship programs through education partnerships and other incentives; and promote state and federal initiatives that result in product stewardship.

Policy initiative three: Develop markets for recycled content and reusable materials

State government agencies should provide leadership on waste conservation through reduction, reuse and recycling in two areas: employing environmental management principles in building design and construction (green buildings), and procurement.

Policy initiative four: Educate manufacturers, consumers and generators

Research continues to show that educated individuals who have accurate and balanced information will choose to protect the environment. The state through the leadership of the OEA should implement the recommendations set forth in the *GreenPrint*, the state's environmental education plan.

Policy initiative five: Revise the SCORE Program

The SCORE Program goals, administration, tracking and reporting mechanisms should more clearly reflect the present day waste management needs and demographic variations within the state.

Policy initiative six: Revise solid waste planning

The state should develop a more flexible solid waste planning process that is more responsive to regional and individual county needs.

D. Proposed Issues for further research, study and action

The OEA will research the following subjects to aid our understanding of the issues and assist in the development of future policy.

Research initiative one: Evaluate economic proposals that support the necessary maintenance and improvements to the state's solid waste abatement system

Minnesota needs economical methods and tools to address the forthcoming waste processing and disposal issues that will be faced by our citizens in the next decade. The state through the OEA should study various alternatives to meeting this potential crisis. A comprehensive set of tools and methods should be evaluated.

Research initiative two: Evaluate the environmental, economic, health and ecological effects of MSW management

Work needs to continue to refine environmental life-cycle analysis data. The economic focus of this research should be on how policies influence statewide economic indicators, such as employment, productivity, and gross state product; and local full-cost accounting measures. Analyses should also be done regarding the long-term costs and externalities of our waste management choices.

Research initiative three: Evaluate opportunities to reduce and recycle construction and demolition debris and industrial solid waste

The state needs to continue our analysis of the current management infrastructure for construction and demolition debris (C&D) and non-hazardous industrial waste as well as analyze the opportunities to pursue waste reduction and recycling.

Research initiative four: Research virgin material subsidy issues

The state should undertake an examination of the economic forces that are hindering the growth of all aspects of recycling including federal and state-supported subsidies for virgin material extraction and production.

Research initiative five: Evaluate barriers and opportunities for volume-based or weight-based pricing

The state should evaluate the effectiveness of the 1989 “pay-as-you-throw” (PAYT) legislation for residential generators.

Section One: Background

The Minnesota Legislature has charged the Office of Environmental Assistance (OEA) with producing a *Solid Waste Policy Report* every two years. Minn. Stat. §115A.411(1998). The *Policy Report* presents an analysis of trends, an update on the current status of the solid waste system, and makes recommendations regarding state policy, solid waste system improvements and research.

This *Policy Report* discusses:

- Major issues facing Minnesota's solid waste systems, surrounding communities and environmental management.
- Specific outcomes for the state to work toward as it manages its waste issues.
- Proposed strategies, policy initiatives and research that will help the state achieve desired outcomes.

Over the past four years, the OEA has conducted projects that have been useful in the preparation of this *Policy Report*. The OEA initiated a broad, consensus-based discussion on the Waste Management Act (WMA), and conducted research on solid waste generation and the broader environmental impacts of various solid waste processing and disposal methods. In addition, the OEA has been involved in an evaluation of product stewardship, an evaluation of the state's environmental education plan (*GreenPrint For Minnesota*),⁹ technical support in implementing the Community-Based Planning Act,¹⁰ and policy and program activities in the emerging area of sustainable communities.

I. Solid waste authorities and responsibilities

Minnesota counties have the primary role in solid waste management and are responsible for ensuring proper management of solid waste within their jurisdictions. County activities may include all parts of an integrated waste management program including waste reduction, recycling, processing and the proper disposal of MSW.

The trend in recent years has been for counties to form groups, either through joint-powers agreements or contracts to manage their solid wastes. Fifteen inter-county solid waste groups exist in the state. In the Metropolitan Area, the Solid Waste Management Coordinating Board (SWMCB) guides the activities of six metro counties through the *Regional Solid Waste*

⁹ Environmental Education Advisory Board, *A GreenPrint for Minnesota – State Plan for Environmental Education*, June 1993.

¹⁰ The law is contained in Articles 1, 4 and 6 of the Omnibus state Department Bill, Minn. Laws. 1997. The law was amended in Minn. Laws. 1998, Chapter 366, Sec. 78.

Management Policy Plan, adopted jointly in 1997 by the SWMCB members and the Director of the OEA.¹¹

Cities and towns also play a role in the collection of MSW and recyclable materials. Cities and towns may undertake these activities themselves or oversee a contractor. A few cities own or operate resource recovery facilities, recycling facilities or landfills. Cities and towns have authority to collect fees to pay for solid waste services and may impose fees on operators of solid waste facilities.

At the state level, the OEA provides technical and financial assistance to local governments, businesses and the general public to improve solid waste management. The OEA also approves county solid waste plans and prepares policy analysis for the Legislature. The Minnesota Pollution Control Agency (MPCA) establishes and enforces solid waste regulations, issues facility permits, operates the state household hazardous waste program, and Landfill Cleanup Program. The MPCA also provides technical assistance, training, and ground water monitoring.

II. Challenges facing the waste management system in the 21st century

Waste is the result of materials production and consumption and is intimately related to other environmental and natural resources issues. Resource conservation and resource efficiency represent ways to conserve and reduce consumption of raw materials and/or optimize reuse and recycling by placing used materials back into the production cycle.

The production of waste and pollution represents inefficiency, lost resources and a long-term economic burden for communities required to manage, treat, remediate, detoxify, or control these wastes. The result is not only environmental degradation, but degradation of our economy and quality of life.

The true cost of managing materials at the end of their life is generally not reflected in the costs of producing the materials. The result is the taxpayer, rather than the producer or user of the product, may pay for disposal part of the true cost of the product. Industrial development often occurs without significant attention to the full environmental impacts of the resulting activity on our environment or natural resource consumption. Businesses often do not realize the full economic impact of managing waste materials.

As a result of production inefficiencies and volume of waste production, Minnesota communities are faced with a multitude of short and long-term environmental, economic and social issues. These issues have been addressed from a short-term perspective. This short-term outlook is a result of a number of factors including the urgency of waste disposal issues, limited financial and human resources, differences in demographics and regions, and political concerns. In order for communities to fully address waste generation and disposal in a sustainable manner and to conserve limited resources, these issues should be considered comprehensively and with a shift in focus from short-term to long-term.

The volume of waste generated in Minnesota increases annually. More waste means an additional burden on Minnesota's waste management infrastructure, which will require additional investments

¹¹ Office of Environmental Assistance and Solid Waste Management Coordinating Board, *Metropolitan Solid Waste Policy Plan*, October 1997.

if changes in how we handle our waste are not made. Other issues faced by communities include increases in certain types of waste based on demographic changes, and the increased economic burden of waste management on communities with both declining populations and tax base.

In fact, between 1995 and 2025:¹²

- Minnesota's total population is projected to grow 15.2 percent, from 4.6 million to 5.3 million. The population growth since 1993 has been more rapid than anticipated.
- About 87 percent of growth will occur primarily in the 9 metropolitan counties in the Twin Cities urban/suburban area.
- Almost one-half of Minnesota counties will lose population and the existing population will grow older. At the same time the child population from birth to 14 will decline substantially in most counties.
- The number of people in the prime working age groups, (25-54), will decline in the majority of counties.
- A larger portion of the state's population will be sixty-five years and older. This age group is expected to be 80 percent larger in 2025 than it was in 1995. The number of Minnesotans age 85 and older is projected to increase 75 percent by 2025.
- By 2025 roughly 17 percent of the state's population will be African American, Asian, American Indian, or Hispanic.
- Growth rates after 2000 will be slower (.6 percent) than at any time in the 20th century.
- Net migration (people moving into the state versus those moving out of the state) will play only a small role in population changes.

To address the challenges faced by our demographic changes and increased waste generation, a number of concepts that embrace sustainable principles should be explored. Indeed, a number of these principles have already begun to take hold. One set of principles, *The Natural Step*,¹³ provides a set of "system conditions" developed as a result of significant scientific consensus.

These *Natural Step* principles have been adopted by corporations and are being embraced by various governments around the world at many levels. In order for human activities to be sustainable these four conditions must be met.

Condition 1: The taking of substances from the Earth's crust must not systematically increase.

Condition 2: Substances produced by society must not systematically increase.

Condition 3: The physical basis for the productivity and diversity of nature must not systematically deteriorate.

Condition 4: Basic human needs must be met with fair and efficient use of energy and other resources.

Another framework that provides more concrete guidance toward changing our industrial system to model and enhance our natural systems to prevent resource depletion and enhance waste

¹² Minnesota Planning State Demographic Center, *Faces of the Future, Minnesota Population Projections 1995-2020*, May 1998.

¹³ *The Natural Step Newsletter*, Vol. 1, No. 9, Summer 1999.

management is called *Natural Capitalism*.¹⁴ This approach requires four major shifts in business practices, which include:

- Dramatically increasing the productivity of natural resources.
- Shift to biological inspired production models.
- Move to a solutions-based business model.
- Reinvest in natural capital.

These shifts require fundamental changes in production, design and technology. They embrace closed-loop production systems where outputs, what we have traditionally characterized as waste, are returned to production or serve as a biological nutrient; toxic materials are “designed out” of the system; biological and natural resources are not only protected but also enhanced; and industrial systems are viewed as a whole rather than separate parts and redesigned accordingly. This requires a shift to “systems” thinking. Fundamental to this approach is adopting (reinvesting in) innovative technologies and products that are environmentally friendly.

III. Environmental and economic benefits of integrated waste systems

This section summarizes the findings of several recent studies that address the economic or environmental implications of the solid waste management choices we have made. It provides information that illustrates the link between waste management and the concepts of conservation and sustainability. A more complete description of this analysis is in Appendix B (bound separately in part two of this report).

The studies conducted to date support the solid waste management hierarchy set out in Minnesota statute. They demonstrate that environmental benefits such as resource conservation, energy conservation, and reduced pollution accrue as waste is reduced or managed as a resource. They also illustrate the long-term costs of solid waste management, identify opportunities for cost reductions, and describe how materials recovery influences statewide economic indicators.

A. Environmental aspects

Several recent studies explore the magnitude of resource conservation associated with solid waste management. These studies include:

- U.S. EPA, *Municipal Solid Waste Management Decision Support Tool*.¹⁵
- R. W. Beck, Inc. and Ecobalance, *Assessment of the Effect of MSW Management on Resource Conservation and Greenhouse Gas Emissions*.¹⁶
- Tellus Institute, Draft, *Resource Conservation Benefits Associated with Waste Diversion in Iowa*.¹⁷

¹⁴ Paul Hawken, Amory Lovins and Hunter Lovins, *Natural Capitalism*, New York: Little, Brown and Company, 1999.

¹⁵ This tool is currently under development by the U.S. EPA Office of Research and Development. The project manager is Susan Thorneioe.

¹⁶ R. W. Beck, Inc. and Ecobalance, *Assessment of the Effect of MSW Management on Resource Conservation and Greenhouse Gas Emissions*, (St. Paul: Minnesota Office of Environmental Assistance, September 1999).

¹⁷ Tellus Institute, *Draft, Resource Conservation Benefits Associated with Waste Diversion in Iowa* (Boston: Tellus Institute, June 14, 1999).

- Tellus Institute, *A One-year Snapshot: Resource Conservation Benefits Associated with 1995 MSW Management in the Twin Cities Metropolitan Area*.¹⁸

While details of each study's methodology may vary, the basic approach taken in each is the same. They assess resource conservation by comparing systems that use raw materials to produce goods and energy with those that use recovered materials or MSW to produce goods and energy or use fewer raw materials through waste reduction. All four studies use the concept of life cycle assessment.¹⁹ The U.S. EPA project is still underway, and the final results of the EPA's case studies using the approach defined in the project are not yet available.

A brief summary of the conclusions of the studies is outlined below.

1. Resource conservation benefits

Results of the Minnesota-wide resource conservation study prepared by R.W. Beck, Inc. and Ecobalance recently became available. Phase I of this study developed a life cycle inventory to characterize the resource conservation associated with Minnesota waste management in 1996. The study defined resource conservation as the avoided use of natural resources, avoided pollution, and avoided waste generation.

To determine whether resource conservation occurred, the study calculated the resource use, emissions, and waste generation from systems that use MSW or recovered materials to produce goods or energy, and then subtracted the resource use, emissions, and waste generation from systems that use raw materials to produce equivalent goods or energy. When the systems that use MSW or recovered materials *conserved* resources, the mathematical result was a negative number; when they *used* more resources or *emitted* more pollutants, a positive number resulted.

For conservation associated with waste reduction, the study assumed a maximum of one-percent waste reduction annually, spread across five materials: office paper, wooden pallets and containers, corrugated cardboard, glass containers, and plastic containers. For recycling, the analysis considered the use of seven common recyclables (old newspaper, corrugated cardboard, HDPE and PET plastic, aluminum, steel/tin cans, and glass). Other types of recyclables, including recyclables identified as "other and unspecified" in the SCORE report, were not included in the analysis. For landfills and processing, the study considered MSW and how it is used to generate electricity. For composting, the study looked at yard waste and MSW composting; however, no credit was given for the raw materials avoided in the production of alternatives to compost, such as fertilizers or mulch because the compost was not frequently or consistently marketed in 1996.

Table 1-1 summarizes the total results by management method and environmental parameter for 1996. The negative numbers illustrate when resource conservation occurred; the positive numbers illustrate when it did not. In most instances integrated MSW management provided an opportunity to reduce resource use, reduce pollution, save energy, and decrease waste disposal. Waste reduction, recycling and problem materials recycling (oil and tires) frequently reduced natural

¹⁸ Tellus Institute, *A One-year Snapshot: Resource Conservation Benefits Associated with 1995 MSW Management in the Twin Cities Metropolitan Area* (St. Paul: Minnesota Office of Environmental Assistance, August 1997).

¹⁹ Life cycle assessment is a method of environmental analysis that considers the entire "life cycle" of a product or process, from raw materials acquisition through end of life management. It can include three steps: 1) an inventory (LCI), in which material and energy inputs and outputs are studied, 2) an impact assessment, in which the LCI flows are translated into potential environmental impacts, such as global warming potential, and 3) an improvement analysis, in which needs and opportunities are assessed and recommendations for action developed.

resource use, fossil carbon dioxide emissions, and other air pollutants. The total magnitude of the waste reduction benefits was limited, however, by the relatively small number of tons modeled.

For incineration, the greatest benefits appear to be the avoided use of fossil fuels to generate electricity, which in turn results in the avoided emission of fossil carbon dioxide; sulfur dioxide emissions were also reduced. Landfilling, because of methane recovery and use to generate electricity, had some net benefit, but to a much lesser extent. Despite the fact that landfills did sequester (or store) some carbon dioxide, methane emissions were still higher than those associated with systems that use raw materials to generate electricity. On a per-ton basis, the greatest potential for resource conservation appears to be waste reduction, followed by recycling, then processing, and landfilling.

Table 1-1: 1996 Modeling results resource conservation and Minnesota's integrated MSW management (annual totals in short tons)

		Units	Landfill	Incineration	Composting	Recycling	Waste reduction	Problem Materials	Total	
Natural Resources	Coal	ton/yr	-30,900	-350,000	388	-227,000	-14,330	-48,800	-670,642	
	natural gas	ton/yr	720	113	128	-37,200	-10,210	-9,900	-56,349	
	crude oil	ton/yr	7,600	4,420	958	-15,800	-12,100	-77,600	-92,522	
	iron ore	ton/yr	0.0039	-43	0	-42,500	-4	0	-42,547	
	Limestone	ton/yr	-4,780	-27,200	52	-34,000	-2,000	-400	-68,528	
Air Emissions	CO ₂ (fossil)	ton/yr	-59,000	-395,000	3,850	-447,000	-57,400	-36,700	-996,250	
	CO ₂ (biomass)	ton/yr	228,000	853,000	150,000	-429,000	-23,700	0	778,300	
	CO ₂ (sequestered)	ton/yr	-500,000	0	-147,400	0	0	0	-647,400	
	CH ₄	ton/yr	46,000	-2,280	4	-1,120	-118	-470	42,017	
	N ₂ O	ton/yr	3.6	170	0.052	-1.2	-2	-3.2	167	
	NMHC	ton/yr	66	18	15	-1,250	-465	-92	-1,709	
	Nox	ton/yr	100	110	153	-1,410	-315	-125	-1,488	
	SO ₂	ton/yr	-480	-3,230	21	-2,730	-480	-158	-7,057	
	CO	ton/yr	560	710	53	-6,270	-260	-48	-5,255	
	PM	ton/yr	-306	-1,500	15	-3,170	-160	-48	-5,168	
	total metals	ton/yr	0.0036	13	0.0029	-1.0	-0.1	-0.044	12	
	Water Effluents	Nitrates	ton/yr	0.0087	-0.12	0.00014	0	0	-0.0014	-0.21
		Phosphates	ton/yr	0.22	0	0	7.2	-0.2	-3.3 E-11	7.3
NH ₃		ton/yr	4.0	1.0	0.064	0.6	-0.1	-4.9	0.6	
TSS		ton/yr	34	12	1.6	-330	-65	-126	-475	
BOD		ton/yr	27	2	0.36	444	-48	-28	398	
COD		ton/yr	110	24	3	66	-440	-236	-473	
Hydro-carbons		ton/yr	0.20	0.04	0.0009	-0.6	-2.6	-0.071	-3.0	
Waste	total waste	ton/yr	-15,600	101,000	170	-36,600	-6,270	-11,100	31,600	
	Landfilled MSW	ton/yr	1,240,600	0	0	0	0	0	1,240,600	

Source: R.W. Beck and Ecobalance, *Municipal Solid Waste Management and Its Impact on Resource Conservation and Greenhouse Gas Emissions*, September 1999.

An Iowa study found similar results, that is, conservation of resources and a reduction in pollution due to recycling and reduction. The Iowa study focused on the land use effects, energy impacts, and avoided air and water emissions associated with waste diversion in Iowa in 1995.²⁰ The study demonstrated that reduction and recycling decreased the demand for landfill space by 100 million

²⁰ Tellus Institute, Solid Waste Group, *Resource Conservation Benefits Associated with Waste Diversion in Iowa, Draft* (Boston: Tellus Institute, June 14, 1999), p. 5.

cubic feet in 1995. The study also documented that Iowa's paper recycling in 1995 avoided the need to harvest about 220,000 acres of forest. Reduced demand for raw materials extraction for products such as iron was also noted, but the land use benefits of these reductions were not quantified. Improvements to the soil from the composting of food and yard waste were also noted, but not quantified.

According to the Iowa study, most of the energy savings from diversion (defined as waste reduction and recycling) occurred "upstream" (in the production process for goods and energy) and were evidenced in a decreased need to extract raw materials and lower energy requirements during manufacturing. The authors converted energy savings attributable to diversion from BTU's to equivalent gallons of gasoline. These calculations demonstrated that the energy savings associated with reduction and recycling of waste materials was equivalent to the energy contained in 43 million to 73 million gallons of gasoline, respectively.²¹

Emission savings were quantified for six pollutants and greenhouse gases. The avoided air and water emissions were substantial.

In 1997, the Tellus Institute studied the resource conservation benefits associated with integrated waste management in the Twin Cities metropolitan area.²² This was Minnesota's first attempt to quantify the environmental benefits of integrated waste management. It calculated the energy and pollutant savings in physical units, such as BTU's, and then attempted to assign an economic value to those savings. Like the studies cited above, the findings of the Twin Cities' study support the use of the solid waste management hierarchy and the use of reduction and integrated waste management as methods of achieving resource conservation.

Overall, the results of all the life cycle assessments cited above support the concept of a waste management hierarchy and policies focused on waste reduction and integrated solid waste management. They place practices that use waste as a resource in context with production processes that use raw materials, illustrating that in many instances, the former hold environmental advantages over the latter.

2. Potential effects on greenhouse gases

In Phase II of the *Assessment of the Effect of MSW Management on Resource Conservation and Greenhouse Gas Emissions*, R.W. Beck modeled historical greenhouse emissions or savings from waste reduction, recycling, processing, and landfilling over a six-year period in Minnesota (1991-1996).²³ Over this period, using Minnesota's integrated waste system to produce goods and energy helped reduce greenhouse emissions between 1.0 and 2.6 million metric tons of carbon equivalent (MTCE) below what they otherwise would have been had raw materials been used to produce those same goods and energy. (Table 1-2). With the exception of landfilling, nearly all methods to reduce and recover solid waste resulted in a net decrease in global warming potential as recovered materials and energy replaced virgin sources of materials and energy. Landfilling, particularly landfilling at facilities that do not recover methane for energy recovery, resulted in an increase in global warming potential, despite the fact that landfills also sequester, or store, some carbon that could otherwise be released.

²¹ Tellus Institute, *Waste Diversion in Iowa*, p. 7.

²² Tellus Institute, *Twin Cities Metropolitan Area*.

²³ R.W. Beck and Ecobalance, *Resource Conservation and Greenhouse Gas Emissions*, p. 5-10.

In the *Resource Conservation Benefits Associated with Waste Diversion in Iowa*, it was estimated that in 1995 diversion avoided the generation of 529,400 tons of carbon equivalent. This is roughly equivalent to the findings in Minnesota.

B. Economic aspects

In assessing the economic aspects of solid waste management three studies were analyzed:

- *Minnesota Solid Waste Management: Economic Status and Outlook.*²⁴
- *MMSW Landfill Liability Report: Findings and Options.*²⁵
- *Minnesota's Value-added Recycling Manufacturing Industries: An Economic and Environmental Profile.*²⁶

In *Minnesota Solid Waste Management, Economic Status and Outlook*, the MPCA prepared legislatively mandated information regarding the extent to which consumer prices for solid waste management cover environmental and human health related costs, subsidies, landfill financial assurance, and several other issues. In this report, the MPCA estimates that the total amount paid by generators for MSW management in 1997 was approximately \$368 million; fees for demolition and construction waste management were \$99.5 million for a total waste management cost of \$467.5 million in 1997. This cost would increase by \$145 million if the public subsidies were eliminated. About 31 percent of the total waste management cost were paid as tip fees at landfills and processing facilities. The study noted several costs that may not included in the current prices paid for solid waste management service:

- Perpetual care costs at landfills.
- Air pollution from waste-to-energy incinerators and hauler trucks.
- Ground water contamination from closed, unlined portions of MSW landfill, and potential contamination from unlined demolition and industrial landfills.
- Odor pollution from MSW compost and yard waste compost facility.
- Potential human health impacts from exposure to contaminants from solid waste processing and disposal facilities.

²⁴ Minnesota Pollution Control Agency, *Minnesota Solid Waste Management. Economic Status and Outlook* (St. Paul: January 29, 1999).

²⁵ Minnesota Pollution Control Agency, *MMSW Landfill Liability Report: Findings and Outlook* (St. Paul: January 1998).

²⁶ Minnesota Office of Environmental Assistance, *Minnesota's Value-Added Recycling Manufacturing Industries: An Economic and Environmental Profile* (St. Paul: June 1997).

Table 1-2: Total greenhouse gas emissions from MSW management metric tons of carbon equivalent (MTCE) per year

Method	1991	1992	1993	1994	1995	1996
Incineration	-92,042	-95,205	-99,830	-98,793	-97,064	-96,678
Landfilling, type A ¹	97,696	99,684	91,194	117,196	85,490	96,637
Landfilling, type B ¹	5,584	4,321	5,935	10,726	14,432	0
Landfilling, type C ¹	570	619	448	67	938	3,976
Composting (Total)	-30,861	-38,755	-39,388	-34,824	-36,013	-35,487
Recycling, Collection ²	5,395	6,569	7,322	8,738	8,981	9,618
Recycling, MRF ²	2,669	3,250	3,622	4,323	4,443	4,758
Recycling, PET ³	-256	-569	-384	-639	-451	-419
Recycling, HDPE ³	-296	-425	-499	-858	-854	-991
Recycling, OCC ³	6,370	8,295	9,120	11,966	12,609	13,659
Recycling, ONP ³	-26,465	-31,552	-35,158	-38,489	-37,401	-39,401
Recycling, Steel/Tin Cans ³	-5,564	-4,526	-6,291	-5,287	-10,056	-13,195
Recycling, Aluminum ³	-63,543	-72,073	-84,613	-108,629	-105,060	-105,942
Recycling, Glass ³	-5,027	-6,146	-6,707	-8,004	-7,648	-7,756
Waste reduction	-12,865	-14,680	-14,555	-14,586	-14,696	-14,977
Total MSW Mgmt (<i>without</i> Paper Recycling Carbon Sequestration and Waste reduction Sequestration)	-118,634	-141,192	-169,782	-157,092	-182,350	-186,197
OCC Recycling Carbon Sequestration	-89,464	-116,509	-128,094	-168,055	-177,099	-191,840
ONP Recycling Carbon Sequestration	-93,236	-111,155	-123,861	-135,593	-131,761	-138,806
Paper Waste reduction Carbon Sequestration	-12,001	-13,695	-13,578	-13,607	-13,709	-13,972
Total Paper Sequestration (recycling and waste reduction)	-194,701	-241,359	-265,533	-317,256	-322,569	-344,618
Total MSW Mgmt (<i>with</i> Paper Recycling and Waste reduction Carbon Sequestration)	-313,334	-382,551	-435,315	-474,348	-504,920	-530,816

¹Type A landfills only vent landfill gas; type B flare landfill gas for a period of time; type C landfills recover landfill gas for electricity generation for a period of time

²Represents only the gross value of emissions from these activities and does not represent the net value through offsetting the recycled-related emissions with equivalent activities (extraction and transportation) for virgin materials.

³Represents the net value for each material by incorporating both virgin and recycled emissions, including specific virgin material extraction, transportation, and manufacturing emissions.

Source: R.W. Beck and Ecobalance, *Municipal Solid Waste Management and Its Impact on Resource Conservation and Greenhouse Gas Emissions*, September 1999.

In *MMSW Landfill Liability Report: Findings and Options* the MPCA studied a number of these costs. The MPCA estimated the present value of perpetual care for currently open MSW landfills to be \$13.8 million, assuming that this sum is set aside today and allowed to gather interest over the next 46 years prior to any expenditures. If the fund were not established for another 16 years (the average remaining operating life that is estimated for open MSW landfills), \$30 million would be needed to cover costs because of the loss of compounded interest earnings. If interest earnings are not allowed to accrue or if MSW landfill owners do not provide for perpetual care costs now, an estimated \$257 million could be required to finance perpetual care of these landfills (perpetual care is defined as the care needed for 100 years after the post-closure period).

Another way to assess the economic aspects of our waste system is to look at the economic contributions of the companies that operate waste management or materials and energy recovery facilities. The OEA investigated such contributions in *Minnesota's Value-Added Recycling Manufacturing Industries: An Economic and Environmental Profile*, which evaluated the economic contributions of companies that use recycled materials as feedstock. The analysis showed that Minnesota manufacturers that use recycled feedstock contribute substantial economic benefits to the state. (See Table 1-3). In 1996, the total value-added to the state's economy was \$1.3 to \$1.9 billion, and the total employment (direct, indirect, and induced) was 18,000 to 26,000 people. In addition, these companies generated state tax revenues estimated between \$40 to \$66 million.

Table 1-3: Estimates of 1996 economic activity associated with Minnesota's value-added recycling manufacturers

Economic Activity Indicator	Based on Reported Employment	Based on Total Estimated Employment,
Direct Jobs (employment at the recycling manufacturers)	6,200	8,700
Estimated Indirect Jobs: Impacts on local suppliers statewide, unadjusted for displacement effects	6,600	9,800
Estimated Induced Jobs: Long term effects on personal income and consumer spending, localized and statewide	5,300	7,400
Total Estimated Job Impact:	18,100	25,900
Total Estimated Wages and Salary Disbursements: The monetary remuneration of employees, including compensation of officers, commissions, tips, and bonus and receipts-in-kind that represent income to the recipient.	\$548 Million	\$772 Million
Total Estimated Tax Revenue: Business/personal state income tax's, sales tax, excise tax and miscellaneous taxes excluding real estate taxes	\$40 Million	\$66 Million
Total Estimated Value-added Activity: Contribution to Gross state Product analogous to GDP(gross domestic product); output excluding the intermediate inputs (primarily compensation and profit)	\$1.33 Billion	\$1.92 Billion
Total Estimated Gross Economic Activity: Amount of production in total sales, includes intermediate goods purchased as well as value-added (compensation plus profit)	\$2.94 Billion	\$4.51 Billion

Source: Gjerde, Wayne, et al, *Minnesota's Value-Added Recycling Manufacturing Industries: An Economic and Environmental Profile* (St. Paul: Minnesota Office of Environmental Assistance, June 1997).

Because the economic studies completed to date have been less than comprehensive and address a variety of economic issues, it is difficult to draw many in-depth conclusions about the economic impacts of our present waste management system. Nevertheless, the work done to date demonstrates that activities such as manufacturing with recovered materials or generating electricity from MSW do have an economic benefit that can be quantified. While landfilling may

have some economic value, it also involves long-term facility management commitments, with associated economic costs, not to mention the impact on the state's limited land resources. An example of a previously unanticipated landfill maintenance cost is the state's Closed Landfill Program. Currently, the Closed Landfill Program receives about \$22 million per year from the solid waste management tax in addition to some revenue from insurance recovery efforts.

IV. Analysis of the SCORE program

In 1989, the Minnesota Legislature adopted comprehensive waste reduction and recycling legislation based on the recommendations of the Governor's Select Committee on Recycling and the Environment (SCORE). Minn. Stat. §§115A.551-115A.558 (1990). The purpose of the SCORE Program is to reduce waste, encourage recycling and composting, develop education programs, develop programs to handle problem materials and household hazardous wastes, and abate litter. This section summarizes the state of the SCORE Program and discusses state, county and MSW management activities that involve SCORE funding. A more detailed analysis of the SCORE Program is undertaken in the *Report on 1998 SCORE Programs* which is published as a separate report.²⁷

A. Recycling

The SCORE legislation sets county recycling goals – 50 percent for the Metropolitan Area counties and 35 percent for Greater Minnesota counties. Minn. Stat. §115A.551(1998). In 1998, 54 counties (three of the seven Metropolitan Counties and 51 of 80 Greater Minnesota counties) and the Western Lake Superior Sanitary District (WLSSD) met the recycling goals set by statute.²⁸ For the state as a whole the recycling rate was 46 percent.²⁹ (See Table 1-4). The statewide recycling rate has increased from 23 percent in 1990 to 46 percent in 1998. As shown in Table 1-4, the state's relatively high recycling rate throughout the 1990s indicates that Minnesota's investment in recycling has been successful.

The growth in recycling in Greater Minnesota is due in part to a more recently developed infrastructure. The Metropolitan Area experienced high recycling rates in the early 1990s, because its development had begun earlier in the mid-1980s. Although recycling rates (percentages) have leveled off in recent years, the total tons of materials collected for recycling have continued to increase. From 1990 to 1998, the tons of recyclable materials collected increased by 32 percent for Greater Minnesota counties and by 19 percent for the Metropolitan Area counties.

²⁷ Office of Environmental Assistance, *Report on 1998 SCORE Programs*.

²⁸ These recycling rates include the waste reduction and yard waste credits as applicable. A three percent credit is given to counties that conduct specific waste reduction program activities. A yard waste credit (up to five percent) is also added to the recycling rates of qualifying counties.

²⁹ This figure is comprised of a base recycling rate of 40 percent (tons collected for recycling, divided by the total tons of MSW generated), plus a statewide average credit for county yard waste and waste reduction activities (six percent).

Table 1-4: Minnesota recycling rates, 1990–1998

Year	Statewide	Greater Minnesota	Metropolitan Area
1990	23%	11%	30%
1991	36%	25%	43%
1992	39%	29%	46%
1993	40%	31%	46%
1994	42%	35%	47%
1995	45%	39%	50%
1996	46%	41%	49%
1997	46%	43%	49%
1998	46%	44%	49%

Source: County SCORE reports, 1990-1998.

Paper continues to represent the largest amount of material collected for recycling. (See Table 1-5). Those materials evidencing the largest increase were textiles, plastics, and mixed paper grades. Businesses and institutions generate about 75 percent of the materials collected, and households generate 25 percent.

Table 1-5: Materials collected for recycling, 1998 (tons)

Materials	Greater Minnesota	Metropolitan Area	Minnesota
Paper	367,305	399,913	767,218
Metal	158,751	166,698	325,449
Glass	62,652	41,889	104,541
Plastic	20,966	20,600	41,566
Organics	84,345	88,778	173,123
Problem Materials	48,155	42,933	91,091
Textiles & Carpet	7,374	9,537	16,911
Other & Unspecified	56,357	534,200	590,557
TOTAL	805,908	1,304,549	2,110,457

Source: County SCORE reports, 1998.

Residents play an important role in Minnesota's recycling efforts. Minn. Stat. §115A.552 subd. 1 requires Minnesota counties to provide all residents with opportunities to recycle. The minimum requirements include:

- At least one recycling center in each county that is convenient for residents to use.
- Convenient sites for collecting recyclable materials.
- Curbside pickup, centralized drop-off, or a local recycling center for at least four broad types of recyclable materials in cities with populations with above 5,000.

- Monthly pickup for at least four broad types of recyclable materials in Greater Minnesota cities with populations above 20,000 and in the Metropolitan Area cities with populations above 5,000.

Counties are required by statute to promote recycling and educate the public about recycling opportunities. The opportunity to recycle must also be provided to multi-family dwellings. Counties must also encourage the availability of recycling services to commercial, industrial and institutional generators.

In 1998, there was a small increase in curbside collection services and drop-off sites. Seventy-six percent of all Minnesotans have access to curbside recycling services. Recycling services available to the public include:

- 742 residential curbside recycling collection programs serving more than 3.6 million people.
- 602 recycling drop-off recycling centers and 718 recycling stations.
- 106 materials recovery facilities.

All counties met the requirement to have at least one recycling center convenient to residents. A convenient recycling center is a facility open to the public at least 12 hours per week, 12 months per year, which accepts at least four broad material types.

In 1998, 20 counties and 106 cities required residents to participate in recycling programs, and 24 counties and 169 cities required haulers to provide recycling collection services.

Minn. Stat. §115A.552, subd. 4 requires all counties to encourage building owners and managers, business owners and managers, and collectors of commercial MSW, to provide appropriate recycling services to generators of commercial, industrial, and institutional solid waste.

In 1998:

- 68 counties had programs promoting commercial and industrial recycling.
- 19 counties required businesses to recycle.
- 52 cities required businesses to recycle.

The number of counties with commercial, industrial and institutional (CII) recycling programs increased from 63 to 68 between 1996 and 1998. The quantity of CII materials recycled increased by 12 percent between 1997 and 1998.

B. SCORE program finance and administration

In 1999, the Legislature dedicated approximately \$14 million dollars per year for SCORE block grants to counties for the 2000-2001 biennium. This appropriation represents over 10 years of uninterrupted SCORE funding from the Legislature. To obtain SCORE funding the county must submit a solid waste management plan that meets state statutory requirements, and each county must match its SCORE block grant with a 25-percent contribution. Minn. Stat. §115A.557 (1998).

In 1998, the OEA disbursed \$14 million in SCORE block grants to counties that met the eligibility requirements of Minn. Stat. §115A.557, subd. 3(c). All but three Minnesota counties have met the requirements and received their SCORE block grants appropriated for fiscal year 1998.

In 1998, the counties dedicated \$41 million to fund SCORE Programs. The counties exceeded the required 25 percent SCORE match by over six times; contributing approximately \$24 million to SCORE Programs. This continued dedication of funds by counties demonstrates their commitment to solid waste abatement.

Section Two: Challenges to Minnesota's Integrated Waste Management System

Minnesota has a mature, integrated municipal solid waste (MSW) system. The move away from a predominantly landfill system to an integrated system was the result of abatement requirements of the Waste Management Act (WMA); potential costs related to the long-term liability from contaminated landfills; and new landfill design and operating requirements. Minnesota's solid waste system is one of the leading systems in the nation in the amount of waste recovered and diverted from landfills to other uses.

In 1998, 67 percent of the state's 5.3 million tons of MSW was either recycled or processed in resource recovery facilities.³⁰ Recycling programs managed 40 percent (46 percent with waste reduction and yard waste credits) of our waste. Sixteen resource recovery facilities managed 27 percent of our waste. Twenty-six in state and nine out-of-state landfills managed 29 percent of our waste. Two percent of our waste was managed as problem materials that were not recycled.³¹ One and a half percent of our waste was managed through on-site disposal.³²

Despite this impressive progress in recycling and processing of solid waste, there are trends and facts that threaten the MSW system's long-term viability. These threats include:

- Rapid growth of the waste stream.
- Recycling problems and market volatility.
- Resource recovery facility closures.
- Infrastructure maintenance needs and improvements.
- Waste management business consolidations.
- Increased landfilling.

I. Rapid growth of the waste stream

In 1998, approximately 5.3 million tons of mixed MSW was generated in Minnesota. This is a nearly six percent increase over the amount of waste generated in 1997. (See Table 2-1). In the Metropolitan Area and Greater Minnesota the amount of MSW increased by 5.6 and 6.2 percent, respectively. Since 1992 there has been a statewide 30-percent increase in MSW. This rate far outpaced our population growth. The average per capita annual increase between 1992 and 1998 was 3.8 percent.

³⁰ 1998 County SCORE Reports.

³¹ For purposes of this definition problem materials includes tires, lead-acid batteries, appliances, motor oil and oil filters.

³² On-site disposal is the amount of MSW that does not enter the formal management system and is burned or buried on-site by the generator. This includes households and farms that burn or bury garbage on their own property through on-site dumping, burn barrels, or incinerators.

Table 2-1: Minnesota MSW generation, 1992-1998 (tons)

Region	1992	1993	1994	1995	1996	1997	1998	MSW change 1992-98	Pop. Change 1992-98
Greater Minnesota	1,621,522	1,715,736	1,762,599	1,787,745	1,866,292	1,961,755	2,083,208	+28%	+6%
Metro Area	2,461,011	2,504,776	2,607,756	2,762,789	2,918,880	3,045,777	3,215,176	+31%	+8%
Minnesota	4,082,533	4,220,512	4,370,355	4,550,534	4,785,172	5,007,531	5,298,384	+30%	+7%

Source: 1992-1998 County SCORE data (excludes yard waste totals for 1992-1994).
Population estimates provided from the Minnesota Demographer's Office.

The Legislature, in 1994, established a minimum ten percent reduction in the state's per capita MSW by the year 2000.³³ Minn. Stat. §115A.55, subd. 4 (1998). However, analysis of our waste system demonstrates that rather than reduce our per capita waste generation, it continues to increase. (See Table 2-2) From 1997 to 1998, the state's per capita MSW generation increased by nearly five percent. From 1992 to 1998, the state's per capita MSW generation increased by 21 percent.³⁴

Table 2-2: Minnesota per capita MSW generation, 1992-1998 (tons)

Region	1992	1993	1994	1995	1996	1997	1998	Per capita generation change 1992-98 ¹
Greater Minnesota	.77	.80	.82	.85	.86	.88	.93	+21%
Metro Area	1.05	1.05	1.08	1.13	1.18	1.21	1.26	+21%
Minnesota	.91	.93	.96	.98	1.02	1.06	1.11	+21%

Source: 1992-1998 County SCORE data. (data excludes yard waste totals for 1991-1994).
Population estimates provided from the Minnesota Demographer's Office.

¹The per capita generation figures are rounded.

If these waste growth trends continue, and there is no reason to believe they will not without a substantial change in our consumption habits, MSW generation will increase up to three-fold over the next 20 years.³⁵ Based on the annual average growth trends, the state by 2020 could generate as much as 13 million tons annually. (See Figure 2-1.)

MSW generation varies significantly by region of the state. (See Figure 2-2.) As expected, the largest MSW generation occurs in the urban areas, particularly the Rochester-Twin Cities-St. Cloud urban corridor. As specific areas of the state continue to experience more economic growth, they will accordingly experience higher increases in waste generation, nor will rural areas fare better. Few rural areas have experienced a decrease in MSW generation.³⁶ (See Figure 2-2.)

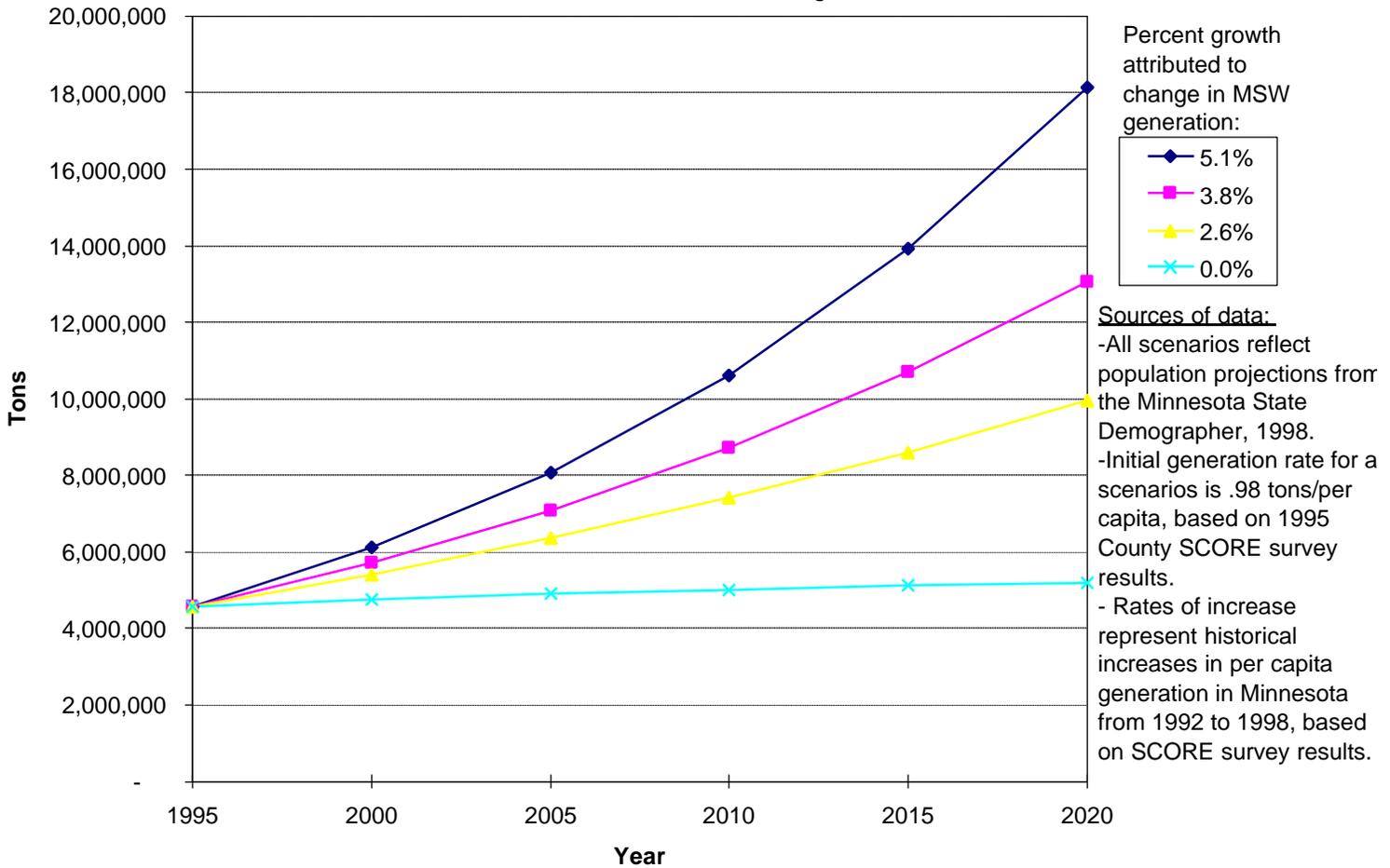
³³ Minn. Stat. §115A.55, subd. 4 requires that the state's per capita MSW generation that occurred in 1993 must be reduced by ten percent by the year 2000.

³⁴ 1992-1998 County SCORE data.

³⁵ 1992-1998 County SCORE data.

³⁶ 1992-1998 County SCORE data.

Figure 2-1
Projected MSW generation in Minnesota:
Possible scenarios of future growth



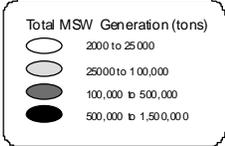
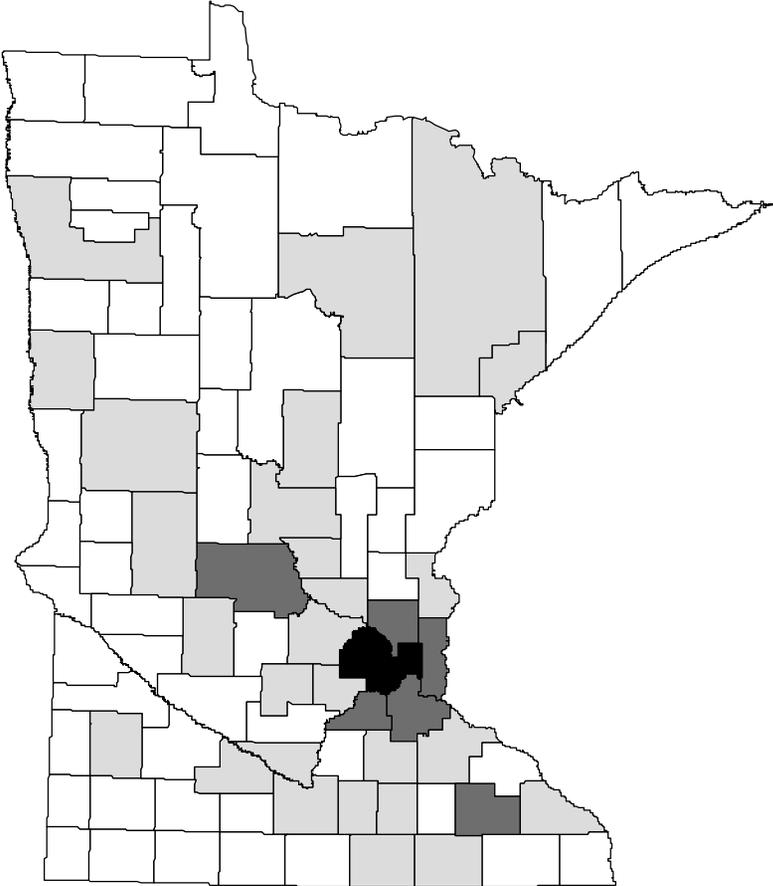
MSW is only one segment of our waste stream. Other solid wastes, such as construction and demolition waste and non-hazardous industrial solid wastes also continue to grow. These wastes are not included in the MSW growth statistics, nor are they addressed by existing state SCORE and planning programs. The landfilling of these wastes will only serve to compound our waste disposal problems.

Increases in waste generation since 1960 have historically been correlated with increased economic activity as measured by gross domestic product and personal consumption expenditures.³⁷ During time of increased economic activity consumers continue to purchase and discard goods at a rate that leads to constant waste growth. Estimates show that for every pound of product purchased by a consumer, many more pounds of waste are generated by the industrial process used to make that product.

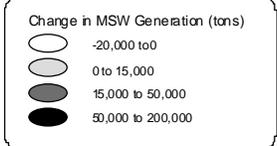
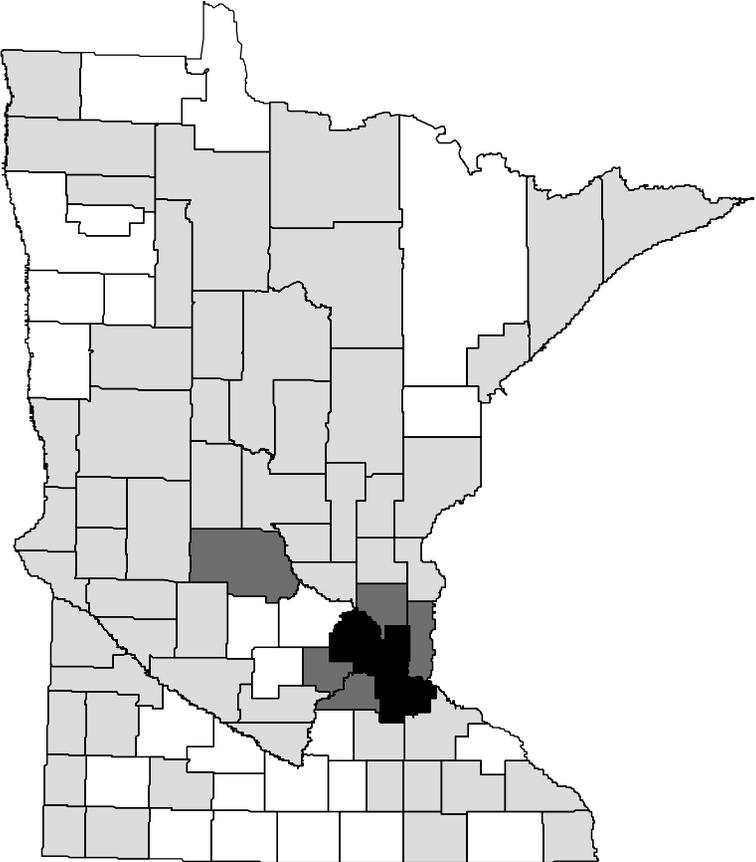
³⁷ U.S. Environmental Protection Agency, *Characterization of Municipal Solid Waste in the United States: 1998 Update*, Prepared by Franklin Associates, August 1999.

Figure 2-2: Total MSW generated, 1998 and change in MSW generation, 1992-1998

Total MSW Generated
1998



Change in MSW Generation
1992 to 1998



Thus, although waste reduction has had some impacts on our per capita MSW generation, it has been small to date, and will continue to be, without major changes in how we operate, think and consume. To reduce our waste generation we will need to develop new strategies and education campaigns.

II. The existing recycling, resource recovery and landfill system

A. The recycling and resource recovery systems

Historically, Minnesota's recycling rate has been one of the highest in the nation. In recent years, however, county recycling levels have peaked and some have declined. The state's recycling rate grew from 23 percent in 1990 to 46 percent in 1996, where it remained in 1998. In 1995 and 1996, recycling markets were volatile because of price instability for the recycled materials. By 1997 there was more stability and moderation in the recycling markets. Prices are now relatively stable for most materials, although some materials, such as recycled plastic, continue to be difficult to market. Market volatility for recyclable materials is expected to continue. Low market prices mean that recycling services cost more to operate and are not able to generate revenue. Consequently, fewer waste materials will be recycled.

MSW is also processed at waste-to-energy incinerators, refuse-derived fuel (RDF) facilities and mixed MSW compost facilities. In 1998, Minnesota's MSW went to 16 resource recovery facilities, including one facility in La Crosse, Wisconsin. (See Table 2-3.) In 1998, this resource recovery system managed about 1.5 million tons, or 27 percent of the total MSW generated in Minnesota. Two MSW compost facilities did not operate in 1998 due to waste supply problems and reconstruction. One MSW mass burn facility was inactive in 1998 due to reconstruction.

Table 2-3: Resource recovery system, 1998 (tons)

Region/Technology	Number of Facilities	Permitted Capacity ¹	MSW Received/Managed ²
Greater Minnesota	12	328,713	285,285
MSW Compost	4	43,390	19,949
Refuse-Derived Fuel (RDF)	2	111,000	93,873
Waste-to-Energy	6	174,323	171,463
Metropolitan Area	3	1,280,000	1,176,461
Refuse-Derived Fuel (RDF)	2	915,000	831,503
Waste-to-Energy	1	365,000	344,958
Minnesota Total	15	1,608,713	1,461,746
Out-of-state	1	N/A	5,349
TOTAL	16	1,608,713	1,467,095

¹MPCA Annual Waste Facility Reports (1998).

²County SCORE Reports (1998) and Metro Waste Certification Reports (1998).

Generally, garbage costs are not substantially greater for households served by resource recovery facilities, but this varies by facility. For example, in the Metropolitan Area the added cost to

households served by resource recovery facilities are approximately 10 to 15 percent more than households served by landfills.

Over the past five years Minnesota has lost over 15 percent of its resource recovery facility capacity. Another ten percent of Minnesota's current resource recovery capacity is at risk. Resource recovery projects throughout the nation and in Minnesota have been subject to substantial legal and financial risks arising out of legal challenges to flow control. Prior to 1994, it was assumed that waste flow³⁸ could be controlled by local ordinances that could be used to direct waste to processing facilities. These flow control/designation ordinances insured a regular flow of waste to the resource recovery facilities.

In 1994, the U.S. Supreme Court ruled that waste flow control/designation ordinances are unconstitutional when they interfere with the movement of wastes across state borders. This ruling led to extensive litigation and ultimately to the closure of several processing facilities, including one Minnesota facility, now temporarily closed. Legal alternatives to flow control ordinances have been and continue to be developed and continue to be challenged by landfill owners and advocates. While many of the more recent challenges to flow control have failed, the courts continue to define the boundaries of local government powers to regulate waste. Despite this, there is still a perception among some local government officials and firms who own and operate resource recovery facilities that there are insufficient tools to assure an adequate amount of wastes to processing facilities. Notwithstanding, Minnesota counties in recent years, with the support of the courts, have successfully used organized collection ordinances, fees on property, waste hauler collected service fees, and long-term waste hauler supply agreement to provide waste assurance for resource recovery facilities.

State and local governments have invested over \$200 million in residential recycling systems since 1990, when SCORE funding became available. This figure does not include private sector capital investment in commercial recycling and recyclables processing nor the cost for recycled materials collection vehicles. There has been approximately \$500 million of capital investment in resource recovery facilities and recycled materials recovery facilities (MRFs).³⁹ This includes capital investments by the state, counties and private companies. The total state bond assistance has been \$42 million.

The state's existing recycling and resource recovery infrastructure needs improvement. Approximately \$4 million in capital investment is necessary to bring two of the state's resource recovery facilities back on line.⁴⁰ These two facilities have a combined capacity to process approximately 460 tons of waste per day. The loss of these facilities would represent a major loss to the state's waste processing system. In addition to these investments needed to maintain the state's waste processing system, up to an additional \$366 million in capital investment may be necessary to meet the state's waste processing infrastructure needs through 2008.⁴¹

³⁸ Flow control provides local governments the ability to require waste haulers to deliver solid waste to designated resource recovery facilities.

³⁹ State of Minnesota capital bond assistance for resource recovery facilities and MRFs (multi-materials recycling facilities) has been \$42 million. Local governments have matched this amount with \$119 million.

⁴⁰ The two facilities needed back on line are the Wright County and East Central Solid Waste Commission MSW composting facilities.

⁴¹ This is a planning estimate based on the assumption that we meet our waste growth needs by developing additional waste processing capacity.

County commissioners and local decision-makers are faced with difficult budget decisions. Recycling and resource recovery services will continue to be priced higher than landfilling, because the full costs of landfilling and return on abatement are not internalized in solid waste system costs. As long as we continue to ignore the true long-range costs of landfills, state and local subsidies for solid waste abatement facilities and services will continue to be necessary to meet existing and future infrastructure needs.

B. The landfill system

The inevitable consequence of the present waste processing system is that Minnesota will be forced to return to a waste management system that predominantly relies on landfilling. In 1998, nearly 1.1 million tons of unprocessed MSW went to 26 Minnesota landfills. In addition, about 445,000 tons of Minnesota's MSW went to nine out-of-state landfills located in Iowa, Wisconsin, North Dakota and South Dakota. Although leading the state in terms of MSW managed by its recycling programs and resource recovery facilities, Hennepin County, at 258,000 tons of MSW (excluding ash), generated the largest quantity of landfilled MSW. Ten of Minnesota's 87 counties generated over half of the landfilled MSW in 1998.

From 1995 to 1998 the quantity of Minnesota MSW landfilled increased by 35 percent. Proportionally, as compared to recycling and resource recovery, landfilling increased by 4 percent from 1995 to 1998. If the waste generation continues to grow, and if there are no increases in reduction, recycling and resource recovery systems, approximately 70 million tons of MSW will have to be landfilled through 2020, and as much as 1,200 acres of land would be consumed in Minnesota. By 2013, landfilling will become Minnesota's predominant waste management method.

Minnesota has sufficient existing landfill capacity to handle this waste increase until the year 2010. If the disposal trends continue, existing landfills will have to be expanded and new landfills will have to be sited. The siting of these new landfills would have to begin as early as 2005. By the year 2020 landfills would consume 100 or more acres in Minnesota land per year. This scenario would have a tremendous fiscal, political and resource impact on all levels of government, but most importantly on local communities.

In addition, a landfill-based system presents substantial long-term risks of increased water and air pollution. Landfills are often viewed as nuisances in communities, they provide few jobs to the local economy, and may depress surrounding property values. Once a landfill closes, the land has limited use for future development. Thus, the social costs of shifting to a landfill based system are great, especially in communities. This jeopardizes "Smart Growth" and "Healthy, Vital Communities" as articulated in the Ventura Administration's *The Big Plan*.⁴²

The trend to consolidate waste industries in Minnesota is likely to lead to serious cost issues for the solid waste system. Minnesota relies largely on private businesses to operate waste services, such as waste collection, recycling, and management of waste facilities. Competition within the industry has been important to Minnesota's high quality, efficient solid waste system. However, there is an alarming and growing trend toward industry consolidation that some believe will result in higher prices and a decline in the quality of services. The largest waste collection companies in Minnesota have traditionally been the advocates for landfills. As they squeeze others out of the waste business, consumers will have fewer choices and bear the liabilities associated with landfilling.

⁴² Office of the Governor, *The Big Plan – Strategic Directions of the Ventura Administration*.

These trends point to a return to landfilling in Minnesota as our predominant method of waste management. This presents long-term liability and cost concerns, potential pollution, lost opportunities for resource savings, and adverse impacts and added responsibilities for local communities. As we move into the 21st century, Minnesota needs to begin the planning for a more integrated waste management system that abates the use of landfills as much as possible.

Section Three: Recommended Strategies for Minnesota

This *Policy Report* articulates several long-range strategies to transition Minnesota's waste management system into the 21st century. These strategies represent broad, overarching themes that support the more specific policy and research initiatives that are described in Sections Four and Five of this report.

I. Strategy one: Transition from waste management system to resource efficient system

We historically think about what to do with our waste only when it *becomes* a waste. The goal then becomes management of waste in an environmentally responsible way. This way of thinking is inconsistent with traditional economic models, which suggests that the cost of an item should reflect the total cost of the item including the environmental costs of manufacture and disposal. Thus, many more business and academic leaders are recognizing costs could be avoided and the additional value could be added to our economy if we treated waste as a resource instead of "trash." This way of thinking is consistent with the philosophy articulated in the Ventura Administration's *The Big Plan*.⁴³

Waste represents inefficiencies in production, distribution and consumption. The management of waste and its prevention is very much a component of the infrastructure of a sustainable community. Sustainable communities maintain nature's ability to function over time. It minimizes waste, prevents pollution, promotes efficiency and develops local resources to revitalize local economies.

By integrating sustainability principles and resource efficiency into our consumer culture, we can begin a transition away from the end-of-pipe practice of waste disposal, such as containment, remediation, and pollution control to a process that maximizes recovery of resources, eliminates toxic materials, prevents pollution, and minimizes the economic liabilities associated with environmental degradation and clean up. The waste management investments can then be shifted to resource recovery and development strategies and relieves local governments of the heavy burden of financing and managing the waste disposal system.

There are several examples that illustrate this point:

- Between 1998 and 2028, the state will pay an estimated \$351 million to take care of 106 old landfills, with more costs to be incurred beyond 2028 at the larger or more problematic sites.⁴⁴

⁴³ Office of the Governor, *The Big Plan – Strategic Directions of the Ventura Administration*.

⁴⁴ Added to this cost is another \$38 million of "probable" or "risk" costs that represent remedial costs (groundwater and gas systems and their replacement) that are unknown, but have some probability of occurring. These costs are not considered part of the base obligation.

In 1994 the Minnesota Legislature chose to make this investment as an alternative to Superfund cost recovery. The Closed Landfill Program was of much help to local governments and businesses, many of whom were being called upon to cover the costs of cleanup and legal fees at multiple sites.⁴⁵ Although the state investment also ensures that the environment remains clean and healthy, it ignores the fact that had this waste had not been put in the ground, Minnesota would have saved \$265 million. Cleanup and care lasting for decades is a cost specific to landfills, and demonstrates the advantages of avoiding, reusing, recycling or processing waste rather than landfilling it.

- In 1996 alone, the total estimated value-added activity (contribution to Gross state Product) of companies using recycled materials in their feedstock was between \$1.3 and \$1.9 billion.⁴⁶ The potential return from using waste materials as a resource in manufacturing adds value to our economy that dwarfs the economic return of landfilling waste as garbage. This is consistent with the philosophy of “Vital, Healthy Communities” and “Minnesota: World Competitor” as articulated in the Ventura Administration’s *The Big Plan*.⁴⁷
- In 1999, IBM introduced the first personal computer using recycled materials. All of the computers’ major plastic parts are made of 100 percent recycled resins. IBM found that switching to recycled plastics did not increase the cost of production and in fact, one of the computer’s eight recycled plastic parts was 20 percent less expensive to manufacture.

II. Strategy two: Encourage healthier, stronger communities

Sustainability principles such as interdependence, stewardship, conservation, and shared responsibility imply that social and economic well being are directly related to the natural systems that support life. Sustainability of our state’s natural systems requires that the full economic cost of present activities be considered. Activities that produce waste, deplete resources, pollute, and degrade ecological systems undermine economic prosperity, destroy our quality of life and undermine the right of future generations to use our natural systems. Activities that protect, conserve, restore, and enhance natural resources and biological systems improve the long-term strength of Minnesota’s communities, and in turn, support “Smart Growth” as articulated in the Ventura Administration’s *The Big Plan* for “Healthy, Vital Communities.”⁴⁸

The solid waste management system must be modified to reflect a comprehensive systems approach. Solid waste issues should be linked to environmental, economic and community issues. By linking solid waste issues with other related issues, policies, processes and practices that affect the extraction, production, consumption and disposal of products we can develop long-term solutions to our waste disposal issues that maximize resource efficiency and waste and toxicity reduction.

Cost-effective waste management is critical. But the full cost of our waste management systems must be recognized and shared by all who benefit from product development, consumption and appropriate waste management, including manufacturers and generators. To accomplish this we

⁴⁵ In many instances the site owners had disappeared or were not financially viable, and so the obligation turned to the businesses whose garbage went to the site to pay the cleanup costs.

⁴⁶ Office of Environmental Assistance, *Minnesota’s Value-added Recycling Manufacturing Industries: An Economic and Environmental Profile*, 1997.

⁴⁷ Office of the Governor, *The Big Plan – Strategic Directions of the Ventura Administration*.

⁴⁸ Id.

must recognize in our communities that short-term business activities have long-term environmental and economic consequences. Some of the strategies to accomplish this, and in turn support healthy, vital communities, include:

- Bring specific waste and resource management information to community planning activities, so local governments can encourage industrial development that benefits both the local economy and environment. Examples include reclaiming brownfields and developing brownfields for projects where different businesses can link their “wastes” and “raw materials,” thus providing jobs and reducing resource use.
- Ensure that government purchasing promotes businesses that consider the full environmental impacts of their products, i.e. recycled materials, materials with minimum packaging, etc.
- Explore tax incentives that would increase and promote industrial development that benefits a community’s long-term economic and environmental well being.
- Work with businesses to establish a set of state goals for resource management by sector.
- Work with other state agencies that provide assistance to businesses to promote and increase the use of full cost accounting that includes both the public costs of waste management and environmental protection as well as private costs in business practices.

III. Strategy three: Research and articulate the benefits of an integrated waste system

As the state moves toward value-added thinking about waste, we must continue to research and articulate the environmental and economic benefits that support an integrated solid waste management system. Research on resource conservation and economic impacts demonstrates that there are substantial environmental and economic benefits to an integrated solid waste system. Quantifying these savings will provide the state with new insights into solid waste policy and program development, climate change mitigation planning, and the development of environmental outcome measures.

Some examples of how to develop this information includes:

- Expansion of environmental life-cycle analyses.
- Study the role of risk-analysis and other types of environmental analyses in policy and program development.
- Research the potential effect of individual policy proposals on statewide economic indicators.
- Addition of local full-cost accounting.⁴⁹
- Explore ways to incorporate externalities into economic analysis.

⁴⁹ According to the U.S. EPA manual, *Full Cost Accounting for Municipal Solid Waste Management: A Handbook*, full-cost accounting is a “a systematic approach for identifying, summing, and reporting the actual costs of solid waste management. It takes into account past and future outlays, overhead (oversight and support service) costs, and operating costs.” However, a number of costs that decision-makers may want to consider as a part of the “true costs” of MSW management are not included in the accounting methodology. Those include costs such as potential liability for property damage or personal injury, costs of remediating potential future releases, social costs, environmental externalities, and upstream and downstream life-cycle costs. It also does not include assessments of changes in statewide economic activity levels or impacts such as indirect employment, changes in tax revenues, or changes in gross regional product.

IV. Strategy four: Increase the sense of responsibility for Minnesota's environment

Each citizen in our state must be responsible for protection of our environment. This also contributes to *The Big Plan's* vision of "Healthy, Vital Communities" and a "Self-sufficient People."⁵⁰ In order to increase this sense of responsibility, state policy should focus on the different groups that must play a role in protecting our environment.

Citizens. Increased citizen involvement and knowledge of the role that resource conservation can play in improving the quality of life in communities is critical. Citizens need to understand the value of treating waste as a resource and the impact their traditional consumer practices have on the environment, before changes can emerge from all parts of society that will build healthier, stronger communities.

Businesses. The state should encourage businesses to take responsibility for the full environmental impact of their products and services. The state should also encourage businesses to educate their customers on the fundamental need to properly dispose of products at the end of their useful life.

Government. Government must share an equal role in protecting the state's environment. Government at all levels must ensure that its actions and policies promote responsibility among government entities as well as among its citizens.

V. Strategy five: Provide comprehensive environmental education

Education plays a key role in protecting our environment as well as in the shift toward a sustainable waste system. Environmental education is a fundamental component of protecting our environment in the future. An educated citizenry is the best future protection of our environment. Education is a fundamental core of all the policy initiatives recommended in this report, and support *The Big Plan's* vision for "Healthy, Vital Communities," and a "Self-sufficient People," and "Minnesota: World Competitor."⁵¹

In some areas, government must take the lead in educating citizens and businesses. For example, the state can and does produce educational materials that help Minnesotans understand the relationship between environmental issues and economic development; educate Minnesotans on the impact toxics have on human health and the environment; and educate generators about the consequences of their waste management practices. But government can also educate citizens more specifically about how tax dollars are and can be used to manage problem materials in the waste stream. This education may spur citizens to change their own practices and encourage them to ask that those who benefit from products and services pay the full cost for those products including disposal.

In other areas, however, government is not the most effective group to educate consumers. Businesses are often in the best position to educate consumers. In these cases, the state should work in partnership with business to reinforce messages to consumers about preferred environmental choices.

⁵⁰ Office of the Governor, *The Big Plan – Strategic Directions of the Ventura Administration*.

⁵¹ *Id.*

The traditional waste management community — recycling and waste haulers and facility operators — must play an invaluable role in educating Minnesotans about the benefits of managing waste as a resource. After years of recycling instruction, customers may be used to looking to their waste haulers for news and information on how to manage waste. If we are to convert waste to a resource, the current collection system may need to change. Haulers need to communicate changes to their customers.

VI. Strategy six: Public entities and institutions as leaders

The themes and policies in this *Policy Report* are premised on the fact that public entities and institutions have the responsibility to ensure that solid wastes are managed in a manner that protects the environment and public health and conserves resources. Consistent with the government leadership roles identified in the various initiatives of *The Big Plan*, government must and should lead the way in effecting the shift towards treating waste as a resource.⁵²

Public entities and institutions should lead by example by practicing resource conservation, toxicity and waste reduction, and recycling. Each level of government, from township to state agencies, has a different, but equally important, leadership role to play. For example, the state has a responsibility to establish public policies that promote abatement and minimize land disposal. All units of government must be responsible for waste and toxicity reduction and recycling. Governments also should maximize their own internal waste reduction efforts through actions that promote resource conservation and environmental protection, including procurement. The combined purchasing power of all levels of government has the potential for a significant impact on the marketplace and should be used to promote waste reduction practices.

All units of government are responsible for creating a greater awareness of the resource conservation and sustainable benefits of an integrated solid waste abatement system. These principles should be incorporated into all relevant aspects of government decision-making, such as planning, procurement, capital investments, and regulation.

Thus, the policy initiatives set forth in this *Policy Report* reflect a shift in the role of government as a leader, away from regulating the market place, to true leadership by example and partnership. Examples of how government can be a leader include:

- Prepare education toolkits for businesses to help them with “Design for the Environment (DfE) activities;⁵³ increase attention to comprehensive education and develop publicity campaigns, such as a “waste reduction” campaign.
- Develop demonstration projects that teach how to approach waste and resource management issues most effectively.
- Provide technical and financial assistance through grants.
- Promote incentives, such as tax policies and credits, for activities that reduce the waste stream.

⁵² Id.

⁵³ Design for the Environment (DfE) is a systematic way of incorporating environmental attributes into the design of a product. DfE has three unique characteristics. First, the entire life-cycle of a product is considered. Second, the point of application is early in the product realization process. Third, decisions are made using a set of values consistent with industrial ecology, integrative systems thinking or another framework.

- Help develop markets through procurement and proactive requirements in government, such as contracts for green building design and other resource conservation activities.

Section Four: Proposed Policy Initiatives

In order to achieve the strategies set forth in Section Three, a number of specific policy initiatives are outlined below to move the state into the 21st century. The proposed policy initiatives recommend public and private actions intended to steer the solid waste system toward an overarching vision of resource conservation and sustainability. These policy initiatives may or may not include legislative recommendations. These initiatives will continue to be refined based on future stakeholder and citizen discussions. The policy initiatives include:

1. Eliminate the landfilling of unprocessed MSW.
2. Product stewardship.
3. Develop markets for recycled content and reusable materials.
 - Green buildings.
 - Procurement.
4. Educating manufacturers, consumers and generators.
5. Revising the SCORE Program.
6. Revising solid waste planning.

Implicit in the policy initiatives is a sense of urgency that all waste generators, including governments, businesses and citizens, take responsibility for the full impacts of their production, purchasing and waste management decisions. It is government's responsibility to ensure that solid wastes are managed to protect the environment and public health and conserves resources. The policy initiatives assume that government play a leadership role in education, demonstration projects, incentives and market participation. Emphasis must be placed on generating greater awareness of the resource conservation and sustainable benefits of an integrated solid waste abatement system. In addition, all waste generators must implement aggressive action to reduce waste.

I. Policy initiative one: Eliminate the landfilling of unprocessed MSW

A. Background

In the past few years, there has been an increase in the amount of MSW landfilled in Minnesota. In addition, Minnesota businesses and households continue to generate more MSW every year.⁵⁴ Data projections indicate that the state's total MSW generation will increase up to three times in the next 20 years. Based on the projected annual average MSW growth rate, approximately 2.8 million tons of MSW will have to be landfilled in the year 2008. At this rate, Minnesota will run out of existing landfill capacity by about the year 2010. Accordingly, landfill expansions and new sitings will have to begin as early as 2005. If these trends continue, by about 2013 landfilling will become the state's

⁵⁴ 1992-1998 County SCORE reports.

predominant solid waste management method, unless steps are taken to reduce, reuse, recycle and recover waste⁵⁵

These trends will put increased pressure on Minnesota's land resources. Currently, the landfilling of MSW in Minnesota consumes about 19 acres of land per year. Assuming no change in the percentage of waste we recover or recycle, this figure could increase up to 40 acres per year by the year 2010 and by over a 100 acres by the year 2020. Presently, the state saves approximately 62 acres per year by recycling and resource recovery.

Continuing to landfill MSW at our present rate will have a tremendous impact on local communities. Landfills emit air contaminants from landfill gas and water contaminants from leachate. The degree of contamination can range from slight to severe, with substances such as heavy metals, organic compounds and disease-producing organisms. Properly designed and operated landfills can manage this contamination, but even the best designed and operated facilities can fail. Long-term assurances that well run landfills will protect the environment can not be guaranteed. The costs of remedial actions can be enormous. In addition, nuisance impacts from landfills include litter, dust, noise and odors. Landfill design and operating practices may not always ameliorate these concerns.

Landfills provide few jobs to the local economy, and can depress surrounding property values. Once a landfill closes, the land has limited use for future development, and may be of limited economic value to the local community.

B. Goals/Outcomes

State law has long recognized that waste in Minnesota should be managed pursuant to an integrated solid waste system. By law Minnesota recognizes the following preferred methods for managing waste:

1. Waste reduction and reuse.
2. Waste recycling.
3. Composting of yard waste and food waste.
4. Resource recovery through mixed municipal solid waste composting or incineration.
5. Land disposal which produces no measurable methane gas or which involves the retrieval of methane gas as a fuel for the production of energy to be used on-site or for sale.
6. Land disposal which produces measurable methane and which does not involve the retrieval of methane gas as a fuel for the production of energy to be used on-site or for sale.

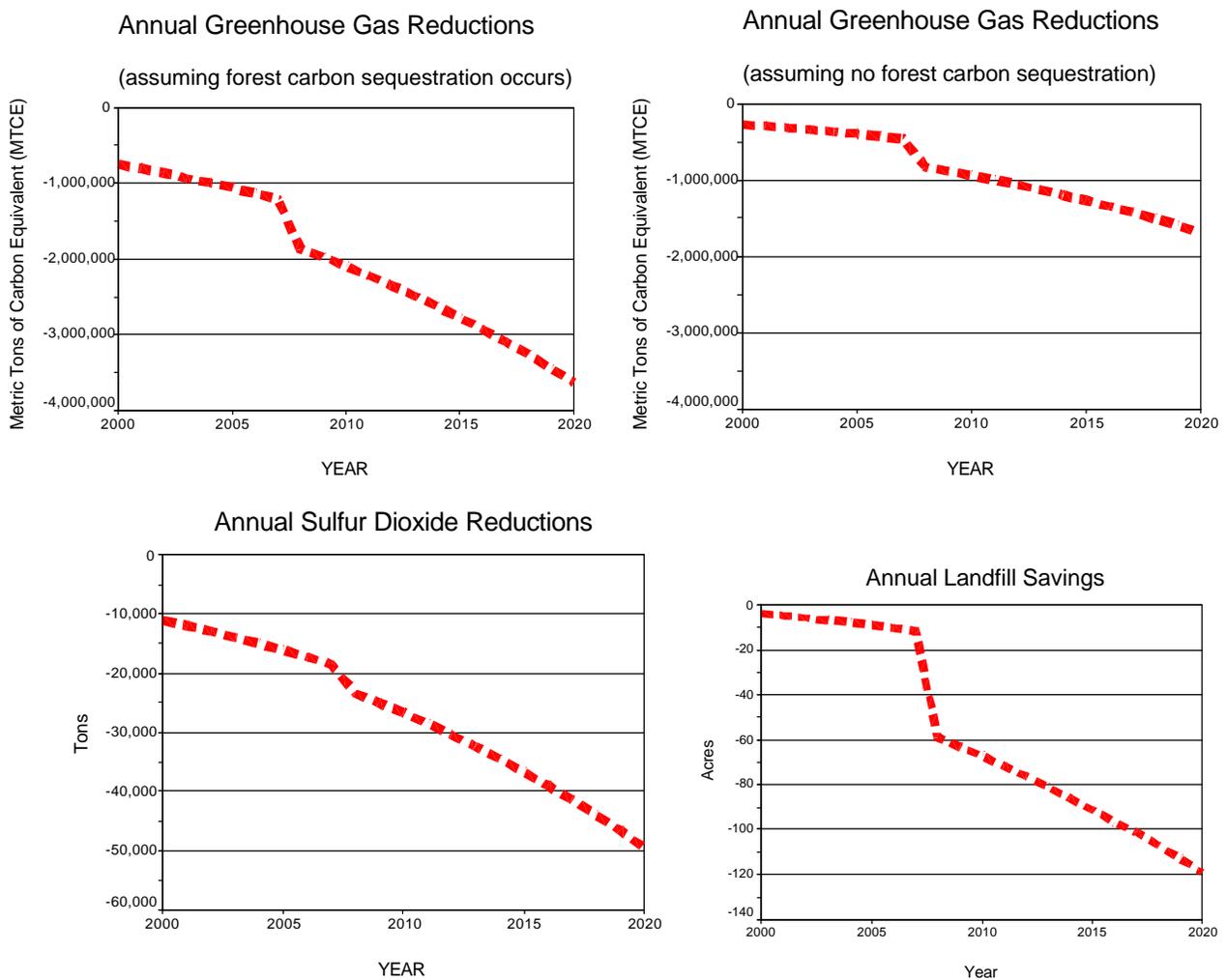
Minn. Stat. §115A.02 (1998).

In addition, research demonstrates in most cases that there are considerable resource savings, less air and water pollution, land resource savings, and economic benefits from a waste system that gives preference to reduction, reuse, recycling and resource recovery. Rather than following our current course of action, by implementing the strategies and policies recommended in this *Policy Report*, the state from 2000 through the end of 2020 will reduce the need for landfill space by about 1,000 acres; the generation of greenhouse gases by an estimated 16 to 26 million metric tons of carbon equivalent; and the emission of sulfur dioxide by an estimated 340,000 tons. (See Figure

⁵⁵ This analysis is based on data derived from the 1992-1998 *County SCORE* reports and the state Demographer's Office.

4-1). In addition, we can avoid the emission of significant amounts of other criteria air pollutants and some water pollutants. Natural resource savings can also be considerable, including the avoided use of coal, natural gas, crude oil and iron ore. By integrating sustainable and resource conservation practices into our waste management practices, we can maximize the recovery of resources, prevent pollution, and minimize the economic liabilities association with environmental degradation.

Figure 4-1: Environmental benefits of implementing no unprocessed MSW in 2008



Concrete actions need to be taken to ensure that Minnesota's integrated waste management system continues to handle our waste in an environmentally preferred manner, and provides an economic development anchor for communities. Strategies that treat waste as a resource and individual responsibility for Minnesota's environment will help us build stronger communities. These waste management practices reflect the Ventura Administration's "Smart Growth" initiatives that *maximize economic opportunity for all while protecting and enhancing the assets that make Minnesota a great place to live, and manage natural resources and agricultural land to ensure they are sustained for future generations.*

A solid waste system that maximizes landfill abatement will:

- Ensure maximum use of Minnesota's resources — don't throw in a landfill what can be reduced, reused, and recovered.
- Strengthen and improve Minnesota's waste management system by ensuring maximum reduction, recycling, and recovery of resources from waste.
- Maximize the economic return to counties and communities from the solid waste abatement services.
- Preserve land for socially preferable long-term uses.
- Increase consumer awareness of the value of resource conservation.
- Position Minnesota as a world leader in resource conservation.

C. Recommendation

For the above reasons, the OEA recommends the following policy:

It is a policy of the state of Minnesota to maximize the conservation of its resources and protect the environment. In furtherance of this policy, after January 1, 2008 all MSW generated in Minnesota must be recycled, composted, or processed in accordance with the goals set out in Minnesota statute that give preference to the hierarchy of waste management practices. MSW is processed if, after collection, but before land disposal, it has undergone separation of materials for recycling, composting, production and use of refuse-derived fuel (RDF), incineration for energy production, or any combination of these processes. The waste remaining for land disposal shall not exceed more than 15 percent on an annual basis of the total weight of the materials that entered the processing facility. MSW shall not be disposed of in Minnesota landfills unless it has been processed. A Task Force should be created to identify the barriers and recommend strategies to the Legislature to achieve the 2008 goal.

This policy is intended to engage Minnesotans in a policy discussion and development of waste management solutions that protect our environment and conserve our resources. This policy is intended to maximize landfill abatement by setting a target goal and date by which we would eliminate the disposal of unprocessed MSW in Minnesota landfills. This policy would not apply to construction and demolition debris (C&D wastes) and industrial solid waste from point source industrial activities.

Generalized examples of how the policy might apply in 2008 under two different abatement scenarios:

Projected Abatement based on waste reduction, maintaining current recycling levels, and processing.

7.9 million tons	Projected MSW generation in 2008
-1.0 million tons	Waste reduction (MSW grows at a 2.6 percent annual growth rate instead of 3.8 percent as a result of waste reduction)
6.9 million tons	Projected MSW generation after waste reduction
<u>-2.8 million tons</u>	Recyclables collected at the curb (current recycling rate of 40 percent).
4.1 million tons	Waste that must be processed.
<u>x.85%</u>	Processing efficiency to achieve no more than 15% land disposal.
3.5 million tons	Processed waste
0.6 million tons	Rejects, residuals, and bypass to landfills. Bypass is MSW that occurs as a result of downtime at the processing facilities.

Projected Abatement based on waste reduction, meeting higher recycling levels, and processing.

7.9 million tons	Projected MSW generation in 2008
-1.0 million tons	Waste reduction (MSW grows less at a 2.6 percent annual growth rate instead of 3.8 percent as a result of waste reduction)
6.9 million tons	Projected MSW generation after waste reduction
<u>-4.1 million tons</u>	Recyclables collected at the curb (60 percent recycling rate).
2.8 million tons	Waste that must be processed.
<u>x.85%</u>	Processing efficiency to achieve no more than 15% land disposal.
2.4 million tons	Processed waste.
0.4 million tons	Rejects, residuals, and bypass to landfills. Bypass is MSW that occurs as a result of downtime at the processing facilities.

D. Discussion of methods to reduce waste available for landfilling

Waste reduction, reuse and recycling are the most effective long-term mechanisms for reducing the need for landfills. These methods also provide the greatest benefits in terms of resource savings, pollution avoided, and greenhouse gas abatement. Thus, concerted efforts to implement waste reduction, reuse and recycling alternatives should be undertaken to reduce the amount of waste that will need to be landfilled. If, for example, we increase our current base 40-percent recycling rate (without waste reduction and yard waste credits) to 60 percent by 2008, we would abate an additional 1.3 million tons of waste. If, as a result of waste reduction, the waste stream grows at a 2.6 percent annual growth rate, rather than the projected average of 3.8 percent, we would reduce the amount of waste by one million tons in 2008.

Another method that has good potential for reducing the volume of waste going to landfills is organic composting. Over the years significant efforts have been made to improve the quality of compost, including the use of a source-separated waste stream to make a high quality compost which can be used by landscapers, nurseries and sod farms. Facilities that use source-separated organics are able to start with a cleaner material, and produce a cleaner compost. The source separation process removes contaminants prior to processing the feedstock. MSW compost facilities have found extensive screening is necessary to produce an aesthetically acceptable high quality compost material. Screened non-compostable materials produce a good quality refuse-derived fuel (RDF), which can be used as a coal-substitute at electrical power plants.

There are a number of operating facilities that emphasize source separated organics composting as a component of their operations. Such facilities are located in Swift County, the city of Hutchinson,

and SKB Environmental in the Twin Cities. Three new source-separated organics composting facilities are in the planning stages in St. Louis County, Boise Fort Reservation and the Western Lake Superior Sanitary District. Dodge County is also considering construction of a facility to compost organic wastes that have been separated from MSW going to a mass burn facility.

Finally, since 1990, important developments have occurred that will improve waste combustion facilities in Minnesota. In 1999, the U.S. Environmental Protection Agency (EPA) published strict standards that require existing waste-to-energy projects to reduce air emissions of pollutants of concern. EPA standards require most of Minnesota's facilities to install additional air pollution control equipment within three years to further reduce air emissions. (Only the Hennepin Energy Recovery Center was built to meet these new standards.) More than \$23 million will be spent in the next two years to bring all of Minnesota's waste combustion facilities into compliance with EPA standards.

In addition, Minnesota has made the reduction and environmentally sound management of mercury a top priority. Programs which separately manage mercury-containing materials such as fluorescent bulbs, thermostats, medical devices, and auto parts have significantly reduced the emissions of mercury from resource recovery facilities. Historically, mercury has been the metal of greatest concern in permitting waste combustion facilities. Coal and gas burning electrical production facilities generate considerably more mercury emissions than waste combustion facilities in Minnesota.⁵⁶

The future holds new opportunities for resource recovery projects in Minnesota. Existing projects have met the challenges posed by the new EPA standards, and will become more competitive during the next decade as the debt incurred to build the original facilities is retired.

These changes mean that there is a potential to expand existing, and open some closed MSW resource recovery facilities in Minnesota. An additional 500,000 tons per year of operating capacity could be added to the state's resource recovery system by expanding existing RDF and mass burn facilities, and by reopening the two closed MSW compost facilities.

It is reasonable to expect that new resource recovery projects will have to meet significant siting and permitting challenges. Indeed, the greater dilemma is how to find public or private sponsorship for these facilities and how to manage the financial risks in a waste management marketplace now controlled by landfill operations. Encouraging waste management companies such as NRG, Waste Management, Browning-Ferris Industries and other waste management companies to shift from landfilling to waste recovery facilities may be the best way to expand the waste recovery system in Minnesota.

E. Action steps

If the 2008 goal is to be realized the solid waste system stakeholders and citizens of Minnesota must be involved in the decisions to identify the best methods to implement the 2008 goal. To this end the following two step process is recommended.

⁵⁶ Minnesota Pollution Control Agency, *Toxics Air Pollutant Update*, February 1999. This report identified 1997 reported emissions of mercury from electrical production facilities in Minnesota. Two municipal waste combustors, the Hennepin Energy Resource Corporation (HERC) facility in Minneapolis and the NSP waste-to-energy facility in Red Wing, contributed 18 percent of the total mercury emissions. The Red Wing facility is upgrading its air pollution control to further reduce air emissions.

Step One: In the year 2000, a Task Force should be created composed of stakeholders and citizens. The Task Force may be composed of:

- Citizens.
- Counties, municipalities and townships.
- Regional governments.
- State agencies (MPCA, OEA, Minnesota Planning).
- Environmental organizations.
- Waste management businesses.
- Retailers.
- Distributors.
- Industries/manufacturers.

This Task Force will be charged with evaluating the barriers and recommending strategies to achieve the 2008 goal. The recommendations should reflect the strategies, policies and research articulated in this *Policy Report* and the Principles of the Ventura Administration's *The Big Plan*.

Step Two: In the year 2001, the Task Force should present its recommendations to achieve the 2008 goal to the Legislature for consideration. These recommendations may give consideration to product stewardship, end-of-life management, education, waste and toxicity reduction, reuse, recycling, organic composting, resource recovery, research, financing, governance, and regional waste management.

Numerical goals could be established that eliminates unprocessed MSW land disposal by January 1, 2008. The goals may be based on targeted demographic, industrial and geographic features of the state, and include specific manufacturer and industry goals.

In addition, the Task Force may recommend ways to encourage individual responsibility for end of life management of waste. Recommendations may be made for waste and toxicity reduction, end of life management, reuse, recycling, secondary manufacturing, and education. Methods should be sought that are innovative, give preference to voluntary non-regulatory actions, increase awareness of waste issues, involve long-term attitudinal changes, and include a feedback system to measure whether the 2008 goal is accomplished. Partnerships with citizens, government and business will be essential to accomplish the Task Force recommendations and goals.

II. Policy initiative two: Product stewardship

A. Background

The concept of product stewardship encourages manufacturers and consumers to make decisions that maximize resource use, emphasizes resource conservation, and recognizes the true economic costs and benefits of product development, consumption and disposal.

Product stewardship can best be defined as a product life cycle where all parties responsible for the design, production, sale and use of a product assume responsibility for the full environmental impacts of the product throughout its life cycle. Various national and international entities have

examined the concept of extended producer responsibility, extended product responsibility and other versions of product stewardship, all of which acknowledge that those who produce and sell products, as well as consumers, must assume more responsibility for the overall impacts.

The concept of product stewardship incorporates the following principles:

1. All parties who have a role in designing, producing, selling or using a product or product components should assume responsibility for:
 - Reducing or eliminating the toxic and/or hazardous constituents in products and product components.
 - Reducing the toxicity and amount of waste that results from the manufacture, use and disposal of products.
 - Developing products that use materials, energy and water efficiently at every stage of a product's life cycle, including product manufacture, distribution, sale, use and recovery.
2. The greater the ability of a party to influence the life-cycle impacts of the product, the greater the degree of responsibility the party should have to minimize those impacts.
3. Those responsible for the design, production, sale or use of a product should have flexibility to determine how to reduce toxic and/or hazardous constituents in products and how to keep materials from becoming waste.
4. The costs of recovering resources and managing products at the end of their useful life should be internalized into the costs of producing and selling the products. The costs of recovering resources and disposing of products at the end of their useful life should not be paid for with general tax revenues.
5. Government should provide leadership in the area of product stewardship in all its activities, including, but not limited to, promoting product stewardship when it purchases products, making capital investments in green buildings and infrastructure, procuring services, and managing products at the end of their useful life.

The principles of product stewardship supports the Administration's Big Plan and budget principles, such as *Growing Smart in Minnesota* and *The Best Climate to Grow Business*. By implementing product stewardship, businesses will help Minnesota communities become more efficient with our resources.

B. Goals/Outcomes

The following are the goals of a product stewardship program:

- Reduction in the volume and toxicity of the waste stream.
- Modifications in product design so that less waste and toxicity are generated when products are manufactured and when products are disposed at the end of their useful life.
- Modification in the behaviors of those who produce, sell and use products to reduce the impact of manufacture and disposal of the product on the environment. For example, producers should be encouraged to make design changes that result in less waste and toxicity in the manufacturing process and in the product itself. Those selling the product should be

encouraged to educate consumers to use and dispose of the product in a manner that is environmentally responsible, and accordingly, consumers would change their behavior.

- Incentives should be developed that will encourage customers to make environmentally responsible choices when purchasing products.
- Manufacturers will understand that by using recycled materials that are cheaper than virgin materials, they may be able to reduce product prices and gain a competitive advantage over a firm that has not made resource cost saving changes. Without actively making an “environmental” decision, customers then purchase the product that is more environmentally healthy.

C. Recommendations

To accomplish the product stewardship goals the following policies are recommended:

- Encourage voluntary stewardship activities in priority business sectors, such as the carpet, paint and electronics containing cathode-ray tube (CRT) industries.
- Work with producers, retailers and other interested parties to develop recycling and recovery goals for specific products, timelines for meeting those goals, and reporting and evaluation criteria for business that produce the product.
- Allow only those companies that practice product stewardship to be approved vendors on state contracts for public entities.
- Assist manufacturers that are committed to product stewardship with publicity, access to public facilities for stewardship activities, information and data.
- Use state funds to educate citizens on the need for greater stewardship.
- Provide grant assistance to encourage product stewardship.
- Explore other options to increase product stewardship.

III. Policy initiative three: Develop markets for recycled content and reusable materials

A. Background

Recyclables market development is very much related to the *Policy Report's* strategy of transitioning from waste to resource efficiency. In the context of recycling, market development emphasizes the creation of primary and secondary markets for recyclable materials. The OEA promotes market development through grants, loans and technical assistance to established and emerging businesses. Without the development of markets for recycled or reused materials we will not be able to transition from a waste to a resource efficient society.

Recycling is an integral and necessary part of Minnesota's solid waste system. Despite the success of Minnesota's recycling programs and demonstrated national leadership, recycling is simplistically viewed as collecting separated materials for recovery. While the emphasis on collection has resulted in high collection rates, remanufacturing and purchasing must be given more attention.

While Minnesota's recycling infrastructure can be broadly described as mature, the current focus of Minnesota's recycling system is on reduction of the per-ton costs of processing the waste and stabilizing the market for recyclables while maintaining high collection levels. Although the market infrastructure for recyclables in Minnesota continues to evolve, the market has been characterized by mergers, expansions, buy-outs and acquisitions of firms involved in all aspects of the recycling industry. In addition, while the procurement of recycled products is in some cases a common practice, the procurement of recycled commodities is not wide spread.

The state should remain committed to working on Minnesota's recycling system including support of local collection programs and development of Minnesota-based markets; expand the types and quantities of materials for recycle; and assist in the use of recycled materials in new and existing products.

The state can play and actively help develop demand for recycled materials in two areas: green building design and construction and procurement of products with recycled content by state government. In conjunction with the state's efforts in these areas, the state will need to provide public education on resource conservation and economic benefits of green building design and environmentally preferable procurement. Education on these issues is needed to maximize the state's efforts to develop markets for recycled content products.

B. Goals/Outcomes

The following are the goals of this policy initiative:

- Spur demand for recycled and other environmentally preferable products.
- Support and enhance market development for recycled content products.

C. Incorporating environmental management in building design and construction (green buildings)

1. Background

Employing environmental management principles to buildings during design and construction presents a significant opportunity to reduce the solid waste destined for landfills or incinerators.

Green building designs offer the opportunity to use building materials with recycled content or to reuse building materials. Green building designs also incorporate features that optimize recycling by building inhabitants. For instance, adequate space for recycling, both near employee workstations as well as outside of the building, is often overlooked when a structure is designed. Finally, green building designs facilitate reuse and recycling of material at the end of the building's life by minimizing demolition waste at the time of design and construction.

2. Recommendations

Several state agencies and local units of government are working on green building projects and assisting private and public entities develop green building designs and techniques. The state needs to help maximize the benefits of these efforts. The "Smart Growth" agenda promoted by the Ventura Administration offers a unique opportunity to emphasize green building within the context of smart community development. The smart growth concept which emphasizes stewardship,

efficiency, choice and accountability can facilitate a dialogue not only about where development is located, but also about the types of development that are environmentally preferable.

The following action items are recommended to implement this policy initiative:

- Examine and rewrite building code specifications to allow use of building materials with recycled content or reused building materials. This examination should identify codes and standards, which pose barriers to the use of resource efficient building materials.
- Explore development of tax credits or other economic incentives for developers or builders who incorporate green building practices into building design and construction, including, but not limited to, recycled content and reusable materials.
- Develop a green building policy for the state, which emphasizes a life-cycle analysis approach to building design and construction. The policy should encourage the use of recycled content, reusable or bio-based building material over virgin materials.
- Establish green building performance standards for newly constructed state buildings.
- Create a “green building” fund administered by the state that will provide rebates to firms engaged in green building practices.
- Promote economic development policies that recognize the opportunities for creating and strengthening markets for resource-efficient building materials in Minnesota.

D. Procurement

1. Background

Minn. Stat. §16B.121 directs the state to consider recycled content, recyclability, durability, reusability and the toxicity of commodities when advertising for bids for state procurement contracts. The statute also requires state agencies to purchase products with recycled content when the price does not exceed comparable non-recycled products by more than ten percent. Minn. Stat. §16B.122 directs public entities to use paper stock and inks which meets environmentally established criteria. The statute also provides that all copier paper purchased by state agencies must contain at least ten-percent post-consumer material. In 1999, the Legislature broadened the purchasing requirements of Minn. Stat. §16B.122 to include not only state agencies, but any entity which receives funding from the Legislative Commission on Minnesota Resources (LCMR).⁵⁷ Although these are good first steps in encouraging procurement of recycled or reused products, government needs to take a leadership role.

Procurement offers public entities the opportunity to develop market demand for environmentally preferable products. A commitment on the part of public entities to purchase recycled materials will allow government to play a leadership role in waste reduction. Government “leading by example” will stimulate investment and market development for products that are reusable, contain recycled content, and contain minimal toxic substances. Environmental procurement also has the potential to provide market stability, which will stimulate the development of regional manufacturing capacity. Environmentally preferable procurement policy sends a strong signal to manufacturers that a market, a potentially significant market in the case of some products, exists

⁵⁷ LCMR grant recipients must be in compliance with Minnesota’s procurement statutes which require the purchase of recyclable, repairable, and durable materials.

for these products. Hopefully, manufacturers within the state will respond to this market signal, or it will encourage new manufacturing start-ups or relocations.

Environmental procurement is an important tool for promotion of industrial ecology and product stewardship. Government procurement policies that give preference to recycled or reused materials support companies, which employ manufacturing practices such as life-cycle analysis, full cost accounting, product take-back and leasing. Environmentally preferable procurement policies also impact management of a product at the end of its life. For instance, purchasing contracts may specify that manufacturers are responsible for managing a product at end of life.

Aggressive government procurement policy sends a message to manufacturers that they, as producers, share responsibility for their products and encourages manufacturers to invest in technology and equipment that meet environmental requirements set by government purchasers.

Since the late 1980s, the state has encouraged consumers to buy source-reduced products and products containing recycled materials. The OEA has held “Buy Recycled” workshops, sponsored the “SMART Shopping” campaign, developed fact sheets and directories to educate purchasers, awarded demonstration grants to educate consumers about the value of these products, and much more. In the last two years, the OEA has expanded its focus beyond promotion of products to one of encouraging government purchasers to buy environmentally preferable products.

The Department of Administration, the state’s central purchasing agency, is working with the OEA and recycling organizations such as the Recycling Association of Minnesota and the Association of Recycling Managers to incorporate environmental specifications into state purchasing contracts. The OEA is also partnering with the major state agencies, such as the Department of Natural Resources and the Department of Transportation to help them develop environmentally sensitive purchasing practices in these agencies. In addition, the OEA has developed a Web site to provide information on the application, performance, cost, and availability of environmentally preferable products for public entities.

On the federal level, President Clinton has issued two executive orders. Executive Order 12873 directed federal agencies to prevent waste whenever practical and feasible, to recycle, and to procure recycled content and other environmentally preferable products. This Executive Order has increased the procurement of recycled content products.⁵⁸ The policy, for example, has resulted in a four-fold increase in the purchases of recycled content paper products. In September 1998, President Clinton signed Executive Order 13101, which strengthens the federal government’s commitment to recycling and purchasing environmentally preferable product. This Executive Order addresses a wider range of environmentally preferable products, including bio-based products.⁵⁹ Bio-based products are products that use biological products, renewable domestic agricultural products or forestry materials.

2. Recommendations

The OEA will develop policies that support the procurement of recycled and reused products by state agencies. Policy options to address this strategy include:

⁵⁸ Executive Order 12873, *Federal Acquisition, Recycling and Waste Prevention*, was signed by President Clinton on October 20, 1993.

⁵⁹ Executive Order 13101, *Greening the Government through Waste Prevention, Recycling and Federal Acquisition*, expands and strengthens the federal government’s commitment to recycling and buying recycled content and environmentally-preferable products.

- Allow a portion of SCORE disbursement to be used for environmentally preferable product procurement by local governments.
- Work with state agencies to develop and implement state procurement policies.
- Create a mechanism to track purchasing and encourage compliance with procurement guidelines by public entities.
- Engage the agencies with a purview for environmental programs in demonstration programs to maximize environmentally preferable procurement.
- In conjunction with the Department of Administration, develop a Memorandum of Understanding between the OEA and Administration that reflects the state's commitment to environmentally sound purchasing and that facilitates the procurement of environmentally preferable products by state agencies.

IV. Policy initiative four: Educate businesses, consumers and waste generators

A. Background

Environmental education is an essential and overarching strategy that is necessary to support all of the policy initiatives. An educated public is essential if we are to develop an integrated waste management system.

The state's goals and responsibilities for environmental education are set out in Minn. Stat. §115A.073 which states:

Pupils and citizens should be able to apply informed decision-making processes to maintain a sustainable lifestyle. In order to do so, citizens should:

1. Understand ecological systems.
2. Understand the cause and effect relationship between human attitudes and behavior and the environment.
3. Be able to evaluate alternative responses to environmental issues before deciding on alternative courses of action.
4. Understand the effects of multiple uses of the environment.

Research shows that environmental education provides the knowledge and tools to help individuals choose to protect the environment.⁶⁰ Most Minnesotans want to protect our state's natural resources, but at times lack the knowledge to make the right decision. Environmental education is a process that promotes the analysis and understanding of environmental issues as the basis for effective public discourse, problem solving, policy-making, pollution prevention and management. Environmental education develops citizen understanding of the scope and complexity of current and emerging environmental problems and in the development of solutions and policies that are ecologically sound.

⁶⁰ U.S. Environmental Protection Agency, *Report Assessing Environmental Education in the United States and the Implementation of the National Environmental Education Act*, prepared for Congress by the National Environmental Education Advisory Council, December 1996.

Environmental and waste education is a basic underpinning of the strategies and policies articulated in this *Policy Report*. All waste management stakeholders, including manufacturers, businesses and governments, have an important role in educating waste generators and consumers about the issues. Environmental and waste education must be implemented on a statewide and regional basis.

The state's environmental education plan is the *GreenPrint*. The *GreenPrint* provides guidance and policy recommendations to individuals, organizations and educators that deliver or support environmental education programs. The *GreenPrint* serves many different audiences. It is designed to foster and expand partnerships with the many sectors needed to produce and deliver environmental education programs and materials to Minnesota citizens. Many of the programs, actions and target audiences articulated in the *GreenPrint* support the strategies and policies articulated in this *Policy Report*. The OEA and the Environmental Education Advisory board are currently in the process of revising the *GreenPrint*.⁶¹

The OEA is specifically involved in a few areas to promote environmental education. One area is to build the capacity of environmental educators, both formal and informal, across the state by helping them develop educational skills to effectively educate their specific audiences. This is done in many ways but primarily through workshops, SEEK, a Web site devoted to environmental education (www.seek.state.mn.us), and an e-mail listserv.

In addition, the OEA is launching a comprehensive waste education program to raise awareness and give Minnesota families with children living at home the tips and tools on how to reduce waste. The campaign, as evidenced by its tagline, "If not you, who?" focuses on personal responsibility to reduce waste. Launching in January 2000, the campaign includes television, radio, billboard and newspaper advertising. In addition, practical "how-to" information will be available on the Web at www.reduce.org and in the OEA's Education Clearinghouse. Hands-on public education will be done in cooperation with local governments and environmental educators throughout the state.

B. Goals/Outcomes

The goals/outcomes of an environmental and waste education effort should be to:

- Increase communication about and promotion of responsible environmental behavior in all sectors, including businesses, governments and the general public.
- Communicate to the public regarding responsible stewardship and resource conservation.
- Increase an understanding of the benefits and resource savings of an integrated solid waste management system.
- Increase partnerships with potential educators and efforts to provide education on accurate, topical issues, such as waste reduction, recycling, reuse and groundwater protection.

C. Recommendation

The OEA, through its involvement to revise to the *GreenPrint*, has identified a number of education strategies and tactics that can be directed at businesses, governments, and consumers.

⁶¹ Environmental Education Advisory Board, *A GreenPrint for Minnesota: A State Plan for Environmental Education, Second Edition*, public review draft, September 1999.

The OEA will promote these environmental education strategies in a manner that supports the policies and goals concerning resource conservation and integrated waste management as articulated in this *Policy Report*.⁶²

V. Policy initiative five: Revise SCORE

A. Background

Over the last ten years, Minnesota has had one of the highest recycling rates in the country, and for the last few years has led the nation. Although counties and communities have been successful in establishing residential recycling programs, the development of successful non-residential recycling programs has been spotty at best. While some counties have exceeded the state's recycling goals, other counties have been unable to even begin to meet these goals.

The potential success of the state's recycling program is further complicated by the fact that markets for recycled materials are subject to the economic pressures of the national and international markets. Consequently, prices for recycled materials vary greatly. These fluctuations result in a significant variability of recycling efforts in the non-residential sector and have made budgeting for residential recycling programs difficult.

The major focus of the SCORE Program to date has been to implement residential recycling programs. Minn. Stat. §115A.551 (1998). Implementation of other critical elements of the original SCORE recommendations, such as waste reduction, has lagged behind residential recycling. This fact has been an issue for the SCORE Program since its inception. Historically, waste reduction programs receive less attention than recycling programs because the success of recycling programs is easier to document (ease of tracking and visibility of results) and large investments have been made in staff and budgets.

State funding for municipal solid waste management has not increased significantly since SCORE's inception in 1989. In fact, the ratio of county to state funding of SCORE Program waste activities has increased dramatically. Today, most counties provide well over the 25-percent match needed to obtain SCORE funding required by statute. In most cases, the revenues provided by the state and counties through the SCORE Program are needed to support the existing and expanding recycling and traditional solid waste management needs of the counties. In light of these facts, counties have requested that the OEA evaluate solid waste funding and make recommendations articulating how to pay for the expanding MSW management, recycling, and abatement infrastructure needs.

Another issue impacting the SCORE Program today is the way we measure successful waste management programs. The current SCORE survey that counties fill out focuses on how well a county is performing by calculating the recyclable materials collected as a percent of the MSW generated by the county. The resulting recycling rate is one important measure but not the only indicator of whether or not a county has an effective solid waste management program in place. Therefore, the current quantitative approach used to measure success by the SCORE Program

⁶² The state's environmental education goals and policies are fully articulated in the *GreenPrint* which may be obtained at the Education Clearinghouse c/o the Office of Environmental Assistance, 520 Lafayette Rd. N, St. Paul, MN. 55155-4100; by calling 1-800-877-6300; or by e-mail: clearinghouse@moea.state.mn.us.

should be combined with other quantitative and qualitative measures. This revised measurement system would provide a more holistic and representative measure of the SCORE Program and a better assessment of the effectiveness of a county's solid waste management programs.

B. Goals/Outcomes

The Minnesota Legislature set out a number of goals for the state's solid waste management system in SCORE. Minn. Stat. §115A.551 (1998). Implementation of the SCORE goals is critical to the waste management system of the 21st century. The state needs to reinvigorate the following aspects of the SCORE Program.

1. Reduce the total amount of waste generated

Minn. Stat. §115A.55, subd. 4 provides that Minnesota's per capita MSW generation must be reduced by 10 percent by the year 2000 (as measured from the base year per capita rate in 1993). MSW generation has in fact risen since the early 1990s at an average per capita rate of 3.8 percent per year.⁶³ To meet the waste reduction goals currently set forth in statute, the state must place greater emphasis on waste reduction and reuse.

2. Incorporate flexibility into the recycling goals

By law, there are different recycling goals for Greater Minnesota counties and the Metropolitan Area counties. Minn. Stat. §115A.551, subd. 2a (1998). An analysis of the factors affecting recycling rates was included in the OEA's *Preliminary Assessment of Regional Waste Management Capacity Report*.⁶⁴ The report identified four geographic and economic factors that appear to explain the variation of recycling rates among counties. Those factors are manufacturing activity, waste generation per capita, curbside collection, and clustering of populations. For example, the type of manufacturing, consumer buying practices, co-mingled versus separated curbside collection, and rural versus urban settings will influence both the quantity and characteristic of the materials collected for recycling. These factors, along with other factors, should be used to develop goals tailored to specific counties or regions.

3. Focus on increasing commercial materials recycled

Although SCORE was intended to deal with both residential and non-residential recycling, implementation has focused primarily on residential recycling. Minn. Stat. §115A.552 (1998). Non-residential recycling programs have been left almost entirely to the private sector and materials markets. Significant market price fluctuations have resulted in an extremely variable non-residential recycling system. When market prices are high, there is a significant effort to collect recyclables from the non-residential generators. When prices are low, efforts to recycle are correspondingly low. Improving the tracking and measuring of commercial recycling through the SCORE reporting is a first step toward the development of stable markets so essential to successful commercial recycling programs.

⁶³ Office of Environmental Assistance analysis of the *County SCORE Reports 1992-1998*.

⁶⁴ Office of Waste Management, *Preliminary Assessment of Regional Waste Management Capacity*, July 1993.

4. Improve SCORE measurement

The primary method of evaluating a county's success in the SCORE Program is the volume of materials recycled. This indicator worked well in the early years of SCORE, but recent SCORE reports have shown that while the materials collected for recycling have increased, the MSW generated has increased at a faster rate. Thus, while the volume of recycled materials has increased statewide, the relative recycling rate has leveled off or fallen. This could lead to the erroneous conclusion that recycling is declining throughout the state when, in fact, the amount of material recycled has increased.

Additionally, there is no effective way to assess county resource conservation and waste reduction activities. SCORE tracking of recycling rates shows only a part of the SCORE picture. It does not effectively measure the county efforts in waste reduction, reuse and resource recovery. An understanding of the system is dependent on developing programs and data on waste reduction, reuse and resource recovery.

C. Recommendations

The current SCORE Program needs to be updated to address current program issues. The following is a proposal for changes to that program.

- Consider legislation that supports updated state, county and regional resource conservation goals to replace the current recycling goals of 35 percent and 50 percent. The new goals could be designed on a regional basis. Since waste is not commonly contained within the borders of any one county, regional or statewide goals seem to make more sense than the current county approach.
- These new goals should continue to track and measure recycling and MSW generation, with increased emphasis on: waste reduction, reuse, pollution prevention, toxicity reduction, and organics composting. A measurement tool would need to be developed to track and measure progress in these programs not previously measured. Recycling would still be an important component of the new goals, but would not be the sole indicator of the state's success in managing its solid waste.
- Develop a revised SCORE annual reporting form which is performance based. Include an assessment of the economic and environmental benefits realized through waste reduction, reuse, and recycling. The revised SCORE Reporting Form should not be more burdensome to the counties than the current version.
- Improve documentation of commercially generated waste. Place increased emphasis on measuring actual volumes, rather than estimates of materials collected for recycling from commercial generators. In addition, documentation should distinguish between commercial and residential MSW sent to disposal facilities and resource recovery facilities. The current SCORE tracking system already makes this distinction for materials collected for recycling, but not for MSW.
- Obtain input from counties, local units of government, and businesses about the most effective ways to update the SCORE goals and reporting process. This information will be used to guide discussions among stakeholders through regional meetings, workgroups, advisory councils, etc. regarding how to update SCORE and the reporting process to bring it in line with the policies of the state. As the result of these stakeholder discussions, the OEA may recommend appropriate SCORE statutory changes as part of the 2001 legislative session.

VI. Policy initiative six: Revise solid waste planning

A. Background

Most of the progress in this state in developing integrated solid waste systems can be credited to the counties and local units of government. These units of government have systematically planned and effectively used state and local funds to build a waste management system that strives to divert as much waste as possible from landfills. Private abatement initiatives were also instrumental in diverting waste from landfills.

Solid waste planning is a fundamental tool that supports all of the strategies and policy initiatives of this *Policy Report*. In 1975, the Legislature mandated solid waste planning in the Metro Area. Minn. Stat. §473.149 (1998). Solid waste planning was mandated in Greater Minnesota in 1984. Minn. Stat. §115A.46 (1998). At that time, limited recycling was occurring in the Metro Area, and little or no recycling was occurring in Greater Minnesota. There was no statewide resource recovery infrastructure. Since the passage of the Waste Management Act, and subsequent amendments, there have been tremendous advances in recycling, yard waste composting, and resource recovery of MSW, and a dramatic decrease in landfilling. Waste reduction and the composting of organic materials have increased at a slower rate.

Initially, planning focused on the development of new integrated solid waste systems to abate landfilling. Meeting the SCORE recycling goals was a major component of the planning. As integrated solid waste management systems were implemented, planning has evolved to look more toward improvements in the existing systems.

Currently, solid waste planning addresses the management of mixed MSW, but not other waste streams, such as construction and demolition waste and industrial solid waste. The WMA hierarchy, statutory goals and bans form the basis for the content of county solid waste plans. Changes to the goals and bans automatically become part of an update to an existing county solid waste plan.

B. Local comprehensive planning

Communities should play a stronger role in solid waste management. Linking solid waste and local comprehensive planning supports strong communities and economic development and business competitiveness through resource efficiency, which is consistent with the Ventura Administration's "Smart Growth" campaign.

Municipalities and townships manage land use and infrastructure needs through planning and regulatory tools, such as ordinances, building approvals, connection fees and other mechanisms. The solid waste infrastructure needs of future developments should be considered in conjunction with other infrastructure needs, such as roads, sewers, water, utilities, right of ways, parks and trail systems. The waste generation and abatement potential of future developments should be addressed at the time local plan and building approvals are granted by local communities.

Local government comprehensive planning is also an important tool in planning for local infrastructure needs, curbing urban sprawl, and supporting sustainable development. In the Metropolitan Area, the mandatory comprehensive planning provisions under Minn. Stat. §473 have recently been strengthened to serve this function. Statewide, Minnesota State Planning has been

authorized to administer the Community-Based Planning Act. In addition, Greater Minnesota communities have enabling authority to prepare local comprehensive plans. These comprehensive plans are an excellent place to begin to address waste issues at a local level.

Solid waste abatement can be aided by local comprehensive planning. Counties and local communities should work with each other to address solid waste issues along with interrelated community issues on a regional basis. Solid waste is the result of complex materials production and consumption processes. By taking a regional comprehensive view, there may be opportunities to curb the waste generation potential of future developments.

Some ideas for regional waste management include:

- Integrate future developments with organized collection systems.
- Foster cluster developments that facilitate waste abatement opportunities.
- Provide incentives to developers that incorporate green building, waste abatement, and toxicity reduction concepts.
- Set aside development zones that encourage solid waste abatement.
- Integrate waste management with the district heating and energy and water conservation needs of a community.
- Assess local service fees (such as connectivity fees) on proposed developments to pay for future solid waste infrastructure needs.
- Require local comprehensive plans to be consistent with the solid waste infrastructure and programs identified in county solid waste plans.

C. Goals/Outcomes

The solid waste planning process should be revised to achieve the outcome of treating waste as a resource by abating unprocessed MSW from landfills. Revising the planning process has multiple goals that include:

- Focus on maintaining and improving the existing system for solid waste management.
- Modify existing programs to incorporate any new state goals, or legal rulings.
- Provide greater flexibility in the planning process.
- Move the present solid waste management system beyond its current level.
- Identify areas that the counties will need to provide technical assistance to local units of government.
- Integrate solid waste planning with local comprehensive planning.

D. Recommendations

The OEA recommends the following changes to the planning process for the Metro Area and Greater Minnesota counties:⁶⁵

⁶⁵ The recommendations support changes that recognize the importance of county planning; provide for more flexibility; and remove the regulatory burdens of the planning process. Moreover, the proposed restructuring of the

- Create one solid waste planning process for the Metro Area and Greater Minnesota counties.
- Use state statute for setting broad statewide policy goals.
- Incorporate into the state *Solid Waste Policy Report* specific regional and/or county goals based on state statutory policy goals.
- Implement a 10-year planning process. Plans would be updated prior to 10 years, if one or more of the following conditions occurred: major changes in statute; expiration of contracts with resource recovery facilities and land disposal facilities; and abatement goals stated in plan are not met.
- Require an annual or biennial progress report that would supplement the SCORE reporting form that describes the performance on all aspects of the regional or county solid waste system. This report could be integrated with existing MPCA reporting requirements.
- Continue to require regions or counties develop solid waste management plans and add performance standards as a prerequisite to the distribution of SCORE Program funds.
- Require greater involvement of the public in the development of solid waste management plans. For example, a county or region could form a citizen advisory committee to provide direction on the solid waste plan.
- Systematically expand the planning from MSW only to include all solid waste, such as construction and demolition debris and non-hazardous industrial waste. Before expanding the scope of planning, the state would have to research the issue and use the information to establish abatement goals for these materials.
- Explore opportunities to link solid waste planning with local government activities and responsibilities such as planning and administration of local ordinances and building requirements.

planning process will assist in implementing a more outcome/resource based solid waste system. These changes are consistent with the platform of the Association of Minnesota Counties.

Section Five: Research Needed To Move Minnesota Ahead

I. Research initiative one: Evaluate economic proposals that maintain and improve the waste abatement infrastructure and services

A. Background

As Minnesota plans for its future, it is critical that the state supports and improves its solid waste infrastructure to reduce the amount of waste. We must support activities that will reduce landfilling to create a healthy community.

At present Minnesota diverts nearly 67 percent of its waste from landfills. The activities required to achieve such a high abatement rate require strong partnerships — public and private, state and local. These partnerships must be strengthened and increased in the future if we are to continue to divert waste from landfills and support our solid waste infrastructure needs. State and local governments, as well as private businesses, have invested a significant amount of money in developing a strong waste abatement infrastructure. Like any investment, there is a need to maintain and improve this system. Local units of government play an important role in this partnership.

Over the past five years, counties and local governments have asked the state to provide more support, money and other resources, to offset increasing solid waste management demands. Counties and cities are finding it increasingly difficult to maintain an acceptable level of service without raising taxes and fees for residents. Moreover, as the state moves towards a sustainable and outcome-based resource conservation approach to managing its waste, more responsibility will be placed on local communities. As the solid waste system begins this transition, it will be necessary to explore alternative methods of financing the ongoing maintenance and expansion of our solid waste system.

The following economic principles should apply as we explore methods of financing the state's solid waste abatement infrastructure and services:

- **The solid waste system should be economical.** The solid waste system should be affordable, but this goal must be balanced with the need to meet our long-term environmental and resource management needs.
- **The solid waste system should reflect all costs to the greatest extent possible.** The rates generators pay do not reflect all of the costs of managing their waste. For example, landfill cleanup costs, pollution prevention, long term monitoring programs, short- and long-term health problems, and land use issues associated with waste are not incorporated in waste

disposal costs. Many costs associated with solid waste management are ignored, hidden or uncertain.

- **The present costs of waste disposal should not be deferred to future generations.** The environmental and economic costs of protecting our environment are not generally reflected in the price we pay for goods and services. We continue to be a “throwaway” society, a fact that is reflected by our increasing waste generation rates.
- **A user fee system should be used to finance our waste management system whenever possible.** Manufacturers, retailers and consumers should all be accountable for the costs of managing waste materials. Such a system should be reflected in the “true product costs” and should be built into the way we do business to ensure a safe and sustainable future.
- **Local control of solid waste is an important aspect of healthy communities.** The ability to locally administer effective solid waste programs contributes to a healthy and vital community. Reestablishing local control over solid waste management provides communities with one tool to help them determine the actions they believe will be beneficial to the long-term economic and environmental health of their community.

B. Recommended research topics

The OEA will research the following topics to assist the financing and development of waste abatement facilities, programs and services.

1. Identify options to link solid waste systems with local development.

As development of additional waste management infrastructure is planned, local communities should have the opportunity to link this infrastructure with other economic development projects in their communities. Evaluate opportunities that link economic development and planning with solid waste infrastructure needs. For example, waste-to-energy plants can provide energy to businesses in an economic development business park. In this way, businesses receive a convenient fuel option, more power is produced without relying on coal-based power plants, and the waste-to-energy plant will have a customer for its product. The resulting development would be a logical link between waste-to-energy and business, create a cleaner environment and create more jobs.

2. Research local fee structures that support state waste abatement and environmental protection goals.

Local governments should consider solid waste service charges similar to other local connectivity fees, such as charges for sewers, roads, and other local infrastructure needs. Communities should charge developers an amount to meet future waste abatement needs. This would allow local communities to plan for and have control over waste matters. Developers that engage in environmentally preferred behavior, such as using green building practices or building with recycled content materials, could receive credits that would reduce the amount of charge they pay.

3. Explore ways to strengthen local control over solid waste management services.

Cities have had very little statutory responsibility regarding the management of solid waste. In keeping with the goal to build healthy, strong communities, it may make sense to assist cities in playing a greater role in waste management in their jurisdictions. For example, cities could franchise waste services in their jurisdiction so that private competition would still exist, but the city would have the right to determine what happens to the waste generated by the citizens and

businesses in their area. Alternatively, cities could organize collection and require that waste travel to a processing facility that meets the goals of the local community.

4. Explore ways to improve and implement variable rate pricing.

Greater implementation of variable rate pricing requirements would assist the abatement activities highest on the Waste Management Act hierarchy — reduction and recycling. National studies have shown that instituting variable rate pricing is one of the most effective tools for abating waste because the generator sees that producing more waste costs more and has a financial incentive to reduce. Minn. Stat. §115A.93 requires that charges for residential solid waste collection services increase as the volume or weight of the waste of the waste collected increases. However, in practice, there is often little price differential between large and small volume generators. Strengthening variable rate pricing in Minnesota should increase reduction and recycling.

5. Identify innovative fee structures, taxes, bonds, levy limits, and contracts to finance solid waste facilities and programs.

Several counties have had success financing their solid waste system using innovative service fees and taxes. Sharing information about the financial tools that have been effective and helpful would provide more counties with information about options that may be available to them. Counties have had the primary responsibility for waste management in the state and most likely will continue to have this responsibility in the future. Ensuring that counties are aware of and using the most helpful tools will help them continue to provide quality service.

Although counties can impose service fees, tip fees, and other line item fees on taxes for solid waste management services, it isn't necessarily the best option for everyone. Ad valorem fees may be a more effective and potentially fair for certain counties and regions. Ad valorem options provide a much-needed option to local governments to sustain preferred waste management facilities. Local governments are limited by state statute as to how high levies can be. As a result, local governments are asked to provide more services without raising taxes.

6. Explore ways to use state funds.

The waste management infrastructure in Minnesota has been financed using a mix of state and local government and private funding. The state should continue to explore ways to use the funding mechanisms available to it to finance the investment in an abatement infrastructure. Accordingly, the OEA will continue to recommend using state general revenue bond funds, Capital Assistance Program (CAP) grants and other general grant funds to support solid waste abatement activities and the infrastructure it takes to make sure these activities can happen in our state.

7. Explore options for interstate and intrastate flow control.

Minnesota's resource recovery system was developed with local government authority to determine where and how the waste will be treated. A number of counties invested in resource recovery facilities intending to require the waste in their jurisdictions to go to these facilities. However, federal court decisions in 1993 and 1994 restricted the ability of local governments to control where the waste would go. Some counties have struggled since then to support these facilities, when faced by the competition of cheaper landfills.

Presently, Congress is debating the state and local governments' ability to restrict the flow of waste. The future closing of the Fresh Kills landfill in New York, and the fact that New York is

now shipping tons of waste to other states, has led states such as Virginia and Pennsylvania to push for federal legislative action to bring back “flow control.” Minnesota should consider supporting these efforts as a tool to support our future processing needs and to return control to local communities.

Federal courts have upheld the ability of counties to direct waste within their own state. This allows local communities to pass ordinances that require waste to be transported to specific facilities within the state. The OEA and the Attorney General should provide ongoing assistance to communities that are interested in adopting ordinances of this type. Creating a good exchange of information and model ordinances may allow more communities to use all of the tools possible to ensure their waste is not landfilled, and may result in more waste going to Minnesota resource recovery plants.

8. Research issues associated with MSW as an alternative energy resource.

In the event of deregulation of the gas and electric industries, inclusion of MSW and refuse-derived fuel (RDF) in a renewable portfolio standard (RPS) may support the resource recovery infrastructure in Minnesota and provide energy consumers with market choices in all types of electric generation.

Revenue from energy generation is an important element of the financial viability for waste to energy facilities. In a deregulated energy environment, adoption of a RPS with MSW may create an incentive for power suppliers to select MSW as one option for meeting the renewable standard.

While no specific proposals have been adopted or a timeline established for a deregulated gas and energy environment, the Department of Commerce is soliciting input as to the future of electricity and gas provision in Minnesota. The Department is considering a RPS that is a market-based mechanism for establishing a minimum level of electricity generated from renewable sources in the portfolios of power suppliers.

An RPS is necessary to level the playing field for renewable energy sources in a deregulated energy market which potentially may result in a preference for power from lower cost facilities which are often less environmentally preferable. An RPS is implemented through a requirement on retail suppliers of electric power to purchase a percentage of renewables based on retail sales. This requirement may be supplemented by a credit trading mechanism, which permits flexibility to select how to meet the renewable standard from a variety of options.

Several states have adopted a renewable portfolio standard including Connecticut, Maine, Massachusetts, Nevada, New Jersey and Texas. Maine is the only state thus far to include MSW in a RPS on par with wind, solar and other technologies. Several other states employ a stratified RPS with MSW included as a Class II renewable.

The OEA will continue to monitor the deregulation debate in Minnesota and will seek to ensure that new energy policy considers the resource recovery infrastructure currently in place and how this energy source addresses the energy policy goals in a deregulated environment.

II. Research initiative two: Evaluate the environmental, economic, health and ecological effects of MSW management

We need to develop a more thorough understanding of both the short- and long-term environmental and economic impacts of reduction and waste management. To accomplish this the OEA will evaluate continued use and refinement of life-cycle environmental analysis. This data may be supplemented by other types of environmental studies such as health and ecological risk assessments or occupational health risk assessments.

Economic studies would focus on policy choices and their influence on statewide economic indicators. The Regional Economic Model Inc. (REMI) model can be used to investigate the economic contributions of recycling manufacturers and evaluate the influence on employment, migration, and productivity. This analysis will provide a comprehensive understanding of the economic implications of waste management policies. To balance this broad statewide view, the OEA should also develop cost accounting research tools that measure the local economic costs of policy implementation.

The OEA should also work with private parties to gather costs and prices and assess how they affect business economic decisions. Attempts to gather high-quality private sector cost and economic information in the past have proven difficult. In addition, the OEA's mission and statutory directives guide the analysis efforts toward the statewide assessments recommended above.

Thus, the OEA should continue to refine its economic analysis and environmental life-cycle analysis tools to improve the data to analyze the economic impacts of responsible waste management and extend that analysis to cover additional relevant perspectives and scenarios.

III. Research initiative three: Evaluate new ways to handle construction and demolition debris and industrial solid waste

A. Background

Solid waste includes municipal solid waste (MSW), the non-MSW components of construction and demolition debris (C&D), and industrial solid waste. SCORE Programs and most county solid waste planning have focused on MSW. Other waste streams have received less attention and have not historically been subject to principles of reduction, recycling and reuse, because of the perception that this waste stream is inert and does not pollute. In addition, there is an absence of reliable data on non-MSW.

Although many non-MSW wastes are considered inert, some of these wastes may have hazardous traits. For example, some industrial wastes such as wood scrap from a construction project or rejected parts from a manufacturing process can be relatively innocuous. Other waste, such as demolition debris from older buildings may contain lead-based paint.

The transfer, processing and landfilling of non-MSW are regulated by the state. These regulations are currently being updated. The MPCA is planning to update its regulations for C&D operations.

County ordinances may regulate non-MSW. Some counties license facilities that manage non-MSW.

It is almost impossible to estimate the volume of non-MSW, because there is little reliable data on the volumes of materials abated or landfilled. Although the MPCA receives annual reports from landfills that receive non-MSW, this information is often incomplete or inconsistent because of variations in how the waste is measured (volume or weight based).

In addition, non-MSW generation can be highly variable. A number of factors can influence the generation of non-MSW, including economic conditions, the weather, periodic special projects, major disasters, and local regulations. Research conducted by the OEA indicated that the volume of non-MSW landfilled is equal to or exceeds the volume of MSW landfilled.⁶⁶

Presently, there are few economic incentives to reduce or recycle non-MSW. Landfilling is relatively cheap. Few governmental bodies have adopted bid specifications for building contracts that require the reduction and recycling of non-MSW. Finally, the characteristics of non-MSW frequently include a higher percentage of problem and noncombustible materials that limit abatement. Notwithstanding, there is a significant existing market infrastructure for many C&D waste stream components.

B. Construction and Demolition Wastes

A subset of the non-MSW materials that are currently landfilled is C&D. Until fairly recently, C&D wastes received only marginal attention from the recycling industry or from the government. This has begun to change as the C&D contractors, the regulatory agencies and the recycling industry begin to look at the challenges, as well as the opportunities, presented by this waste stream.

In the United States we generate an estimated 200 million tons of C&D per year.⁶⁷ Annual operating reports for dedicated demolition waste facilities submitted to the MPCA indicate that approximately two million tons of C&D waste per year is being disposed in Minnesota.⁶⁸ We have experienced a 27 percent increase in the disposal of C&D wastes between 1996 and 1998. Table 5-1 shows the materials typically found in C&D wastes.

Table 5-1: Materials in construction and demolition debris

Materials	Content Examples
Wood	Forming and framing lumber, stumps, plywood, laminates, scraps
Drywall	Sheetrock, gypsum, plaster
Metals	Pipes, rebar, flashing, steel, aluminum, copper, brass, stainless steel
Plastics	Vinyl siding, doors, windows, floor tile, pipes
Roofing	Asphalt and wood shingles, slate, tile, roofing felt
Rubble	Asphalt, concrete, cinder blocks, rock, earth
Brick	Bricks and decorative blocks
Glass	Windows, mirrors, lights
Misc.	Carpeting, fixtures, insulation, ceramic tile

Source: Charles D. Bader, "MSW C&D Debris," *MSW Management*, May-June 1999.

⁶⁶ Office of Environmental Assistance, *Consolidated Solid Waste Report*, 1995.

⁶⁷ Charles D. Bader, "MSW C&D Debris," *MSW Management*, May-June 1999.

⁶⁸ Minnesota Pollution Control Agency data files, September 1999.

One historical area in which recycling attention has focused is concrete, asphalt and metals. These portions of the C&D waste stream have been reused or recycled for many years. Unfortunately, recycling of other C&D wastes has been impracticable because of the lack of markets. In addition, the ability to make a profit from processing C&D wastes is typically small.

The processing and recovery of C&D wastes is not as prominent in the Midwest as it is on the east and west coasts. However, in the Twin Cities Area, the road-and-bridge related portion (concrete, metal and asphalt) of the C&D equation is routinely recovered and reused by MnDOT, local units of government and private contractors. This reuse of road construction materials is quite common throughout the country, as it is relatively economical to reuse asphalt and concrete.

The other part of the C&D equation is building related materials. In 1992, there were 86 permitted facilities in Minnesota that accepted these types of C&D wastes. Only limited processing and recovery occurs at some of these facilities. By and large it remains more cost effective to dispose of these materials than it does to recover them. There are, however, exceptions. Markets have remained steady and relatively convenient for ferrous and nonferrous metals. Thus, many facilities regularly separate metals for recovery prior to disposal. This separation is usually done using manual labor. As a general rule, the recovery of other materials depends upon on local conditions, such as markets and types of wastes.^{69,70}

The OEA met several times with C&D industry representatives throughout 1998. The industry representatives indicated a desire to recover and process the C&D waste stream, because markets for this C&D waste appear to exist. There appear to be opportunities to recover and process greater than 50 percent by weight of this waste stream. The industry has asked the state for assistance in developing reasonable incentives that would reward those that recover and/or process demolition debris.

To facilitate the recovery of demolition materials Minnesota could, like Iowa, extend our solid waste tax to apply to the disposal of C&D wastes. Facility operators would only pay a tax on that portion of the waste stream that was landfilled. There are, however, other models which might be equally effective.

C. Recommendation

To explore the options available to convert C&D and industrial solid wastes to reusable products, the OEA recommends the following research activities:

- Analyze the current management infrastructure for these materials as well as opportunities for waste reduction and recycling.
- Quantify the generation rates for C&D and industrial solid waste in Minnesota.
- Research the impacts on and the amount of land lost to the disposal of C&D and industrial solid waste.
- Research methods that create incentives to encourage the recovery and processing of C&D wastes and report to the results of this research to the Legislature during the 2001 session.

⁶⁹ Minnesota Pollution Control Agency, *Measure Twice Cut Once*, August 1993.

⁷⁰ Bader, "MSW C&D Debris."

IV. Research initiative four: Evaluate virgin material subsidies and their impact on the solid waste system

A. Background

The term “subsidies” is often used to describe a policy in which public resources are used to reduce costs or risks or which rewards certain groups or activities. Many of these subsidies are long standing and were not implemented with a consideration for long-term environmental impacts. There are extensive subsidies on virgin materials nationally and statewide that reinforce the use of virgin materials over recycled materials in the manufacture of products.

Several types of subsidies exist that support virgin material extraction and production. These subsidies include resource subsidies that promote below-cost pricing of public assets, such as the sale of timber by private timber owners. Private timber owners enjoy significant federal tax benefits upon the sale and harvest of timber. These tax incentives support continued investment in virgin timber operations and the manufacture of products from virgin timber. Other types of subsidies designed to favor use of virgin material industries or activities include cash-subsidies and subsidized credit. Some specific federal laws and tax policies that subsidize virgin material extraction include the 1872 Mining Law that allows mining on public lands without paying royalties, and the percentage depletion allowance targeted towards oil and gas production.

Another type of subsidy is the infrastructure subsidy. This type of subsidy involves government infrastructure investments, the costs of which are not passed on or are only partially passed on to the benefiting user.

A recent study issued by the GrassRoots Recycling Network concluded that 15 federal subsidies averaging \$2.6 billion annually benefit resource extractive industries that favor use of virgin materials in the industrial process.⁷¹ The study indicates that, as a result of the subsidies that support the use of virgin materials, taxpayers pay more for recycled content products than products made from virgin materials.

This report should, however, be contrasted with the 1994 EPA report which concluded that federal incentives for virgin materials extraction do not significantly impact the relative prices of virgin and recycled products.⁷² The study acknowledges, however, the combination of federal and state subsidies and other policies favoring virgin commodity markets can place recycling at a disadvantage. The study concluded that the removal of subsidies would eliminate the economic disadvantage felt by some aspects of the recycling industry.

Up to this point, no extensive inventory of Minnesota virgin materials extraction and product subsidies has occurred to date. Several entities have, however, called for research on this issue:

- The OEA’s 1997 Waste Management Act Examination process recommended an evaluation and/or removal of federal and state subsidies on virgin materials.⁷³

⁷¹ GrassRoots Recycling Network et al, *Welfare for Waste*, April 1998.

⁷² U.S. EPA, *Federal Disincentives: A Study of Federal Tax Subsidies and Other Programs Affecting Virgin Industries and Recycling*, August 1994.

⁷³ Office of Environmental Assistance, *Report on the Waste Management Act Examination Process*, January 1998.

- The final report of the Governor's Roundtable on Sustainable Development recommended the formation of a special commission to examine virgin material subsidies and tax expenditures that could be reduced or eliminated to support a revenue neutral tax shift.⁷⁴
- The OEA's/Solid Waste Management Coordinating Board's *Metropolitan Solid Waste Management Policy Plan 1997-2017* observed that virgin material subsidies are recognized nationally as placing recyclable feedstock at competitive disadvantage.⁷⁵
- A report prepared by the Sustainable Communities Partnership and presented to the Environmental Quality Board in 1998 recommended a commission examine virgin material subsidies.⁷⁶

In 1997, the Minnesota Legislature established a Corporate Subsidy Reform Commission to evaluate selected subsidy programs and tax laws. While the Commission focused on business subsidies, the work of the Commission provides a methodology for the examination of state supported subsidies.

B. Recommendation

In order to develop a comprehensive understanding of the relationship between virgin material subsidies and their potential impact on the market competitiveness of recycled content products, research is needed into state level subsidies. These research activities include:

- An examination of the economic forces that hinder the growth of all aspects of recycling, including state supported subsidies for virgin material extraction and production.
- Development of baseline data on subsidies for the extraction and production of products in Minnesota and how these subsidies impact recycling.

V. Research initiative five: Evaluate volume-based or weight-based pricing

A. Background

The topic of "pay-as-you-throw" (PAYT) programs, in which generators are charged based on the amount of garbage they throw out, rather than paying a flat fee, was legislated for residential generators in Minnesota in 1989 as part of the SCORE legislation. Minn. Stat. §115A.93, Subd. 3 and 3a (1990). Local governments responsible for licensing haulers or for collecting waste service charges directly are required to implement charges for collection of MSW that increase with the volume or weight of waste collected. The intent of the legislation was to provide an economic incentive by reducing fees for household generators that reduce or recycle MSW. The concept is simple: households that throw away less MSW should pay less than households that throw away more MSW.

⁷⁴ Minnesota Roundtable on Sustainable Development, *Investing in Minnesota's Future*, May 1998.

⁷⁵ Office of Environmental Assistance and Solid Waste Management Coordinating Board, *Metropolitan Solid Waste Management Policy Plan 1997-2017*, October 1997.

⁷⁶ Sustainable Communities Partnership of the Minnesota Environmental Quality Board, *Action Plan for Sustainable Development for Minnesota state Government*, November 1998.

Based on a review of county solid waste plans, local governments in nearly every county, if not all, have instituted a PAYT program. Some consider this program, among others, to have played a supporting role in achieving high recycling rates. However, there exists an underlying uncertainty by many state and local government officials as to whether PAYT programs are operating within the spirit of the law as it was written. A national study by Skumatz and Associates suggests, however, that PAYT programs increase waste diversion rates, most notably recycling rates.⁷⁷

Research indicates that the MSW waste stream will triple by 2020, despite our current waste abatement efforts. The research also shows that this growth is largely related to increases in per capita generation, not population growth. In other words, people are consuming and disposing of more materials than they have in the past. Recycling rates remain steady and waste reduction efforts have had little impact to slow the increase in waste generation.

Interviews with policy makers involved in the original SCORE legislation recalled that the PAYT concept was a strategy aimed at providing a direct financial incentive to households who recycled. Those who did little or no recycling should not receive an economic benefit. Many other issues, such as household size, container size, and existing collection services, were all factored into the current statutory language.

For a number of jurisdictions, only minor price differences exist between the various sizes of containers. For instance, it is not uncommon for a household to pay only \$1 difference per month between 30, 60 and 90 gallon containers, or for unlimited garbage pickup. Clearly, this price differential provides the consumer with no real economic incentive to reduce the amount of waste thrown away.

In May 1997, R.W. Beck conducted a workshop for Anoka County to investigate strategies to improve recycling and residential solid waste program collection efficiencies. At that time R.W. Beck articulated a need to:

- Encourage communities and collection service providers to eliminate the unlimited MSW collection service option via licensing, ordinance, franchise or contract.
- Encourage communities and collection service providers to offer a low-volume collection option, i.e., less than 30 gallons.

B. Recommendation

There is a need to evaluate the benefits and impacts of PAYT and the effectiveness of the current legislation. Issues to be evaluated include:

- Collection service price differentials that exist for residential, commercial, urban and rural waste generators.
- The effectiveness of PAYT at influencing waste generator behavior to reduce and recycle more.
- Technology considerations such as collection vehicles that weigh wastes.
- The impact of PAYT on the cost of solid waste collection service.

⁷⁷ Lisa A. Skumatz, *Beyond Case Studies: Quantitative Effects of Recycling, Incentive, and Diversion Program Choices*, Skumatz Economic Research Associates, June 1997.

Definitions

Terms used in this *Policy Report* are intended to have meanings consistent with state statutes. Any words not defined below should be understood to have a meaning consistent with state law.

Acre-foot	A volume of mixed municipal solid waste, 1,613 cubic yards, which will cover an area of one acre to a depth of one foot.
Collection	The aggregation of waste from the place at which it is generated and includes all activities up to the time the waste is delivered to a waste facility. Minn. Stat. §115A.03, subd. 5 (1998).
Commercial solid waste	Includes solid waste generated by stores, offices, businesses, restaurants, warehouses and other non-manufacturing activities, and non-process wastes such as office and packing wastes generated at industrial facilities.
Composting	The controlled microbial degradation of organic waste to yield a humus-like product. (Minn. Rules, sec. 7035.0300, subp. 20)
Curbside collection	Collection, at the point of generation, of recyclables or compostable collection materials.
Construction debris	Waste building materials, packaging and rubble resulting from construction, remodeling, repair and demolition of buildings and roads. Minn. Stat. §115A.03, subd. 7 (1998). Also referred to in the <i>Policy Report</i> as construction and demolition waste.
Hazardous waste	Any refuse, sludge, or other waste material or combinations of refuse, sludge or other waste materials in solid, semisolid, liquid, or contained gaseous form, which because of its quantity, concentration, or chemical, physical, or infectious characteristics may (a) cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness; or b) poses a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed. Categories of hazardous waste materials include but are not limited to explosives, flammables, oxidizers, poisons, irritants and corrosives. Hazardous waste does not include source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended. Minn. Stat. §116.06, subd. 11 (1998).
Household hazardous waste	Waste generated from household activity that exhibits the characteristics of or that is listed as hazardous waste under agency rules, but does not include waste from commercial activities that is generated, stored, or present in a household. Minn. Stat. §115A.96, subd. 1b (1998).

Inorganics	Noncombustible, nonmetallic material such as grit, rocks and ceramics not otherwise categorized.
Integrated waste management	A solid waste management system that incorporates an array of preferred management methods that most appropriately fit the characteristics of the waste stream
Land disposal	Depositing of waste materials in a land disposal facility.
Land disposal facility	Means any tract or parcel of land, including any constructed facility, at which solid waste is disposed of in or on the land. (Minn. Rules, sec. 7035.0300, subp. 52)
Land disposal site capacity	The volume of space at a land disposal facility that is permitted by the MPCA to be filled.
Leachate	Liquid that has percolated through solid waste and has extracted, dissolved, or suspended materials from it. (Minn. Rules, sec. 7035.0300, subp. 56)
Life-cycle analysis	Life-cycle analysis is a method of environmental analysis that considers the entire "life cycle" of a product or process, from raw materials acquisition through end of life management. It can include three steps: 1) a life-cycle inventory (LCI), in which material and energy inputs and outputs are studied; 2) an impact assessment, in which the LCI flows are translated into potential environmental impacts as a global warming potential; and 3) an improvement analysis, in which needs and opportunities are assessed and recommendations for action developed.
Local governmental unit	Cities, towns and counties. Minn. Stat. §115A.03, subd. 17 (1998).
Mass-burn incinerator	A solid waste combustion facility that is designed to burn unprocessed mixed municipal waste. It might also burn certain other wastes such as rejects and residuals from other waste processing technologies.
Mixed municipal solid waste (MSW)	(a) "Mixed municipal solid waste" means garbage, refuse, and other solid waste from residential, commercial, industrial, and community activities that the generator of the waste aggregates for collection, except as provided in paragraph (b) Mixed municipal solid waste does not include auto hulks, street sweepings, ash, construction debris, mining waste, sludges, tree and agricultural wastes, tires, lead acid batteries, motor and vehicle fluids and filters, and other materials collected, processed, and disposed of as separate waste streams, but does include source-separated compostable materials. Minn. Stat. §115A.03, subd. 21 (1998).
Nonferrous	Metals other than iron, such as copper, brass, zinc and lead.
Non-hazardous Industrial solid waste	Solid waste resulting from an industrial, manufacturing, service, or commercial activity that is managed as a separate waste stream. It does not include hazardous wastes.

Organized collection	A system for collecting solid waste in which a specified collector or a member of an organization of collectors is authorized to collect from a defined geographic service area or areas some or all of the solid waste that is released by generators for collection. Minn. Stat., §115A.94, subd. 1 (1998).
Organics	Combustible and/or compostable wastes not otherwise categorized. They include food waste, plastics, rubber, textiles, leather and paper that is not repulpable, as well as small quantities of other materials so mixed as to not be recyclable.
Problem material	Material that, when it is processed or disposed of with mixed municipal solid waste, contributes to one of the following results: 1) the release of a hazardous substance, or pollutant or contaminant; 2) pollution of water; 3) air pollution; or 4) a significant threat to the safe or efficient operation of a solid waste processing facility. The four conditions are further defined in Minn. Stat. §115A.03, subd. 24a.
Processing	The treatment of waste after collection and before disposal. Processing includes, but is not limited to, reduction, separation, resource recovery, physical, chemical, or biological modification and transfer from one waste facility to another. Minn. Stat. §115A.03, subd. 25 (1998).
Recyclable materials	Materials that are separated from mixed municipal solid waste for the purpose of recycling, including paper, glass, plastics, metals, automobile oil, and batteries. Refuse derived fuel or other material that is destroyed by incineration is not a recyclable material. Minn. Stat. §115A.03, subd. 25a (1998).
Refuse-derived fuel	A product resulting from the processing of mixed municipal solid waste in a manner that reduces the quantity of noncombustible material present in the waste, reduces the size of waste components through shredding or other mechanical means, and produces a fuel suitable for combustion in existing or new solid fuel fired boilers. Minn. Stat. §116.90, subd. 1d (1998).
Residuals	Waste materials left after recovery of recyclables and/or the physical, chemical or biological processing of wastes.
Resource recovery	The reclamation for sale, use, or reuse of materials, substances, energy, or other products contained within or derived from waste. Minn. Stat. § 115A.03, subd. 27 (1998).
Resource recovery facility	A waste facility established and used primarily for resource recovery, including related and appurtenant facilities such as transmission facilities and transfer stations primarily serving the resource recovery facility. Minn. Stat., §115A.03, subd. 28 (1998).
Solid waste	Garbage, refuse, sludge from a water supply treatment plant or air contaminants treatment facilities, and other discarded waste materials and sludges, in solid semisolid, liquid, or contained gaseous form, resulting

from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include hazardous waste; animal waste used as fertilizer; earthen fill, boulders, rock; sewage sludge; solid or dissolved materials in domestic sewage or other common pollutant in water sources, such as silt, dissolved or suspended solids in industrial wastewater effluents or discharges which are point sources subject to permits under section 402 of the federal Water Pollution Control Act; as amended, dissolved materials in irrigation return flows; or source, special nuclear, or by-product materials as defined by The Atomic Energy Act of 1954, as amended. Minn. Stat. §116.06, subd. 22 (1998).

Solid waste management

The systematic administration of activities that provide for the collection, separation, storage, transportation, transfer, processing, treatment and disposal of solid waste.

Source-separated compostable materials. (115A. Subd. 32a.)

"Source-separated compostable materials" means mixed municipal solid waste that: (1) is separated at the source by waste generators for the purpose of preparing it for use as compost; (2) is collected separately from other mixed municipal solid wastes; (3) is comprised of food wastes, fish and animal waste, plant materials, diapers, sanitary products, and paper that is not recyclable because the director has determined that no other person is willing to accept the paper for recycling; and (4) is delivered to a facility to undergo controlled microbial degradation to yield a humus-like product meeting the agency's class I or class II, or equivalent, compost standards and where process residues do not exceed 15 percent by weight of the total material delivered to the facility.

Unprocessed mixed municipal solid waste

Waste is "unprocessed" if it has not, after collection and before disposal, undergone separation of materials for resource recovery through recycling, incineration for energy production and use of refuse-derived fuel, composting, or any combination of these processes so that the weight of the waste remaining that must be disposed of in a mixed municipal solid waste disposal facility is not more than 35 percent of the weight before processing, on an annual average. Minn. Stat. §473.848, subd. 5 (1998).

Waste flow designation

A requirement by a waste management district or county that all or any portion of the mixed municipal solid waste that is generated within its boundaries or any service area thereof be delivered to a processing or disposal facility identified by the district or county. Minn. Stat. §115A.81, subd. 2 (1998).

Waste facility

All property real or personal, including negative and positive easements and water and air rights, which is or may be needed or useful for the processing or disposal of waste, except property used for the collection of the waste and property used primarily for the manufacture of scrap metal or paper. Waste facility includes, but is not limited to, transfer stations, processing facilities, and disposal sites and facilities. Minn. Stat. §115A.03, subd. 35 (1998).

Waste management	Activities that are intended to affect or control the generation of waste and activities which provide for or control the collection, processing and disposal of wastes. Minn. Stat. §115A.03, subd. 36 (1998).
Waste reduction or Source reduction	"Waste reduction" or "source reduction" means an activity that prevents generation of waste or the inclusion of toxic materials in waste, including: (1) reusing a product in its original form; (2) increasing the life span of a product; (3) reducing material or the toxicity of material used in production or packaging; or (4) changing procurement, consumption, or waste generation habits to result in smaller quantities or lower toxicity of waste generated.
Yard waste	The garden wastes, leaves, lawn cuttings, weeds, shrub and tree waste, and prunings. Minn. Stat. §115A.03, subd.38 (1998).

Appendix A: A Review of Information on the Environmental and Economic Aspects of MSW Management Practices

I. Background

This section summarizes the findings of several recent studies that addressed the economic or environmental implications of solid waste management choices. The studies summarized include:

- *Municipal Solid Waste Management Decision Support Tool* (U.S. EPA).
- *Assessment of the Effect of MSW Management on Resource Conservation and Greenhouse Gas Emissions* (prepared for the OEA).
- *Draft, Resource Conservation Benefits Associated with Waste Diversion in Iowa* (prepared for the Iowa DNR).
- *Greenhouse Gas Emissions from Management of Selected Materials in Municipal Solid Waste* (U.S. EPA).
- *MMSW Landfill Liability Report: Findings and Options* (MPCA).
- *A One-year Snapshot: Resource Conservation Benefits Associated with 1995 MSW Management in the Twin Cities Metropolitan Area* (prepared for the OEA).
- *Minnesota's Value-added Recycling Manufacturing Industries: An Economic and Environmental Profile* (OEA).

A. Municipal solid waste management decision support tool (under development) (U.S. EPA Office of Research and Development)

Over the past five years, the U.S. EPA has been developing a computer tool (the decision support tool (DST)) that will accomplish two functions:

- Provide a method for calculating the relative full-costs to local governments of solid waste management choices.
- Provide a method for assessing the relative environmental burdens of those solid waste management choices through life-cycle analysis.

Case studies demonstrating the methods are also being developed. The project has involved extensive review by internal staff at the EPA and the U.S. Department of Energy (DOE), a group of project stakeholders, and a project peer review committee.

The EPA expects that the software developed as a part of this multi-million dollar project will be available for licensing within a year. When it becomes available, it will use information on full-

cost accounting and an environmental life-cycle inventory to describe and evaluate alternative waste management strategies, including optimizing the system given certain conditions and constraints. The EPA views the tool as a planning and screening tool to help guide and direct discussions of solid waste management strategies. Those discussions, of course, would need to include consideration of additional political, social, and economic constraints and goals that were not modeled. Final decisions on local implementation would also need to involve the more detailed information provided by design and engineering studies, among others.

When the DST becomes available, the OEA intends to investigate its usefulness in estimating certain costs associated with those portions of the solid waste management system that currently involve, or that are proposed to involve, public expenditures at the state level. The OEA also will investigate the usefulness of the environmental life-cycle inventory. Further, the OEA will work with the counties, cities, and other interested parties to assess whether this tool is one that should be widely adopted for use, in totality or in part, at the local level.

B. Assessment of the effect of MSW management on resource conservation and greenhouse gas emissions (R.W. Beck, Inc. and Ecobalance, Inc., prepared for the OEA, September 1999)

The OEA, working with the consultant team of R.W. Beck and Ecobalance, recently completed a life-cycle analysis that is analogous to the life-cycle approach the U.S. EPA is developing. The benefits of integrated MSW management go beyond merely keeping waste out of landfills; they can include a range of resource conservation benefits:

- Avoided materials consumption and use.
- Avoided energy use.
- Avoided use of land and natural resources.
- Avoided air and water emissions.

By extending the life cycle of the products we use, reducing consumption, and reducing the amount of material used in a product, we reduce the drain on the raw materials used to produce that product and avoid the need for waste management. By making products with recyclable materials, we further ease the drain on raw materials and are frequently able to make products using less energy and emitting fewer pollutants than before. By recovering energy from otherwise wasted materials, similar types of benefits can be obtained. This study was intended to capture, on a statewide system basis, this broader range of benefits of reduction and integrated MSW management.

1. Estimating resource conservation using life cycle analysis

To estimate resource conservation, the OEA compared production systems that use recovered materials with those that use virgin materials. We examined the full spectrum of impacts associated with making, using and disposing of a product. This approach included looking at production, extraction and transportation of raw materials, collection of MSW and recyclable materials, product manufacturing, transportation and distribution, and ultimate disposal at the end of life. All the various waste management practices used in Minnesota, such as recycling, energy recovery through incineration, landfilling and composting were considered.

2. Findings

Minnesota's approach to waste management provided an overall net savings or benefit in terms of resource conservation in 1996. (See Table A-1). The largest total benefits were realized through recycling and waste-to-energy activities; the total savings from source reduction were limited by the small amounts modeled. The findings are a function of both the total quantity of materials managed by each method and the per-ton resources used or emissions released. Some examples of resource conservation include the avoided use of over 600,000 tons of coal and over 92,000 tons of oil. In addition, the system helped avoid the emission of over 900,000 tons of fossil carbon dioxide and over 7,000 tons of sulfur dioxide.

Table A-1
1996 Modeling Results
Minnesota's Integrated MSW Management System
(short tons per year)

		Landfill	Incineration	Composting	Recycling	Source Reduction	Problem Materials	Total
Natural Resources:	Coal	-30,900	-350,000	388	-227,000	-14,330	-48,800	-670,642
	Natural gas	720	113	128	-37,200	-10,210	-9,900	-56,349
	Crude oil	7,600	4,420	958	-15,800	-12,100	-77,600	-92,522
	Iron ore	0.0039	-43	0	-42,500	-4	0	-42,547
	Limestone	-4,780	-27,200	52	-34,000	-2,000	-400	-68,528
Air Emissions:	CO ₂ (fossil)	-59,000	-395,000	3,850	-447,000	-57,400	-36,700	-996,250
	CO ₂ (biomass)	228,000	853,000	150,000	-429,000	-23,700	0	778,300
	CO ₂ (sequestered)	-500,000	0	-147,400	0	0	0	-647,400
	CH ₄	46,000	-2,280	4	-1,120	-118	-470	42,017
	N ₂ O	3.6	170	0.052	-1.2	-2	-3.2	167
	NMHC	66	18	15	-1,250	-465	-92	-1,709
	Nox	100	110	153	-1,410	-315	-125	-1,488
	SO ₂	-480	-3,230	21	-2,730	-480	-158	-7,057
	CO	560	710	53	-6,270	-260	-48	-5,255
	PM	-306	-1,500	15	-3,170	-160	-48	-5,168
	Total metals	0.0036	13	0.0029	-1.0	-0.1	-0.044	12
Water Effluents:	Nitrates	0.0087	-0.12	0.00014	0	0	-0.0014	-0.21
	Phosphates	0.22	0	0	7.2	-0.2	-3.3 E-11	7.3
	NH ₃	4.0	1.0	0.064	0.6	-0.1	-4.9	0.6
	TSS	34	12	1.6	-330	-65	-126	-475
	BOD	27	2	0.36	444	-48	-28	398
	COD	110	24	3	66	-440	-236	-473
	Hydrocarbons	0.20	0.04	0.0009	-0.6	-2.6	-0.071	-3.0
Waste:	Total waste	-15,600	101,000	170	-36,600	-6,270	-11,100	31,600
	Landfilled MSW	1,240,600	0	0	0	0	0	1,240,600

Source: Minnesota Office of Environmental Assistance, *Municipal Solid Waste Management and its Impact on Resource Conservation and Greenhouse Gas Emissions*, prepared by R.W. Beck, Inc. and Ecobalance, September 1999.

With respect to source reduction, five materials were studied: office paper, wooden pallets/containers, old corrugated cardboard (OCC), glass containers, and plastic containers. Measurable benefits included avoided materials consumption, energy use, air and water emissions, and natural resource use, but the overall impacts were limited because source reduction represents

such a small share of the overall quantity of waste managed. Nevertheless, on a per-ton basis, the results were high in comparison with other methods.

Recycling provided large benefits due to reducing natural resource use and reducing energy use needed in production, with frequently associated benefits in lower air and water emissions. On a smaller scale, similar benefits occurred from beneficial reuse of the problem materials studied (used oil and tires). The recyclables investigated include old newspaper, corrugated cardboard, HDPE and PET plastic, aluminum, still and tin cans, and glass.

Although only a limited amount of information was available to assess the resource conservation benefits of composting, the study found some measurable benefit as composting creates a partial sink for carbon dioxide, preventing its release into the atmosphere. Both MSW and yard waste composting were considered. The OEA hopes to extend its work on composting as more data become available.

Incineration of MSW (including both waste-to-energy and refuse-derived fuel) provided significant benefits by displacing coal for energy production. However, this method of waste management contributed the largest releases of nitrous oxide and trace metals emissions.

For landfills that produce energy from captured gases, offsetting coal for energy production produced some net savings, and all landfills served as a sink for carbon dioxide. However, landfills also contributed emissions (including methane) in most other categories and consumed land that would be available for other purposes.

The OEA analysis, augmented by funding from the EPA, looked at greenhouse gasses (GHG) emissions resulting, or avoided, from waste management activities over longer time period, 1991-1996. These GHG emissions are a subset of the overall emissions categories from the life cycle inventory, comprised of carbon dioxide, methane and nitrous oxide.

The GHG analysis provided results consistent with the broader overall resource conservation analysis. (See Table A-2). Historically, the two largest factors in reducing global warming potential through waste management activities in Minnesota have been recycling and waste-to-energy incineration. In contrast, landfilling contributes the largest amount of potential, most notably through the release of methane. Source reduction has significant benefits on a per-ton basis, but its overall impact has been small due to its relatively small prominence relative to other management strategies. On a material specific basis, excluding forest carbon sequestration, recycling aluminum and newspaper produce the largest benefit. However, if forest carbon sequestration is considered, recycling of newspaper and cardboard are the most beneficial. In fact, when forest carbon sequestration is included in the modeling of paper recycling, it produces more benefit than the rest of the activities combined. The most significant source reduction benefits produced in this study were in the categories of office paper and plastics. This benefit is primarily in the reduction of carbon dioxide emissions.

Table A-2
Total greenhouse gas emissions from MSW management
Metric tons of carbon equivalent (MTCE) per year

Method	1991!	1992!	1993!	1994!	1995!	1996!
Incineration	-92,042	-95,205	-99,830	-98,793	-97,064	-96,678
Landfilling, type A	97,696	99,684	91,194	117,196	85,490	96,637
Landfilling, type B	5,584	4,321	5,935	10,726	14,432	0
Landfilling, type C	570	619	448	67	938	3,976
Composting (Total)	-30,861	-38,755	-39,388	-34,824	-36,013	-35,487
Recycling, Collection ⁽¹⁾	5,395	6,569	7,322	8,738	8,981	9,618
Recycling, MRF ⁽¹⁾	2,669	3,250	3,622	4,323	4,443	4,758
Recycling, PET ⁽²⁾	-256	-569	-384	-639	-451	-419
Recycling, HDPE ⁽²⁾	-296	-425	-499	-858	-854	-991
Recycling, OCC ⁽²⁾	6,370	8,295	9,120	11,966	12,609	13,659
Recycling, ONP ⁽²⁾	-26,465	-31,552	-35,158	-38,489	-37,401	-39,401
Recycling, Steel/Tin Cans ⁽²⁾	-5,564	-4,526	-6,291	-5,287	-10,056	-13,195
Recycling, Aluminum ⁽²⁾	-63,543	-72,073	-84,613	-108,629	-105,060	-105,942
Recycling, Glass ⁽²⁾	-5,027	-6,146	-6,707	-8,004	-7,648	-7,756
Source Reduction	-12,865	-14,680	-14,555	-14,586	-14,696	-14,977
Total MSW Mgmt (without Paper Recycling Carbon Sequestration and Source Reduction Sequestration)	-118,634	-141,192	-169,782	-157,092	-182,350	-186,197
OCC Recycling Carbon Sequestration	-89,464	-116,509	-128,094	-168,055	-177,099	-191,840
ONP Recycling Carbon Sequestration	-93,236	-111,155	-123,861	-135,593	-131,761	-138,806
Paper Source Reduction Carbon Sequestration	-12,001	-13,695	-13,578	-13,607	-13,709	-13,972
Total Paper Sequestration (recycling and source reduction)	-194,701	-241,359	-265,533	-317,256	-322,569	-344,618
Total MSW Mgmt (with Paper Recycling and Source Reduction Carbon Sequestration)	-313,334	-382,551	-435,315	-474,348	-504,920	-530,816

⁽¹⁾ Represents only the gross value of emissions from these activities and does not represent the net value through offsetting the recycled-related emissions with equivalent activities (extraction and transportation) for virgin materials.

⁽²⁾ Represents the net value for each material by incorporating both virgin and recycled emissions, including specific virgin material extraction, transportation, and manufacturing emissions.

Source: Minnesota Office of Environmental Assistance, *Municipal Solid Waste Management and its Impact on Resource Conservation and Greenhouse Gas Emissions*, prepared by R. W. Beck, Inc. and Ecobalance, Sept. 1999.

These findings, as well as the broader resource conservation findings, support the development of policies and programs in the following areas:

- Promotion of product stewardship, particularly as a strategy for promoting source reduction and the use of recycled materials as feedstock.
- Increased landfill abatement through source reduction, recycling, and MSW processing.
- Landfill gas recovery, perhaps for energy production, at all landfills.
- Increased efficiency of electricity generation at waste-to-energy processing facilities.

- Removing virgin materials subsidies that may be negatively affecting the use of recycled feedstock.
- Environmentally sound procurement, especially as it relates to source reduction and the purchase of materials with recycled content.
- Promotion of “green buildings,” particularly policies and programs that seek to improve the efficiency of materials and energy use, and that incorporate the use of recycled materials during construction, furnishing, and operations.
- Volume-based pricing as an incentive to reduce and recycle.
- Promoting, at the federal level, innovative mechanisms to enable states to obtain credit for the greenhouse gas offsets provided through their source reduction and recycling activities.

3. Estimating the effect of changes to the solid waste system

To take these findings a step further, the OEA looked at four scenarios for the future, based on theoretical changes in waste management as a result of policy or program initiatives. These hypothetical scenarios were designed to estimate projected benefits of system changes through 2020.

Scenario 1: Assumes an annual increase in source reduction of one-percent per year of MSW generation, with the remaining incremental growth in generation being landfilled.

Scenario 2: Assumes an annual increase in the total materials collected for recycling as equal to the projected annual growth in the quantity of materials being generated.

Scenario 3: Assumes an annual increase in the total materials that are collected for resource recovery (processed) as equal to the projected annual growth in the quantity of materials being generated.

Scenario 4: Assumes a "ramping up" of the quantity of materials that are placed in landfills with active landfill gas energy recovery from 60 percent to 85 percent by the year 2010, with the latter percentage remaining constant from 2010 through 2020.

In this particular case, Scenario 2, based on increased recycling efforts, produced the greatest potential benefit, followed by Scenario 1, which increased source reduction.

C. Resource conservation benefits associated with waste diversion in Iowa (Draft) (Tellus Institute, prepared for the Iowa Dept. of Natural Resources, June 14, 1999)

This report summarizes the economic benefits, land use effects, energy impacts, and avoided air and water emissions associated with waste diversion in Iowa in 1995. The study includes source reduction, recycling, and centralized yard waste composting as diversion techniques. Overall, the state diverted approximately 34 percent (1.3 million tons) of its waste.

1. Economic benefits

Tellus measured the economic value of waste diversion three ways:

- The market price of recovered materials (\$18.1 million).
- The avoided purchase price of source reduced materials (\$121.9 million).
- The avoided waste management costs of source reduction (\$33.8 million).

No specific beneficiaries of the reduced costs and additional revenue were identified. Although the study uses market prices to establish the value of recovered materials, it is not clear whether the recyclables recovered in Iowa were actually sold at the prevailing market prices. For source reduction, the value was based on the avoided purchase price of the product or material for which demand was reduced. For avoided waste management costs, the study assumed that all associated landfill disposal costs, and half of collection costs, are avoided by source reduction.

Tellus did not attempt to model the effect of the sales of recyclables or changes in demand due to source reduction on the Iowa economy as a whole. However, the study does estimate direct employment in remanufacturing at 8,400 people, and reports direct employment in companies that use recycled feedstock at 8,800. Using a multiplier, the company estimates total associated employment at 47,100, or about 3 percent of the state's total employment.

2. Land use effects

Tellus discussed three types of beneficial land use effects of diversion: decreased landfilling, decreased impacts associated with harvesting and extraction, and improved soil. According to the report, reduction and recycling decreased the demand for landfill space by 100 million cubic feet. Further, paper recycling avoided the need to harvest about 220,000 acres of forest. Reduced demand for raw materials extraction for materials such as iron was noted, but the land use benefits were not quantified. Improvements to soil from composting of food and yard waste were also noted but not quantified.

3. Energy impacts

Tellus states that most of the energy savings from diversion occur “upstream,” through a decreased need to extract raw materials and lower energy requirements during manufacturing. Based on the 1998 EPA report *Greenhouse Gas Emissions from Management of Selected Materials in Municipal Solid Waste*, Tellus calculated diversion energy savings and converted them from BTU's to equivalent gallons of gasoline. In these terms, source reduction avoided the need for the equivalent of 43 million gallons of gasoline, and recycling avoided the need for the equivalent of 73 million gallons of gasoline.

4. Avoided air and water emissions

Tellus quantified emissions savings for six pollutants and greenhouse gases. The report concludes that avoided air and water emissions were substantial. (See Table A-3). For greenhouse gases, the report estimated that diversion avoided the generation of 529,400 metric tons of carbon equivalent.

Table A-3
Selected air emissions avoided by Iowa diversion in 1995

Pollutant	Amount avoided (tons)
Carbon monoxide	6,336
Hydrocarbons	1,602
Nitrogen oxides	3,273
Particulate Matter	2,832
Sulfur Oxides	3,892
Lead	1.5

Source: Iowa Department of Natural Resources, *Draft Resource Conservation Benefits Associated with Waste Diversion in Iowa*, A Technical Report prepared by the Tellus Institute, June 14, 1999.

D. Greenhouse gas emissions from management of selected materials in municipal solid waste (U.S. EPA Office of Solid Waste, September 1998)

This report examines how MSW management and climate change are related, presenting material-specific GHG emissions factors for various waste management options. The primary application of the GHG emissions factors is to support climate change mitigation accounting for waste management practices.

The report responds to several of 50 voluntary initiatives identified in the 1993 U.S. Climate Change Action Plan: accelerated source reduction and recycling of MSW, and reduction of landfill methane emissions. Initially, the EPA estimated that about five percent of the overall goal of the Action Plan, or 5.6 million metric tons of carbon equivalent (MTCE) could be eliminated through the source reduction and recycling initiative.

The study uses a streamlined life cycle analysis approach to look at MSW and greenhouse gas emissions, considering:

1. Raw material acquisition (fossil fuel energy and other emissions, and changes in forest carbon sequestration).
2. Manufacturing (fossil fuel emissions and non-energy related emissions).
3. Waste management (such as carbon dioxide emissions from combustion and methane emissions from landfills).
4. Transportation-related energy emissions at each of steps 1 through 3.

It focuses on those MSW components believed to have the most potential to influence GHG based on:

- The quantities generated.
- Differences in energy use for manufacturing a product from virgin vs. recycled inputs.
- The potential contribution of materials to methane generation in landfills.

The 11 components studied were: newspaper, office paper, corrugated cardboard, aluminum cans, steel cans, glass containers, HDPE, LDPE and PET plastics, food scraps and yard trimmings. (See Table A-4). Together, these components make up about 55 percent, by weight, of MSW. The report also looked at the GHG implications of mixed MSW as disposed, mixed recyclables (excluding food scraps and yard trimmings), and mixed paper (broad, office, and residential categories)

Table A-4
 Net GHG emissions from source reduction and MSW management options
 Emissions counted from a waste generation reference point
 (MTCE/ton)

Material	Source Reduction	Recycling	Composting	Combustion	Landfilling
Newspaper	-0.91	-0.86	NA	-0.22	-0.23
Office paper	-1.03	-0.82	NA	-0.19	0.53
Corrugated	-0.78	-0.70	NA	-0.19	0.04
Mixed Paper					
Broad definition	NA	-0.67	NA	-0.19	0.06
<i>Resid. def.</i>	NA	-0.67	NA	-0.19	0.03
<i>Office Paper def.</i>	NA	-0.84	NA	-0.18	0.10
Aluminum cans	-2.98	-3.88	NA	0.03	0.01
Steel cans	-0.84	-0.57	NA	-0.48	0.01
Glass	-0.14	-0.08	NA	0.02	0.01
HDPE	-0.61	-0.37	NA	0.21	0.01
LDPE	-0.89	-0.49	NA	0.21	0.01
PET	-0.98	-0.62	NA	0.24	0.01
Food scraps	NA	NA	0.00	-0.05	0.15
Yard Trimmings	NA	NA	0.00	-0.07	-0.11
Mixed MSW	NA	NA	NA	-0.04	-0.02
Mixed recyclables	NA	-0.76	NA	-0.18	0.03

Source: U.S. EPA, *Greenhouse Gas Emissions from Management of Selected Materials in Municipal Solid Waste*, September 1998.

In general, source reduction represented a good opportunity to reduce GHG emissions. It avoided the energy-related CO₂ emissions from raw materials acquisition and manufacturing, and emissions from waste management. Recycling generally had the second lowest GHG emissions. In most cases, recycling reduced energy-related CO₂ emissions during manufacturing and avoided emissions from waste management. Paper recycling was a source of increased storage of forest carbon.

Composting appeared to be a good management options for food scraps and yard trimmings. Net GHG emissions from composting were lower than landfilling for food scraps and higher than landfilling for yard trimmings (because some yard trimmings will not fully degrade in landfills; instead, the carbon they contain will be sequestered). It appears that the emissions factors for composting or combusting these materials are similar however, the composting numbers used in this analysis have considerable uncertainty.

Net emissions from combustion and landfilling were similar for mixed MSW in this study. When comparing combustion and landfilling of mixed waste, net emissions are determined more by technology factors than by material specificity, since the composition of the waste managed is the same. On a site-specific basis, the ordering of the results between landfilling and combustion could be different from the ordering this study found, which was based on national average results. In particular, the study found the landfill results are sensitive to the percentage of landfilled waste sent to landfills with gas recovery, the methane oxidation rate, and gas collection system efficiency.

The study recognized limitations due to data uncertainties and unavailability, but encouraged the use of the analysis for voluntary programs.

E. Mixed MSW landfill liability report: Findings and options (Minnesota Pollution Control Agency, January 1998)

This report discussed four subjects of relevance:

- Conventional financial assurance costs at open MSW landfills.
- Perpetual care costs for MSW landfills.
- Expanding the Closed Landfill Program to accept open MSW landfills.
- Issues related to old municipal dumps.

1. Conventional financial assurance costs

Owners of MSW landfill facilities must demonstrate proof of financial responsibility for MSW landfill closure, post-closure care, and contingency action for a period of thirty-years past closure of the facility. For currently open MSW landfills, the total obligations for closure, post-closure care, and contingency actions cost are approximately \$94 million. Historically, most funds for these activities have been set aside into trust funds.

Despite the high value of these obligations, the agency notes several problems with assuring that adequate funds will be available to cover the necessary activities. Through its experience in the closed landfill program, the agency has noticed a tendency for facility owners to inadvertently underestimate closure costs. Currently, the Minnesota Pollution Control Agency (MPCA) expects average facility closure costs to be about \$50,000 per acre. Furthermore, the agency has in recent years received an increasing number of requests to cover the costs of closure, post-closure care, and contingency action in a different fashion, moving from placing money into trust funds toward the use of third-party guarantees. To the extent that the viability of third-party guarantees relies on the continued health of companies that are becoming more and more reliant on landfill profits, rather than a broad base of business activities, to generate revenues, such action has the effect of tying the state financially to the continued success of MSW landfilling. Finally, experience in the closed landfill program has shown that parties who used standby letters of credit to guarantee coverage if their financial assurance obligations were not able to provide the full amount of money necessary to fund post-closure care and contingency action costs.

2. Estimating perpetual-care costs

The question of what happens to landfills after the thirty-year post-closure period is one that has caused concern among legislators and other interested parties. To address this concern, MPCA staff estimated potential costs associated with perpetual care, that is, caring for currently open landfills after the time period addressed in rules and regulations. Because no lined landfill has been closed for 30 years MPCA staff, working with a Perpetual Care Workgroup, had to make educated assumptions about perpetual care requirements and costs. While some very long-term costs were felt to be conjectural, others (such as continual site maintenance and monitoring) were felt to carry a higher level of certainty.

The staff set the time period of perpetual care at 100 years, assuming that at that point the net property value of the filled ground will have risen to a point that it covers the remaining costs of remediation and maintenance. Activities that staff expects to see continue after the 30-year post-closure period are:

- Routine groundwater monitoring and maintenance costs.
- Operation and maintenance costs (such as mowing, passive gas-extraction and erosion repair).
- Gas monitoring and maintenance costs (for active gas-extraction at some landfills).
- Leachate management costs at portions of landfills that are lined and have leachate-collection systems (includes eighty years of treatment after closure, and perpetual pump-out).
- Contingency–action costs (about 50-60 percent coverage for all possible contingency events).

Staff assumed that technologies and environmental standards would stay the same as they are today.

The present value of perpetual care for the 29 open MSW landfills was estimated at \$13.8 million, assuming that this sum is set aside today and allowed to gather interest over the next 46 years prior to any expenditures. If the fund were not established for another 16 years (the average remaining operating life that is estimated for open MSW landfills), \$30 million would be needed to cover costs because of the loss of compounded interest earnings. If interest earnings are not allowed to accrue or if MSW landfill owners do not provide for perpetual care costs prior to their need, an estimated \$257 million could be required to fund future liabilities into perpetuity.

3. Options and costs of expansion of the Closed Landfill Program

As an alternative to the federal Superfund clean-up process, Minnesota established the Closed Landfill Program (CLP) in 1994. This report discusses and evaluates several mechanisms for expanding the closed landfill program to include currently operating landfills. All of the options remove perpetual care responsibility and costs from the landfill operator/owners and transfer it to the state. Because of this, they may also inadvertently encourage less-than-optimal operating and maintenance practices during the active landfilling, closure, and post-closure phases.

Currently, the Closed Landfill Program receives about \$22 million per year from the Solid Waste Management Tax. In addition, the state has received some revenue from insurance recovery efforts. These funds are used for the care and remediation of the 106 landfills enrolled in the program. The state has no end date for the program. Annual program expenses are expected to peak around the year 2000 as cover construction and active gas system installations occur, and then go into a less-expensive maintenance phase. Program revenues are anticipated to begin exceeding program expenses around the year 2003, which would potentially provide a source of funds for expanding the program.

The report makes it clear, however, that the MPCA will oppose taking on major new landfill security and care duties unless it is assured that revenues are available to pay for them. If the Legislature provided for state care only after facility owners have closed their landfills and have completed 30 years of post-closure care using their own financial assurance funds, then the present value cost of program expansion would be \$14.8 million. If the state were to offer a one-time window of opportunity, setting a near-term deadline for landfill entry in to the CLP, the cost is expected to be \$16.3 million, based on the closure of nine MSW landfills.

4. Old municipal dumps

Old dumps, which were operated and closed before landfill requirements were in place, are a source of additional concern and cost. At the time the report was published, simply ascertaining the number of dumps needing attention over and above current programs was expected to take

significant effort. The report recommends considering statutory changes that would allow waste from old dumps on publicly owned land to be relocated onto CLP landfills that are undergoing cover construction. Approximately 20 CLP landfills will be receiving covers in the future.

F. A one-year snapshot: Resource conservation benefits associated with 1995 MSW management in the Twin Cities Metropolitan Area (Tellus Institute, Prepared for the OEA, August 1997)

This report estimates the resource conservation benefits of integrated MSW management in the Twin Cities Metropolitan Area in 1995. The focus is on the benefits of the system as a whole, not on comparing and contrasting management choices. This information is relevant to planners for several reasons. First, protection of the environment, including resource conservation, is often used as a justification for integrated MSW management systems. As long as resource conservation and environmental protection issues are relevant to waste management decision-making, an understanding of the nature, magnitude, and distribution of the resource conservation benefits is valuable. Second, a simple focus on the prices paid locally for MSW management components omits, in part, consideration of the value of resource conservation.

This report defines resource conservation benefits defined as avoiding:

- Use of materials.
- Use of energy.
- Production of air and water emissions (whether controlled or uncontrolled).
- Use of land for resource extraction or landfilling of wastes.

The report addresses the above resource conservation benefits with respect to each of the following MSW management components:

- Source reduction.
- Recycling.
- MSW processing.
- MSW landfilling.
- Problem materials management.

In summary, the study found the environmental value (in terms of avoided materials use, emissions, energy use, and land use) and economic value of the resource conservation benefits of integrated MSW management in the Twin Cities area in 1995 to be substantial. (See Table A-5). Avoided materials use was the key benefit category for source reduction and processing. Source reduction avoided the purchase of finished products, such as office paper, or the use of finished materials as packaging. In both cases the avoided material cost per ton was high. In contrast, recycling and processing supplied alternatives to virgin feedstock and fuel. The value of recycled materials and the value of the electricity produced by processing were important.

Table A-5
Summary of resource conservation, Twin Cities Metropolitan Area, 1995

Management Technique	Conservation Category	
	Total Avoided Energy Use (MMBtu)	Total Avoided Landfill Space (acre-feet)
Source Reduction	1,235,685	1.88
Recycling	11,772,230	21.54
Processing	208,359	16.11

Source: Minnesota Office of Environmental Assistance, *A One-year Snapshot: Resource Conservation Benefits Associated with 1995 MSW Management in the Twin Cities Metropolitan Area*, prepared by the Tellus Institute for the OEA, August 1997.

Energy accounted for a substantial portion of the resource conservation benefits. These benefits primarily reflect the avoidance of energy use in virgin materials production through source reduction and the use of recycled, rather than virgin, materials as feedstock.

With respect to emissions, avoided improper disposal of problem materials had the most obvious resource conservation benefit on a per-ton basis. However, benefits due to reduced emissions from production, associated with source reduction and recycling, were also significant when total benefits were calculated.

Land use benefits, especially avoided landfilling, and resulted from recycling and processing. In addition, land use due to avoided production also occurred, including avoided forest use due to recycling and source reduction of paper, and avoided use of western lands for coal mining.

Tellus believes the results of this analysis are relatively insensitive to the particular numerical values used in the analysis. This is important because substantial judgment was required in the analysis. Tellus states that one could modify the assumptions substantially and still reach the same qualitative conclusions, particularly concerning the relative importance of production.

G. Minnesota's value-added recycling manufacturing industries: An economic and environmental profile (Office of Environmental Assistance, June 1997)

This study, completed in 1997, investigated the economic and environmental contributions of companies that use recycled feedstock in manufacturing processes. The primary tools used were a survey of manufacturing companies, economic modeling, and a review of related studies and reports. Working with the Department of Administration, the OEA conducted a survey in late 1996 of 90 companies. Most used recycled materials as feedstock in manufacturing processes; a few produced refined recycled feedstock for other manufacturers.

To estimate statewide economic activity associated with the recycling manufacturers, the Regional Economic Models, Inc. (REMI) model was used. Total employment (which includes direct, indirect, and induced employment), sales and tax revenue, and value-added to the state economy were estimated using this model.

1. Contributions to the state economy

Table A-6 summarizes the findings of the REMI modeling as applied to Minnesota recycling manufacturing industries.

Table A-6
Estimates of 1996 economic activity associated with Minnesota's value-added recycling manufacturers

Economic Activity Indicator	Based on Reported Employment	Based on Total Estimated Employment,
Direct Jobs (employment at the recycling manufacturers)	6,200	8,700
Estimated Indirect Jobs: Impacts on local suppliers statewide, unadjusted for displacement effects	6,600	9,800
Estimated Induced Jobs: Long term effects on personal income and consumer spending, localized and statewide	5,300	7,400
Total Estimated Job Impact:	18,100	25,900
Total Estimated Wages and Salary Disbursements: The monetary remuneration of employees, including compensation of officers, commissions, tips, and bonus and receipts-in-kind that represent income to the recipient.	\$548 Million	\$772 Million
Total Estimated Tax Revenue: Business/personal state income tax's, sales tax, excise tax and miscellaneous taxes excluding real estate taxes	\$40 Million	\$66 Million
Total Estimated Value-added Activity: Contribution to Gross State Product analogous to GDP(gross domestic product); output excluding the intermediate inputs (primarily compensation and profit)	\$1.33 Billion	\$1.92 Billion
Total Estimated Gross Economic Activity: Amount of production in total sales, includes intermediate goods purchased as well as value-added (compensation plus profit)	\$2.94 Billion	\$4.51 Billion

Source: Office of Environmental Assistance, *Minnesota's Value-added Recycling Manufacturing Industries: An Economic and Environmental Profile*, June 1997.

2. Employment

Manufacturers that use recycled feedstock employ a significant number of people. Survey respondents reported nearly 6,200 employees, and the estimated total number of employees exceeds 8,700. The estimated number of employees in the recycling manufacturing industry exceeds the number of people employed in the communications services and communications equipment sectors, which are considered important and rapidly growing industries in Minnesota. Most employment (over 5000 jobs) occurs in Standard Industrial Classification (SIC) Code 26, paper and allied products.

Approximately 50 percent of the jobs reported are skilled manufacturing positions, 35 percent are non-skilled manufacturing positions, ten percent are office or clerical positions and five percent are managerial positions. If this distribution holds true for total estimated employment, the result is approximately 391 jobs in management, 784 jobs in office or clerical positions, 4,445 jobs in skilled manufacturing, and 3,059 jobs in unskilled manufacturing.

3. Sales revenue

Survey respondents reported recycled product sales exceeded \$911 million. Adding sales estimates for non-respondents increases the total to nearly \$1.5 billion. As with employment estimates, most sales occur in SIC Code 26, paper and allied products.

Many of the surveyed manufacturers purchased their feedstock from Minnesota sources. This activity contributes to the viability of Minnesota's recycling efforts by creating suppliers and local end markets and reducing transportation costs.

In addition, many companies export finished products across state boundaries. Of the 50 companies responding to questions about location of sales, two-thirds reported selling products internationally. These exports contribute to the state's base of economic activity. Their relative importance also suggests a potential for actual job loss in Minnesota should the companies close. If the primary market for manufacturers is local, another company will often expand its local market share if a competitor closes. However, if a company that has substantial markets out-of-state goes out of business, it is less likely that another local competitor will fill the market void, and more likely that an out-of-state competitor will capture the market share of the company that closed its doors.

4. Estimated tax revenue

The OEA estimated that recycled manufacturing businesses contributed between \$40 million and \$66 million in annual taxes to the state in 1996. Although this amount does not include property taxes, it does include:

- Individual state income tax on employees' earnings.
- State sales tax.
- State excise tax.
- Corporate franchise tax.
- Sales tax on capital equipment.
- Sales tax on non-capital equipment.

5. Private investment

Forty-one companies reported investing in equipment and buildings from 1994 through 1996. Altogether, their investments exceeded \$177 million. Estimates of capital investments made by non-reporting companies were not calculated.

6. Influence on statewide economic indicators

According to results obtained using the REMI model, the level of economic activity associated with recycled manufacturers is substantial. The total estimated job impact, which includes direct, indirect, and induced jobs, ranges from about 18,000 to nearly 26,000. Total estimated wage and salary disbursements ranged from \$548 million to \$772 million. Finally, the total estimated value-added activity contribution to the gross state product was estimated at \$1.33 to \$1.92 billion.

II. Conclusions and suggestions for future research

Research done to date supports the encouragement of integrated MSW management systems. The environmental benefits shown in the research appear to support the continued management of waste according to the hierarchy specified in the WMA, and support the policies identified in this report. The economic research, while incomplete, lends credence to the notions of factoring in the long-term costs of landfilling and the value of externalities of all waste management strategies when considering waste management policies and choices.

The OEA realizes that more comprehensive and more complete economic and environmental analysis of policies and actions is important to informed decision-making, particularly if short- and long-term, as well as local and more global, ramifications are to be understood. A suite of applicable environmental and economic analysis tools can best provide the information the OEA and local units of government need to guide their thinking.

To that end, the OEA intends to continue refining its environmental life-cycle analysis work, working to improve the data used in the analysis and extending the analysis to cover additional relevant perspectives and scenarios. On the economic side, the OEA intends to add the use of tools to help understand traditional local costs more fully, such as the EPA's full-cost accounting model as a tool.

In addition, the OEA intends to broaden the use of tools such as the REMI economic analysis model, which can provide a sense of the implications of policies and programs for the state economy as a whole. To the extent possible, the OEA would like to develop and use tools geared toward better understanding and valuing externalities of solid waste management choices. Other applicable tools will also be evaluated and used as applicable.

Appendix B: Summary of the Public Review and Response

I. Overview of the public review process

The OEA encourages public participation on complex public policy issues. In August, the OEA released for public review a draft solid waste policy discussion document.¹ This review was used to solicit public and stakeholder input regarding the pertinent issues affecting Minnesota's integrated waste management system. This review assisted the OEA in its preparation of this *Policy Report*.



Attached to Appendix B are the written comments received during the public review of this report.

The following public and stakeholder meetings were held between September 8 and October 12, 1999:

Solid Waste Management Coordinating Board Lead Staff	Marshall (Southwest Regional Meeting)
Northeastern Waste Advisory Committee St. Paul (Metropolitan Regional Meeting)	Rochester (Southeast Regional Meeting) Duluth (Northeast Regional Meeting)
Fergus Falls (Northwest Regional Meeting) Solid Waste Administrators	Minnesota Resource Recovery Association Minnesota Waste Association
Association of Minnesota Counties Solid Waste Management Advisory Council	Minnesota Chamber of Commerce Prevention, Reduction, Recycling Advisory Council
Association of Recycling Managers	Citizens for Better Environment/Minnesota Center for Environmental Advocacy

Counties and Cities Involved in Source Reduction and Recycling

Written comments were received from the following parties:

Name	Affiliation
Susan Haigh	Solid Waste Management Coordinating Board
Lisa Disbrow	Waste Management
Doug Carnival	Counsel to National Solid Waste Management Association
Arlene Vee	Jackson County Solid Waste Administrator

¹ Office of Environmental Assistance, *Waste Management in Minnesota: A Transition to the 21st Century – Draft Policy Discussion and Proposal*, August 1999.

Doug Morris	Crow Wing County Solid Waste Administrator
Matt Schuerger and Diana McKeown	Minnesotans for an Energy-Efficient Economy and Clean Water Action Alliance of Minnesota
Timothy Rudnicki	Citizens for a Better Environment
Mike Kirchmeier	Region 8 Solid Waste Administrators - Cottonwood, Jackson, Lincoln, Lyon, Murray, Nobles, Pipestone, Redwood, Rock, Lac Qui Parle, Renville, Yellow Medicine
Mike Kirchmeier	Cottonwood County Solid Waste Administrator
David Morris	Institute for Local Self-Reliance
Mike Robertson	Minnesota Chamber of Commerce
Doug Walker	NRG, Inc.
Mike Hanan	President, Solid Waste Administrator Association
Gene Mossing	Olmsted County Solid Waste Administrator
Trudy Richter	Minnesota Resource Recovery Association
Mike Lynn	Minnesota Pollution Control Agency
Jeff Pelowski	Roseau County Solid Waste Administrator
George Minerich	Stearns County Solid Waste Department
Dan Holm	Becker County Solid Waste Administrator
Kurt Soderberg	Western Lake Superior Sanitary District
Mary Hershberger Thun	Solid Waste Management Advisory Committee Member
Jonathan Allan	Citizen

II. Issues and concerns raised

The following discussion summarizes the major issues and concerns raised during the public review process. The parties raising each issue and concern are identified, a summary of their comments is presented, and an OEA response is included. It was not possible to respond to each individual comment made. The OEA response below is intended to address the main issues and concerns only.

A. Eliminate the landfilling of unprocessed MSW by the year 2006

Respondents

Roseau County Environmental Office	Becker County Environmental Services
Cottonwood County Solid Waste Department	Crow Wing County Solid Waste Department
Duluth Meeting	Rochester Meeting
Region 8 Solid Waste Administrators	Northeastern Waste Advisory Committee Meeting
Western Lake Superior Sanitary District	Solid Waste Administrators Association
Jackson County Environmental Health, Zoning and Planning	Solid Waste Management Coordinating Board Lead Staff Meeting

Fergus Falls Meeting
Minnesota Resource Recovery Association Meeting
Association of Minnesota Counties Meeting
Minnesota Chamber of Commerce Meeting
Stearns County Solid Waste
Waste Management Inc.
NRG, Inc.
Institute for Local Self-Reliance
Prevention, Reduction, Recycling Advisory
Council

Minnesota Waste Association
Solid Waste Administrators Meeting
Solid Waste Management Advisory Committee
Member
National Solid Waste Management Association
Citizens for a Better Environment
Minnesota Resource Recovery Association
letter and Meeting
Citizen
Olmsted County Solid Waste
Association of Recycling Managers

Summary of comments

The overarching comments below reflect many of the individual comments on this issue.

- This goal is unrealistic, unachievable and contrary to the waste management hierarchy of preferred waste management methods.
- There were comments in support of this policy initiative — waste-to-energy deserves praise, we process over 85 percent of our wastes, we can do even better. Also, move date up to 2004.
- Is the state concerned that this may promote more exporting of waste to other states?
- There is a concern that this goal is driven to solve Metropolitan Area problems with little regard to the regional differences and realities of Greater Minnesota.
- Many comments were detail-related and examples include costs to households, environmental risk studies should be conducted on processing facilities, the CAP program is not getting legislative support, the OEA should do a report card on MSW composting facilities and new definitions will need to be developed.
- Inquiries questioned how the OEA would ensure that toxic or hazardous wastes are not channeled to waste-to-energy facilities. There were suggestions that the state should first focus on eliminating toxic and hazardous materials from the waste stream along with more efforts directed at education, source reduction, reuse and recycling.
- How are we going to process the waste by 2006? Need to look at the hierarchy instead.
- How much processing capacity in the state is currently being used? People are going to be upset with new special assessments to build processing facilities.
- The proposal to eliminate landfilling of unprocessed waste but not processed waste might be too narrow an interpretation to guide public policy. For example, landfilling of incinerator ash over the landfilling of inert unprocessed portions of the waste stream.
- The future should be a market driven free enterprise model with limited government controlled facilities and less government market participation.
- The waste management hierarchy should be eliminated; it is not mandatory but based on preference.

- Potentially huge financial implications on residents and businesses and speculation regarding intrusion implications on businesses.

Response

Policy initiative one (eliminate the landfilling of unprocessed MSW) in this *Policy Report* takes into consideration many of the comments above with two exceptions — removing the hierarchy of preferred waste management methods and abandoning the recommendation of no landfilling of unprocessed MSW.

The values that underlie the Waste Management Act (WMA) hierarchy — resource conservation, human health and environmental protection — appropriately guide Minnesota’s integrated solid waste management systems. In addition, research conducted to date supports the management of wastes according to the WMA hierarchy.

Waste represents inefficiencies in our production, distribution and consumption systems. Thus, by integrating sustainability principles and resource efficiency into waste management, we can begin a transition away from end-of-pipe practices that are consistent with the waste management hierarchy of preferred waste management practices.

The date of January 1, 2006, was changed to January 1, 2008, based on comments that 2006 did not allow enough time for the transition.

The OEA concurs with many of the concerns raised and is recommending a series of action steps that will enable stakeholders and citizens to be involved in the decisions about the best methods to implement the 2008 goal. Many of the issues raised will be addressed through this process.

Step one recommends that a Task Force should be appointed by the Governor to prepare a long-range implementation plan that evaluates the methods to eliminate the disposal of unprocessed MSW. Step two recommends that the Task Force should present for legislative consideration the implementation plan.

B. Product Stewardship

Respondents

Minnesota Resource Recovery Association Meeting	Northeastern Waste Advisory Committee Meeting
Western Lake Superior Sanitary District	Jackson County Environmental Health Zoning and Planning
Duluth Meeting	Rochester Meeting
CISSSR Meeting	Fergus Falls Meeting
Citizen	Minnesota Waste Association
Crow Wing County Solid Waste Department	Stearns County Solid Waste
Solid Waste Administrators Meeting	Citizens for a Better Environment
NRG, Inc.	Minnesota Chamber of Commerce Letter
Olmsted County Solid Waste	Prevention, Reduction, Recycling Advisory Council

Summary of comments

Essentially all of the comments supported the proposed product stewardship recommendations. Other comments included:

- The OEA should also continue to support (financially and technically) keeping household hazardous wastes out of the waste stream through county household hazardous waste programs.
- Examine how to use the tax code to promote product stewardship.
- Voluntary efforts seldom work, put it in law.
- What leverage does the state have in effecting a change in the design or production of a product designed to be less toxic?
- Product stewardship is important enough that it should be included in the waste management hierarchy.

Response

The SCORE pass-through disbursements to counties that help support household hazardous waste programs are recommended to remain the same. Also, there are no plans to discontinue distributing money from the MPCA to sponsoring household hazardous waste counties.

The OEA is committed to pursuing a voluntary approach to meet the goals and outcomes for product stewardship. Successful voluntary programs work when involved parties agree to mutual goals and can achieve these goals through a partnership. Through technical assistance, state contract preferences, education and publicity efforts, design production decisions can be influenced.

There are no recommendations to alter the existing WMA hierarchy of preferred waste management practices. Product stewardship as defined in this report transcends all methods of the hierarchy as it assumes the full environmental impact of the product throughout its life cycle.

C. Modern landfills

Respondents

Northeastern Waste Advisory Committee Meeting	Crow Wing County Solid Waste Department
Rochester Meeting	Duluth Meeting
Jackson County Environmental Health Zoning and Planning	Olmsted County Solid Waste
Fergus Falls Meeting	Stearns County Solid Waste
Citizens for a Better Environment	Minnesota Chamber of Commerce Meeting
National Solid Waste Management Association	Waste Management

Summary of comments

Most of the comments centered on the modern landfill as opposed to landfills of the past that did not have liners and leachate collection systems. There was a suggestion that the OEA should consider “treatment type” technologies that may benefit integrated solid waste management systems. Examples are bioreactor or recirculation cells and landfill gas recovery. Comments also

stated that RCRA Subtitle D EPA-approved landfills are safe and deemed acceptable. Another comment stated that there is a much greater risk from landfills and this issue must be addressed. Lastly, a remark indicated that since most of the landfills in the state are privately owned, there is a bias toward private business.

Response

Landfilling MSW without first capturing its value as a resource is not consistent with managing waste based on principles of conservation and sustainability. Subtitle D landfills approved by the EPA are recognized as a permitted method of managing waste. However, manufacturing activities that recover materials or generate electricity from MSW have varying types of economic value that can be quantified. Landfilling involves very long-term commitments for facility care with associated economic cost uncertainties. An example of the long-term economic costs is reflected in the state's Closed Landfill Program.

From an environmental perspective, the study results to date have shown that the greatest potential for resource conservation on a per-ton basis appears to be source reduction, followed by recycling, then processing, and lastly, landfilling. Moreover, the OEA will continue to refine the environmental life-cycle analysis data and long-term costs and externalities of our waste management choices.

Lastly, recovering wastes, based on principles of sustainability and conservation, is not a bias approach toward the private sector. Most of the permitted MSW landfills in the state are publicly owned. Moreover, the OEA is not proposing to close landfills, since they will continue to be needed for the disposal of processed wastes — bypass, rejects, and residuals — and for the disposal of C&D and non-hazardous industrial wastes.

D. Planning

Respondents

City of Marshall Meeting
Western Lake Superior Sanitary District
Crow Wing County Solid Waste Department

Summary of comments

The comments received included: support for the planning recommendations; questions as to how much control can be gained through planning; and the viewpoint that planning is “an attempt to pursue unfunded mandates,” and approval of a county plan belongs to a county and not a state agency.

Response

The recommendations are consistent with most of the platform of the Minnesota Association of Counties. The OEA worked with counties over the past several years to streamline and improve the planning process and to update the planning requirements to better reflect our current solid waste infrastructure. The proposed changes are meant to make the planning process more meaningful and useful for local decision-makers. The planning process through county and state approvals has been recognized as an important decision tool. County plans have been upheld in the courts. As part of

the streamlining process the OEA will review the legal implications concerning the state approval requirement.

E. MSW as a renewable energy resource

Respondents

Minnesota Resource Recovery Association Meeting	Solid Waste Management Coordinating Board Lead Staff Meeting
Solid Waste Management Coordinating Board	Minnesota Resource Recovery Association Letter
NRG, Inc.	Institute for Local Self-Reliance
Minnesotans for an Energy-Efficient Economy	Association of Recycling Managers

Summary of comments

There were many comments on this issue, both for and against. The following illustrates the comments received.

- Waste-to-energy is a better energy source than wind. Wind turbines require more energy to run than they produce. The state and OEA must get involved in the deregulation debate.
- We support efforts for the inclusion of refuse-derived fuel as a green fuel that has energy value.
- Adopting this policy in our judgement would violate existing Minnesota Statutes, raise electricity rates, and undermine efforts to minimize waste and return Minnesota back to pre-1985 days when garbage burning was the number one strategy.
- Waste-to-energy is not like natural cycles (wind, energy, sun and rain), but rather a human generated activity. We need to minimize waste, attain zero waste. Cities can recycle 65 percent.
- We believe such an approach is seriously misguided, solid waste is neither renewable nor sustainable, and burning waste directly undermines the primary goals of reduction reuse and recycling.
- MSW has historically been a large contributor of mercury. By defining waste-to-energy as a renewable resource, this could dramatically alter the hierarchy of preferred practices. Also, waste-to-energy is an old approach to waste management and it is neither renewable nor sustainable.

Response

Due to the complexity of this issue and the uncertainty of when deregulation will occur, the OEA is recommending this issue as a research initiative. The OEA is proposing to monitor the issue to ensure that the new energy policy considers the waste-to-energy infrastructure currently in place and how it addresses the energy policy goals in a deregulated environment. Other states have adopted a renewable portfolio standard (RPS). Maine included MSW in a RPS on par with wind, solar and other technologies. Several other states employ a stratified RPS with MSW included as a Class II renewable.

The OEA supports waste-to-energy as an alternative to the use of coal, but is not suggesting it to be a preferred energy source over solar or wind. The OEA will keep an open forum available for

interested parties to examine the issue as more information is made available. Also, it should be noted that the federal government has not taken a firm position on this issue.

F. SCORE and solid waste tax

Respondents

Rochester Meeting	Western Lake Superior Sanitary District
Region 8 Solid Waste Administrators	Crow Wing County Solid Waste Department
Becker County Environmental Services	St. Paul Meeting
Duluth Meeting	Fergus Falls Meeting
Minnesota Waste Association	Marshall Meeting
Solid Waste Administrator Meeting	Minnesota Chamber of Commerce
National Solid Waste Management Association	Stearns County
Association of Minnesota Counties	Minnesota Resource Recovery Association

Summary of comments

The comments on the SCORE recycling law were primarily targeted at the state providing more money to support local recycling programs, or at least maintaining the existing amount of dollars (don't alter the formula) currently given to counties from the solid waste tax. Additionally, the OEA was urged to consider disbursing more SCORE dollars to counties that meet the recycling goals versus counties that don't meet the goals. It was also suggested that the OEA focus on the commercial sector for additional recycling opportunities. A comment was made that we need to get a full accounting of the solid waste tax. The Department of Revenue needs to provide a full accounting of the solid waste tax dollars.

Response

There are no plans to change the SCORE disbursement formula. The OEA proposes in Policy Initiative Five more focus on tracking and measuring commercial sector recycling. As the OEA solicits further input about the most effective ways to update the SCORE goals and reporting process, more discussion regarding commercial recycling is expected to take place.

The *Policy Report* proposes two SCORE outcomes that respond to the other issues mentioned. The OEA will place greater emphasis on waste reduction and reuse, and will explore replacing the current recycling goals with goals more tailored to specific counties or regions.

The OEA agrees with the comment regarding the need for a full accounting of the solid waste tax.

G. Market development

Respondents

Fergus Falls Meeting	Region 8 Solid Waste Administrators
Crow Wing County Solid Waste Department	Becker County Environmental Services
Solid Waste Administrator Meeting	Solid Waste Administrator Association
Minnesota Waste Association	Association of Minnesota Counties

Solid Waste Management Advisory Committee	Association of Recycling Managers
Solid Waste Management Coordinating Board Staff	Western Lake Superior Sanitary District
Citizens for a Better Environment	Prevention, Reduction, Recycling Advisory Council

Summary of comments

Recycling markets are inconsistent, unreliable and economically well below a level necessary to justify increased participation. Also, the state is powerless to impact national and international markets. These sentiments reflect the strained state-of-affairs regarding recycling markets. Recycling market fluctuations have generally created a break-even proposition for recycling programs since SCORE was passed into law in 1989.

Many comments supported the state leading by example by developing strong procurement policies. These should be followed by local initiatives that encourage the use of recycled products on a broader scale. Other comments suggested that the OEA build some success stories first by perhaps targeting the most toxic materials.

Response

The OEA remains committed to working with local collection programs and Minnesota-based markets to strengthen the recycling system, expand the types and quantities of materials that can be recycled, and assist in the use of recycled materials in new and existing products. Policy initiative three recommends that the OEA examine opportunities that result in a demand for recycled and other environmentally preferable products and support and enhance market development for recycled content products. Policy initiative three supports working with the Department of Administration to improve the purchasing of environmentally preferable products.

H. Waste generation trends

Respondents

Fergus Falls Meeting	Counties and Cities involved in Source Reduction and Recycling Meeting
Crow Wing County Solid Waste Department	Duluth Meeting
Northeastern Waste Advisory Committee Meeting	Minnesota Waste Association
Marshall Meeting	Association of Minnesota Counties Meeting
Stearns County	Minnesota Chamber of Commerce Letter and Meeting
National Solid Waste Management Association	

Summary of comments

Many comments were received regarding the waste trend analysis prepared by the OEA. These issues concerned the acceptability of the methodology and the accuracy of the numbers. There was skepticism about whether the waste stream is growing, and if so, why. It was suggested that the analysis imply uniform growth in the waste across the state, and that there are in fact regional

differences. The Minnesota Chamber of Commerce has contracted with Franklin Associates to review various aspects of the OEA's analysis.

Response

Since 1990, counties have been required to submit annual SCORE reporting forms to the OEA. Included in the forms are questions about waste generation. The OEA works closely with the counties to ensure that the reporting is consistent and accurate. The OEA is satisfied that the waste generation numbers from 1992 through 1998 reflect the best available data.

The OEA acknowledges that regional variations exist in the amounts of waste generated. The OEA will consider a more targeted approach to understand the variations in waste generation and its associated characteristics. The results of the OEA/MPCA's waste composition study contains useful information relative to waste generation will be available in January 2000.

If better data can be found concerning MSW waste generation in Minnesota, the OEA is open to incorporating this data to improve the waste trend analysis.

I. Labeling

Respondents

Crow Wing Solid Waste Department

Fergus Falls Meeting

Summary of comments

The state should develop and enforce meaningful labeling laws.

Response

In 1997, the state Legislature repealed the hazardous products labeling law (Minn. Stat., §115A.9523). This law would have required the Director of the OEA to establish a uniform label on any product exhibiting the characteristics used to determine if a material qualifies as a hazardous waste. Labeling was discussed during the WMA Examination process, and it was recommended that future labeling discussions be included in product stewardship measures.

Policy initiative two, concerning product stewardship, does not identify labeling as a tool to be pursued. However, the OEA's product stewardship goals and outcomes effectively include a more up-front approach. Reducing the amount and toxicity of the waste stream and changing how products are made so that they create less waste and toxicity minimizes the need to pursue labeling policy at this time.

J. Flow control

Respondents

Stearns County Solid Waste Department

Minnesota Resource Recovery Association

Crow Wing County Solid Waste Department

Fergus Falls Meeting

Summary of comments

Flow control is a tool that is needed to support a policy aimed at processing wastes prior to landfilling, and also to support our existing infrastructure.

Response

Flow control is recommended as a research initiative in the *Policy Report*. The OEA will closely monitor the flow control issue ongoing in Washington D.C., but there are other tools now available for public entities that produce the same outcome. Counties and cities have the ability to contract for services, or impose fees that help to maintain competitive tip fees at the resource recovery facilities. The OEA will continue to research new tools that direct waste to preferred facilities, and the OEA and the Attorney General will continue to provide ongoing assistance to communities that are interested in adopting ordinances of this type.

K. Education

Respondents

Fergus Falls Meeting

Citizen

Becker County Environmental Services

Citizens for a Better Environment

Minnesotans for an Energy Efficient Economy

Rochester Meeting

Crow Wing County Solid Waste Department

National Solid Waste Management Association

Stearns County

Summary of comments

All of the comments contained a common message — the OEA should develop a strategy that elevates the importance of environmental education. One comment read, “education is the key element in changing attitudes, changing paradigms and creation of new and novel ways to evolve the processes by which we manage our solid waste.” It was noted that perhaps the OEA should not rely too much on businesses providing environmental education to their customers because they may be self-serving and not consistent with state goals and outcomes.

Response

Increasing education on environmental issues is an overarching strategy that supports all of the policy initiatives. The OEA and the Environmental Education Advisory Board are in the process of revising the state plan for environmental education called the *GreenPrint*. The *GreenPrint* provides guidance and policy recommendations to individuals and organizations that deliver or support environmental education programs to different audiences. Also, many aspects of the *GreenPrint* support the strategies and policies in this report. The OEA is committed to environmental education as it is a basic underpinning to existing and future strategies and policies. The goals/outcomes outlined in policy initiative four encourage the OEA to place additional resources towards the strategies and tactics outlined in the *GreenPrint*.

L. Volume-based pricing

Respondents

Duluth Meeting	St. Paul Meeting
Rochester Meeting	Minnesota Waste Association
Solid Waste Management Coordinating Board	Fergus Falls Meeting
Lead Staff Meeting	
Solid Waste Administrators Meeting	Citizen

Summary of comments

The volume-based pricing or “pay as you throw” (PAYT) issue received contrasting comments. Some believe that PAYT programs are a waste of taxpayers' money and will lead to more burning and burying of waste on-site. There was skepticism that waste containers do not contain a proportionate amount of waste by weight. The assumption that waste containers contain a proportionate amount of waste by weight is false. PAYT is a waste of taxpayer dollars. It will lead to burning and burying. Others said that the state should be bold in developing improved policy that supports PAYT programs to reflect the full costs.

Response

The PAYT issue is being recommended as a research initiative. The OEA plans to evaluate the benefits and impact of PAYT programs and the effectiveness of the current legislation.

M. Construction and demolition

Respondents

St. Paul Meeting
Western Lake Superior Sanitary District

Summary of comments

There were no negative comments received regarding this issue, rather there was support for the OEA’s position.

Response

The OEA met several times with C&D industry representatives in 1998. They have indicated a desire to recover and process this waste stream and believe market opportunities exist. As such, the OEA recommends doing additional research and to report back to the Legislature during the 2001 session.

N. Enforcement

Respondents

Crow Wing County Solid Waste Department
Olmsted County Solid Waste

Duluth Meeting
Fergus Falls Meeting
Minnesota Resource Recovery Association

Summary of comments

It was felt that if the state's waste management transition to the 21st century is to be successful, it must be enforced with stiff consequences. Also, there was a feeling that the state is doing a poor job of enforcing the current laws.

Response

Enforcement can not be overstated as an important and effective tool to use when all other practical measures have been exhausted. The enforcement of laws locally and by the state will continue to play an important role now and in the future. Staff and budget resources for enforcement are typically limited due to budget constraints, often beyond the control of the agencies and local governments attempting to enforce them.

O. Time frame

Respondents

Minnesota Chamber of Commerce Letter
National Solid Waste Management Association

Summary of comments

Concern was expressed that the OEA did not provide an appropriate time frame for public review and comment on a report of this significance. An additional concern was expressed that the R.W. Beck report was not available to comment on during the public review period.

Response

Over the past two years the OEA has presented segments of the R.W. Beck report along with the other various studies undertaken. The draft R.W. Beck report, which characterized resource conservation savings, became available more than a year ago in October 1998. This report also included greenhouse gas data for 1996. In November 1998, the draft R.W. Beck report was presented to the OEA's advisory councils (which have industry representatives) and copies were mailed to industry representatives, including a representative of the Minnesota Chamber of Commerce. There was no request to change the approach taken in the report or the data.

The draft R.W. Beck report was also presented at National Recycling Congress (NRC) in September 1998, and at the Recycling Association of Minnesota/Solid Waste Association of North America (RAM/SWANA) conference in November 1998. A workshop on greenhouse gas emissions was conducted by the OEA/MPCA in January 1999 for the advisory councils. The final R.W. Beck report added an analysis of forest carbon sequestration and historical greenhouse gas impacts as part of the GHG analysis. The final report was not available during the public review period on the draft policy report, because it was not back from the printer until mid-October 1999.

P. Format and editorial comments

Respondents

Citizen

Solid Waste Management Advisory Council Member

Becker County Environmental Services

Mike Lynn – Minnesota Pollution Control Agency

Citizens for a Better Environment

Response

No response required. The OEA extends our gratitude to those whose comments regarding format, content and editorials.