MICHIGAN

SOLID WASTE POLICY

Published By:

Michigan Department of Natural Resources

Waste Management Division

Resource Recovery Section

June, 1988

Printed on Recycled Paper

When faced with threats to our natural environment, the citizens of this state have always kept their commitment to a clean Michigan. Today, we must again meet the challenge and face our mounting volume of solid waste. This Solid Waste Policy, developed at my request and with the support of Michigan's Natural Resources Commission, is an exciting opportunity for our state to lead the way again in environmental protection.

Michigan faces a potential solid waste crisis and must act now to prevent serious damage to our quality of life. By generating excessive quantities of garbage — and by landfilling the bulk of it — we jeopardize our drinking water resources, consume valuable energy and land, waste potentially recoverable materials, and lose the opportunity to create jobs. Unless we act, costs of solid waste disposal will increase dramatically and some areas of the state may exhaust landfill capacity.

Fortunately, we can work together to promote proper solid waste management. Experience under our own Clean Michigan program and innovations in other states and nations strongly suggest that reducing the quantity of solid waste we produce, reusing materials, and recycling, composting, and waste-to-energy projects can revolutionize solid waste management across the state. We can protect our natural resources and stimulate new industries in landfill alternatives.

Change will not be easy. Attacking our solid waste problem means altering our waste disposal habits, taking extra time and effort to manage garbage properly. But I am confident Michigan's citizens will join us in fulfilling a vision of our future that preserves the beauty of our air, water, and land, an endowment which we must guard carefully for generations to come. Please join us in working to act upon Michigan's new solid waste policy.

James J. Blanchard
Governor

MICHIGAN SOLID WASTE POLICY

CONTENTS

	Page #
CHAPTER 1 — INTRODUCTION	3
Technology Goals	4
Relationship of the State Solid Waste Policy to County Solid Waste Management Plans	7
Policy Implementation Period	8
CHAPTER 2 — TECHNOLOGIES AND PRACTICES	11
Waste Reduction	11
Reuse	11
Composting	12
Recycling	13
Waste-to-Energy	17
Landfilling	18
CHAPTER 3 — EDUCATION	23
CHAPTER 4 — IMPLEMENTATION	27
REFERENCES	31
APPENDICES	
Appendix 1, Projected Goals	33
Appendix 2, Major Events and Target Dates	35
Appendix 3, Project Spotlights	37

DIRECTOR'S MESSAGE

On May 26, 1988, the Michigan Natural Resources Commission adopted a Solid Waste Management Policy for the State of Michigan. Adopting and implementing this policy is the top priority for the Michigan Department of Natural Resources for 1988 and is a critical component of Governor James J. Blanchard's programs for 1988.

The 1987 PA 209, which amends 1979 PA 641, the Solid Waste Management Act, requires that we develop a strategy to encourage resource recovery and establish waste-to-energy facilities. The act directs "[t]he strategy and report shall be prepared with the goal of reducing land disposal to unusable residuals by the year 2005." The Commission's policy statement is consistent with that legislation.

This policy builds on the experience in solid waste management of the State of Michigan during the past five years and upon a wealth of new information on costs, waste-stream composition, and technology alternatives generated through "Clean Michigan Fund" activities. It is a major step toward the implementation of a solid waste program for Michigan. There are several things which must be said about the plan from an overall perspective.

First, the policy emphasizes individual responsibility. In the long run, our success or failure in managing Michigan's solid waste will be determined by the actions of individual citizens and businesses. If we voluntarily choose an appropriate and constructive relationship with our environment, we will be successful in addressing our solid waste problems. Responsible action on the part of individuals, as citizens and as business decision-makers, is the single most effective and economical way to address our solid waste crisis.

Secondly, the policy emphasizes the need for cooperation among levels of government and the public and private sectors. No level of government can fully address the problem independently. Without cooperation, we will be unable to maximize the strengths which are particular to state and municipal government, and to the private sector. We will also be unable to take advantage of the flexibility which is a central element of this policy.

Thirdly, the policy represents a vision — a strategy — not a set of mandatory requirements. Those detailed elements must result from the implementation of the policy, not be decided prior to its implementation. The strategy is a long-term one. We cannot, in 1988, determine what actions are not appropriate for 1995. We can, however, set the framework for action and initiate the processes necessary to allow us to anticipate the problems of the next 20 years and react to them in the most constructive ways. That is the function of this policy.

Lastly, this approach is a policy which depends on positive and incentive approaches, rather than mandatory or penalty-oriented responses to the crisis. It emphasizes maintaining pressure in a positive way for waste reduction and for providing a full range of technical expertise and options to communities as they participate in responding to this crisis. If we are successful in addressing these problems, then this policy is far preferable to other approaches. It should be noted, however, that if major changes in behavior do not occur voluntarily and soon, then communities and the state will have little alternative but to pursue more intrusive regulatory measures which will mandate behavior changes. If that is necessary to protect the precious resources of this state, we will not shrink from the task. It is our firm belief, however, that the participatory approach which we propose will allow us to work together in the most positive way to reduce the amount of trash which we generate and to handle that trash which we do generate in a much more environmentally sound fashion.

David F. Hales, Director
Michigan Department of Natural Resources

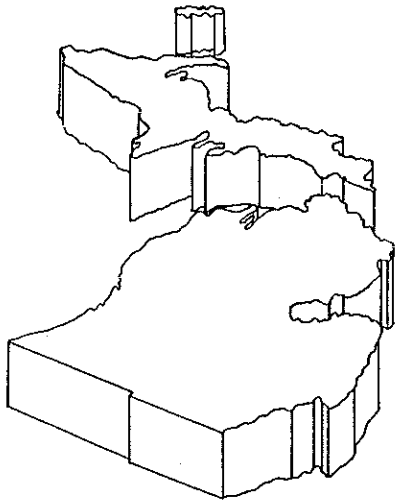
PREFACE

CHAPTER 1

INTRODUCTION

INTRODUCTION

This statewide Solid Waste Policy provides a comprehensive approach to reducing significantly the amount of solid waste currently disposed of in landfills in Michigan, and assuring proper disposal of solid waste that is landfilled. A recently completed series of waste stream assessments throughout the state (reference #1) indicates that an average of 32,000 tons per day of solid waste (residential, commercial, and industrial) is generated in Michigan. This amounts to about 11.8 million tons per year. The great majority of this waste is disposed of in landfills.



The overall goal of the statewide policy is to promote waste reduction, reuse, composting, recycling and incineration with energy recovery while limiting use of landfills. The policy sets forth a range of statewide goals for each resource recovery technology; however, it does not and cannot mandate that any community conform exactly to these goals. A mix of technologies, most suited to the needs, characteristics, and preferences of each

"The overall goal of the statewide policy is to promote waste reduction, reuse, composting, recycling and incineration with energy recovery, while limiting use of landfills."

community, will ultimately provide the maximum diversion of solid waste from landfills. The information and goals contained in this document should help guide state policy and local decisionmakers in the choices that must be made in order to reduce dependence on landfills.

As the statewide policy is implemented on a regional and local basis, decisionmakers and the public should recognize that changes in solid waste management practices will not occur overnight. The predominant method of disposal in Michigan at present, landfilling, will continue to play a significant role in solid waste management during the foreseeable future, despite state policies to reduce reliance on landfills. Siting of some landfills will continue to be necessary. Additionally, communities should avoid reliance on any single technology as a solution to solid waste management problems. Solutions that are perceived to be simple and to require little change in current waste management habits, particularly waste-to-energy technology, should be carefully scrutinized.

"... changes in solid waste management practices will not occur overnight."

"Reaching the goals of the state Solid Waste Policy cannot be done by government alone."

"...goals must be reviewed periodically as implementation of the policy proceeds."

Ultimately, a combination of solid waste reduction, reuse, recycling, composting, incineration with energy recovery and landfilling will provide a balanced approach to solid waste management problems statewide.

Because actual solid waste management methods will vary significantly among regions of the state after adoption of this policy, state government will work closely with regions to interpret and adjust the statewide goals to conform to local problems and opportunities. Of particular importance is the interpretation of the statewide policy for rural and northern Michigan. Lighter population density, greater distances between larger communities, and financial limitations are likely to make the attainment of goals for capital intensive technologies, especially waste-to-energy, more difficult in these areas.

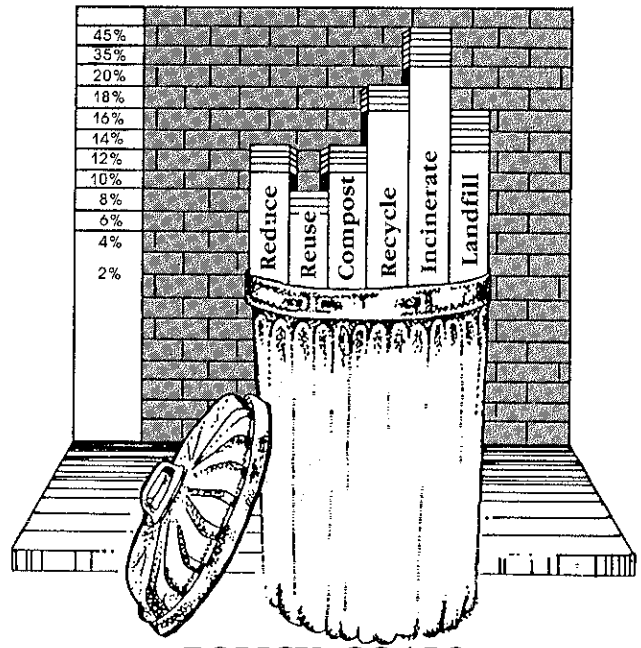
This policy will be implemented in partnership with local communities, constituent groups, and the general public through a variety of methods. A first priority will be efforts to publicize the statewide goals and work cooperatively to set appropriate regional or local goals.

Reaching the goals of the state Solid Waste Policy cannot be done by government alone. Support from individual citizens and from Michigan's commercial and business community is critical. Implementing alternative solid waste management practices will affect the lifestyles of every Michganian; it will also require the private sector to make adjustments. But it will also provide an opportunity to create new jobs in emerging and expanding waste management, reduction, and recycling enterprises, and to provide for a clean Michigan for generations to come.

Technology Goals

The technology goals in this policy are long-range goals, to be achieved by the year 2005, and are expressed in ranges rather than specific percentages. Reasons for this include: (1) the goals are not mandates; (2) some technologies will be better suited to a particular community than others, and therefore a greater percentage of the waste stream could be managed by that particular technology than the goals may suggest; and (3) the goals represent what can happen under a variety of circumstances and conditions. While one jurisdiction may achieve 40 percent recycling and zero incineration, another may achieve 70 percent incineration and 20 percent recycling.

Further, these goals must be reviewed periodically as implementation of the policy proceeds. Future regulations and the development and application



POLICY GOALS

of new solid waste management approaches and technologies will alter these goals. The state should review the statewide goals every five years prior to the development of updated county solid waste management plans, so that these plans can reflect revisions in this policy.

The resource recovery technologies and management techniques in the Solid Waste Policy may be briefly described as follows:

1. ***Waste Reduction*** (source reduction) is a philosophy or practice which results in not creating or generating waste. The industrial and commercial sectors can contribute most signifcantly to waste reduction. To a lesser extent, government and individuals can also employ waste reduction practices. The policy goal for waste reduction is eight to 12 percent of the solid waste stream.

2. ***Reuse*** is using a product again, either for its originally intended purpose or another purpose, without changing its original form.

   Reuse can be practiced by individuals, government and businesses alike. The policy goal for reuse is four to six percent of the solid waste stream.

3. ***Composting*** is the natural decomposition of organic matter, such as leaves, grass clippings, garden waste and small brush, into a material called humus. As used in the policy, composting refers to low technology applications for yard waste that householders can implement in their backyards, or local governments can undertake community-wide, with a minimum of equipment. The policy goal for composting is eight to 12 percent. This goal can be achieved through significant expansion of markets for this material. As more sophisticated composting technology is perfected, more food waste and other compostables in the waste stream may be handled in this manner. This strategy, however, does not include high technology composting processes in goals, costs, or recommendations.

4. ***Recycling*** is a major component of this policy. Recycling is the separation, collection, and processing of materials which would otherwise become solid waste, for conversion into raw materials or new products. Separation of materials for recycling can be accomplished either at the source (household, office or business) or on a larger scale at collection and processing facilities.

   The recycling goal of this policy is 20 to 30 percent of the municipal solid waste stream. This goal can also be achieved through significant expansion of markets for these materials.

"Future regulations and the development and application of new solid waste management approaches and technologies will alter policy goals."

"The recycling goal of this policy is 20 to 30 percent of the municipal solid waste stream."

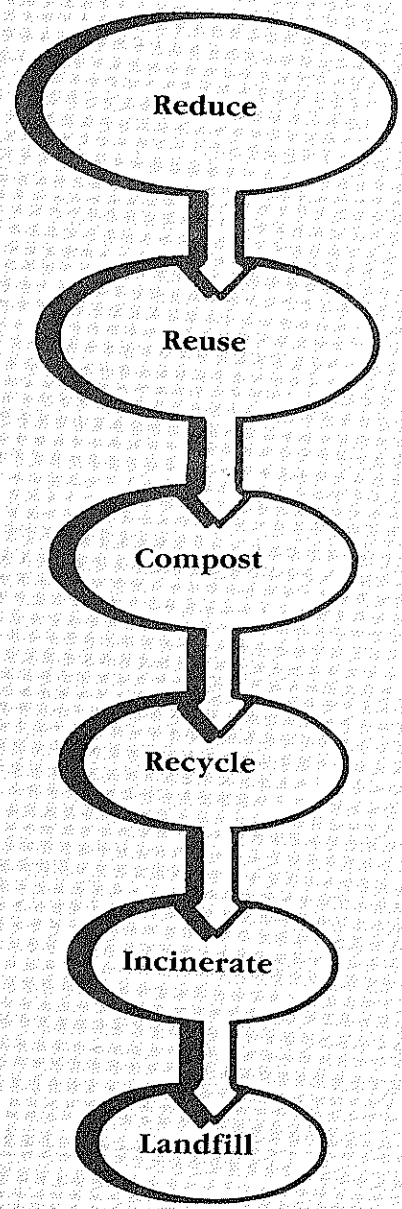
"The most effective solid waste policy will involve an integrated system incorporating a mix of technologies to accomplish the greatest recovery and utilization of solid waste."

"All of the technologies are compatible and may proceed simultaneously."

5. ***Incineration with energy recovery, or waste-to-energy,*** is also a component of Michigan's Solid Waste Policy. Waste-to-energy involves the incineration of solid waste at high temperatures under controlled conditions, with energy recovery. It is a capital-intensive technology, and in the more rural areas of the state, will require a regional approach to be affordable. The waste-to-energy goal for the policy is 35 to 45 percent of the solid waste stream.

6. ***Landfilling*** is the final element in the state's solid waste hierarchy. Some 85 to 90 percent of Michigan's solid waste is currently deposited in land disposal facilities. Most of this waste enters landfills licensed under the Solid Waste Management Act, PA 641 of 1978. While the least desirable option because of the risk of groundwater contamination and the waste of some valuable materials, landfilling is still the cheapest option and will continue to play a part in solid waste management. The landfilling goal of the policy is 10 to 20 percent of the waste stream, including residues from incineration.

The most effective Solid Waste Policy will involve an integrated system, incorporating a mix of technologies to accomplish the greatest recovery and utilization of solid waste. This comprehensive system may blend low technology approaches such as waste reduction and yard waste composting with high-technology approaches such as recycling and incineration with energy recovery. All of the technologies are compatible and may proceed simultaneously. In fact, implementation of a balanced mixture of these technologies ensures the most environmentally sound, energy efficient, cost effective and socially acceptable approach to solid waste management.



This hierarchy promotes the simplest, cost-effective alternatives first.

The state Solid Waste Policy promotes a hierarchy of resource recovery technologies:

1. Reduce solid waste;

2. Reuse materials;

3. Compost yard wastes such as leaves and grass clippings;

4. Recycle everything possible;

5. Incinerate whatever cannot be diverted by the previous methods and recover the energy resulting from the combustion of these materials, and;

6. Landfill the residuals.

This hierarchy promotes the simplest, most cost-effective alternatives first. These alternatives should be the first priority for receiving the limited state funds available for solid waste management. All components, however, are viewed as integral elements of a comprehensive solid waste management system.

Relationship of the State Solid Waste Policy to the County Solid Waste Management Plans

The Solid Waste Management Act, PA 641 of 1978, as amended, requires every county in the state to prepare a 20-year solid waste management plan. Each plan is to assure that all non-hazardous solid waste generated in the planning area is collected and recovered, processed, or disposed of at facilities which comply with state laws and rules. The plans are to be updated every five years.

County solid waste management plans were scheduled to undergo five-year updates in 1988. It is therefore important to assure that the goals of the state Solid Waste Policy are reflected in the plan updates. This will be accomplished through the provisions of PA 6 of 1988, and guidance developed by the Department of Natural Resources. PA 6 amends Act 641 to require every county five-year update to evaluate the feasibility of recycling and composting, and if feasible, develop an implementation program. The development of an implementation program for recycling and composting will make the five-year updates compatible with this state Solid Waste Policy.

"It is . . . important to assure that the goals of the state Solid Waste Policy are reflected in the plan updates."

To assure that the five-year updates address the waste-to-energy goals of the policy, the Department of Natural Resources is also asking counties to evaluate the feasibility of waste-to-energy technology as a part of the five-year update. This evaluation will be assisted through information and feasibility studies developed under the Clean Michigan Fund program. The department guidance stresses the need to develop a program to implement feasible alternatives to landfilling.

The five-year updates will likely have greater impact in directing local solid waste management practices to meet the statewide policy's goals for recycling, composting, and waste-to-energy. The goals for waste reduction, reuse, and development of markets for recycled materials will likely best be accomplished through statewide initiatives. However, the updates should address local roles in implementing or participating in statewide initiatives, for reduction, reuse, and recycling market development.

"The goals for waste reduction, reuse, and development of markets for recycled materials will likely best be accomplished through statewide initiatives."

The goals of the policy are statewide goals, and may not be met by every county. The success of

"... success of the five-year updates of county solid waste management plans should be measured by how well they cumulatively (not individually) meet the goals of the policy."

"This policy establishes percentages of the solid waste stream to be affected by the different resource recovery technologies by the year 2005..."

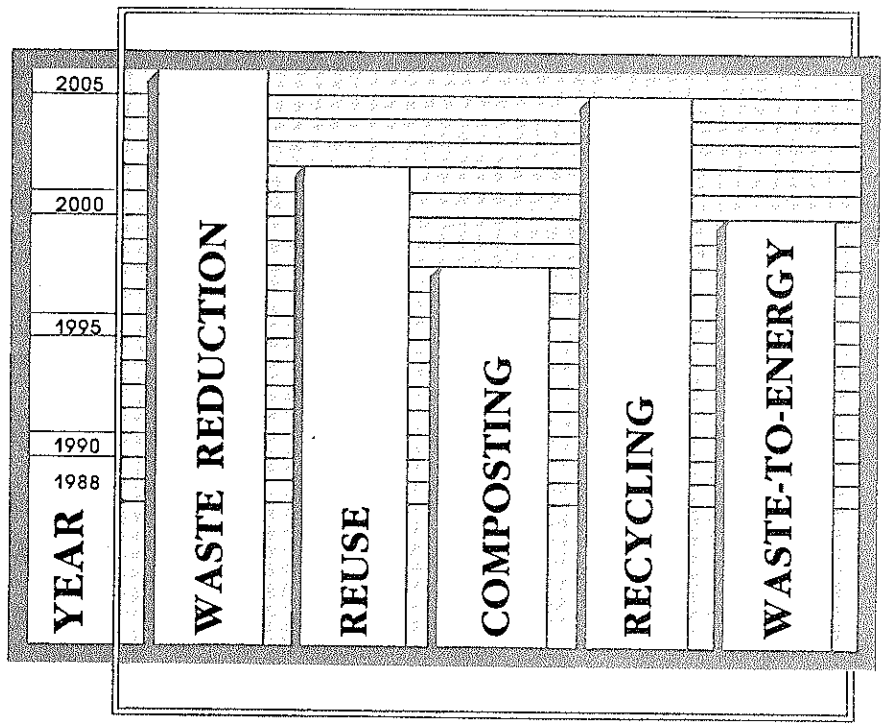
the five-year updates of county solid waste management plans should be measured by how well they cumulatively (not individually) meet the goals of the policy.

Implementation Period

PA 209 of 1987 amends the Solid Waste Management Act to set a long-range goal for implementing the state's Solid Waste Policy. Act 209 requires the director of the Department of Natural Resources to develop a strategy that will reduce land disposal of solid waste to only "unusable residuals" by the year 2005. This, in effect, would require that all solid waste be reduced, reused, composted, recycled, or incinerated (with energy recovery) by the year 2005, with only whatever is remaining disposed of in landfills. This policy is consistent with the legislated implementation period for the state solid waste strategy.

This policy establishes percentages of the solid waste stream to be affected by the different resource recovery technologies by the year 2005, the goal of Act 209. The accompanying chart shows current percentages of solid waste managed through various methods, interim goals, and long-term goals for the year 2005.

TIME VS. POLICY GOALS



TECHNOLOGY

CHAPTER 2

TECHNOLOGIES & PRACTICES

TECHNOLOGIES AND PRACTICES

Before discussing specific solid waste management technologies and practices, it is important to note that all of these can be improved by the proper separation of hazardous materials, especially from household wastes. The state Solid Waste Policy calls for state financial assistance and appropriate legislation to stimulate the expansion of household hazardous waste management programs. Waste collection days have already successfully educated residents of individual communities about the nature of hazardous products commonly found in household waste and on the need to dispose of them properly. This policy supports the establishment of permanent programs to build upon this foundation. A practical option for many communities, using state and local funds, will be the establishment of household hazardous waste collection centers, where citizens may make an appointment to drop off wastes for proper disposal. The state should also explore the development of legislation and programs to encourage the separation and proper disposal of batteries and other common household materials which may pose unacceptable risks in a landfill, or as feedstock for incineration facilities.

Waste Reduction

Reducing the quantity of waste generated at the source is the most direct and cost effective resource recovery technology. Waste reduction is primarily achieved through extensive information and education efforts, although state incentives or regulations could also reduce solid waste. These efforts may involve the general public, commercial establishments, institutions, offices and industries.

A variety of approaches may be employed to reduce the amount of material that eventually ends up in the waste stream. For example, consumers may choose to purchase products with less packaging. Commercial establishments may elect to provide merchandise in bulk or in wrappings and containers that may be recycled or refilled instead of discarded. Waste reduction measures can also be established in offices and institutions, while industries may make process changes and improvements resulting in less waste.

The state Solid Waste Policy estimates that between eight and 12 percent of Michigan's waste stream could be diverted as a result of serious waste reduction efforts. The state must take the lead in providing educational and technical assistance in order to accomplish this goal. Public and private entities at the local level also have an important role in waste reduction initiatives. The actual costs associated with accomplishing the waste reduction goals are difficult to quantify; however, costs will arise chiefly from education programs and financial incentives in some cases.

Legislation related to waste reduction focuses primarily on packaging concerns. Often this legislation attempts to reduce waste by promoting recycling or requiring that a product be degradable. For example, several Great Lakes states are considering legislation that would require the labeling of all plastic containers as to resin type in order to facilitate separation of plastics for recycling. Also, much discussion has focused on the need to establish taxes or bans on the use of packaging materials that are not recyclable or biodegradable.

Reuse

The diversion of materials from the waste stream through reuse is closely related to waste reduction. Reuse, however, specifically involves the use

"Reducing the quantity of waste generated at the source is the most direct and cost effective resource recovery technology."

"The state must take the lead in providing educational and technical assistance in order to accomplish this (policy) goal."

"... using washable dishes as opposed to disposable paper or styrofoam plates can have a substantial impact on waste quantities."

of a product either for its originally intended purpose or another purpose without changing its original form. For example, using washable dishes as opposed to disposable paper or styrofoam plates can have a substantial impact on waste quantities. The concept of "disposable" is increasingly used as a marketing tool for consumer items such as diapers, razors, cigarette lighters, even cameras. All of these items are also available as durable, reusable products. Affecting a change in consumer preferences for reusable products is one aspect of accomplishing waste reduction through reuse.

Another approach involves the reuse of products for new purposes. Popular examples include using egg cartons as seed trays or empty butter/margarine tubs as storage containers.

The state Solid Waste Policy estimates that between four and six percent of Michigan's waste stream could be diverted through reuse. As with waste reduction, accomplishing the goals for reuse will require extensive educational efforts. Statewide efforts could be combined with educational efforts related to waste reduction, increasing the cost efficiency of both efforts. The actual costs will depend on many factors, including the design and extent of the educational/information efforts. The state should again take the lead. Local involvement and resources will be critical to ensure success. Existing efforts and accomplishments related to both waste reduction and reuse will be further discussed in Chapter 3 — EDUCATION.

"Composting involves the natural decay of organic wastes and produces a finished product that is valuable as a mulch or soil conditioner."

Composting

Leaves, grass clippings, and other residential yard debris can be diverted from landfill disposal by composting. Composting involves the natural decay of organic wastes and produces a finished product that is valuable as a mulch or soil conditioner. Composting can be done by individuals in backyards, or implemented on a neighborhood or municipal level. In the latter case, yard wastes are either collected from each household, or brought by residents to a central composting site. The finished compost may be given to the public, sold to local nurseries or used in community parks or landscape projects.

In addition to providing valuable plant nutrients, composting also reduces disposal costs by diverting eight to 18 percent of an average community's waste from landfills (reference #1). Often the avoidance of landfill tipping fees for this substantial quantity of waste is a primary economic motivation for establishing municipal composting programs.

COMPOST! Michigan.

The Solid Waste Policy establishes a range of eight to 12 percent as an attainable goal for composting. The successful implementation of composting programs will rely on several factors. The state should assist in implementation by identifying state land, and/or, in areas of the state where little suitable land is available and where it is consistent with the uses for which state land is managed, providing such land for use in composting projects and by providing funds where necessary for capital costs. Also instrumental will be enactment of state or local bans on leaf burning, state and local publicity and education efforts to create community involvement and awareness, proper program design and operation, resolution of odor and soil containment concerns, and development of specific markets for the finished compost product.

Composting startup and operation costs will vary depending on the size of the operation, method and frequency of collection, and the intensity of the compost process. The estimated total cost for accomplishing a median statewide composting goal of 10 percent is $13,630,000. This estimate is based on the following assumptions and calculations:

- *32,000 tons per day (TPD) total waste generation in Michigan*
- *10 percent goal = 3,200 TPD (300 TPD presently composted; 2,900 TPD remaining to reach goal)*
- *average composting cost = $4,700 per ton/day of capacity**
- *2,900 TPD × $4,700 per ton/day = $13,630,000*

It is estimated that over 100 communities in Michigan are now involved in some type of composting program. Many of these programs have not documented tonnages and it is, therefore, difficult to accurately assess the existing overall level of composting in the state. It is estimated that approximately 300 TPD is being composted statewide.

Since simple, low cost community composting programs can have a tremendous impact on this diversion of waste from landfills, legislative initiatives should be enacted to help hasten the development of composting programs. A statewide ban on the landfilling of yard wastes (leaves, grass and brush) would require the establishment of landfill alternatives such as composting. Such a ban should be phased in and pursued in conjunction with local burning ordinances and capitalization assistance for composting programs.

Recycling

Recycling is the process whereby materials which would otherwise become solid waste are collected, either source or site separated, processed, and returned for conversion into raw materials or new products.

Recycling reduces waste, saves energy, protects natural resources, reuses resources, and creates jobs. A ton of paper recycled, for example, conserves about 3½ cubic yards of landfill space, avoids $12-30 in landfill disposal costs, and can be marketed for sale. Recycling is already well-established for certain materials, particularly paper. In 1987, over four million tons of waste paper were shipped overseas to be recycled, and this quantity is expected to double by the year 2000.

"It is estimated that over 100 communities in Michigan are now involved in some type of composting program."

"A statewide ban on the landfilling of yard wastes (leaves, grass and brush) would require the establishment of landfill alternatives such as composting."

---

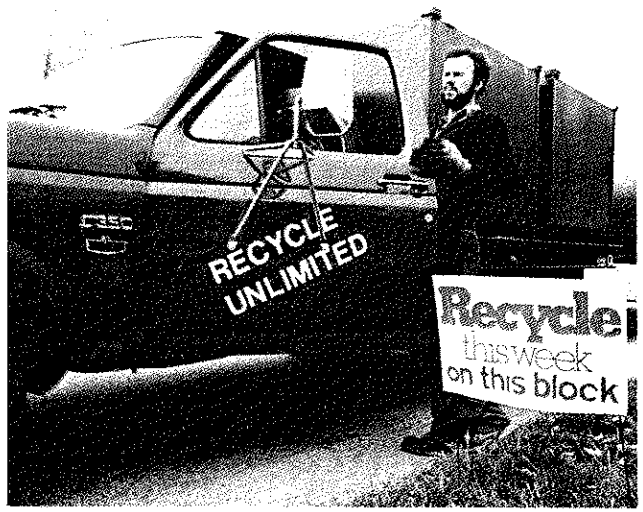
* *NOTE: These cost figures are estimated for use in planning the necessary financial commitment at the state level. At the local level, these costs could be greatly reduced by such things as local contributions of land and site improvements, sharing of equipment and volunteer assistance.*

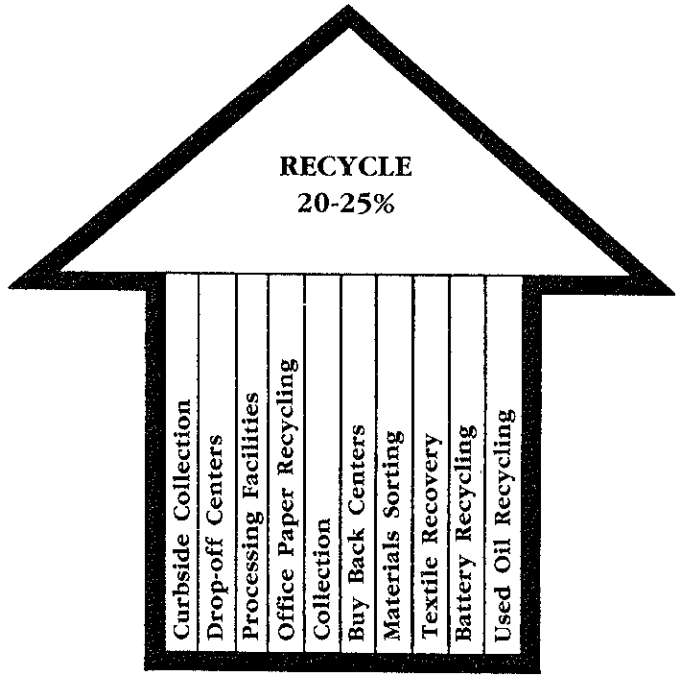
"Recycling reduces waste, saves energy, protects natural resources, reuses resources, and creates jobs."

"...it is estimated that between 10 and 15 percent of the waste stream is recycled."

The recycling of discarded municipal and residential materials such as glass, tin (steel) cans, newspaper, and plastics cannot always be expected to cover expenses merely through the sale of recovered materials. Recycling economics should be calculated not only in light of revenues from the sale of materials, but also in light of disposal costs avoided.

The state Solid Waste Policy promotes a statewide goal of recycling 20 to 30 percent of the solid waste stream. While it is difficult to determine the current level of recycling in Michigan, it is estimated that between 10 and 15 percent of the waste stream is recycled. Recycling levels attributed to Michigan's Beverage Container Deposit Legislation and recently conducted market studies (reference #3) support this estimate, and indicate that the Solid Waste Policy recycling goal is achievable. Existing levels of residential recycling lag far behind recycling levels in the commercial and industrial sectors. Therefore, this policy stresses increased recycling of municipal solid waste.





Recycling is well underway in the commercial and industrial sectors. The economics of avoided disposal costs are quite evident in these sectors and often complemented by the uniform composition of waste which makes it relatively easy to accommodate recycling. As waste materials become more and more dispersed and commingled and farther from their point of origin, more energy, labor, time and money are required to process them. Therefore, it stands to reason that recycling is better developed in the commercial and industrial sectors than in the municipal sector. The industrial sector has also had the advantage of focusing on the high-grade materials which yield the highest rate of economic return.

Reaching the goal of recycling 20-30 percent of Michigan's solid waste stream will require recycling systems using various mixes of:

- *Curbside collection*
- *Drop-off centers*
- *Regionalized processing facilities*
- *Office paper recycling*
- *Collection at multi-family dwellings*
- *Buy-back centers*
- *Used oil recycling*
- *Battery recovery and recycling*
- *Textiles recovery and recycling*
- *Mechanical and/or labor intensive materials sorting operations*

The 11 recycling feasibility studies conducted under the Clean Michigan Fund program (reference #4) show that recycling will work effectively in every area of the state. The specific approach for each region, county, and municipality will be characterized by a unique blend of the recycling technologies listed. Different programs will function more cost effectively in different areas of the state, affecting varying degrees or percentages of an area's solid waste.

Certain technologies work best in certain types of communities characterized by varying geographic, social, and economic factors. These factors are identified in Volumes I and II of the Recycling Feasibility Background Reports (references #5 and 6). These reports identify strong marketing opportunities in southeastern and southwestern lower Michigan and the western half of Michigan's Upper Peninsula. These regions coincide with Michigan's population centers and suggest good potential for expanding recycling opportunities. Studies also suggest that regionalized processing facilities should be closely examined for northern lower Michigan and the Upper Peninsula. Sites contiguous with, or adjacent to waste-to-energy facilities are excellent locations for recycling drop-off, processing, and/or site separation plants. Recycling facilities at transfer stations are also excellent locations, since they reduce unnecessary waste handling and transportation, while providing the user with incentives to recycle. This approach effectively demonstrates the direct link between solid waste management and recycling.

"Certain technologies work best in certain types of communities characterized by varying geographic, social, and economic factors."

Experience has shown that curbside collection of recyclables and the use of curbside boxes is necessary to divert substantial percentages of municipal solid waste. Newly emerging trends in curbside

". . . transfer stations . . . reduce unnecessary waste handling and transportation, while providing the user with incentives to recycle."

"Every county and Act 641 solid waste planning committee can structure a system most appropriate to its own population, community characteristics, industries, and waste composition."

"... by creating an atmosphere favorable to the growth of the recycling industry, state government can help accomplish recycling goals."

collection present increasing opportunities for local waste haulers to provide this service. Sustained high participation rates are crucial. Public education and promotion are essential. This public education effort must be a continuing commitment to sustain high diversion rates. Successful curbside collection is a formidable undertaking that needs the stability of institutional support and strong local commitment in order to be effective.

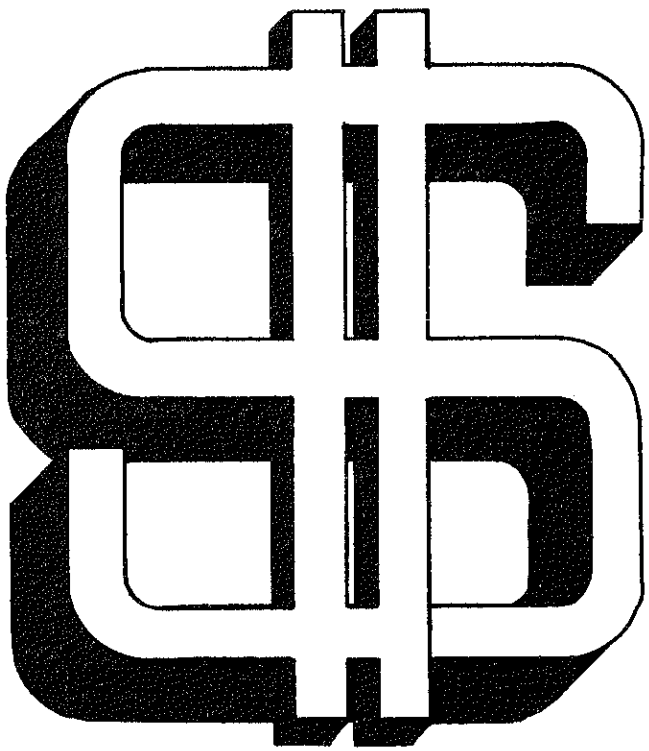
Every county and Act 641 solid waste planning committee can structure a system most appropriate to its own population, community characteristics, industries, and waste composition. Each community can adopt appropriate recycling goals based on an evaluation of waste composition data in the county's solid waste management plan, present and projected disposal costs, and availability and distance to markets for recycled materials. Establishing interim goals may help sustain movement towards the maximum level of recycling deemed feasible.

Not every city, village or township recycling project needs its own baler, granulator, conveyor, and related processing equipment. Reducing the costs of collection and transportation is also particularly important for certain materials, such as glass containers, tin cans, and some grades of waste paper. What these items have in common is that adequate markets exist if the material could be collected and transported at a reasonable cost. For these reasons, there has evolved a trend towards development of large-scale regional processing facilities for recovered materials. This policy calls for state financial and technical support of such regional processing facilities.

Collection of separated materials alone does not constitute recycling. Michigan's Solid Waste Policy includes a clear call for development of markets for the separated materials so that they can be processed into useful products. Market development can be accomplished in a number of ways. First, the state must demonstrate leadership, since economic markets can best be created on a large scale, by targeting the recycling industry for expanded technical and financial assistance and by removing any regulatory impediments to the growth of the industry. Second, the state must set an example for the private sector, local units of government, and individual citizens by dramatically expanding the purchase and use of recycled products, demonstrating their practicality in a number of applications. Third, state government can ultimately be most instrumental in promoting development of markets for these materials by developing or providing clear, useful information to businesses, local units of government, and citizens on the quality and cost of recycled products and by serving as a clearinghouse linking those collecting recycling goods with those able to convert them into products. Simply by creating an atmosphere favorable to the growth of the recycling industry, state government can help accomplish recycling goals.

The establishment of effective recycling programs in Michigan will require the involvement, support and cooperation of the private and public sectors, numerous interest groups, commercial, industrial and institutional entities. There is a role for each, and each will contribute toward recycling the highest percentage of the waste stream deemed "feasible." Feasible is generally defined as the cost of recycling versus the cost of traditional waste collection, transportation, and disposal.

The costs associated with implementing recycling technology will vary depending on the specific characteristics of the program. The estimated total cost for accomplishing a median statewide



recycling goal of 25 percent of the state's solid waste stream is approximately $84,448,000. This estimate is based on the following assumptions and calculations:

- *$32,000 TPD total waste generation in Michigan*
- *25 percent goal = 8,000 TPD*
- *estimated current recycling level = 12 percent = 3,840 TPD*
- *4,160 TPD (13 percent) remaining to reach goal*
- *average recycling cost = $20,300 per ton/day of capacity **
- *4,160 TPD × $20,300 per ton/day = $84,448,000*

Funding for recycling projects could take the form of matching state grants for capitalization and equipment and/or tonnage grants, where grants are given based on demonstrated accomplishments in tons of material diverted.

Community leaders and decisionmakers can now acknowledge recycling as a viable solid waste management technology. The closure of illegal dumps, fully allocated disposal costs, and improving market conditions will continue to drive Michigan communities towards recycling. In order to ensure the continued growth and development of recycling, public funding will be essential.

"Costs associated with implementing recycling technology will vary depending on the specific characteristics of the program."

Waste-to-Energy

The incineration of solid waste with energy recovery, commonly referred to as waste-to-energy, can reduce waste volumes by 80 to 95 percent, while recovering a valuable energy resource. Waste-to-energy (WTE) facilities are currently in operation throughout the United States, Europe, and Japan.

"Community leaders and decisionmakers can now acknowledge recycling as a viable solid waste management technology."

---

* *NOTE: The Clean Michigan Fund recycling feasibility studies have indicated that the average cost per ton/day of capacity associated with implementing recycling technology is approximately $20,300. This cost also includes the cost of materials collection. This cost figure is an estimate for use in planning the necessary financial commitment at the state level. At the local level, these costs could be greatly reduced by such things as local contributions of land and site improvements, sharing of equipment, utilities and office space, and volunteer assistance. On a per ton basis, the cost of recycling, given good participation by citizens, will range between $30 and $80 per ton, including collection.*

"The statewide Solid Waste Policy estimates that 35 to 45 percent of the solid waste stream will remain to be incinerated after waste reduction, reuse, composting, and recycling initiatives are implemented."

"Waste-to-energy facilities represent an opportunity to recover energy from a portion of the waste stream that would otherwise be landfilled. This opportunity should only be pursued in conjunction with extensive community involvement, and as part of an integrated system which includes waste reduction, reuse, composting, and recycling."

In Michigan, several facilities for mixed municipal waste are in various stages of planning and design. In early 1988, one Michigan facility was operating, located in Jackson County. This mass burn facility is designed to handle 200 tons of waste per day. Two other municipal incinerators were in operation in Michigan; these facilities do not recover the energy generated as a result of combustion.

Approximately four percent of Michigan's solid waste stream is currently incinerated, either with or without energy recovery. By the year 1990, with the addition of municipal WTE facilities in Kent County and Detroit, approximately 19 percent of Michigan's solid waste stream will be incinerated. The statewide Solid Waste Policy estimates that 35 to 45 percent of the solid waste stream will remain to be incinerated after waste reduction, reuse, composting and recycling initiatives are implemented. Assuming the short-term (1990) attainable level of 19 percent, an additional 21 percent would accomplish a median long-term level of 40 percent of the municipal solid waste stream being handled by incineration. This estimate is based on the following assumptions and calculations:

- *32,000 TPD total waste generation in Michigan*
- *40 percent level = 12,800 TPD*
- *estimated short-term attainable WTE level — 19 percent = 6,080 TPD*
- *average WTE cost = $115,000 per ton/day of capacity*
- *6,720 TPD × $115,000 per ton/day = $772,800,000*

Local communities and the private sector should be the primary source of financing for waste-to-energy facilities. Several current projects demonstrate that state financial assistance is not necessary in the construction and operation of these facilities. Further, the limited state assistance available for solid waste management should first be provided to those options which are first in the proposed solid waste management hierarchy: waste reduction, reuse, recycling, and composting. However, to increase separation of materials prior to incineration or to assure installation of proper air pollution equipment to reduce emissions, the state should offer limited subsidies.

Many issues arise from the development of WTE facilities, including questions about toxic air emissions, fly ash and bottom ash toxicity, and power sales contract rates. Proceeding with the goals of the statewide Solid Waste Policy requires careful consideration and balancing of concerns and priorities. Waste-to-energy facilities represent an opportunity to recover energy from a portion of the waste stream that would otherwise be landfilled. This opportunity should only be pursued in conjunction with extensive community involvement, and as part of an integrated system which includes waste reduction, reuse, composting, and recycling. This integrated approach is further discussed in Chapter 4 — IMPLEMENTATION.

Landfilling

The landfilling of solid waste is the final component of a comprehensive solid waste management system. Landfilling will still be a necessary component for handling residuals that are not diverted by waste reduction, reuse, recycling, composting or waste-to-energy. This includes incinerator residues.

Landfill facilities that are developed must be properly planned, constructed, licensed, and operated. The siting of landfill facilities must be con-

sistent with county Act 641 solid waste management plans. Costs associated with landfill development are continuing to increase due to more stringent standards that must be met in order to assure adequate environmental protection.

The proper closure of facilities that are not operating according to the standards contained in the Solid Waste Management Act, PA 641 of 1978, is also an important element of the strategy. Currently in Michigan, there are 83 unlicensed landfill facilities that are in need of full closure. At an average cost of $325,000 per closure, the total cost is approximately $27 million. The state should continue to provide up to 75 percent of this cost, or approximately $20 million.

"Landfilling will still be a necessary component for handling residuals that are not diverted by waste reduction, reuse, recycling, composting, or waste-to-energy."

"Costs associated with landfill development are continuing to increase due to more stringent standards . . ."

CHAPTER 3

EDUCATION

EDUCATION

Education efforts play a critical role in the successful implementation of all components of the statewide Solid Waste Policy. Waste reduction and reuse are especially dependent on public information efforts since a systems change or behavioral change is required to implement the technology. Likewise, recycling and composting programs need extensive and consistent publicity in order to maintain sufficient participation. In all cases, the general public needs to understand that a solid waste problem exists, and then be able to obtain adequate information — both general and technical — in order to effectively implement and participate in resource recovery activities.

Education efforts should be aimed at all levels of development including school age children, young adults, and older adults. The most effective approach will use a variety of media such as newspaper and magazine articles, newsletters, radio, television, and personal presentations. Education initiatives need to be pursued at both the state and local levels, and include information relevant to both the general public and commercial/industrial sector.

Current initiatives at the state level include the development of curricular materials for use in kindergarten through 12th grade. These materials will complement existing courses taught in Michigan schools and inform both teachers and students on solid waste problems and various resource recovery technologies.

A second educational initiative at the state level is aimed at consumers and promotes the purchase and use of recycled products. The "Buy Recycled Products" campaign attempts to create an increased demand for materials collected in Michigan recycling programs by stimulating consumer preference for recycled products which will, in turn, influence manufacturers and suppliers at the retail level.

The Michigan Department of Natural Resources has also developed, and makes available at no charge, general publicity materials for use by local entities. These materials include brochures, stickers and other promotional items, logo sheets, posters, and audio-visual materials.

". . . the general public needs to understand that a solid waste problem exists, and then be able to obtain adequate information . . . in order to effectively implement and participate in resource recovery activities."

"Education initiatives need to be pursued at both the state and local levels . . ."

"The 'Buy Recycled Products' campaign attempts to create an increased demand for materials collected in Michigan recycling programs by stimulating consumer preference for recycled products."

"... in the areas of waste reduction and reuse, an intensive (education) effort is required in order to meet the goals of the proposed policy."

A wide variety of educational efforts exist at the local level. Local recycling programs use various techniques to publicize their programs and encourage participation. There is a definite need for funding assistance to continue existing efforts and expand outreach. This may take the form of local support or state support through grants or materials development.

The state has an important role in continuing existing efforts and encouraging new educational initiatives. Particularly in the areas of waste reduction and reuse, an intensive effort is required in order to meet the goals of the proposed policy. This effort, combined with educational needs related to recycling, composting, waste-to-energy, and other solid waste management issues, will require a coordinated approach involving other state departments, businesses, local government and local informational networks. Technical assistance, including the specifics of program implementation, must also be a part of this effort. The costs associated with attaining the policy goals through education are difficult to estimate. Based on the costs documented for other statewide education/information programs involving all of the elements discussed in this chapter, it is estimated that the goals of this policy may be achieved with an education component in the range of $3 million to $4 million annually.

CHAPTER 4

IMPLEMENTATION

IMPLEMENTATION

Successful implementation of Michigan's Solid Waste Policy depends on many developments. Basic economic considerations will drive the solid waste management emphasis from landfilling towards resource recovery alternatives. Increasing costs associated with landfill development and operation, combined with the need to develop alternative sources of energy and raw materials, are making resource recovery alternatives more attractive to both public and private entities. The opportunity to recover valuable energy and material resources from discarded waste has several economic advantages. In addition to the value associated with the sale of recovered materials or the energy recovered from the combustion of waste materials, there is an even greater economic advantage in the avoidance of disposal costs. Every ton of material that is reused, recycled or otherwise utilized as a resource, is one less ton that requires disposal. These "avoided costs" are a legitimate part of the solid waste management cost equation. Municipalities, businesses, and other public and private entities must consider the total economic picture in order to decide the most desirable approach to managing their solid waste.

Another part of this picture involves hidden costs. These costs may not be readily identified in the initial equation, but they do involve existing or potential expenditures related to solid waste management. For example, the energy value of materials lost to landfilling or potential groundwater contamination cleanup costs to the public may be viewed as hidden costs. In addition, costs related to solid waste management are often hidden in the tax structure. Some communities utilize a charge per bag of waste. This system is a more equitable approach and presents a financial incentive to reduce waste. It may also set the stage for implementation of curbside recycling programs which incorporate a reduced charge for the collection of a bag of recyclables.

The materials collection process is a key part of the comprehensive solid waste management system. Whether the materials are recycled, composted, incinerated or landfilled, a collection mechanism must be in place to aggregate the appropriate materials for processing or disposal. The costs associated with the collection and transportation of materials generally account for between 70 and 80 percent of the total costs of the overall solid waste management system.

In addition to providing collection services, waste haulers may also play a role in encouraging the expansion of resource recovery opportunities. For example, providing separate collection of recyclable materials, or establishing a variable collection fee to encourage separation of materials for recycling, are methods by which a waste hauler may encourage the recovery of significant quantities of materials.

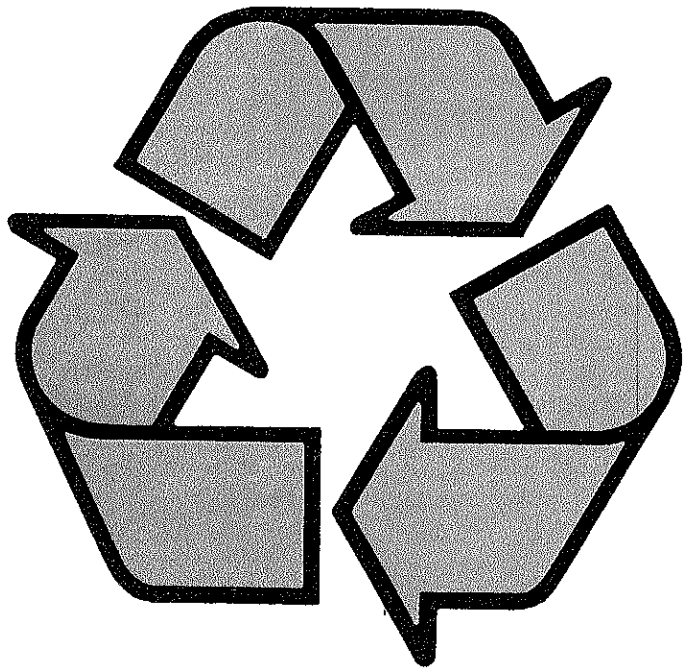
Implementation of the state Solid Waste Policy is also dependent on the existence of adequate markets for the materials collected in the network of recycling systems established throughout the state. Materials that are collected and processed, but not incorporated into manufacturing and production, are not truly recycled. The recycling process is complete only when collected materials are brought back into the system as raw materials or new products.

"Every ton of material that is reused, recycled or otherwise utilized as a resource, is one less ton that requires disposal. These 'avoided costs' are a legitimate part of the solid waste management cost equation."

"The materials collection process is a key part of the comprehensive solid waste management system."

"The recycling process is complete only when collected materials are brought back into the system as raw materials or new products."

"The state plays a critical role in market development activities, and this role has been assigned a high priority by the Governor's office, the Natural Resources Commission and the Department of Natural Resources."



Market development initiatives are necessary in order to ensure that the expansion of recycling collection in Michigan does not exceed the capacity of available markets for the materials that are collected. The state plays a critical role in market development activities, and this role has been assigned a high priority by the Governor's office, the Natural Resources Commission and the Department of Natural Resources. Financial assistance, such as the market development grants made available through the Clean Michigan Fund program (reference #8), is one form of state support. The total range of market development initiatives to be pursued at the state level will be based on data and recommendations contained in the "Michigan Secondary Material Market Development Strategy" developed as part of the Clean Michigan Fund program (reference #9). These initiatives include: actions to improve the business climate for recycling industries; transportation and regional marketing assistance; affirmative procurement; education and promotion; internalization of costs; and direct assistance.

In order to fully demonstrate the benefits of implementing resource recovery alternatives to local governments and private industries, extensive cost data, equipment performance, systems design factors and other actual operation and capitalization information must be made available. Since it is most effective to illustrate successful program operation by example, the state must also play a role in establishing state-funded demonstration programs. The data compiled by funded demonstration programs will help remove some uncertainties for local officials and private sector interests that are contemplating the establishment of resource recovery projects, particularly recycling. The demonstrations would provide the necessary data, and would also provide opportunities for individuals to examine and scrutinize the programs as functioning examples of viable landfill alternatives. It is therefore recommended that the state provide up to 100 percent of the capital costs associated with several community-wide recycling projects. These projects should be selected on a competitive basis, considering local organization and commitment to operation of the program.

Along the same lines, state assistance is needed for research and development, particularly in the areas of new technologies (e.g. plastics recycling), environmental controls (e.g. air emissions and ash testing), and market development initiatives.

There is a critical need for funding to implement the components of the state Solid Waste Policy.

The costs associated with development and expansion of resource recovery projects, as well as education and market development initiatives, can be very high. State general fund dollars are not available on a long-term basis to assist with capitalization and other costs. Therefore, it is necessary to pursue a dedicated funding source such as a disposal fee or bond program to help finance the major elements of this state Solid Waste Policy.

Passage of the necessary legislation related to funding and other aspects of this policy will require the support of a wide range of interests in both the public and private sector. A cooperative partnership between state, local and private interests is necessary in order to provide the impetus behind proposed legislation, and to implement effectively all elements of the state Solid Waste Policy.

Implementation of many of the policy elements will vary according to local needs and priorities. A regional approach will likely be most effective for successful implementation of most of the policy elements. For example, cooperative regional marketing arrangements between smaller recycling programs that are located substantial distances from materials markets, will result in implementation of a more cost effective overall operation. The state should develop guidance and incentives for regional and subregional cooperation in impleenting improved solid waste management. Each locality that desires to implement some type of resource recovery program must assess its strengths and needs and develop an approach that best suits the institutional and community factors associated with its particular project and the region in which it is located (reference #6).

Another factor to be considered in the policy implementation process is the need for stronger local controls and enforcement related to illegal disposal and litter. In order for properly operated solid waste management systems to be established, it is necessary to reduce or eliminate the incidence of trash being tossed into ditches, dumped in the woods, or otherwise improperly disposed. This illegal dumping, in addition to posting numerous environmental and health concerns, presents an artifically low perception of the cost of waste disposal. Resource recovery technologies and properly constructed and operated disposal facilities

"A cooperative partnership between state, local and private interests is necessary in order to provide the impetus behind proposed legislation, and to implement effectively all elements of the state Solid Waste Policy."

"A regional approach will likely be most effective for successful implementation of most of the policy elements."

cannot economically compete with illegal disposal. Increased enforcement of local ordinances and tougher penalties will help alleviate some of the negative effects of illegal disposal.

"Increased enforcement of local ordinances and tougher penalties will help alleviate some of the negative effects of illegal disposal."

As discussed in previous chapters, an integrated approach to establishing a comprehensive solid waste management system which involves all of the resource recovery technologies included in this policy, will result in a balanced movement away from dependence on landfills in Michigan. The promotion of this integrated approach will form the basis of future legislation and funding initiatives at the state level. The state Solid Waste Policy presents many challenges for all levels of government, both non-profit and profit oriented groups, businesses, industries, environmental interests, and all of the citizens of Michigan. Implementation of this policy will help ensure continued use, enjoyment, and protection of our state's natural resources, and further enhance Michigan's quality environment.

"The state Solid Waste Policy presents many challenges for all levels of government . . ."

REFERENCES

(1) Waste Stream Assessments; Michigan Department of Natural Resources, June, 1986.

(2) City of Portage, 7800 Shaver Road, Portage, MI 49081.

(3) Statewide Market Study for Recyclable Paper, Glass, and Metals; Plastics; Used Oil; Used Tires; Michigan Department of Natural Resources, February, 1987.

(4) Recycling/Composting Feasibility Studies (Wayne County, Redford, Eaton County, Kinross Township, TASCO-Baraga County, St. Clair County, Village of Holly, St. Joseph County, City of Niles, Houghton County, Washtenaw County); Michigan Department of Natural Resources, September, 1986.

(5) Background Report to Recycling Feasibility Studies, Volume I — Markets; Michigan Department of Natural Resources, June, 1986.

(6) Background Report to Recycling Feasibility Studies, Volume II — Institutional and Community Factors, Recycling Technologies, Case Reviews; Michigan Department of Natural Resources, April, 1986.

(7) Waste-to-Energy Feasibility Studies (Calhoun County, East Central Michigan, Iosco County, Luce County, Macomb County, Monroe County, Oceana County, Ingham/ Eaton/Clinton Counties, Washtenaw County); Michigan Department of Natural Resources, April, 1986.

(8) Clean Michigan Fund Program; contact — Michigan Department of Natural Resources, Waste Management Division, Resource Recovery Section, P.O. Box 30028, Lansing, MI 48909.

(9) Michigan Secondary Material Market Development Strategy; Michigan Department of Natural Resources, February, 1987.

PROJECTED GOALS

TECHNOLOGY	1988/89	1990	1995	2000	2005
WTE *	4%	19%	29%	40%	40%
RECYCLE	12%	12%	17%	22%	25%
COMPOST	1%	1%	7%	10%	10%
SOURCE RED	0%	0%	2%	5%	10%
REUSE	0%	0%	2%	4%	5%
% RECOVERED	17%	32%	57%	81%	90%

* 10-15 percent of waste incinerated will be converted to ash and will be landfilled. Actual percentage of recovery will be reduced by the amount landfilled.

MAJOR EVENTS & TARGET DATES

APPENDIX 2

1. Enact necessary amendments in 1989 to the Clean Michigan Fund program in order to accomplish the following:

   A. Properly close improperly operating/improperly closed municipal landfills and dumps (1989-1991).

   B. Develop transfer stations (1989-1991).

   C. Implement a comprehensive strategy to expand recycled materials markets (1989-1995).

   D. Fund capital costs associated with recycling and composting (1989-2003).

   E. Fund recycling demonstration projects and necessary research (1989-1992).

   F. Establish household hazardous waste collection centers (1989-1992).

   G. Ensure that recycling and composting initiatives are incorporated into waste-to-energy projects that receive state financial assistance (ongoing).

2. Levy a surcharge on landfilled solid waste (1988-2005).

3. Designate the resource recovery industry as a Michigan target industry (1988-1989).

4. Establish a Plastics Recycling Council to promote government-industry cooperation in developing recycling of plastics (1989).

5. Enact legislation to ban the landfilling of yard wastes (1989-legislation; 1992-ban).

6. Request that the Public Service Commission provide an adequate place for energy purchased from waste-to-energy projects (1988).

7. Enact legislation to curb unnecessary or environmentally unsound packaging (1989-1990).

8. Develop a comprehensive set of bills to accomplish the following:

   A. Require communities to establish systems to separate wastes for collection and recycling (1989-legislation; 1992-implementation).

   B. Expand the state's Container Deposit Law to include all glass containers (1989-legislation; 1995-implementation).

   C. Impose a fee on a specific list of products generating household quantities of hazardous waste (1990-legislation; 1992-implementation).

   D. Ban the use of some non-recyclable containers in food sales (1989-legislation; 1991-implementation).

E. Require the labelling of plastic packaging by resin type in order to facilitate plastic recycling (1988-legislation; 1990-implementation).

F. Amend Act 641 of 1978 to clarify that the law is not intended to prohibit the separation and collection of recyclable materials (1988).

G. Require certain state facilities to function as used oil collection sites (1988-legislation; 1991-implementation).

PROJECT SPOTLIGHTS

APPENDIX 3

CITY OF PORTAGE COMPOSTING PROJECT
Kalamazoo County

The City of Portage, Michigan provides a good example of a new comprehensive community low tech composting program. The program first started in 1985 with the collection of 4,000 cubic yards of leaves with a single leaf vacuum truck. In 1986, 12,000 cubic yards of leaves were diverted by the addition of two front end loaders, and city dump trucks.

In 1987, the city banned open burning of leaves (with an annual 10-day exception) and other refuse within the city. With the replacement of front end loader bunkers with two "leaf claw" attachments and utilization of a combination of packer and dump trucks, the city was able to divert 70,000 cubic yards of leaves and 1,500 cubic yards of brush to their compost site that year.

While the overall program cost rose 43 percent, the cost per cubic yard handled was reduced considerably. Transportation costs of hauling refuse to a landfill were reduced in addition to reducing air pollution and increasing the amount of leaves to be composted. In addition, the city avoids paying increased disposal fees for the volume of leaves collected and composted. The compost will be used internally by the city and also marketed to county residents and businesses.

CITY OF MIDLAND COMPOSTING PROJECT
Midland County

Midland, Michigan began their leaf composting program in 1968 to generate material to enrich the clay soil on property owned by the city. They are presently collecting and composting about 40,000 cubic yards of leaves, sawdust, and stump grindings annually at three sites around the city. The leaves are picked up using both front end loaders and leaf vacuum machines. Once transported to the various compost sites, they are processed through a "shredder-mixer" and are either formed into windrow piles approximately 90 feet by 20 feet by 10 feet high, or are "sheet composted" over a four-acre site, one to two feet deep, and tilled approximately every 10 days. The compost is then ready for use after 30 days.

All the final compost generated by the program is either utilized by the city for top dressing or soil amendments in the city municipal parks and golf courses, or is given away free to local residents. In addition, approximately 5,000-9,000 cubic yards of refined compost is used to plant approximately 1,000 trees a year in the city's beautification program, which has received national recognition.

RECYCLERS OF INGHAM, EATON AND CLINTON COUNTIES

The Recyclers of Ingham, Eaton and Clinton counties began operations at two locations in the Lansing area in 1982, and used steel bins rented from a local waste hauling company to collect glass. Newspaper is stacked into a semi-trailer provided by the buyer. A Clean Michigan Fund grant in 1986 allowed the Recyclers to purchase recycling equipment which enabled the group to open two new monthly collection sites and expand materials collection to include steel "tin" cans, aluminum and plastic milk jugs. More than 200 volunteers now staff the four drop-off collection sites on a monthly

basis in the Greater Lansing area. Each center is open one Saturday per month; collection equipment is shared among the sites.

The volunteers place highly visible recycling signs around the sites, and orange traffic cones are set up to guide cars in a drive-through pattern. Drivers of incoming cars are greeted and recyclables are unloaded from vehicles and placed into the appropriate bins. Materials are delivered to market when containers are filled. This usually occurs during the week after collection at two of the more heavily-used sites. At the other two locations, materials are combined for once-a-month delivery.

CURBSIDE RECYCLING IN ANN ARBOR
Washtenaw County

Ann Arbor's model recycling program has achieved an impressive recycling record since 1971. Recycle Ann Arbor, a service of the Ecology Center of Ann Arbor, collected 2,200 tons of materials in fiscal year 1985-86 and at the same time reduced the city's recycling cost per ton by 10 percent.

Volunteer block coordinators promote use of the curbside program by distributing pamphlets, monthly reminder tags and information about the recycling service to their neighbors. Participants in the curbside program set out an average of 57 pounds of recyclables per household, each month. All of the city's 20,046 single family residences are served by Recycle Ann Arbor's 20 curbside collection routes. Apartment dwellers utilize a staffed drop-off center, open two days per week.

This particular program receives continued support from local government through purchases of capital equipment and other program operating expense contributions. Other funding sources include internally generated funds from the recycling program, Clean Michigan Fund grants from the State, and donations from private sector companies involved in shipping, marketing, and processing recyclables. Equipment that is owned by the city is leased for a small fee to the recyclers.

Recycle Ann Arbor bales its newspapers, old corrugated containers, and high-grade and mixed-grade paper in a 3,500 square foot processing facility located on two acres of land adjacent to the City of Ann Arbor's landfill.

RECYCLE UNLIMITED
Kent and Ottawa Counties

Recycle Unlimited, a private, non-profit corporation, was founded at Calvin College in Grand Rapids in 1972. Begun as a "hands-on" engineering project at the college, Recycle Unlimited rapidly progressed from weekend glass drives to its current status as Michigan's highest-volume residential recycling organization. Operating a drop-off site program, Recycle Unlimited currently services 30 recycling centers in both Kent and Ottawa counties. Area residents deposit green, amber and clear glass, food cans, aluminum materials, plastic milk jugs, brown grocery bags and newspapers in containers at the recycling centers for collection by Recycle Unlimited employees. Currently, Recycle Unlimited collects and markets more than 3,000 tons of recyclable materials annually, and since its inception has diverted more than 25,000 tons of materials from West Michigan landfills.