

Municipal Solid Waste Policy and Universities:  
A Case Study of the Cambridge Mandatory Recycling Ordinance and MIT

by  
Joseph Webster

Submitted to the Department of Urban Studies and Planning  
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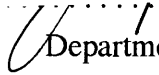
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ABSTRACT

State and local governments in the Northeast face the environmental and political issue of excessive municipal solid waste. One of several policy alternatives to address the solid waste problem is mandatory recycling. It is important to the success of recycling policy in the Northeast that universities in particular undertake and maintain recycling programs, as the many colleges in the region are both responsible for large volumes of solid waste and can by their example exert powerful influence on students and society in favor of recycling. The Massachusetts Institute of Technology has been recycling for several years, but recycling rates there are low compared to other area universities, both before and after the passage of the City of the Cambridge's Mandatory Recycling Ordinance in 1991. An analysis of the effect of Cambridge's Mandatory Recycling Ordinance on the MIT Recycling Program indicates that recycling programs on campus must become institutionalized to achieve significant recycling levels, influence the university community, and persist over the long-term. Municipal recycling policy may be able to encourage the institutionalization of university recycling programs by providing civic incentives.

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## **TABLE OF CONTENTS**

CHAPTER I INTRODUCTION

CHAPTER II GOVERNMENT POLICY RESPONSES TO THE  
MUNICIPAL SOLID WASTE ISSUE

CHAPTER III THE CAMBRIDGE MANDATORY RECYCLING ORDINANCE  
AND THE INSTITUTIONALIZATION OF MIT RECYCLING

CHAPTER IV TOWARDS 25% RECYCLING AT MIT

CHAPTER V CONCLUSION





## CHAPTER I INTRODUCTION

In the past twenty-five years government at all levels has struggled to design policy and take action that reduces the many threats to the environment. One of the more down-to-earth threats, that of solid waste, is simple to outline: As a society what we consume in material goods has exceeded our ability to dispose of the remnants in a healthy, or environmentally safe manner.

Solid waste policy that effectively controls and reduces the problem is especially necessary in the heavily populated urban Northeast. Trash is abundant but the disposal methods of the past, landfills and incineration, are no longer very viable. Mandatory recycling and similar policy mechanisms that encourage people to reduce the amount of materials they consume, and to chose products manufactured from recyclable materials, are becoming more common at the state and municipal level. Like much of environmental policy, solid waste policy involves influencing people's behavior, getting them to stop doing one thing (disposing trash in landfills or incinerating it) and start doing another (recycling).

One sector whose behavior governments in the Northeast need to impact is the universities in the region. Universities are large generators of solid waste and possible enthusiastic backers of recycling. Further, recycling by universities can increase the likelihood of local and nationwide recycling success: students who experience effective recycling programs on campus are more likely to return home with a strong sense of its value.

Such an opportunity to promote recycling on campus exists in Cambridge, MA, where the Massachusetts Institute of Technology (MIT), is located. MIT was chosen as a case study because its recycling rate compared to other area universities, both before and after the passage of a city ordinance, the Mandatory Recycling Ordinance(MRO), has been relatively low. The average MIT recycling rate over the past three fiscal years has

been 4%; Harvard University, also located in Cambridge, averaged a 12% rate during the same period, and Northeastern University in Boston had such an extensive recycling effort, characterized as a closed loop effort because Northeastern purchased napkins, towels, and other paper goods from the company that recycled its paper, that it received an EPA award for its program. What is the cause for MIT's low rates? Should the MRO be modified to raise MIT's recycling rates? Or are there other methods of achieving a higher rate of success?

These questions are first put into context in Chapter II, "Government Policy Responses to the Municipal Solid Waste Issue," which outlines the problem and then reviews two related policy responses: The Massachusetts Master Solid Waste Plan of 1990 (MSWP) and the Cambridge Mandatory Recycling Ordinance of 1991, which was adopted as a means for the city to fulfill the requirements of the state plan.

The effect of the MRO on recycling at MIT is examined in Chapter III, "MRO and the Institutionalization of the MIT Recycling Program." The policy did encourage the extension of nascent recycling activities and supported the formalizing of the MIT Recycling Program (MRP). The policy's weak point, however, was that it could not promote the institutionalization of the MRP, which is necessary to the program's expansion and long-term effectiveness. A program that is institutionalized within an organization has six identifying features: a full-time staff person; authority; a staff network; a public image; community ownership; and milestones. These were either lacking or only moderately present in the MRP.

Chapter IV, "Towards 25% Recycling at MIT," suggests changes that can be made both to the MRO and to the MRP that would make a 25% recycling rate at MIT an attainable goal. Based on MIT's past recycling behavior, it appears that adding a "civic incentive" to the MRO such as a required recycling percentage goal is more likely to increase recycling at MIT than an economic incentive such as unit-pricing of solid waste disposal. Changes at MIT would be those that would encourage institutionalization:

hiring a full time coordinator, establishing student work-study positions within the program, and designing and implementing a comprehensive education and promotion program.

There are two main conclusions from this case study:

1. Institutionalization of a university recycling program is very important to its ability to achieve high recycling rates.
2. Municipal recycling policy may be able to encourage the institutionalization of university recycling programs by providing civic incentives.

## **CHAPTER II            GOVERNMENT POLICY RESPONSES TO THE MUNICIPAL SOLID WASTE ISSUE**

This chapter studies the responses of Massachusetts, as an example of state government, and Cambridge, MA, as an example of municipal government, to the solid waste issue in order to establish the context for the MIT Recycling Program. It begins with a sketch of the origins and extent of the solid waste problem in the US and in the Northeast.

### **THE SOLID WASTE ISSUE IN THE US**

We are facing limits in ways to dispose our waste. The traditional method has been to landfill solid waste. This approach was feasible while the size of the US population was still low relative to today, when population density was not as high as it is today, when the economy produced goods and services in a far smaller volume, and the landfills themselves were far from full. All that has changed. The EPA estimates that between 1970 and 1988, the total quantity of municipal solid waste (MSW) grew 37% (or approximately 2% per year) and that at the same time, landfills have been closing at such a rate that more than 50% of the landfills in the US will reach their capacity and close by 1995.<sup>1</sup>

It is unlikely that new landfills will be built. Few communities are willing to allow a new landfill to be sited in their area; the "Not-In-My-Backyard" (NIMBY) stance is very familiar. People object to landfills for both health and aesthetic reasons. No matter how well managed, landfills are unsightly. Older landfills in particular experience problems with leachate, harmful chemicals from the variety of toxic materials that can be part of

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<sup>1</sup> Stavins, Robert , Project 88--Round II, Washington, DC, May 1991, p.41.

the waste stream. These compounds can seep out of the landfill enter groundwater aquifers that are used as municipal drinking water supplies.

Incineration has been proposed as a solution to the shortcomings of landfills, and use of this option has been increasing. The percentage of waste incinerated in the US doubled from 1984 to 1989, rising from 7% to 15%.<sup>2</sup> It currently stands at 16%.<sup>3</sup> But new incinerators are unlikely completely to replace landfills because they face many of the same obstacles that landfills do. Few municipalities are anxious to have an incinerator located within their borders, despite the potential tax and employment benefits.

Incinerators are resisted on health grounds; they have been shown to emit dioxins<sup>4</sup> and other carcinogenic air pollution, and the ash left over from the combustion process, which must be disposed of, is also contaminated with heavy metal residues. Whatever the scientific validity of these claims (industry officials contend that newer incinerators prevent escape of all but a small percentage of contaminants), they do make siting and construction of new incinerators difficult.

The MSW problem is particularly acute in the Northeast for several reasons. First, population density is especially high in this region. Second, groundwater supplies are quite close to the surface and so are more susceptible to contamination from leachate of landfills built on or near them<sup>5</sup>. A 1985 study of landfills in Massachusetts revealed that most were located over groundwater supplies.<sup>6</sup>Third, because the landfills in this area tend to be older than those in other parts of the country, they have reached their capacity

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<sup>2</sup> Gore, Al, Earth in the Balance, Houghton Mifflin: NY, 1992, p. 156.

<sup>3</sup> Grove, p. 99.

<sup>4</sup> Czuczwa, John M., and Hites, Ronald A., "Airborne Dioxins and Dibenzofurans: Sources and Fates," Environmental Science and Technology, Vol. 20, No. 2, 1986, p. 195.

<sup>5</sup> Stavins, p. 41.

<sup>6</sup> Boston Globe, 4/30/89.

much earlier; the New York State Legislative Commission on Solid Waste Management in 1992 expected that all landfills in New York state would fill and close by 1995.<sup>7</sup>

The following section covers how the state of Massachusetts and the city of Cambridge have approached the MSW dilemma.

## POLICY RESPONSES TO THE MSW PROBLEM

The topic of this section is how government at the state and local level in Massachusetts has responded to the solid waste problem. The first part covers the evolution of solid waste policy at the state level in the 1980's and its culmination in the present law, the Master Solid Waste Plan (MPSW) of 1990. It is a very interesting case because within the space of four years -- from 1983 to 1987 -- state policy changed from an emphasis on incineration to promotion of recycling as the primary response to the solid waste crisis. The second part describes the Cambridge MRO of 1991, which was directly influenced by the solid waste bans contained in the MPSW. Both laws employ mandatory recycling requirements to achieve solid waste reduction.

### State Recycling Policy: The Massachusetts Master Plan for Solid Waste of 1990

The Massachusetts MPSW (310 CMR 19.00) was the culmination of a decade long development of state solid waste policy. Landfills and incineration were the main approaches to managing MSW in the 1960's and 1970's. In the early 1980's tipping fees for landfills -- the charge per ton for disposing MSW -- began rising quickly as landfills began to reach capacity and close in large numbers<sup>8</sup>. It was clear that tipping fees would continue to rise as demand for disposal space overtook landfill availability. This meant that a less expensive alternative to landfilling would be needed; staff at the Massachusetts

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<sup>7</sup> Tietenberg, p. 179.

<sup>8</sup> This trend continued throughout the decade; in 1989 the Massachusetts DPW estimated that of the 194 landfills still in operation at that time, 151 would close by 1992; Boston Globe, 9/24/89.

Department of Environmental Quality and Engineering (DEQE)<sup>9</sup> began work on a comprehensive solid waste plan in 1984 which ultimately became the MPSW.

At the time, incineration of solid waste appeared to be the least expensive alternative. "Waste-to-energy facilities," as they were known, promised to be far cheaper than landfilling because the cost of operating the incinerator could be offset by selling the electricity generated by the combustion process. Not only was incineration expected to be less expensive than landfilling, but it promised additional benefits: tax revenues for municipalities and jobs.

Municipalities began building incinerators at an accelerated pace. While the percentage of waste incinerated in the US doubled from 1984 to 1989, rising from 7% to 15%,<sup>10</sup> in Massachusetts, the percentage of waste incinerated increased from 30% to 49% between 1988 and 1989.<sup>11</sup> The City of Boston, the state's largest generator of MSW, had started planning to construct an incinerator in the South Bay section of the city, an industrial zone bordered by several neighborhoods, in 1983.<sup>12</sup>

Many people in communities across the state did not support incinerators because of the negative health and environmental effects they were perceived to produce. For example, many residents of East Bridgewater, MA, and environmental groups throughout the state opposed even an increase in the capacity of an existing incinerator<sup>13</sup> These perceptions were bolstered by studies of incinerator emissions in the mid 1980's which had revealed that they contained dioxins, a carcinogen,<sup>14</sup> and other forms of air pollution. Additionally, people were concerned that the ash left over from the

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<sup>9</sup> DEQE became the Department of Environmental Protection -- DEP -- in the summer of 1990.

<sup>10</sup> Gore, p. 156.

<sup>11</sup> Boston Globe, 9/20/89.

<sup>12</sup> Ibid., 4/3/89.

<sup>13</sup> Ibid., 1989.

<sup>14</sup> Czuczwa, John M., and Hites, Ronald A., "Airborne Dioxins and Dibenzofurans: Sources and Fates," Environmental Science and Technology, Vol. 20, No. 2, 1986, p. 195.

combustion process would be contaminated with concentrated heavy metal residues, posing a new disposal problem.

In response to public concerns, the state took several steps to de-emphasize the role of incinerators in solid waste policy. In December 1987 the Dukakis administration reversed its support of Boston's plan to build an incinerator.<sup>15</sup> The state also imposed a one year moratorium, beginning in November 1988, on the construction of new incinerators and increases in operating capacity at existing facilities. By that time there were nine incinerators operating in the state.<sup>16</sup>

The state also began to create incentives for recycling. One was the passage of the 1987 Solid Waste Act, which included \$35 million for the study and support of recycling.<sup>17</sup> A second example was the drafting of a plan for a packaging tax to discourage the sale and consumption of products using excessive amounts of packaging, especially packaging that was not recyclable. Under the bill, income from this tax would be earmarked for recycling programs. The bill also committed the state to buying more products made from recycled materials. This draft plan was mothballed, however, in January 1989 because of concerns among some legislators and the Revenue Department that it would not bring in the anticipated revenue, and that the more successful it was, the less income it would produce, making the measure difficult to administer.<sup>18</sup>

A less ambitious bill to support recycling was signed by Governor Dukakis in June 1989, a plastics labeling bill. The law, which had the support of the plastics industry as well as environmentalists, became effective July 1 of that year and required plastic

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<sup>15</sup> op. cit., 4/3/89.

<sup>16</sup> Ibid., 6/5/89

<sup>17</sup> Ibid., 4/30/89.

<sup>18</sup> Ibid., 1/10/89



containers to be imprinted with the number and abbreviated name of the resin of which the container was made, to allow easier sorting and recycling.<sup>19</sup>

The most significant of the administrations plans prior to the MPSW however, was to build two regional recycling centers, one in Springfield for the western region and one in the Boston area for the eastern region. The Springfield center was under construction during 1989, and opened in January 1990; the Boston center was not built because an appropriate site could not be found. At full capacity it was able to recycle 60,000 tons of materials annually.<sup>20</sup> This represented recycling only 1% of the state's annual amount of garbage. Clearly, recycling efforts throughout the state in each municipality were needed to achieve a higher level of recycling.

The MPSW was voted on and became law in June 1990. The goals of the MPSW were for the state to achieve 46% recycling by the year 2000. At that time, if the state met its goals, 46% of the waste stream would be recycled, 50% incinerated, and 4% landfilled.<sup>21</sup> MPSW sought to drive recycling to this level through a series of bans on the disposal of recyclable materials. It established the following deadlines:

- As of January 1, 1992, all leaf waste, automobile batteries, tires, and white goods (large appliances) would be banned from landfills, incinerators, and transfer stations<sup>22</sup>;
- As of January 1, 1993, all other yard waste, recyclable aluminum, metal cans and glass containers would be banned;

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<sup>19</sup> Ibid., 6/24/89.

<sup>20</sup> Ibid., 8/4/89

<sup>21</sup> Ibid., 9/20/89.

<sup>22</sup> A transfer station is a facility that accepts trash and recyclables. Recyclables are sorted and transported to a processing center; trash is crushed in a compactor and transported to a landfill or incinerator. Thus there is no burial of wastes at a transfer station.

- As of January 1, 1995, all grades of recyclable paper, newspaper, corrugated cardboard and plastic bottles would be banned.

The state planned to enforce these bans by requiring operators of disposal sites to visually inspect the contents of trucks delivering waste. Operators would be required to turn away any load that was found to contain recyclable materials.

The MPSW has had a mixed success. The first ban was implemented on schedule in January 1992. However, this was not much of a challenge, as composting programs were in place in many localities, and programs for the collection of the other materials (all items that were not regularly generated as waste in vast quantities) were well established. As the January 1993 deadline approached, many towns pressured the state for a delay, as they had not yet established sufficiently efficient recycling programs.<sup>23</sup> As a result the ban on metal, glass, and yard waste was amended to begin in April 1993.

#### Municipal Policy: The Cambridge Mandatory Recycling Ordinance

MPSW did succeed in promoting municipal recycling programs, particularly in Cambridge. The MPSW was cited in the preamble of the MRO as a reason for the law.<sup>24</sup> The Cambridge City Council voted to adopt Section 8.24.070 of the Municipal Code on March 16, 1991. The ordinance identifies a number of legal obligations with which all residential, commercial, and institutional buildings in Cambridge must comply.

A "non-profit establishment occupying property in the City of Cambridge," such as MIT, is required to fulfill the following five legal obligations under the ordinance:

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<sup>23</sup> Rob Gogan, personal communication, Fall 1993. A major bone of contention between the state and towns was funding; towns argued that the state had imposed an unfunded mandate, and so should pay for recycling programs since state law requires that state mandated programs be funded by the state

<sup>24</sup> The MRO also has its roots in citizen volunteer recycling that began in the late 1980's, which the City supported with logistical and promotional help.

- Prepare and submit a Recycling Plan to the Department of Public Works (DPW) Commissioner by January 1, 1993, for all recyclable materials that comprise 5% or more by weight of the institution's total solid waste stream;
- Begin implementing the Plan within four months of notification of Plan approval by the DPW Commissioner;
- Store recyclable materials in containers complying with all applicable laws in areas that do not block public passage and access;
- Inform all employees of requirements of the recycling program; and
- Submit an annual Recycling Plan update to the DPW.

The Recycling Plan must describe how the institution will collect and transport for processing the recyclable materials that comprise 5% or more by weight of the institution's total solid waste stream. The ordinance identifies the following materials as recyclable: aluminum, tin cans, corrugated cardboard, glass, leaves, magazines, newspaper, plastic, sorted office paper, yard waste, and white goods.

The Plan is required to include the following sections:

- A waste audit;
- A description of the separation, collection, and transport to market process;
- Information on the employee notification and education program;

- Certification from the hauler that materials were being recycled.

The waste audit is conducted to determine which recyclable materials comprise 5% or more of the waste stream. The ordinance does not require a specific kind of waste audit. Two methods are suggested in the "Cambridge Recycling Guide" provided by the DPW to assist in the preparation of recycling plans. The first is to conduct a manual sampling of the waste stream; the second is to use the "Matrix of Waste Composition by Business Type" included in the Guide. The matrix gives waste compositions by material for several business types (office, retail, restaurant, etc.).

The MRO also established a penalty of \$25 per infraction of the Ordinance. For example, there is a fine of \$25 for each day a Plan is not on file with the City after January 1, 1993. Additionally, any institution that did not recycle a designated material in sufficient amounts would be fined \$25 per day per category of material.

The next chapter reviews the impact of Cambridge's law on MIT.

# **CHAPTER III      THE CAMBRIDGE MANDATORY RECYCLING ORDINANCE AND THE INSTITUTIONALIZATION OF MIT RECYCLING**

## **INTRODUCTION**

As noted in the previous chapter, the aim of the MRO was to make recycling in Cambridge an official, comprehensive, and effective program, building on the citizen volunteer efforts that preceded the ordinance. This chapter considers how successful the MRO was at MIT. Two measures of MRO success are examined: the extent to which MRO animated recycling at MIT and the extent to which MRO institutionalized recycling there. I conclude that while the MRO did moderately animate recycling at MIT, it has not caused recycling to become institutionalized at MIT. Without becoming institutionalized, the MIT Recycling Program will have difficulty making significant contributions to recycling volumes, influencing the university community, or persisting over the long term, and so will contribute less than optimally to reaching the goals of the MRO policy.

## **MRO AND THE ANIMATION OF THE MIT RECYCLING PROGRAM**

One measure of MRO's success is to what degree it animated recycling at MIT. That is, did it encourage the elements within MIT that created and maintained recycling -- student volunteerism, student-administration cooperation, and administrative commitment? Somewhat. Did MRO cause recycling collection or education to expand at MIT? Yes. One key example was the creation and implementation of the official, comprehensive MIT Recycling Plan. MRO's contribution to recycling at MIT consisted of three factors -- a timetable, a set of goals, and a civic aspect -- that made recycling a priority and a public duty.

The civic aspect that MRO imbued on recycling is the most interesting of the three factors because it is the least obvious. The timetable, as discussed in Chapter II, was for the submission and implementation of recycling plans; the goals were to collect all recyclable materials over 5% of the waste stream, and to undertake an education program. The civic aspect, in contrast, was a change in the appearance of recycling when viewed from outside MIT (or outside any other establishment in the city). Prior to MRO, recycling at MIT would have been regarded as a laudable, but an independent and private, exercise. It would not have been seen as a betterment of the community as a whole or as a sign of solidarity and support of the community's goals. In fact, it may not have been noticed at all.

With the passage of the MRO, however, MIT's recycling activities appeared in a different light. Now MIT was participating in a Cambridge initiative, accepting its responsibility as a citizen of Cambridge and contributing to the city. The contribution is two-fold: a reduction in the total amount of solid waste generated in the city<sup>1</sup> with the concomitant increase in recycling totals, and reaffirmation of the importance and necessity of recycling citywide. If MIT is fulfilling its civic duty, it sets a strong example for others. Moreover, mandatory recycling also puts MIT on the spot, because one's civic aspect is both projected and seen: An active recycling program will encourage others, but a defunct one will only gain their disapproval. A change in the nature of recycling can thus result in a change in commitment to recycling, as it did at MIT.

The central elements of recycling at MIT -- student volunteerism, student-administration cooperation, and administrative commitment -- and the effect of MRO's contribution (a timetable, set of goals, and a civic aspect) is considered in the next section.

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<sup>1</sup> Technically, reductions in the volume of waste that MIT achieves are not credited to the Cambridge total. MIT and Cambridge trash end up at different sites. Cambridge trash is collected by BFI, Inc. and hauled to an incinerator in Haverhill. MIT waste is hauled by a private contractor, Laidlaw, Inc. to a landfill.

### Student Volunteerism

Student volunteerism has consistently been the initiator of recycling at MIT. The first surge of student volunteer recycling activity at MIT was in the 1970's. Recycling was first organized by a number of unconnected voluntary campus groups.<sup>2</sup> What did connect them, interestingly, was one of the original Boston area recycling contractors, Earthworm. Earthworm was founded by three MIT graduates in 1970 and picked up white paper for more than thirty of these groups.<sup>3</sup> Despite this direct link between those recycling on campus and a "MIT" recycling processor, these efforts were not combined into a formal campus-wide recycling program (either by the students or by the administration).

The next wave of student recycling began in 1989. Students organized a dormitory based program, gathering various materials (mainly newspapers, bottles, and cans) at a number of dormitories and transporting the recyclables to local collection centers. Again, this effort was spontaneous and was not a result of official MIT action.

### Student-Administration Cooperation

A second element that helped to expand recycling at MIT prior to the MRO was student-administration cooperation. The point of connection was between students and upper level staff of the Housing and Food Services Department. As recycling in the dormitories grew, it came to the attention of the East and West Campus House Managers (who are responsible for all the dormitories on East and West campus respectively). In order to store recyclables in a particular dormitories prior to pickup, the students needed clearance from that dormitory's House Manager. Some House Managers may also have

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<sup>2</sup> "Recycling to Begin," MIT Tech Talk, 4/4/90.

<sup>3</sup> Ibid.

provided bags, barrels, or other containers. All of the House Managers also had regular contact with their respective Campus House Manager, and apprised them of the student activities.<sup>4</sup>

The Campus House Managers were very supportive of student recycling and provided logistical and organizational support to them. The Campus House Managers also were able to provide material support, since they had the authority to prepare and submit budgets, to acquire resources, and to advocate for more space for recycling -- all important components of a recycling program that students could not easily acquire by themselves. In December 1990 the Campus House Managers began to meet regularly with the students to organize more extensive dormitory recycling and formalize the program, in anticipation of the passage of the MRO.<sup>5</sup>

The formal Housing Recycling Program began in March 1991, coinciding with the adoption of the MRO. A collection system was organized in every dormitory on campus for all recyclable materials including commingles (glass, plastic, aluminum, and steel containers collectively), white paper, cardboard, and newspaper. Student volunteers coordinated the recycling in each dormitory in conjunction with floor tutors and house managers; plastic bins and signage were provided by Housing; and Jet-A-Way, a local recycling processor was contracted for weekly pickups. The overall effort was directed by the General Manager of Operations for Housing and Food Services. Comprehensive recycling, at least in the dormitories, had arrived as an official entity in which the administrative structure had a stake.

#### Administrative Commitment

The third element that spurred recycling at MIT before the passage of MRO was administrative commitment in the form of a pilot program. This pilot recycling program

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<sup>4</sup> Personnel communication, Jack Corcoran , Fall 1993.

<sup>5</sup> Ibid.



began less than a year before the start of the Housing Recycling Program in another wing of the MIT administrative structure, the Grounds Services Department<sup>6</sup>. Grounds Services first put its resources to the "greening" of MIT with a three month pilot program for recycling white paper that began May 1990. This was directed by the Superintendent of Support Services and Building Maintenance who had been designated as the Recycling Program Coordinator. The purpose of the pilot was to establish what level of participation there would be in a white paper recycling program among general staff.<sup>7</sup> The pilot program targeted buildings E17, E18, E19, E23, and E25, with pickups by Building Services staff every other day from desk-side recycling baskets and larger copy-machine-side containers. Grounds Services evaluated the program in August 1990, found that participation was strong and collections reasonable, and decided to expand white paper recycling section by section to all of physical plant. Grounds Services also began recycling scrap metal, wood pallets, and yard waste in 1990.

MRO Impact on Student Volunteerism and Student-Administration Cooperation

The MRO had a mixed impact on the three elements -- student volunteerism, student-administration cooperation, and administrative commitment -- that were responsible for recycling on campus. The MRO had the least success in fostering student-administration cooperation on recycling. Several students and administrators of W20, the Campus Activities Complex (CAC), began meeting in the spring of 1992 to discuss the solid waste problems at that site. W20 includes retail stores, a supermarket, a cafeteria and food outlets, as well as offices and student activity rooms, so there is a wide variety of waste materials and sources. The ad hoc group organized specifically in reaction to the passage of the MRO; several of the students, in fact, were also active in dormitory

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<sup>6</sup> Grounds Services is responsible for both exterior management of MIT property (grounds) as well as interior management (coordinated by Building Services, a sub-unit).

<sup>7</sup> Personal communication, Jennifer Combs, Fall 1993.

recycling. However, there was no student-administration collaboration on possibilities for recycling in the academic sections of campus, where most of MIT's waste is generated, and student support of recycling would be important.

MRO was better able to promote student volunteerism. The MRO encouraged student activity in two ways. First, the MRO gave recycling a new standing in the community by making it a form of public duty. To note this change in status, the Cambridge Advisory Committee on Environmentally Desirable Practices (formed by the DPW to support recycling and the MRO) presented the Housing and Food Services Department along with Physical Plant with an award recognizing its achievements in waste reduction and recycling in March 1992. The award, which was accepted at a formal reception by a joint student-Housing staff delegation, contributed strongly to the feeling in the dormitories that recycling was an important and necessary aspect of dormitory life.<sup>8</sup> There were no other college recipients of the award that year, an additional honor.

Second, by making recycling mandatory, and setting timetables for implementation of recycling plans, MRO gave it a prominence and urgency that it previously lacked. Before MRO, recycling was just a good idea; afterwards, it was also the law. This prominence particularly effected the Class of 1993. The Class of '93 was very active in creating and continuing recycling in the dormitories; two of the class officers were also the facilitators for collection in their houses. These officers, among others, were instrumental in persuading the class as a whole to choose recycling containers for the main MIT walkway as their class gift. Members of the class gift committee organized a number of educational events on the problem of solid waste and the role of recycling in the solution, including a large display in the main lobby of the central campus area. This display, composed of stacks of newspaper, aluminum cans, and barrels of paper, illustrated the

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<sup>8</sup> Personal communication, Jack Corcoran, Fall 1993.

volume of waste at MIT that potentially could be recycled, the amount of natural resources that could be saved, and included posters, facts and figures concerning recycling.

It could be objected that it is difficult to determine whether the factors MRO added to MIT recycling activity -- a timetable, a set of goals, and a civic aspect -- solely encouraged the changes in student volunteerism and student-administration cooperation described above. Perhaps some other factor was equally important. There is merit to this point, as it is very difficult to pinpoint and measure a group's motivation for action. However, it is not clear that the changes would have happened without the presence of the MRO, that is, if the role of MRO was only as a background -- but key -- support.

#### MRO Impact on Administrative Commitment

As noted above, MRO added a civic aspect to the recycling picture at MIT that made recycling a priority and a public duty, not just a good idea. This civic aspect, in conjunction with the timetable and goals that MRO established, had significant impact on MIT's administrative commitment to recycling. There are two main examples of this impact: the appointment of the second Recycling Coordinator, and the expansion of the program.

A critical juncture for administrative commitment to recycling at MIT came in 1991, when the first Recycling Coordinator retired. The position was left vacant for over a year (August 1991- October 1992), and a weakening of the administrative commitment to recycling at MIT seems to have been the reason for that hiatus. The delay was not because the retirement was a surprise; the original Recycling Coordinator was a long term Grounds Services employee, and close to retirement, when he took responsibility for the pilot program. Nor was the delay caused by a search for a candidate from outside MIT. The ultimate replacement was from the same department. More to the point, the delay was not caused by the time involved in the creation of a new position. The original

Recycling Coordinator had several other duties as Superintendent of Support Services and Building Maintenance. The second Recycling Coordinator likewise has a number of additional duties; that of overseeing the recycling program was simply added to the rest.

The second Recycling Coordinator was finally appointed in October 1992 because the deadline for submission of recycling plans was January, 1993. It would have been quite embarrassing, and a poor reflection on MIT's civic pride, if it had turned its plan in late (and after scores of businesses and apartment building managers had submitted theirs). Had it not been for the priority that MRO placed on recycling by setting this deadline, it is quite possible that the second Recycling Coordinator may have been appointed even later, and that a recycling plan may not have been drafted so promptly.

The expansion of the MRP from October 1992 to the present, symbolized by the MIT Recycling Plan, is also an example of the impact of MRO on MIT administrative commitment to recycling. In late 1992 MIT, in order to meet the timetable and reach the goals set by the MRO, needed to create and implement a plan to expand its program. The expansion followed the appointment of the second Recycling Coordinator, discussed above, who became the critical force behind it. There were three stages of the expansion process: the drafting of the recycling plan, the collection of new materials at additional recycling sites, and the revival of the education component.

The chief task facing the coordinator was to draft and submit a comprehensive MIT Recycling Plan that would delineate how recycling would be carried out throughout MIT, not just in the dormitories or in some buildings in physical plant. The Recycling Coordinator began preparing MIT's Recycling Plan in December 1992. The plan was completed promptly, and submitted January 1, 1993.

Of course, with any plan there is the possibility that it will not be put into place promptly or effectively. Even if this had happened at MIT (it did not) the process of drafting of the plan by itself helped expand MRP by linking together the various administrative figures active in recycling. Since MIT, in terms of recycling, is divided

into three areas -- physical plant, housing, and W20 -- the Recycling Coordinator needed a sub-plan from each of these areas. The coordinator met and spoke often with the General Manager of Operations for Housing and Food Services, and managers at W20, as well as the Campus House Managers for East and West Campus regarding the preparation of the sub-plans and the overall recycling plan. This was the first time that W20 had been involved with recycling at all, and the first time a Recycling Coordinator actively worked with representatives of departments besides Grounds Services. Once these connections were set, the Recycling Coordinator was able to draw on them for support as the program continued to expand. The Campus House Managers were particularly helpful as they were very familiar with area recycling contractors, material costs (bins, etc.), and other details. It was the need to meet the MRO timetable for plan submission that brought these staff members together.

A second stage in the expansion of the MRP was the collection of new materials at additional recycling sites. A variety of materials had been gathered at the dormitories since the inception of the MRO. However, on the rest of campus as of January 1993 the only thing collected in substantial amounts was white paper. Prior to the designing of the recycling plan, there were no formal plans at MIT to expand recycling to include other materials or additional sites on campus. The MRO though, as noted above, required as one of its pivotal goals that an establishment separate all recyclable materials that comprised 5% or more of its waste stream, as determined by a waste audit. The Recycling Coordinator thus prepared a waste audit in December 1992. The matrix (the second method) was used for the waste audit because a manual waste audit is expensive and not always accurate.<sup>9</sup> The waste audit indicated that MIT was legally required to

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<sup>9</sup> The waste audit considered the waste streams of Physical Plant, Housing, and W20 separately since each waste stream is composed of different proportions of materials. Technically, since CAC has gross lease arrangements with W20 tenants, the Ordinance considers W20 a separate entity from MIT. CAC thus was

prepare and implement a plan to recycle cardboard, commingles and newspaper along with white paper in the three main sections of MIT as indicated in Table 3.1.

**Table 3.1: Materials MIT Must Recycle**

site	Physical Plant	Housing	W20
<b>material<sup>a</sup></b>			
<b>cardboard</b>	14%	14%	16%
<b>commingles</b>	12%	12%	17%
<b>white paper</b>	6%	6%	<1%
<b>newspaper</b>	6%	6%	2%

<sup>a</sup> Number indicates percentage of waste stream material represents

Source: MIT Ground Services

The MRO also requires that collection of materials at a site must begin recycling within 4 months of Recycling Plan approval. The MIT Recycling Plan was approved in June 1993, so technically it had until October 1993 to begin recycling newspaper, cardboard, and commingles. If the goals of the MRO had not had made a significant impression on MIT's administrative commitment to recycling, separation of these objects may not have been organized until late in the year. Instead, programs to begin sorting all three were in place within six months of completing the waste audit. In March 1993, Grounds Services recycling efforts were expanded on a trial basis to include collection of newspaper in the first-floor lobbies of Buildings 7, 8, and 10, and at the junctions of Buildings 2 & 6 and 5 & 1 (five pickup sites in all)<sup>10</sup>. Recycling of commingles at high volume food service sites began in May 1993 at E52 (Faculty Club, Refresher Course) and expanded to Walker Memorial (Building 50, which is mainly a cafeteria). Cardboard

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required to prepare a separate recycling plan for W20, though it was submitted as part of the overall MIT plan.

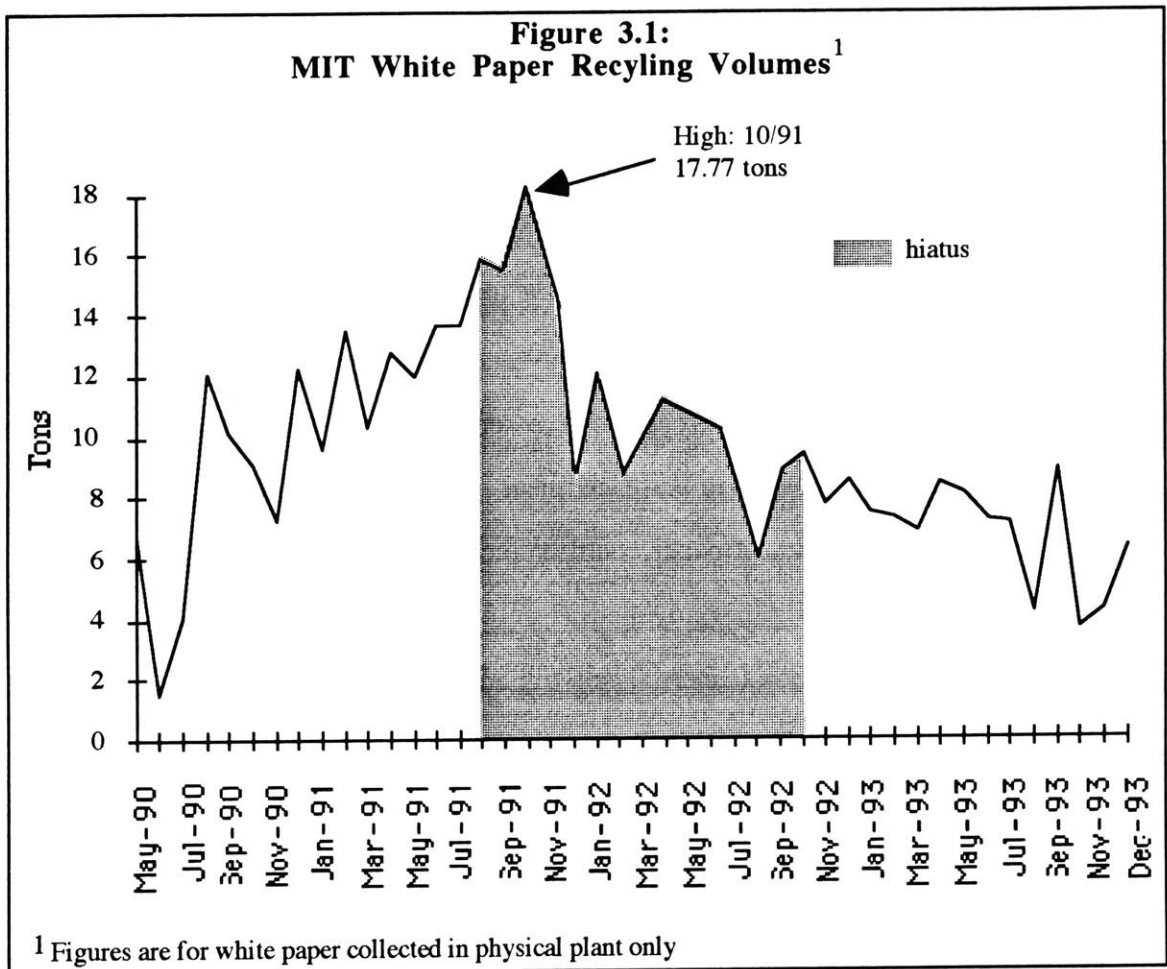
<sup>10</sup> This trial program was organized in anticipation of the Class of 1993 gift.

recycling also began in May 1993 at high-volume cardboard sites buildings E53 and WW15 (receiving centers and base of Office of Lab Supplies, the procurement department for MIT), and Walker Memorial. The MRP was in compliance with the MRO goal of implementing its plan five months ahead of time! Additionally, these sites were being incorporated into the MRP for the first time. All of this growth in the MRP happened because the administration was aiming to fulfill the goals of MRO; more administration directed change occurred in the five month period after the Recycling Plan was submitted than had happened in the preceding over two-and-a-half years (May 1990 - January 1993).

The third, and crucial, stage, was the revival of the MRP's education component, in accordance with the MRO goal that a full education program accompany recycling. The original recycling coordinator had organized an education program in conjunction with the beginning of white paper recycling in May 1990. Letters introducing the program and explaining what kinds of paper to recycle were sent out to all employees. Grounds Services distributed large posters to be placed near recycling containers and in offices listing which grades and types of paper could be recycled and which could not, with a small piece of each kind of paper attached as an example. There were also several articles in the major school newspapers, TechTalk and The Tech. This activity petered out, however, after the first Recycling Coordinator retired, and from November 1991 until September 1992 there was no educational component of the MRP. The importance of this component can be seen by comparing white paper collection levels before and after the original education program ended.

While the education program was running (May 1990 - August 1991), an average of 10.99 tons per month of white paper was recycled. The average monthly collection from July 91 - October 91 was 15.70 tons. When the education program stopped, white paper collection volumes plummeted. The average monthly collection for November 91 - June 92 decreased 32% from the July 91 - October 91 monthly rate, to 10.66 tons/month.

Figure 2 below shows the pattern of white paper collection rates from May 1990 to December 1993; note that the high point was October 1991, just after the education program trailed off, when 17.77 tons were collected. White paper total monthly volumes then dropped more than ten tons to only 7.54 tons in January 1992. Average monthly recycling volumes were only 7.8 tons in FY 93. In short, the education program was critical to the success of the MRP.



Source: MIT Grounds Services

The second Recycling Coordinator began to reinvigorate the education component of the MRP soon after submitting the Recycling Plan in January 1993. It is interesting to note that data on white paper collection volumes was analyzed at a much later date, so



note that data on white paper collection volumes was analyzed at a much later date, so that the incentive to reactivate the education program was not the realization that it increased white paper volumes. New articles were published in Tech Talk; a variety of memos were issued updating employees about the MRP and describing the newspaper, cardboard, and commingles pilot recycling programs. The recent successful drive by Grounds Services to collect catalogues, magazines, and books was advertised on bulletin board posters and in Tech Talk.

### Summary

The MRO did not contribute money or material resources to recycling at MIT. However, it did inject several valuable intangible properties -- a timetable, a set of goals, and a civic aspect -- that were able to animate the MRP. These factors did enliven the elements within MIT that created and maintained recycling--student volunteerism, student-administration cooperation, and administrative commitment. The most important influence was on administrative commitment; without the stipulations of the MRO, the MRP may have been without a Recycling Coordinator or a Recycling Plan for a longer period than it was. The MRO in effect restored, stabilized, and expanded the MRP after a long period of decline and inactivity (with the exception of the dormitory program) following the retirement of the first Recycling Coordinator.

The MRP continued to stabilize and expand after the implementation of the pilot cardboard and commingles collections, which became permanent after a three month trial. The class of 1993 permanent bins were finally installed (replacing makeshift plastic barrels) in May 1994. In Lobbies 7 and 11 there are four bins, two for newspapers and two for commingles at each site. There is one of each container at the junctions of Buildings 2 & 6 and 5 & 1. Interestingly, these are the first large commingle bins on campus, the first that are not in a dining or dormitory area, and the only ones that bear the standard symbols designating HDPE and PET bottles and containers.

The post-1992 expansion of the MRP seems to have run its course as of May 1994: all materials as required by MRO are being recycling, white paper occurs throughout campus, and plans for recycling at W20 are being developed. The MRO thus successfully has been able to animate the MRP. Animation, however, is not synonymous with institutionalization. The next two sections define institutionalization and its role in the success of recycling at MIT, and discuss why MRO has been unable to institutionalize the MRP.

#### INSTITUTIONALIZATION AND ITS IMPORTANCE TO THE SUCCESS OF RECYCLING AT MIT

When policies such as the MRO are put into place, it is the hope of the policy crafters that their work endures and operates over a long period of time, because the problem they are aiming to correct or ameliorate, such as too much solid waste, is not a brief or passing phenomenon. Particularly in Massachusetts, with the ongoing moratorium on the construction of new incinerators or the expansion of existing ones, and the near impossibility of finding a site for a new landfill for those few materials that legally can be landfilled, pressure on state and local officials to cut waste levels is intense. Recycling policy needs to produce consistently higher levels for the immediate future of recycling to meet the goals set by the state and Cambridge solid waste policies.

Cambridge, in order to achieve the goals set forth in the MRO, needs the MRP to help by consistently increasing the percentage of its solid waste stream that it recycles. To constantly raise recycling rates, the MRP should be institutionalized. For the purpose of this discussion, a program is institutionalized within an organization when it is empowered by the organization's leadership, linked to other parts of the organization, and supported by the organization's general community. In other words, it has become part of the institution, an institution within the institution. A program that is institutionalized can endure, obtain resources, and regularly expand.

There are six features that mark a program that has become institutionalized within an organization:

1. a full-time staff person;
2. authority;
3. a staff network;
4. a public image;
5. community ownership; and
6. milestones

These six features occur more or less in this sequence. Each successive feature widens the programs circle of potential and support. Each additional feature is also dependent on the previous ones.

An organization's leadership empowers a program by assigning it a full-time staff person. The leadership will assign a full-time staff person if it believes that the program is valuable, based on a cost-benefit analysis, a consideration of the programs contribution to the organizations goals, or other factors. A full-time person can obviously get more done than a part-time person, and so is more helpful to a program. But the appointment of a full-time person is actually more important for what it symbolizes about the program. It shows that the program has the seal of approval of the highest levels of the organization, that it is a program in which it is worthwhile to invest, and that the leadership stands behind and is identified with the program.

The naming of a full-time staff person in turn imbues a program with a sufficient amount of authority. By authority is meant that the program is taken seriously and regarded as an equal among other parts of the organization. It has the right to compete with them for resources and support, though this is not to say that the program is equal in stature or power to the others. A program with authority can also request the cooperation of other parts of the organization when necessary, and expect that this help will be

forthcoming. Its requests are likely to be seen as legitimate because, by virtue of its authority, it is a full-fledged member of the organization.

A program that is institutionalized will also be linked to other parts of the organization by a staff network, that is, a series of working relationships with staff in certain other parts of the organization. The program needs their cooperation and help because only they are responsible for a particular service, area, or both. The program can more easily communicate with, seek and receive help from, and coordinate activities with these parts of the organization because of this network. Additionally, the network and the authority the program has are mutually reinforcing; a program can create a network in part because it has authority, and as the network expands, its authority grows.

The staff members and departments in this multi-nodal network become vested in the program to the degree to which they make the program happen, and they become co-responsible for the success of the program. As a program's network grows, its place in the organization is solidified and the number of its allies grows. Of course, this relationship is symmetrical, and the program also becomes more integrated into the organization to the extent that it helps, supports, and becomes a co-owner of other efforts.

The previous three qualities of an institutionalized program originate in whole or part from outside the program. The fourth feature, a public image, is generated almost entirely from within the program. The image is created and maintained in a number of ways. An easily recognized, publicly prolific and unique logo and name is an important visual constituent of a program's image; a newsletter or regular written form of communication with the general community is another. Whatever the vehicle, the image should be represented often in public settings within the organization so that people have the opportunity to become familiar with it.

The most important component of a program's image is a clear, brief, and specific set of goals; anyone familiar with the program should be able to quickly list them. Without a familiarity with the *raison d'être* of the program, fewer people will want to aid the effort.

Goals of programs such as recycling which are very quantifiable can be easily conveyed visually, along with progress towards those goals. In the case of recycling, for instance, this could be a graph in a newsletter or a large graph or chart displayed in a prominent public place, like the oversize "thermometers" that track donations or funds raised.

If a program has been able to create and circulate its image, it can more easily engender the support of the organization's general community. This support is evidenced by community ownership and the celebration of milestones, the fifth and sixth components of an institutionalized program. The image, having communicated the values, goals and processes of the program, will attract those people who share these values and inspire them to be part of the programs goal-oriented activity. Community ownership means that a large number of the general community see themselves as the program and believe that the program would not exist without their contribution

Community ownership of a program within an organization occurs when there are enough opportunities for simple, quick, but meaningful contributions to the program. The program needs to have a mechanism to involve community members, some action they can take on a regular basis that will advance the programs cause. Recycling, of course, is based on just such a mechanism: to participate in the program, all one has to do is place the appropriate material in the designated receptacle. There should also be chances to make more involved contributions with greater amounts of responsibility and participation, i.e., working closely with the program staff, assisting with the maintenance of the public image, etc.

The sixth and final aspect of a program that is institutionalized is that it will have and celebrate milestones. Milestones are events such as the launching of a new endeavor, the achievement of a goal, or recognition of achievement. These events are important in themselves: They show that the program is working, is successful, and is trustworthy, that is, performing the function encapsulated in its image. They also are significant because they reiterate to the community and leadership the reason for the programs

existence: to address a particular situation by eliminating and/or replacing a problem with something preferable. They announce that the program has staying power, vitality, and continued value to the community. Without such milestones, the program will eventually grind to a halt or simply be closed down because there is no longer any great interest in it, whether or not there still exists a need for it.

The MRO's influence on the institutionalization of the MRP is the second measure of MRO's success at MIT, after its ability to animate the MRP. In the next section, a consideration of the current status of the MRP, with reference to the six features of a firmly institutionalized program as discussed above, indicates that the MRO has been unable to promote the institutionalization of the MRP.

#### MRO AND THE INSTITUTIONALIZATION OF THE MRP

If the MRP as of May 1994 was more or less fully institutionalized, as a result of the MRO, it would display the six basic aspects discussed above, but it does not. First, the MRP does not have a full-time staff person, the first sign of an institutionalized program. The recycling coordinator spends 20-25 hours weekly managing the overall program, including 10-15 hours per week of clerical work (phone calls and record keeping), approximately 50-60% of the coordinators work time. The rest of the week is devoted to other Ground Service's responsibilities. Not only does the lack of time constrain how much the Recycling Coordinator can develop the program, but the work that is done is spread all over the week, and it is difficult to focus.<sup>11</sup>

There are other staff on campus that spend time on the MRP, but it is a small amount and cannot replace the need for a full-time, centralized coordinator. Management staff in the dormitories and at W20 who administer the recycling program in their respective spend roughly 5 hours or less on the program each week. Building Services staff also

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<sup>11</sup> Personal communication, Jennifer Combs, Fall 1993

empty recycling containers, move material to collection sites, and manage those collection sites. Building Services estimates that recycling work accounts for approximately 2-3 hours per week per staff person involved, of which there are many.<sup>12</sup>

The MRP does have some authority, as there is at least a part-time coordinator, but the degree of authority is inadequate to establish the MRP as equal to other buildings and grounds programs. The program is taken seriously by other departments. For example, not only are the white paper recycling baskets and bins in place throughout used, but many sites have posted their own signs and instructions concerning recycling, especially the libraries. It is more questionable, however, if the MRP is regarded as equal to other buildings and grounds programs by the various sectors and departments at MIT. The program places demands on their time and personnel, but has no resources to offer in return. Recycling can become a chore and seen as a headache, not a positive goal, especially in high-volume locations such as Walker and W20, where recycling is constrained by space restrictions. Even the Department of Urban Studies and Planning, which of any MIT Department is likely to have both an academic and practical interest in recycling, does not have a formal system in place to support the MRP (though there are some informal student initiatives to collect commingles in the Common Room and at the Computer Resources Laboratory).

The third indication that a program is institutionalized, a staff network, is not fully in place at MIT. The Recycling Coordinator has in the past worked with the Campus House Managers and with staff at W20. These relationships were necessitated by MRO: As mentioned, the first contact between a recycling coordinator and staff in these departments occurred in late 1992 because a recycling plan was required from both. However, now that the plans have been submitted, there is no scheduled, regular

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<sup>12</sup> Personal communication, Austin Petske, Spring 1994.

communication (such as a regular planning meeting) between the Recycling Coordinator and the contact staff in these departments.

The MRP has a very tentative and weak public image as measured by the definition discussed above. The salient, and fairly serious reason, is that there is not a clear, brief, and specific set of MRP goals. There is the general goal of recycling and having an education program. The MRO has not challenged the MRP to any other goals than these, nor has the MRP identified any (at least not to the general community). There are no percentage targets for how much of the total MIT solid waste stream to recycle by a certain date, and there is no public plan for increasing recycling volumes.

In fact, because there are no volume or percentage goals, there is a relatively low level of commitment or interest on campus even to maintaining a certain level of recycling volumes. One major example of this trend at MIT is the on-going problem with contamination. Contamination occurs when non-recyclable trash is thrown in recycling bins or when different recyclable materials are mixed together. Contaminated batches of recyclables are rejected by recycling processors because foreign materials can damage recycling machinery and degrade the quality of the finished product.

At MIT, white paper has been especially susceptible to contamination because the small recycling baskets resemble trash baskets and are often placed near them. Informal reports from custodians are that contamination of white paper recycling bins (by food waste and other non-white paper materials) is more prevalent in the 1993-94 academic year than in the past.<sup>13</sup> Contamination would most likely be much less of a problem if the MRP had clear goals, as there would be more positive pressure on all community members to both increase amounts recycled and not to contaminate (which would lower totals).

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<sup>13</sup> Ibid.



The MRP does have some components of an image, but they do not carry the program very far without a set of goals to publicize. First, although there is a logo affixed to all recycling containers on campus, and a name for the program, "MIT Recycles," that only appears occasionally in TechTalk, these features do not communicate a clear, brief, and specific set of MRP goals and values. As symbols they do not convey much information and so are not efficient at generating continued enthusiasm and support for the program. A noticeable drop in student recycling in the dormitories in particular, both in volume of collections and number of student volunteers, has been noted by Housing staff.<sup>14</sup>

Another sign of and reason for the weakness of the MRP's image is the absence of some periodic form of communication between the program and the general public. There is a recycling number that can be called for program information or to request containers. But this is a passive way of communicating, relying on the initiative of the caller, and limits the amount of information that can be shared. The MRP does not have a newsletter, or even an irregular brochures that track progress, and it has never had a public display on campus.

Community ownership of the MRP, the fifth indication that a program is institutionalized, is very ill-defined and undeveloped. Community ownership is ill-defined because the public image of the MRP, which helps to instill this ownership, is weak. It is difficult for people to become more than moderately enthused about the MRP because the program lacks a defining set of goals and an appropriate vehicle such as a newsletter to inform them of the importance of MIT recycling. They cannot identify themselves with the MRP if it lacks depth and substance.

Community ownership is undeveloped because there is no chance for more interested community members to make substantial contributions to the MRP. For instance, even if a student or staff member had a feasible idea for a recycling project, it would be difficult

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<sup>14</sup> Personal communication, Jack Corcoran, Fall 1993.

for the Recycling Coordinator to provide even minimal resources or time to assist that endeavor. There are many opportunities for members of the MIT community to make easy but essential contributions to the program by recycling whatever material is collected in their area, but this is not enough to institutionalize the MRP.

Finally, the MRP lacks real institutionalization because the program's few milestones do not function well. Some milestones have occurred: the submission and acceptance of the Recycling Plan, the Cambridge Advisory Committee on Environmentally Desirable Practices award to Housing and Physical Plant, and the start of newspaper, cardboard, and commingles collection in Physical Plant. The purpose of milestones is not just to mark events such as these, but to remind the community and leadership of the reason for the program's existence. The articles about these events in TechTalk simply indicated that the MRP was recycling, as it should be; they did not repeat the purpose of the program, restate its aims, or acknowledge how the events bring the MRP closer to specific goals. There is no context for these events, they are isolated, indications simply that the MRP is doing something, without much of a sense of why, or of the extent of the solid waste problem.

## CONCLUSION

This chapter has reviewed the impact of MRO on the MRP. The extent to which MRO animated and institutionalized recycling at MIT were considered as indicators of the policy's degree of success. The results are mixed. The MRO did moderately animate recycling at MIT but did not achieve the institutionalization of the MRP. Institutionalization of the MRP would be very advantageous for the MRO and Cambridge. If institutionalized, the MRP would be better able to increase recycling volumes, make recycling part of the fabric of MIT, and continue on for many years. Such a program at MIT would in turn help Cambridge to reach its recycling goals, and signify that the city's recycling policy, in terms of MIT, had been fruitful.

## CHAPTER IV      TOWARDS 25% RECYCLING AT MIT

### INTRODUCTION

The goal of Cambridge officials continues to be 25% recycling by 1996. Increases in the recycling rate at MIT would contribute towards meeting this goal. A 25% recycling rate at MIT is not inconceivable. Nationwide, the average state recycled 13% of its waste; Massachusetts now recycles just under 23%<sup>1</sup> Levels in the 20-30% range have been achieved in the best municipal programs. Seattle, widely touted as setting the pace of the art, recycles 40% of its waste; other recycling leaders are Portland, OR at 33% recycling and Lincoln, NE at 25%.<sup>2</sup>

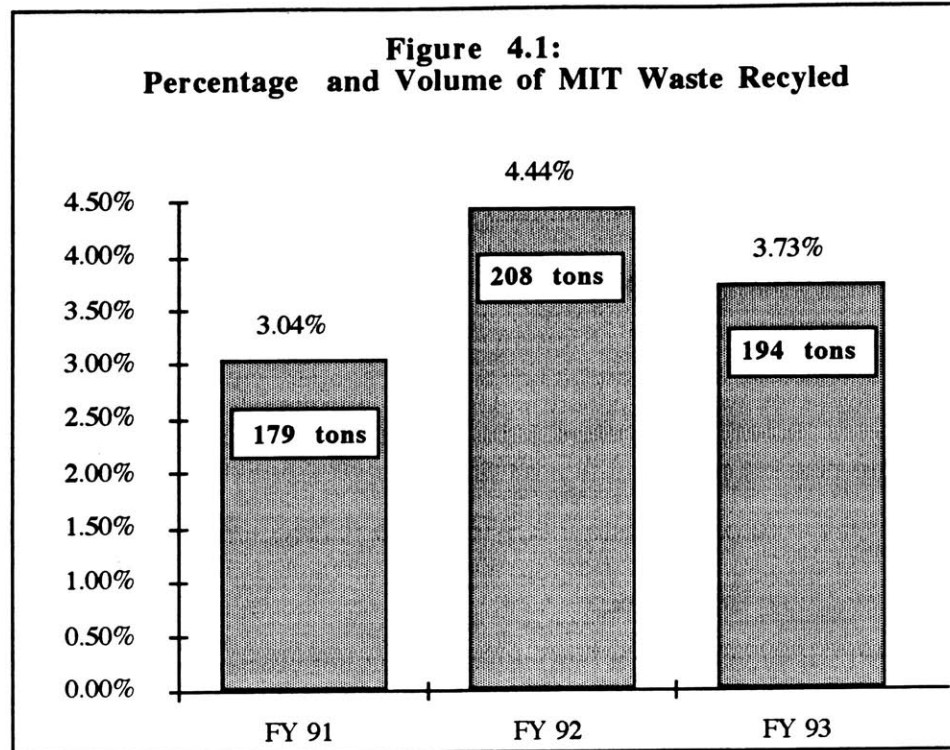
Presently, MIT is recycling at a fairly low rate (see Figure 4.1). Over the past three fiscal years (FY 91-FY 93), of the 5,356 tons of waste generated per year on average, MIT has

- recycled an average of 3.6% of the total waste stream per year
- recycled an average of 170 tons of materials per year;
- recycled a total of over 500 tons of recyclables

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<sup>1</sup> Boston Globe, 9/20/89, 7/1/90.

<sup>2</sup> Ibid. 9/10/92.



Source: MIT Grounds Services

The MRO as it stands does not appear likely to catalyze MIT recycling efforts towards higher rates, however. This chapter considers how the incentives provided by the MRO and the organization of the MRP can be changed so that a 25% recycling rate at MIT would be feasible.

#### CHANGES TO THE MRO TO PROMOTE 25% RECYCLING AT MIT

In order to improve the MRO it is useful to consider the logic behind the policy. How does the policy aim to gain compliance? It depends, of course, on how the policymaker understands the individual. Mark Sagoff, in The Economy of the Earth proposes one framework for viewing the individual. He distinguishes between two roles that an individual plays in society, that of the consumer and that of the citizen. He cautions that public policy, particular social policy like environmental regulation, needs to be clear which of the two roles is to be influenced. He argues that the goal of social regulation

should be to persuade the citizen to take action, because only the citizen will act to benefit the community as a whole.

As a citizen, I am concerned with the public interest, rather than with my own interest; with the good of the community, rather than simply the well-being of my family...social regulation should reflect the community-regarding values we express...<sup>3</sup> (emphasis in original)

Implicit in his argument is the idea that policy should be about attaining what is best for the community by appealing to the individual's allegiance to the community, not to the individual's self concern.

Policy that aims to benefit the community by motivating the consumer will most likely fall short of its intentions because the consumer acts primarily based on self-interest, with little thought of the consequences for the community. There are also often situations in which policy can address the consumer to act on the consumer's self interest, with positive results for the community as a outcome: mandatory wearing of seatbelts, for example, which protects the health of the consumer and lowers insurance and health care costs for the community. Sagoff's point is simply that the consumer will never act first and foremost with the community in mind, though the citizen will.

What is most interesting about Sagoff's discussion is the idea that there are multiple bases for decision making within a individual. The implication for policy is that there are a variety of ways to persuade the individual to act in the desired fashion. This is quite different from the conception of neo-classical economic theory, which focuses on one role, the consumer, as the definitive one when it comes to making choices in the marketplace. It is important to investigate this position, because the extent to which it is accurate will strongly influence the type of policy mechanism chosen by the policymaker.

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<sup>3</sup> Sagoff, Mark, The Economy of the Earth. Cambridge University Press: New York, 1988., p.8.

If individuals do indeed base their market decisions solely on utility considerations, then policy should adjust itself accordingly in order to be effective.

The contention of neo-classical economic theory is that evaluations of cost and benefit usually precede all others, and that a particular path is chosen mainly because it is the most cost-effective. For environmental issues, this means that policy should begin with the economic decisions of the individual. As Robert Stavins, a Harvard economist contends,

The approach [to environmental problems] that seems most promising...is one of harnessing market forces...using economic incentives (and disincentives) to make the everyday economic decisions of individuals, businesses, and governments work effectively for the environment.<sup>4</sup>

Other considerations, such as social responsibility or community loyalty, may sometimes be counted, but they are rarely decisive. Thus policy that seeks to change people's behavior should begin with "getting the prices right."

Cambridge policymakers thus can define MIT as a rational economic actor--a consumer -- or as a civic minded community member -- a citizen.. In assessing how MRO seeks compliance, they need to evaluate how MIT responds to the MRO, whether as a citizen of Cambridge or as a consumer who happens to be located in the city. Changes to the MRO could aim for increased recycling volume by motivating the consumer or by encouraging the citizen .

#### Appealing to MIT as Consumer: Unit Pricing

Policymakers could consider a change in the MRO that would be aimed at MIT as consumer. They could add an amendment to the MRO that established a system of unit-pricing of refuse, an economic incentive to reduce waste and recycle. Essentially, unit-

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<sup>4</sup> Stavins, Robert, Project 88: Harnessing Market Forces to Protect our Environment. Washington, DC., 1988, p.1.

pricing is a system that allows the consumer to decide how much they will pay for solid waste disposal. The municipality sells rights to garbage collection, either in the form of different-sized barrels or stickers. The price of the barrels or the stickers (which can only be affixed to a certain size trash bag) is based on the average cost of disposal per household. Materials that were recyclable would be collected, if separated from non-recyclable trash, for a low charge per barrel, or for no-cost.

This system potentially could reduce solid waste volumes and encourage recycling. People have an incentive to throw out as little as possible, since the more they dispose the more they pay, and an incentive to recycle as much as possible, since the collection cost per unit of recyclable material would be lower than the disposal cost per unit. Households naturally, without the presence of a mandatory law, would turn to recycling, reduced consumption, or changed buying patterns to reduce their waste total. The decision would be up to them, but because of the incentive structure, would most likely work to the municipality's benefit (less solid waste) as well as their own (lower cost collection).<sup>5</sup>

The success of an economic approach such as unit-pricing depends on the choices an individual makes as a consumer. For unit-pricing to work, the individual must base his or her recycling decisions squarely on the cost of recycling relative to the cost of disposal. If the individual assesses his or her solid waste choices primarily on other factors, and only secondarily on cost-effectiveness criteria, the policy will not have the intended effect. Likewise, if the individual is aware of the comparative costs of various decisions but does not respond strongly to the low cost alternative, the policy will not achieve as large a reduction in solid waste volumes.

It is necessary at this point to clarify the difference between actors such as MIT as a whole along with the individuals that comprise the university, and the household

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<sup>5</sup> See Tietenberg, Thomas, Environmental and Natural Resource Economics, p. 205-209, and Stavins, pp. 40-53 for complete discussions of unit-pricing and descriptions of actual programs.

discussed in the section on unit-pricing above. Clearly they are distinct types of actors. The relevant distinction is that, while individual students, staff, or faculty may not know the cost of solid waste disposal, the department responsible for disposal -- Ground Services -- does. MIT, instead of receiving disposal services through the city, in which case they would be akin to the household in their ignorance of the true cost of collection, contracts with a private firm, with charges based on weight (similar to a unit-pricing system). The fact that MIT is aware of its waste costs does not undermine the unit-pricing scenario, however; if anything, knowing the true cost of its waste removal should, theoretically, allow MIT to act with more precision to recycle in the most efficient ways.

(As mentioned above, MIT does not receive waste services from the city, and so would not be affected by any unit-pricing scheme for municipal pickup. For the sake of argument, let us assume that MIT does receive waste removal services from the city. The purpose here is not to explore how a unit-pricing provision could be applied to MIT, but to see whether in theory such an economic-incentive approach would work).

A unit-pricing provision in the MRO might not have the desired effect at MIT. The reason is that the experience of MIT recycling indicates that individuals within the community (students and other volunteer recyclers), and MIT as a whole (represented by Grounds Services), have not responded strongly to the economic incentives and disincentives relating to solid waste disposal and recycling. There are three examples of this tendency: the student volunteer efforts of 1989-91, the early period of white paper recycling in Physical Plant (May 1990 - October 1991) roughly coinciding with Fiscal Year (FY) 1991, and the post October 1991 to August 1992 decline (roughly FY 1992). In all three cases, clear price signals did not result in significant changes in recycling or disposal behavior consistent with the economic theory underpinning unit-pricing.

The student volunteer efforts of 1989-91 were very important to energizing recycling on campus, yet were not the result of reaction to price signals. To begin with, students had no knowledge of the cost of solid waste disposal to them individually (since it was

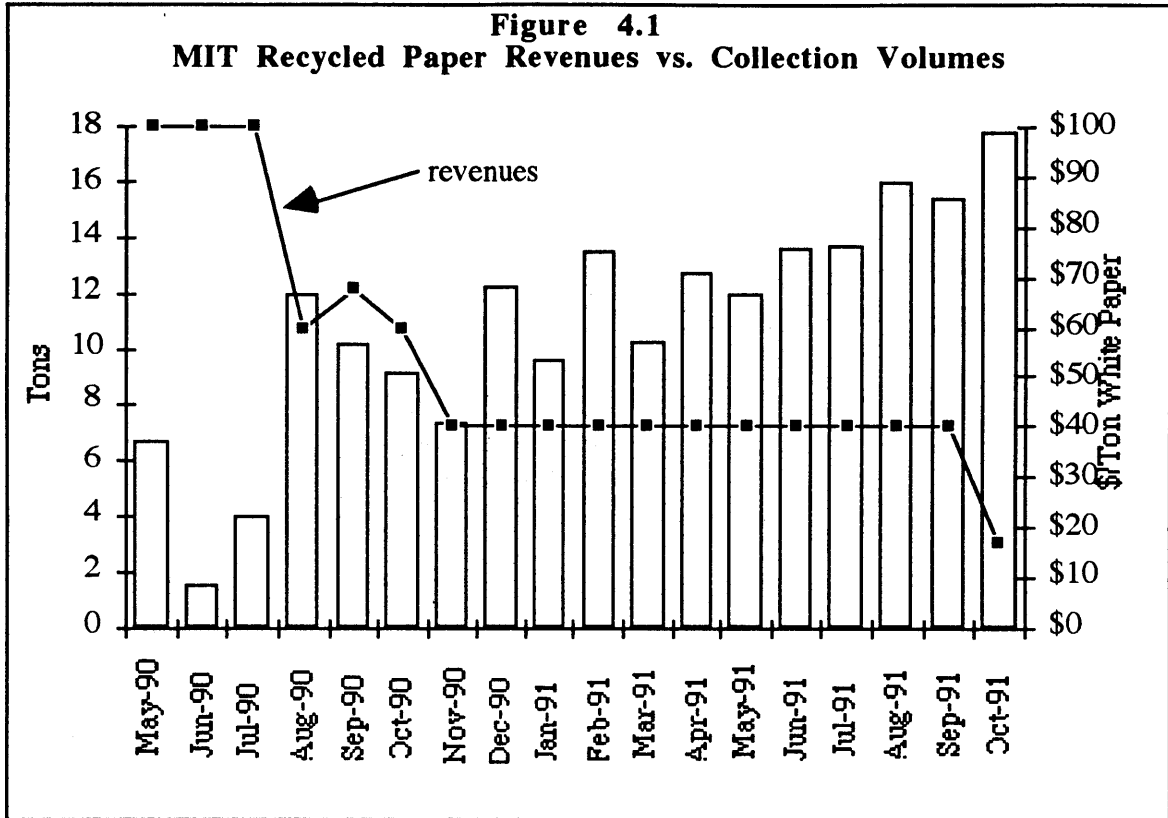


actions on the relative cost of each option. Neo-classical economic theory would indicate that instead of recycling (which might cost them something) they would be more likely inordinately throw materials away, since as far as they knew dorm trash collection was "free."

In contrast, the cost in time to the student recycling volunteers was quite high. Not only was there no economic return on the labor they expended to collect their own materials for recycling, but by gathering and transporting recyclables for an entire dorm, they were taking on part of the recycling costs (the cost of transport) of hundreds of other students. It is not likely that students, either casual recyclers or the more active volunteers, paid much attention to price signals when they decided to participate.

A second period of recycling activity at MIT during which cost differentials did not seem strongly to effect recycling and disposal choices was the early phase of white paper recycling in physical plant roughly coinciding with Fiscal Year (FY) 1991 to FY 1992. Unlike later periods, recyclable white paper commanded a market price. The collection firm paid MIT for its white paper from the start of white paper recycling in May 1990 until October 1991, when the market for recyclable white paper collapsed because of oversupply in fall 1991.

If Grounds Services based its support of the recycling project primarily on price signals, then white level collection levels would have echoed the price per ton for recyclable white paper from May 1990 to October 91. When the price of recyclable white paper was high, the department would have pushed for more collection; when the price was low, the department would have reduced its emphasis on recycling, and volumes would more or less follow suit. The exact opposite happened. As the price per ton dropped month by month, leveling at \$40 per ton for a while only to plummet to \$17 per ton, white paper recycling volumes at MIT continued to rise (see Figure 4.1). The level of recycling cost-effectiveness was presumably not the driving factor behind the growth in white paper collection volumes.



Source: MIT Grounds Services

In the third period, the decline of October 1991 to August 1992, if the cost of recycling compared to the cost of disposal was the dominant decision rule for how much to recycle, the percentage of the MIT solid waste stream recycled should have increased dramatically. Disposal charges rose 15%, from \$61 per ton in FY 1991 to \$70 per ton in FY 1992. In comparison, the cost to Grounds Services of recycling<sup>6</sup> Physical Plant white paper dropped from \$70 per ton in FY 1991 (the high figure reflected startup expenses--baskets, containers, etc.) to a stunningly low \$6 per ton in FY 1992. The figure was so low at that

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<sup>6</sup> The per ton cost of recycling is calculated as follows: expenses per ton - disposal cost avoided per ton = cost per ton. The avoided cost is the price of disposing one ton of solid waste.

baskets, containers, etc.) to a stunningly low \$6 per ton in FY 1992. The figure was so low at that time because the collection firm could cover the expenses of white paper collection with revenues from the sale of white paper, and so did not charge MIT to collect it.

If MIT Grounds Service was making solid waste management decisions directed primarily on a cost-effective basis, one would expect to see the department engaged in or promoting very energetic white paper recycling activity during the period, in order to reap the benefits of the wide cost differential. Instead (as related above) the absence of a Recycling Coordinator during this interval in large part was responsible for a precipitous drop in white paper collection volumes, which fell from a high of 17.8 tons in October 1991 (representing \$1260 in costs avoided) to 5.5 tons in August 1992 (only \$484 in costs avoided<sup>7</sup>). If recycling levels could have been maintained at an average of 13 tons/month for this period, MIT could have saved approximately \$10,000. Instead, the average was 11 tons per month, and MIT only saved approximately \$8500.

In sum, it does not appear very likely that Cambridge policymakers could improve the MRO's ability to increase recycling volumes at MIT by adding a unit-pricing provision. For unit-pricing to work, those who make decisions at MIT about recycling would have to have a habit of orienting their choices in the least cost and most cost effective direction. The choices of students and other community members who voluntarily recycle do not seem to reflect such a calculus. They choose to recycle despite the proportionally higher cost to them (in time) of recycling to disposal. Grounds Services, which makes solid waste management determinations for MIT as a whole, also does not seem to make price signals the only or decisive factors in its decisions regarding recycling. Grounds Services has not vigorously pursued greater recycling levels when

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<sup>7</sup>By FY 1993 the disposal cost per ton had risen to \$88.

the price of recycling favorably compared to the price of waste disposal, nor did it de-emphasize recycling when recycling became relatively less attractive.

#### Appealing to MIT as Citizen: A Percentage Goal

Policymakers could also make a change in the MRO that would seek to motivate MIT as a citizen of the Cambridge and the Massachusetts community. They could require all institutions and businesses in Cambridge to adopt the same goal that the city has for waste reduction and recycling: 25% recycling by 1996 (to match the goal set by the state). Currently the MRO only requires institutions to recycle "to the fullest extent possible" without specifying a target.

A percentage goal would ask people at MIT to recycle based on citizen values: to recycle because it was good for the community as a whole, not simply because it was good for MIT. If MIT did, the fact that MIT was making progress towards 25% recycling would serve as a tremendous impetus and example to the rest of the city.

A percentage goal could increase recycling rates at MIT. The review of MIT recycling shows that many people at MIT base their decision to recycle on citizen values. There are two indications from the experience of recycling at MIT from 1989 on, though no hard data such as a survey or poll, that attest to the likelihood that campus recycling is done with the welfare of the larger community in mind.

The first indication is that volunteer recycling began before there was a clear sense on campus that recycling also benefited MIT. Volunteer recycling began in the spring of 1989; the education program, which highlighted the economic benefits to MIT, kicked off in May 1990. These volunteers certainly were aware that recycling conserved natural resources, reduced pollution, and moderated consumption. But they could only marginally experience these positive outcomes; nearly all of these environmental benefits would be experienced most directly by the community beyond MIT. The point is that

they recycled even though there was no clear benefit to themselves or MIT. They apparently recycled because it was beneficial to them as members of a wider community .

The importance of recycling enthusiasts to the growth of the MRP is another indication that a Cambridge recycling policy aimed at MIT as a citizen might work. Many of the improvements and expansions in the recycling program have occurred because of the efforts of these volunteers. These volunteers have for the most part been motivated by to recycle primarily for the good of the community. For example, many members of the class of 1993 who were active their first year at MIT (1989-90) in the initial dorm recycling exercise -- and were motivated primarily by citizen values -- were also key organizers of the drive to raise funds for recycling bins as the class gift in their last year (1992-93). MIT community members like them may well respond positively to a percentage goal in the future.

The final indication that MIT as a whole recycles based on citizen values is that MIT fully and quickly complied with the MRO. It is a simple but meaningful fact. MIT has not always had the best of relations with Cambridge and has not cooperated with the city on every policy created by municipal government. The fact that MIT has acted deliberately on MRO indicates that, at least in terms of recycling, it acts as a citizen of Cambridge.

This section has reviewed how MRO could be changed so that it prompts higher recycling rates at MIT in the future. An evaluation of the history of MIT recycling suggests that the primary criteria behind recycling decisions on campus has been the welfare of the community, and that calculations of the most cost-effective behavior have not had a strong impact on recycling. Consequently, the policy change that may best suit the MRO and Cambridge's aim of increasing recycling rates at MIT would be to require that MIT achieve 25% recycling by 1996. The next section considers what kind of changes would be necessary at MIT to achieve this goal, both operationally and organizationally.

## ORGANIZATIONAL CHANGES AT MIT TO REACH 25% RECYCLING

Enacting the changes to the MRO discussed above would provide MIT with the necessary motivation, but MIT itself would have to make certain organizational changes in order to move towards a 25% recycling goal. There are three key organizational changes that would increase the potential for MIT to reach a goal of 25% within the next five years: hiring a full time coordinator, establishing student work-study positions within the program, and designing and implementing a comprehensive education and promotion program.

### 1. Hire a full-time Recycling Coordinator

First and foremost, in order for the MRP to become institutionalized, a full-time staff Recycling Coordinator will have to be hired. A full-time person is essential to providing the MRP with the legitimacy necessary to expand. Appointing a full-time coordinator would send the strongest signal of all, to the MIT community and to the city, that MIT was becoming more serious about recycling. While budget restrictions at MIT make this change fairly unlikely in the near future, they do not make it any less important, and it is possible that the expense could be balanced by cost savings.

### 2. Establish Work-Study positions for recycling

Whether or not a full-time Recycling Coordinator is hired, establishing work study positions so that students could take on more responsibility within the program would both move the MRP closer to institutionalization and increase student participation. Students could work in the dorms or at the recycling office.

Students working in the dorms would focus on improving collection. A student responsible for moving recyclables in dorms with particularly high volumes would prevent recyclables from accumulating unnecessarily, and would save the program

money by ensuring that full loads were collected by the recycling contractor. Housing pays for pickup even if very few or no materials are collected, so low volume loads are proportionally more expensive.

A work-study student could assist the Recycling Coordinator. The student would focus on researching and tracking the market for recyclables, publicizing and promoting the recycling program, and coordinating communication and information sharing among the three administrative units responsible for recycling, which would enhance the sense of MIT having a unified recycling effort.

### 3. Design and implement a comprehensive education and promotion program

The second organizational change would be to design and implement a comprehensive education and promotion program. A newsletter would be the cornerstone of the program. Universities that have consistently high rates of recycling such as Harvard and Northeastern are fueled by monthly newsletters that report on the programs successes, problems, and new initiatives. Updates that include successes would encourage employees, faculty, and students to do more (as evidenced by the link at MIT between promotion activity and high recycling rates). Honest presentation of problems with the system could inspire the MIT community to develop creative solutions.

The recycling program could make more use of MIT media: Tech Talk, The Tech, The Thistle, and MIT Cable TV. Other options are Lobby 7 displays that track the amount and percentage of materials recycled on a monthly basis in tangible terms of money, landfill space, trees and other natural resources saved. Recognition for outstanding staff and student recycling efforts would also help to promote recycling on campus.

A campaign to decrease contamination of recyclables should be a key element in the education initiative. A "Contamination Education" project would identify how

contamination occurs, how contaminated recyclables interfere with processing of recyclables for re-use, and easy ways to avoid contamination.

## CONCLUSION

The solid waste problem is a community problem. Everyone in the community was partly responsible for creating it, and everyone also has responsibility for helping to solve it. Municipal government can best achieve a concerted and united community effort if it appeals to residents and institutions as citizens, not as consumers. This holds true for MIT; the experience of the MRP shows that the recycling behavior of MIT students, staff, and faculty was likely to be more strongly motivated by a desire to improve the condition of the larger community than by considerations of personal gain.



## CHAPTER V CONCLUSION

This case study began with an observation and two questions. The observation was that MIT's recycling rates were low compared to rates at other area colleges. This was true before and after the passage of a Cambridge ordinance mandating recycling. Since the aim of the policy obviously was to increase recycling rates at MIT as well as throughout the city, two pertinent questions arose:

- What is the cause for MIT's low rates?
- How can the MRO be modified to raise MIT's recycling rates?

To answer these questions, state and local MSW policy was reviewed in Chapter II, the impact of the MRO on the MRP was considered in Chapter III, and suggestions for modifications of the MRO and MRP were presented in Chapter IV.

There are two main conclusions from this case study:

1. Institutionalization of a university recycling program is very important to its ability to achieve high recycling rates.

The MRO was able to encourage more vigorous recycling efforts at MIT, but has been unable to effect the institutionalization of recycling on campus which is necessary for program to increase recycling rates. Recycling rates at MIT are more likely to rise after the program has become fully institutionalized.

2. Municipal recycling policy may be able to encourage the institutionalization of university recycling programs by providing civic incentives

Currently institutions such as MIT that do not receive municipal solid waste collection are not required to reach the 25% recycling goal established in the MRO. Requiring MIT to do so would appeal to MIT as a citizen of Cambridge, not simply as a

consumer, and such an appeal could provide the necessary motivation for MIT to increase its recycling efforts.

MIT's experience with recycling is particularly instructive because it is a case that illustrates the interaction of a number of factors integral to the outcome of recycling: governmental, economic, institutional, social, and educational. By exploring the MIT experience with recycling we can better understand the policy ingredients that minimize and maximize recycling success and so design better programs in the future.

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