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**Strategic Plan to Promote the Use of  
Recyclable Materials in Massachusetts  
Project**

**Phase III Final Report: The Strategic Plan**

*Prepared for:*

**The Chelsea Center for Recycling and Economic  
Development  
on behalf of the Commonwealth of Massachusetts**

***Dorn and Associates***

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## TABLE OF CONTENTS

Acknowledgements .....	i
Executive Summary .....	E-1
Background.....	E-1
Purpose and Contents of the Plan .....	E-2
General (Cross-material) Recommendations.....	E-3
Material-Specific Recommendations .....	E-10
Management Strategy Recommendations .....	E-16
Path Forward .....	E-19
Chapter 1. Introduction.....	1
1.1 Purpose and Structure of Strategic Plan Report.....	2
1.2 Institutional Involvement in Strategic Planning Effort.....	3
Chapter 2. Role of the Commonwealth in Recycling Market Development .....	4
2.1 Meeting the State’s Recycling Goal: The Need for Recycling Market Development .....	4
2.2 The Potential Impact of One State on Materials Markets .....	6
2.3 Principles of Approach – The Role of State Government in Recycling Market Development.....	8
2.4 Components of a Recycling Market Development System in Massachusetts.....	11
Chapter 3. Massachusetts Programs for Recycling Market Development .....	13
3.1 Overall Goal of a State Recycling Market Development Effort.....	13
3.2 Approach .....	13
3.3 General (Cross-Material) Strategies.....	14
3.3.1 Feedstock Conversion .....	15
3.3.2 Technology Development and Commercialization .....	19
3.3.3 Support of Existing Recycled Product Manufacturing Businesses.....	25
3.3.4 New Recycled Product Manufacturing Business Development.....	29
3.3.5 Buy Recycled.....	31
3.3.6 Collection and Processing Best Practices and Technology Development.....	35
Chapter 4. Material-Specific Challenges and Opportunities in Massachusetts .....	37
4.1 Role of Material-Specific Analysis in State Recycling Market Development .....	37
4.2 Priority Secondary Material Grades .....	38
4.3 Identification of Market Opportunities Among Target Material Grades .....	43
4.4 Challenges to Realizing Recycling Market Development Opportunities .....	50
4.5 Recommendations for Addressing Material-Specific Market Development Needs and Opportunities .....	54
Chapter 5. Recycling Market Development Management System .....	58
5.1 Principles of Approach to Managing Recycling Market Development.....	58
5.2 Management Strategy Recommendations .....	59
5.2.1 Communication, Consensus and Coordination, and Goal Setting .....	60
5.2.2 Market Intelligence Gathering .....	61
5.2.3 Ongoing Strategic and Implementation Planning.....	63
5.2.4 Monitoring and Evaluation .....	64
Chapter 6. The Path Forward .....	66
Appendix A: Recommended Allocation of Program Roles and Responsibilities of State Agencies with Primary Activity in Recycling Market Development .....	A-1
Appendix B: Outline for Approach to Evaluation of Program Appropriateness and Effectiveness.....	B-1

## **EXECUTIVE SUMMARY**

### **Background**

In 1997, the Massachusetts legislature mandated the creation of a strategic plan to promote the development of in-state markets for recyclable materials. The Chelsea Center for Recycling and Economic Development was selected by the Executive Office of Environmental Affairs to oversee development of the plan. The Chelsea Center retained the consulting firm of Dorn and Associates to conduct related research, facilitate the strategic planning process, and prepare all associated project reports. The overall purpose of the Strategic Plan for Recycling Market Development project was to:

- Help set the course in Massachusetts for enhancing the capacity of the state to identify and realize recycling market development opportunities; and
- Identify recycling market business opportunities that have potential to serve as the focus for near-term recycling market development efforts.

The project involved three distinct phases of work:

- I: An analysis of recyclable materials supply and demand
- II: Identification of potential recycling market development opportunities and barriers
- III: Strategic planning for recycling market development

An Advisory Committee was established by the Chelsea Center to guide the project and participate in the strategic planning process. The Committee was comprised of representatives from the Massachusetts Department of Environmental Protection (DEP); Massachusetts Executive Office of Environmental Affairs (EOEA); MassHighway; Massachusetts Manufacturing Partnership; Massachusetts Office of Business Development (MOBD); MassRecycle; University of Massachusetts President's Office; U.S. Environmental Protection Agency Region I; and WasteCap of Massachusetts.

Phase I entailed in-depth analysis of markets for eight commodity groups of recyclable materials found in municipal solid waste (MSW) and in the construction and demolition (C&D) waste stream: glass, plastics, metals, paper, wood, organics (yard waste and food waste), tires, and textiles. Among the eight commodity groups, 37 individual grades of recyclable materials were analyzed. For each commodity and grade, the analysis prepared estimates of in-state supply, in-state recovery, and in- and out-of-state demand for the recovered material, and discussed barriers to increased supply and demand.

Sixteen material grades were selected, on the basis of this analysis, to serve as the focus of market opportunity investigations conducted in Phase II. As a result of Phase II research, 18 specific market development opportunities were identified. The nature of these opportunities included: recycling business development, feedstock conversion, recycled product research and development, and increasing processing capacity.

Phase III of the project involved preparation of the recycling market development strategic plan, described in this Executive Summary, plus development of a draft Memorandum of Understanding regarding roles and responsibilities of state agencies having primary responsibility and involvement in recycling market development in Massachusetts.

The Massachusetts Strategic Recycling Market Development Plan contains:

- A discussion of the rationale for and approach to state intervention in markets for recyclable materials;
- A discussion of components of a comprehensive recycling market development system;
- Principles of approach to recycling market development;
- An assessment of the current status of Massachusetts efforts in recycling market development;
- Massachusetts program and management goals and strategy recommendations; and
- A brief discussion of the recommended path forward in implementing the Strategic Plan.

This Executive Summary presents the key strategy recommendations outlined in the plan.

### **Purpose and Contents of the Plan**

The primary aim of a Massachusetts recycling market development effort is to increase the use of secondary materials generated in Massachusetts in recycled products manufacturing. Within its state government and non-profit organizations, Massachusetts contains a corps of professionals who are extremely knowledgeable about recycling and secondary materials, and who are highly dedicated to the goal of raising the level of recycling activity in this state over time. The purpose of the recycling market development plan is to build the capacity of the state and the tools at the disposal of these professionals, to stimulate the development and growth of markets for recyclable materials, and so help support existing recycling programs and the state in achieving its [the state's] recycling goal.

The Strategic Plan is structured around building the state's institutional capacity to promote recycling market development in three primary ways:

- To encourage and support market development across a variety of secondary materials and recycled products through focusing on the development of ***cross-material*** program tools in six important dimensions of market development activity – conversion, technology development and commercialization, support of existing recycled product manufacturers, recycling business startups, buy recycled, and collection and processing best practices and technology development;
- To identify and pursue ***material-specific*** opportunities (which may include opportunities for conversion, attraction, expansion and startup), and priorities through assessing individual markets and choosing and pursuing priorities; and
- To create a recycling market development ***management system*** that provides for consensus, coordination, and communication around four ongoing system components – market intelligence and assessment (i.e., staying current on market conditions and trends), strategic planning, program implementation, and program evaluation.

This approach to capacity building is based on a recognition that:

Markets are the most efficient mechanism for allocating resources,

The primary function of the state in recycling market development is to develop the capacity to identify and address market inefficiencies,

The workings of the markets for secondary materials are ever-changing, and

To be effective, the state needs to be in touch with and responsive to changing circumstances as they occur.

Recommendations pertaining to cross-material, material-specific, and management system strategies are

presented below. For greater detail, a discussion of current activities, and an explanation of the rationale supporting each recommendation, see the full version of the Strategic Recycling Market Development Plan.

## **General (Cross-material) Recommendations**

### **Feedstock Conversion**

Goal: To encourage existing Massachusetts manufacturers to convert from virgin to secondary materials to the extent that technology and markets allow.

General Approach: Use information, facilitation, and financial incentives to promote conversion as a means of improving product performance and reducing production costs. Use information tools to promote the development of products targeted to “Green” markets (markets for environmentally friendly products).

#### Actions:

1. Prepare and periodically update a priority target list of Massachusetts manufacturing sectors that contains candidates for conversion, absorbing a significant amount of secondary material.
2. To firms on the priority target list, disseminate information on feedstock conversion as a means for improving product performance and reducing production costs.
  - a) Develop a one-stop center for Massachusetts firms to gain access to technical information on feedstock conversion.
  - b) Prepare a companion base of information on approaches for firms to use in determining whether or not to convert and in managing the implementation of a conversion process.
  - c) Aggressively market the availability of the information resources to target manufacturing sectors and to state and local economic development agencies.
  - d) Continue to implement the Recycling Industries Reimbursement Credit (RIRC) program.
3. Promote conversion as a means of increasing profits through “Green” product marketing:
  - a) Utilize the RCRA librarian in EPA Region I to gather information regarding the potential size of and profit potential in Green markets for recycled products (markets of consumers specifically seeking to purchase, and often willing to pay more for, recycled products).
  - b) If significant potential appears to exist, use existing information sources to prepare and regularly update an analysis of U.S. and international markets for recycled products as Green products.
  - c) Aggressively promote the results of this analysis to Massachusetts manufacturers, particularly those in target sectors.
4. For small manufacturers considering conversion, but short on funds to test the feasibility of doing so, continue to provide conversion feasibility grants.

### **Technology Development and Commercialization**

Goal: To the fullest extent possible, encourage the successful development and commercialization of innovative recycled products, and of manufacturing technologies for recycled products, in Massachusetts.

General Approach: Provide potential recycled product developers with information regarding the market needs for such products and technologies, access to the full range of information and resources needed to successfully develop and commercialize them, and a regulatory review process that protects environmental quality without unnecessarily impeding technology development and commercialization. In addition, explore the potential for taking advantage of the concentration of manufacturing engineering talent in Massachusetts and promoting the state as a center for the development of innovative recycled products and recycled product manufacturing technologies.

Actions:

1. Identify Massachusetts firms, entrepreneurs and research organizations with some potential to develop new recycled products and/or recycled product manufacturing technologies. Identify and organize information regarding market opportunities for such products and technologies. Disseminate information to target organizations.
2. Expand access by recycled product developers and recycled manufacturing technology developers to technology development resources and opportunities.
  - a) Expand the existing service provider guide (in print and on the Web) to include additional resources for technology development and commercialization, including public and private research organizations, consultants, and testing services. Continue to use trade and professional associations, business assistance organizations, and development agencies to actively promote facilitation services that link technology developers to the appropriate development and commercialization resources.
  - b) Continue to host periodic workshops on best practices in technology development and commercialization for recycling businesses.
  - c) Continue to encourage informal relations among private sector recycling technology developers, academic researchers, and resource providers.
  - d) Continue to assist recycled product and manufacturing technology developers in accessing research, development and testing assistance through the Strategic Envirotechnology Partnership (STEP), other technical assistance resources of the University of Massachusetts, EPA's Environmental Technology Verification (ETV) program<sup>1</sup>, the Federal Laboratory Consortium (FLC)<sup>2</sup>, and similar organizations. Explore means by which STEP can become more accessible to recycled product developers.
  - e) Encourage university researchers to consider spinning off business startups based on technologies they develop.
  - f) Using FLC, identify Federal laboratories that are potential sources of technology transfer – that is, are carrying out research and technology development activities that may be of interest to Massachusetts recycling businesses looking for commercialization opportunities. Assist businesses

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<sup>1</sup> The ETV program seeks to “verify the performance characteristics of commercial-ready environmental technologies through the evaluation of objective and quality assured data so that potential purchasers and permittees are provided with an independent and credible assessment of the technology that they are buying or permitting.” Two appropriate ETV Pilot Partnerships for recycling technologies are those for Pollution Prevention, Recycling and Waste Treatment Systems (with the State of California) and the Environmental Technology Evaluation Center (EvTEC) managed by the Civil Engineering Research Foundation.

<sup>2</sup> The FLC provides access to technical assistance and technology transfer from several hundred Federal research laboratories around the U.S. The FLC Web site can be used to identify Federal labs that have research capacities

- in gaining access to pertinent technologies through cooperative research and development agreements and licensing.
- g) Regularly and systematically monitor innovative recycled product manufacturing technology development around the U.S. (e.g., at out-of-state universities and companies), and link Massachusetts businesses with specific opportunities as appropriate.
  - h) Using MTC, monitor Small Business Innovation Research (SBIR) announcements by the Federal government that may be of interest to Massachusetts recycled product manufacturing technology developers, and provide links to resources that can assist developers in being awarded SBIR contracts.<sup>3</sup>
3. Create a flexible, strategic research and development (R&D) financial subsidy effort.
    - a) Continue to fund university research grants, product development grants, product testing grants, and RIRC.
    - b) Explore creation of R&D consortia comprised of public and private sector members for pre-development research seen as of particular value to Massachusetts recycling firms (may include out-of-state parties).
  4. To the extent possible, encourage the development of Massachusetts as a center for R&D in recycled product development and technologies for manufacturing recycled products.
  5. Continue to identify means by which the Beneficial Use Determination (BUD) process can be revised to better promote new recycled product development in Massachusetts without compromising environmental quality, and make changes as necessary and appropriate.

### **Support of Existing Recycled Product Manufacturing Businesses**

Goal: To provide existing Massachusetts recycled product manufacturers with access to the financial, professional, educational, and infrastructure resources necessary for expansion of sales, profits, and jobs.

General Approach: Create a mechanism for regularly communicating with recycled product manufacturers regarding needs and opportunities. Jointly undertake a strategic competitive analysis of Massachusetts' recycled product manufacturing industry – opportunities, threats, strengths and weaknesses – and adjust business assistance programs accordingly. Continue with active referral of firms to existing resources to meet identified needs.

#### Actions:

1. Create a Massachusetts Recycled Product Manufacturers Network (the Network), comprised of the state's recycled product manufacturers. The aim of the Network would be to provide a mechanism through which Massachusetts recycling firms could develop formal and informal relations with one another, and identify and act on issues and opportunities of common interest.
2. Assist Massachusetts recycled product manufacturers with gaining access to a variety of information, facilitation and financial resources that promote business expansion.

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<sup>3</sup> The SBIR program is mandated by Federal law, which requires each Federal agency funding research and development to set aside a certain proportion for small business researchers.

- a) Continue to provide one-on-one assistance to recycling businesses, as requested, in gaining access to needed resources, including management assistance, market assessment and marketing assistance, technical assistance, debt finance and venture capital, human resource development, and environmental permitting.
  - b) Enhance the current services directory (on-line and in print) by providing information regarding access to private sector resources, including financing, in addition to that currently provided on public sector and non-profit resources; written guidance on suggested approaches to choosing which resources to contact based on the nature of particular needs; and suggestions on resources to assist in the overall management of the process of business growth.
  - c) Develop a page on the Chelsea Center web site listing potential sources of financing, with hotlinks to each of the listed financing programs' web sites, where available.
  - d) Provide workshops to recycled product manufacturing businesses regarding the management of business expansion, on an as-needed basis (working with Network members).
  - e) Promote access to conversion and Green markets information (discussed above) to existing recycling businesses.
  - f) As was done in 1995 by the Department of Environmental Protection (DEP), carry out a survey, interviews and focus groups with Massachusetts recycled product manufacturing businesses to more clearly identify the nature of unmet capital needs, particularly needs for access to "patient capital," including equity. To the extent appropriate, make use of DEP's manufacturers survey results obtained in the design of RIRC program.
  - g) In light of previous step, identify those specific capital gaps that should be addressed by the Recycling Loan Fund, and capital services for which the fund is not needed, and restructure the operations of the loan fund accordingly.
  - h) Consider whether a portion of Clean Environment Fund monies used to capitalize the RLF should be redeployed. Options may include creating a second capital fund (e.g., for equity investment).
  - i) Consider deploying funds to provide access to marketing assistance for Massachusetts recycled product manufacturers. If and when the Network is organized, operate the marketing assistance program through the Network, and allow Network members to assist in program design.
3. With the participation of the Network, prepare and utilize the results of a strategic competitive analysis of the Massachusetts recycled product manufacturing industry.
- a) Carry out and periodically update a strategic analysis of the Massachusetts recycled product manufacturing industry.
  - b) Utilize the findings of the strategic analysis to organize and create greater access to resources needed to take advantage of opportunities and address threats.

### **New Recycled Product Manufacturing Business Development**

**Goal:** To encourage and support the startup of new final and intermediate recycled product manufacturing businesses in Massachusetts, including non-profit and for-profit community-based enterprises (i.e., those in lower income communities that employ local residents).

**General Approach:** Continue with active identification of private sector entrepreneurs, provision of direct service, and referral to existing resources. Continue to offer access to capital to entrepreneurs through the RLF and RIRC, plus explore the unmet needs of entrepreneurs for venture capital and means of addressing them. Proceed with work in promoting business development through community-based organizations

throughout Massachusetts. Revise the Beneficial Use Determination (BUD) process to encourage recycled product manufacturing business development without compromising environmental quality.

Actions:

1. Stimulate recycled product manufacturing business development by Massachusetts entrepreneurs.
  - a) Through referrals from public and private service providers throughout the state, attendance at conferences, and other means, seek to identify individuals who are considering starting recycled product manufacturing businesses.
  - b) Publicize business development opportunities identified through material-specific market analyses.
  - c) Through on-line and printed materials, continue to provide access to a variety of information, facilitation and financial resources for entrepreneurs seeking to start recycling businesses, and written guidance on how to make effective use of these resources.
  - d) Consider a variety of means for increasing access of Massachusetts entrepreneurs to venture capital, e.g., explore investment of some portion of RLF funds with a sustainable business development fund.
  - e) Revise the BUD process to better promote the development of new recycled product manufacturers in Massachusetts.
  
2. Promote community-based recycling business development in Massachusetts.
  - a) As planned, select two or three communities with which to work on the development of community-based recycled product manufacturing operations.
  - b) Provide community business developers with models of successful development, including examples of success stories in the U.S. and other countries, and a guide to effective practices and pitfalls in community recycling business startup and operation.
  - c) Seek to determine effective means of using the Community Reinvestment Act (CRA) to leverage commercial bank investment in community recycling businesses.
  - d) Work with a variety of community-oriented organizations to promote recycling business development, including the Massachusetts Association of CDCs and its various members, commercial bank CDCs operating in Massachusetts (e.g., Fleet)<sup>4</sup>, the Massachusetts Community Development Finance Corporation, the Minority Business Assistance Center at UMass-Boston, and various community-oriented small and micro-business lenders.
  - e) Examine the need for creating a targeted recycling micro-business loan fund, with capitalization from a special U.S. Department of Treasury program. Facilitate access by community-based businesses and their sponsors to relevant non-Massachusetts resources, e.g., foundation grants, Federal grant programs.

**Buy Recycled**

Goal: To promote the purchase of recycled products by government, business, institutions, and other consumers, particularly recycled products manufactured in Massachusetts.

General Approach: Increase coordination among various state entities to promote buy recycled through establishment of a Buy Recycled Coordinating Committee and by integrating buy recycled efforts with

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<sup>4</sup> Commercial bank CDCs are bank subsidiaries with the mission of investing in low-income communities.

recycling market development efforts, Environmental Preferable Procurement (EPP) efforts, and the promotion of sustainable consumption; increase efforts to encourage businesses and consumers to buy recycled; and conduct research and testing that leads to making recycled products available through state contracts.

Actions:

1. Develop a coordinated, strategic approach to promoting buy recycled.
  - a) Create a coordinating committee (the Committee) for the state's buy recycled efforts, including: EOE, DEP, Chelsea Center, Operational Services Division (OSD), MassHighway, Division of Capital Asset Management and Maintenance, Executive Office of Transportation and Construction and other key state buying agencies; EPA Region I; U.S. General Services Administration regional office; and other appropriate organizations.
  - b) Have DEP's Consumer Program EPP Branch provide staff support to the Committee.
  - c) Have the Coordinating Committee develop a buy recycled strategic plan, including a clarification of agency and organizational roles.
  - d) Hold periodic meetings of the Committee to coordinate implementation activities.
2. Promote buy recycled efforts aimed at businesses, and institutions.
  - a) Continue to support WasteCap and MassRecycle buy recycled programs.
  - b) Develop a partnership with the Massachusetts Purchasing Managers Association to inform business and institutional purchasing managers about buy recycled opportunities.
  - c) Offer buy recycled training for business and institutional as well as public sector purchasing managers.
  - d) Explore opportunities for establishing more recycled product and EPP purchasing cooperatives.
  - e) Encourage the Network to develop a program to market recycled products made in Massachusetts, e.g., exhibits at buy recycled fairs and environmental expos, a catalog of products.
3. Promote EPP (including recycled product) purchasing by state and local governments, universities, and authorities.
  - a) Continue with existing programs that have proven results, including allowing local governments to buy off the state contracts.
  - b) Use effective buy recycled activities at the state level to serve as a model for local government and other purchasers: universities, public schools etc.
  - c) Consider requiring agencies working with contractors to require their contractors to buy recycled on certain products, and encourage such purchases on others. Provide contractors with a list of recycled products and materials available as well as vendors, highlighting those made in Massachusetts.
  - d) Provide buyers with the opportunity to comment on product performance on a message board established on the OSD web site - in other words, make the message board interactive.
  - e) Promote buying recycled as a way to increase demand for recyclable materials to the legislature as well as to all buying agencies and institutions to ensure adequate investment in and support for buy recycled efforts.

4. Proceed with the development of an integrated approach toward promoting sustainable consumption practices by individual consumers including buying recycled.
  - a) Support DEP's implementation of its program to promote sustainable consumption on the part of the general public, currently being planned.
  - b) Leverage Massachusetts's purchasing power in influencing its suppliers to promote buying recycled.
  - c) Build on state efforts that require the use of recycled paper in proposals and bid documents submitted to the state by consultants and other vendors.
5. Conduct research to support buy recycled efforts.
  - a) Assess and determine strategies for removing barriers to purchasing EPPs and recycled products.
  - b) Encourage recycled product development and testing that leads to placement of recycled products on state contracts.
  - c) Determine buy recycled activities that have the greatest impact on stimulating demand for recyclable materials as well as recycled content products.
6. Integrate buy recycled activities with other recycling market development activities.
7. Promote recycled products manufactured using recycling-related technologies developed with STEP assistance, by encouraging their purchase through buying recycled efforts and placement on state contracts.

### **Collection and Processing Best Practices and Technology Development**

Goal: To promote the development and adoption of collection and processing technologies and best practices that reduce the cost and improve the quality and availability of secondary materials needed by recycled product manufacturers.

General Approach: Assess purchaser needs, providing best practices information to suppliers, and establish a research and development program that addresses technical barriers to improved marketability.

#### Actions:

1. Obtain input from end users (e.g. via the Recycled Product Manufacturers Network) on needs and issues pertaining to cost, quality, and availability of supply as well as potential strategies for lowering cost and improving materials quality and availability.
2. Conduct training and educational activities aimed at aiding suppliers in reducing recovery costs and improving the quality of supply.
3. Provide information to DEP and other organizations involved in supply development activities concerning the supply development needs of recycled product manufacturers.
4. Convene forums that bring together suppliers and end users for the purpose of improving mutual understanding of each other's needs and capabilities pertaining to addressing quality issues and lowering materials handling costs.

5. Support selected R&D projects aimed at developing technologies that improve collection and processing efficiency and lower costs. Also support prototype technology testing.

### **Material-Specific Recommendations**

Certain secondary materials markets are particularly problematic, with inefficiencies that cannot be addressed simply by providing the private sector with information and access to resources. In such instances - particularly when environmental protection needs exist - it is appropriate for the state to become more involved in finding means to address these inefficiencies. Identifying such market opportunities starts by identifying:

- Those materials with significant untapped potential for increased diversion,
- Market inefficiencies that prevent this potential from being reached, and
- Specific market opportunities that might be realized if these inefficiencies were overcome.

As part of this strategic planning effort, an investigation was made of market opportunities for specific priority material grades. In Phase II of the project, 42 possible market development opportunities pertaining to 16 target materials were reviewed on an initial basis. Of these, 18 were deemed to have sufficient potential to warrant further investigation. Criteria utilized in selecting the market development opportunities included:

- A *sufficient supply* of the recyclable material can be obtained.
- Use of the recyclable material to make a recycled product appears to have *technical feasibility*.
- Massachusetts-based firms that would produce the recycled product would appear to have some *competitive advantage* in selling that product.
- Potential exists for *sufficient demand* for the recycled product to allow the producer to make a profit.
- Major challenges (e.g., technical, economic) that might exist for the implementation of the opportunity can be identified, have not been addressed by the market working alone, and have the *potential to be overcome* through state intervention.
- Realization of the market opportunity has the potential to result in tangible additional diversion of MSW.
- Realization of the market opportunity has *potential economic benefits*, for example, job creation/retention, increased competitiveness, increased entrepreneurship.
- The market is *not currently addressing* this opportunity in any meaningful way.

TableE-1 outlines the 18 opportunities by material category and discusses the nature of the application, possible state action, and potential benefits. The table indicates that a number of market development opportunities have potential to significantly increase the diversion of MSW from landfills. The table also indicates that a large majority of the opportunities offer positive economic benefits, in terms of job creation and retention, increased competitiveness, and avoided disposal costs.

TableE-2 organizes the 18 market development opportunities by primary category of opportunity, including:

- *Recycling business development* - the startup, attraction, or expansion of firms making recycled products.

- *Feedstock conversion* - existing producers' substitution of the target secondary material as feedstock for another, usually virgin, feedstock. For the most part, such producers are not making a recycled product at present. The range of producers targeted by the opportunities include existing manufacturers, construction firms, and the Massachusetts Department of Highways.
- *Recycled business development and feedstock conversion* - related to the opportunity to support the development of a glass processor, and end use applications for the output of that processing.
- *Recycled product research and development* - investment in the development of innovative recycled products that appear to have potential for market success.
- *Increased processing capacity* - investment in the capacity to add value to secondary materials through increased processing.

Prior to pursuing any specific opportunity, there is a need for the state, through an interagency process, to examine in further depth the feasibility and potential impacts of the various market opportunities identified above. As a result of this more detailed analysis, opportunities can then be selected which have a high likelihood for success and thereby merit pursuit by the state. Suggestions for criteria to consider in making this determination can be found in Section 4.5 of the Strategic Plan.

These and other criteria determined through an interagency decision-making process can be utilized to categorize the 18 market opportunities as high, medium, and low priority for investigation. A strategy should then be developed for investigating each high priority opportunity. After the decision is made to pursue an opportunity, an execution strategy will need to be developed, including delineation of responsibilities for implementation in light of staff and budgetary resources available.

It is recommended that the state track and periodically report on the conditions of specific materials markets, and determine priority materials for focused recycling market development effort. The state should routinely seek to identify new market development opportunities with potentially significant diversion impacts and that are not addressed because of problematic market inefficiencies. Suggestions for implementating this recommendation include:

1. Assign various staff members of state and non-profit recycling market development organizations with the role of tracking market trends for one or two commodities, that is, developing and using a commodity-specific market intelligence network, and reviewing commodity-specific opportunities that arise.
2. On an annual basis at a minimum, ask each staff member involved in tracking markets to write a short (three-four page) review of current issues, potential opportunities, and challenges to their realization for each grade covered.
3. On a semi-annual basis, convene all staff to review reports and revise list of possible short-range and long-range priority opportunities.
4. Pass possible priority opportunities for further examination and implementation to appropriate program staff and the Department of Commerce, based on the nature of each opportunity and possible state action.
5. Utilize most recent reports, and staff knowledge, of commodity markets as inputs for adding material-specific strategies in revisions of the state's recycling market development strategic plan.
6. Disseminate reports to other Massachusetts stakeholders including the municipalities, WasteCap, MassRecycle so that suppliers can follow trends and adjust their markets if necessary.

**Table E-1: Overview of Market Development Opportunities**

<b>Market Opportunity</b>	<b>Application</b>	<b>State Action to Consider</b>	<b>Potential Benefit</b>
<b>Glass - Mixed Container, Other Glass</b>			
Optical Sorting	Cullet in container glass manufacturing	Work with major cullet manufacturer to find economical means of installing and operating an optical sorter.	Waste diversion: Higher value added of separated cullet strengthens demand for container glass.  Economic: Development impacts are minimal.
Ground Glass Applications	Filler (stucco, reflective paints, non-skid surface treatments); abrasives for paint and scale removal.	Seek to support ground glass product manufacturers, and educate potential users of ground glass	Waste diversion: Successful firm would increase consumption of other glass, encouraging recovery, and offer higher value use for mixed container glass, also encouraging recovery. Tonnage impact low-moderate.  Economic: Initial development impact minimal. However, the development of ground glass capability should encourage development of other Massachusetts businesses. Increased recovery of other glass would reduce business and municipal disposal costs.
Crushed Glass as Filtration Medium	Filtration medium in septic and wastewater treatment systems, water treatment facilities, pools, fish farms, and industrial filtration applications.	Educate potential users of crushed glass, work with MRFs and other suppliers to meet supply needs.	Waste diversion: Potential diversion impact is moderate-high. Increased demand for crushed glass would stimulate recovery of other glass, and encourage higher value added use of mixed color container glass, also encouraging greater recovery.  Economic: Development impact is minimal. Increased recovery of other glass would reduce business and municipal disposal costs.
Glass as Construction Aggregate	Construction aggregate in drainage, road bed, fill and paving applications.	Educate potential users of glass as aggregate (MassHighway, MassPort, etc), and work with MRFs and suppliers to meet needs.	Waste diversion: Potential diversion impact is moderate-high. Increased demand for glass as aggregate would serve to stimulate recovery of other glass.  Economic: Development impact is minimal. Increased recovery of other glass would reduce business and municipal disposal costs.

**Table E-1: Overview of Market Development Opportunities**

<b>Market Opportunity</b>	<b>Application</b>	<b>State Action to Consider</b>	<b>Potential Benefit</b>
Glass Brick and Tile Products	Glass brick and tile products	Seek to establish new sintered glass tile manufacturer, and/or encourage feedstock conversion and new product development among state brick and tile manufacturers	<p>Waste diversion: Potential diversion impact is low-moderate. As a high value- added effort, successful implementation would stimulate increased recovery of other and mixed color container glass.</p> <p>Economic: For new facility and business expansion, potential development impact is moderate; for conversion, job impact is minimal, but competitiveness would be increased.</p>
<b>Paper - Mixed, High Grades</b>			
Increased Paperboard, Tissue and Medium Mill Use of Mixed Paper	Substitution of mixed paper for higher value secondary paper as feedstock.	Encourage specific mills to undertake feedstock conversion.	<p>Waste diversion: Potential diversion impact is high. Displaced higher grades would find other markets.</p> <p>Economic: Primary impact would be increased competitiveness due to lower feedstock costs. Immediate job impacts are minimal.</p>
Increased Specialty and Printing & Writing Mill Use of Deinked Market Pulp	Substitution of deinked market pulp for virgin market pulp and pulp substitutes as feedstock.	Encourage mills to undertake feedstock conversion.	<p>Waste diversion: Potential diversion impact is low-moderate. Consists of finding markets for planned new in-state deinked pulp production by Sirius Pulp and Paper, Fitchburg mill, plus existing tissue mills which would consume recycled paper.</p> <p>Economic: Primary impact on users would be increased competitiveness in offering recycled products. Immediate job impacts minimal. Will support deinked pulp production at in-state recycled paper mills.</p>
<b>Wood Waste</b>			
Milled Wood Products	Remilled lumber, flooring, wood furniture	Encourage business startups, expansion, attraction	<p>Waste diversion: Diversion potential is moderate to high.</p> <p>Economic: Job development potential is low to moderate. Commercial disposal costs would decline.</p>
Composite Wood Products	Medium density fiberboard, particleboard	Encourage business attraction	<p>Waste diversion: Diversion potential is high.</p> <p>Economic: Job development potential is low to moderate. Commercial and municipal disposal costs would decline.</p>

**Table E-1: Overview of Market Development Opportunities**

<b>Market Opportunity</b>	<b>Application</b>	<b>State Action to Consider</b>	<b>Potential Benefit</b>
<b>Food Waste</b> Compost	Landscape and horticultural uses	Encourage startup and expansion of agricultural, municipal, commercial and community-based composting operations	Waste diversion: Potential diversion impact is high.  Economic: Job development potential is low to moderate. Municipal and commercial disposal costs would decline.
Manufactured Animal and Fish Feeds	Feed for livestock and aquaculture-bred fish	Encourage startup, attraction and expansion; assist development of two planned facilities	Waste diversion: Potential diversion impact is high.  Economic: Job development potential is low to moderate. Municipal and commercial disposal costs would decline.
Food Banks and PFFPs	Surplus food for distribution by charitable organizations	Encourage food bank and PFFP program expansion	Waste diversion: Potential diversion impact is high.  Economic: Job development potential is low to moderate. Municipal and commercial disposal costs would decline.
<b>Scrap Tires</b> Civil Engineering Applications for Tire Chips	Lightweight fill for road beds, septic tank drain fill, retaining wall backfill, insulating fill, landfill construction, noise barriers	Support tire-derived product manufacturers in educating potential users, particular Mass Highway	Waste diversion: If TDF markets decline and/or Old Scrap Tires are recovered, diversion potential is high.  Economic: If TDF markets decline and/or Old Scrap Tires are recovered, job impact potential is moderate. User quality-adjusted costs would decline.
Crumb Rubber Applications	Rubber-modified asphalt, turf applications, molded and extruded products, and athletic, recreational and flooring applications	Educate potential users, particularly Mass Highway; encourage startup, attraction and expansion; support and pursue efforts (Routhier, Sears) and demonstration project (STMC)	Waste diversion: If TDF markets decline and/or Old Scrap Tires are recovered, diversion potential is high.  Economic: Job impact potential is moderate. User quality-adjusted costs would decline.

**Table E-1: Overview of Market Development Opportunities**

<b>Market Opportunity</b>	<b>Application</b>	<b>State Action to Consider</b>	<b>Potential Benefit</b>
<b>Used Clothing</b>			
Non-Woven Applications	Facing inside of clothing, battery separators, quilt linings, bandages, diskette liners, disposable wipers, casket liners, carpet padding, automobile roof and hood linings, and stuffing	Work with existing non-woven manufacturers regarding feedstock conversion and new product development	Waste diversion: Potential diversion impact is moderate.  Economic: Potential job impact is low-moderate. Municipal disposal costs would decline. With feedstock conversion, business competitiveness would increase.
<b>Carpets</b>			
Development of New Carpet-Based Products	Carpet-based tiles from ground whole carpet, products from shoddy (e.g., carpet padding, soundproofing material for autos, furniture stuffing, sod reinforcement in athletic fields)	Assist in the development of molded polypropylene backed carpet-based products and shoddy-based products	Waste diversion: Potential diversion impact is moderate.  Economic: Potential job impact is moderate. Municipal and commercial disposal costs would decline.
<b>Plastics - Film, 3-7 Plastics</b>			
Film Plastics	Plastic film products (e.g., trash, grocery, garment bags)	Encourage state plastic film manufacturers to consider feedstock conversion and new product development	Waste diversion: Potential diversion impact is high.  Economic: Potential job impact is low to moderate. Manufacturer competitiveness is increased. Municipal disposal costs would decline.
Plastic Lumber (using 3-7 plastics)	Landscape timber, picnic tables, pallets, non-load bearing marine uses.	Encourage business startup or attraction	Waste diversion: Potential diversion impact is moderate.  Economic: Potential direct job impact is low to moderate. Presence of plastic lumber manufacturer would encourage plastic lumber furniture fabricators, with low-moderate job impact. Disposal costs would decline.

**Table E-2: Market Opportunity, by Primary Focus of Effort**

<p><b><u>Recycling Business Development (Startup, Expansion, Attraction)</u></b> Milled Wood Products Composite Wood Products Compost Manufactured Animal and Fish Feeds Food Banks and PFPs Plastic Lumber</p> <p><b><u>Feedstock Conversion/Recycled Product Development in Non-Recycling Operations</u></b> Increased Paperboard, Tissue and Medium Mill Use of Mixed Paper Increased Specialty and Printing &amp; Writing Mill Use of Deinked Market Pulp Civil Engineering Applications for Tire Chips Crumb Rubber Applications Non-Woven Textile Applications Film Plastics</p> <p><b><u>Recycling Business Development AND Feedstock Conversion/Recycled Product Development in Non-Recycling Operations</u></b> Ground Glass Applications Crushed Glass as Filtration Medium Glass as Construction Aggregate Glass Brick and Tile Products</p> <p><b><u>Recycled Product Research and Development</u></b> Development of New Carpet-Based Products</p> <p><b><u>Increased Free Standing Processing Capacity</u></b> Color Sorting of Mixed Glass</p>
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## **Management Strategy Recommendations**

### **Communication, Consensus and Coordination, and Goal Setting**

Goal: To provide for ongoing communication and joint decision-making among the state agencies involved in recycling market development work in Massachusetts.

General Approach: Establish a Recycling Market Development Steering Committee for the purposes of setting annual and long range (3-5 year) goals, recommending funding and programmatic priorities, clarifying organizational roles/relationships, coordinating strategic plan implementation, and tracking progress in meeting goals outlined in the plan. State agencies and other organizations involved in implementing the recycling market development plan would seek to develop their respective programs of work in support of and accordance with the Steering Committee's recommendations.

#### Actions:

1. Through a memorandum of understanding (MOU), create a Recycling Market Development Steering Committee, comprised of representatives from the Chelsea Center, DEP, EOEA, and MOBD. In the MOU, also clarify organizational roles and relationships and obtain the commitment of the

organizations represented on the Committee to support and uphold the Recycling Market Development Strategic Plan. (See Appendix A of the Plan for an outline of recommended roles and responsibilities.)

2. Designate the Chelsea Center as responsible for providing administrative and staff support to the Committee.
3. Rotate the duty of Committee Chair among the participating organizations, or designate a standing chair to serve on its behalf.
4. Charge the Committee with periodically updating the Recycling Market Development Strategic Plan and preparing annual implementation plans.
5. Enable the Steering Committee to establish work groups and subcommittees as appropriate.
6. In the creation of such work groups and subcommittees, provide, as appropriate, for the input and involvement of other key stakeholders and knowledgeable parties in the planning and decision-making process, including, but not limited to MassRecycle, WasteCap, OSD, the University of Massachusetts, and other state and federal organizations and agencies.
7. Utilizing the Steering Committee meetings and the resources of the participating organizations, ensure that good reporting, record keeping, and information exchange takes place regarding recycling market development activities.

### **Market Intelligence Gathering**

Goal: To provide a means of maintaining up-to-date knowledge regarding factors, trends and circumstances affecting the marketplace for recyclable materials in Massachusetts and the “marketplace” for recycling market development services and programs.

General Approach: Undertake the market tracking and reporting activities outlined above. Create an informal network of recycling market development stakeholders and adjunct groups to provide for two-way exchange of information concerning specific recycling market sectors. Continue to conduct targeted research and to develop more effective means of sharing market intelligence information among the recycling market development personnel.

### Actions:

1. Maintain an up-to-date database of information on supply and demand, action steps for which were delineated above.
2. Expand opportunities for ongoing two-way communication/information flow between market players and market development entities: Tap communication mechanisms presented by the proposed Massachusetts Recycling Manufacturer Network (the Network), WasteCap, MassRecycle, E-Call and other business and organizational networks, as well as collectors and processors in the state and region. Tap into regional, national, and international recycling related networks to share information, etc.
3. Continue to rely upon targeted research to address specific information gaps.
4. Establish more effective means of sharing information among recycling market development stakeholders, with possibilities including establishment of a Massachusetts Recycling Market Development list serve discussion group and posting key research findings, survey results, announcements of upcoming activities, etc. on the Chelsea Center web site.
5. For each secondary material grade, place one staff person in charge of organizing and managing a relevant, yet uncomplicated, market intelligence network, utilizing the above tools, and being responsible for organizing findings into periodic reports for use by the Recycling Market Development Steering Committee.

### **Ongoing Strategic and Implementation Planning**

Goal: To ensure a focused, targeted, and effective approach to recycling market development in Massachusetts.

General Approach: Conduct an annual strategic planning process involving all agencies represented on the Steering Committee during which long range goals and actions are revisited and annual implementation plans and budgetary needs are determined. Hold regular meetings of the Steering Committee throughout the year for plan fine tuning. Integrate recycling market development planning with other related planning processes such as solid waste master plan revision and economic development planning.

#### Actions:

1. Annually hold an inter-agency planning retreat, timed to support the budget process. During the first retreat, specific objectives and detailed implementation strategies could be developed that build upon the strategy recommendations outlined in this report.
2. Obtain EOEAs commitment to rely upon the Steering Committee's annual recommendations as guidance in its annual budget-setting and funding allocation process for the Clean Environment Fund.
3. Integrate recommendations of this and future updates of the Strategic Plan into Solid Waste Master Plan revisions, economic development plans and other key related planning efforts in Massachusetts.
4. Develop a sustainable consumption implementation plan with Buy Recycled strategy recommendations as an integral component targeting business, institutional, governmental, and individual consumers. Involve DEP; OSD, UMass, MassHighway, and other key state purchasing agencies; the Chelsea Center; WasteCap; and regional entities such as NERC, EPA Region I, and the General Services Administration (GSA) regional office.

### **Monitoring and Evaluation**

Goal: To monitor and evaluate the success of recycling market development efforts in meeting specified program goals and objectives.

General Approach: Develop and implement a recycling market development monitoring and evaluation plan that establishes measurable performance objectives, program monitoring procedures, and a process for assessing the results of monitoring efforts.

#### Actions:

1. Involve Steering Committee member agencies in establishing recycling market development performance indicators and objectives to be met by each of the key existing and planned recycling market development programs.
2. Charge each state agency involved in recycling market development to develop monitoring and evaluation procedures for key recycling market development programs (and recycling market development parts of larger programs).
3. Ensure that provisions are made for regular evaluation of the appropriateness and effectiveness of all the key programs. Utilize the results of these evaluations (as well as the forthcoming STEP evaluation) to update the Recycling Market Development Strategic Plan as appropriate.
4. Include monitoring and evaluation requirements in all state grant application procedures.

5. Implement existing programs in a manner that allows for the ongoing collection of information and data pertinent to the periodic evaluation.
6. Establish a mechanism to track progress toward enhancing recycling markets based upon the performance indicators identified through Action 1 above.
7. Develop a process for benchmarking key Massachusetts recycling market development efforts with similar efforts undertaken in other states.

## **Path Forward**

With regard to the sequence of implementation activities, recommendations are as follows:

1. In the near-term, put in place those management systems and action plans necessary to guide the implementation of the strategic plan. Specifically, the recommended focus of near-term efforts include:
  - a) Signing of a Memorandum of Understanding (MOU) among the four public agencies with primary responsibilities in recycling market development (Chelsea Center, DEP, EOEA and MOBD);
  - b) Creation of the Recycling Market Development Steering Committee;
  - c) Preparation of an implementation plan regarding the components of market intelligence and assessment, including the regular updating of the secondary materials markets database and the development of a market intelligence network;
  - d) Determination of priorities among cross-material strategy action items provided in Chapter 3, and preparation of agency-specific plans regarding the implementation of these priority action items. The following actions are recommended as high priority:
    - Maintain all current programs recommended for continuation.
    - Work to get the “wholesale and retail” information dissemination system in place.
    - Complete the Beneficial Use Determination (BUD) regulation review process and make changes as determined appropriate.
    - Develop the Massachusetts Recycled Product Manufacturers Network and begin to tap the Network to determine manufacturer’s service needs, material supply issues, etc.
    - Create the Buy Recycled Coordinating Committee, and develop an implementation plan for buy recycled recommendations.
  - e) Determination of high priority market-specific opportunities identified in Chapter 4, based on the criteria outlined in Chapter 4, and implementation plans for addressing those opportunities.
2. In the intermediate range, recommended implementation activities include:
  - a) Launching of the implementation plans prepared per 1(c) through 1(e) above;
  - b) Full operation of the market intelligence system;
  - c) Preparation of competitive analysis of Massachusetts recycled product manufacturing sector;
  - d) Development of a system for evaluating impacts of various market development tools; and.
  - e) Modification of existing programs in accordance with available staffing and established priorities.
3. Over the long term, the nature of activities would reflect the extent to which the capacity for recycling market development had been developed, and the evolution of markets in the state. As noted above, as

capacity is built and tools put in place, agencies can consider the preparation of material-specific strategies as part of a revised strategic plan.

To implement the strategic plan in full will ultimately require a budget that exceeds current level funding for recycling market development in Massachusetts. However, the budgetary implications of the implementation of the strategic plan can be determined only after the Steering Committee chooses priorities and a timeframe for implementation, identifies the staff and other resources needed to implement these priorities, and decides the extent to which new staff positions and other resources are necessary.

## CHAPTER 1. INTRODUCTION

In 1997, the Massachusetts legislature mandated the creation of a strategic plan to promote the development of in-state markets for recyclable materials. The overall purpose of the Strategic Plan for Recycling Market Development project was to:

- Help set the course in Massachusetts for enhancing the capacity of the state to identify and realize recycling market development opportunities; and
- Identify recycling market business opportunities that have potential to serve as the focus for near-term recycling market development efforts.

Funding for the Strategic Plan Project came from the Clean Environment Fund, comprised of unredeemed beverage container deposits, through the Executive Office of Environmental Affairs. The Chelsea Center for Recycling and Economic Development was selected by the Executive Office of Environmental Affairs to oversee the strategic planning project. The consulting firm of Dorn and Associates was retained by the Chelsea Center to conduct related research, facilitate the strategic planning process, and to develop all associated project reports.

The strategic plan project involved three distinct phases of work:

- I: An analysis of recyclable materials supply and demand
- II: Identification of potential recycling market development opportunities and barriers
- III: Strategic planning for recycling market development

Phase I entailed in-depth analysis of markets for eight major groups of recyclable materials found in MSW and in the construction and demolition (C&D) waste stream: glass, plastics, metals, paper, wood, organics (yard waste and food waste), tires, and textiles. Among the eight commodity groups, 37 individual grades of recyclable materials were analyzed. For each commodity and grade, the analysis prepared estimates of in-state supply, in-state recovery, and in- and out-of-state demand for the recovered material, and discussed barriers to increased supply and demand. Based on this analysis, sixteen material grades were selected to serve as the focus of market opportunity investigations conducted in Phase II.

By commodity group, these material grades were:

- Glass - mixed glass containers, other (non-container) glass
- Paper - mixed paper, high grades
- Wood - pallets and shipping containers, tree residues, C&D wood
- Organics - food waste
- Textiles - used clothing
- Tires - new scrap tires, old scrap tires

- Used Carpet - all grades
- Plastics - LDPE (non-film), PP, Film, mixed plastic bottles and containers #3-7

Phase II provided the foundation for the second stated purpose of the recycling market development strategic plan: identification of near-term, material-specific market development opportunities. The assessment of opportunities for each target material grade included:

- Profiling the material and the nature of supply;
- Identification of products and applications that can be produced using the recovered material;
- Discussion of the current market situation for material recovered in Massachusetts, including the role of key in-state processors and end users;
- Determination of the potential for increased production in-state for each of the major products and applications; and
- In-depth discussion of the nature of the market development opportunity, the possible waste diversion and economic benefits, and challenges to realizing the opportunity for those products and applications with significant and realistic potential.

On the basis of this assessment, 18 specific market development opportunities are identified. These opportunities are of various types, including: recycling business development, feedstock conversion, recycled product research and development, and increasing processing capacity.

This assessment is a first-stage attempt to identify opportunities worthy of further investigation. As such, for each opportunity a number of unknowns exist regarding the specifics of supply, demand, profitability, and the nature of challenges to recycling market development. Addressing these unknowns is the function of additional analysis by state organizations to be undertaken in implementing the strategic plan.

Phase III of the project involved preparation of the strategic plan. The findings of Phases I and II were utilized to identify material-specific opportunities to pursue in addition to more general programmatic recommendations. Phase III also entailed the development of a draft Memorandum of Understanding regarding roles and responsibilities to be approved by state agencies having primary responsibility and involvement in recycling market development in Massachusetts.

## **1.1 Purpose and Structure of Strategic Plan Report**

This document is the strategic plan report. Contained herein is:

- A discussion of the rationale for and approach to state intervention in markets for recyclable materials;
- A discussion of components of a comprehensive recycling market development system;
- Principles of approach to recycling market development;

- An assessment of the current status of Massachusetts efforts in recycling market development;
- Massachusetts program and management goals and strategy recommendations; and
- A brief discussion of the recommended path forward in implementing the Strategic Plan.

## **1.2 Institutional Involvement in Strategic Planning Effort**

An Advisory Committee comprised of key stakeholders in recycling market and economic development in Massachusetts was established by the Chelsea Center to guide the project. Advisory Committee members were asked to provide input to the Consultant and the Chelsea Center regarding approach, issues definition, and available resources at the start of each work phase, reviewed and commented upon key project deliverables, and participated in the strategic planning process. The Project Advisory Committee is comprised of representatives from:

- Massachusetts Executive Office of Environmental Affairs;
- The Corporation for Business, Work and Learning;
- Massachusetts Department of Environmental Protection;
- Massachusetts Office of Business Development;
- Massachusetts Highway Department (MassHighway);
- The President's Office, University of Massachusetts;
- The U.S. Environmental Protection Agency, Region I;
- MassRecycle – the Massachusetts Recycling Coalition; and
- WasteCap of Massachusetts.

A list of Advisory Committee members is provided in the acknowledgements at the front of this report, along with members of the Dorn and Associates project team. In addition to Advisory Committee members, input was gathered through interviews and site visits with over one hundred processors, end-users, trade associations, and other stakeholders on the local, regional and national level.

## **CHAPTER 2. ROLE OF THE COMMONWEALTH IN RECYCLING MARKET DEVELOPMENT**

### **2.1 Meeting the State’s Recycling Goal: The Need for Recycling Market Development**

In 1990, the Commonwealth of Massachusetts established a goal of recycling 46 percent of its municipal solid waste (MSW) by 2000. As of 1997, the recycling rate was estimated to be 34 percent (according to the Massachusetts Recycling 2000 Baseline Report working paper). To reach the 46 percent goal, a significant gap must be covered in a relatively short amount of time.

For a number of years, Massachusetts state government has had an extensive set of programs aimed at promoting and supporting the development and expansion of recycling programs at the local level. These primarily “supply-side” efforts by the state have been crucial in achieving the current recycling rate. It is important to understand the factors that hinder a move from the present rate to the state’s goal, and identify means to address them.

In determining how aggressively to implement recycling, local governments balance two factors – the fiscal costs and benefits of recycling weighed against service recipients’ desires to seek, and pay for (either through a separate bill or through tax dollars), the environmental benefits and cost savings that come from diverting waste from disposal. For most communities, there is a level at which the costs of additional recycling outweigh residents’ and businesses’ desire to pay for those costs. And for some municipalities as well as most businesses, the cost of recycling versus the cost of disposal is the predominant factor determining the extent to which they undertake recycling.

The net fiscal cost of a municipal or private sector recycling program is the difference between net operating costs (factoring in avoided disposal costs) and revenues through sale of secondary materials. Various factors have led many recycling program operators to view the net costs of an aggressive recycling effort as too high:

- Recycling program operators are able to sell a number of secondary materials at prices well below the cost of collecting those materials. Secondary materials prices often are low because they are constrained by the price of virgin material substitutes, e.g., secondary plastic prices are limited by the price of virgin plastic resins. At times, while market demand for a low-priced material may actually be plentiful, a constraint exists on the willingness of recycling program operators to supply the material at that price.
- For a number of secondary materials, potential suppliers face uncertain markets – they are not assured of a buyer and they are not assured of a price, even a low one. In fact some may need to pay to move their materials into the market. Markets for some materials (e.g., paper) can be cyclical as well as volatile. Suppliers that cannot be assured of ongoing markets for their materials at roughly stable prices face significant fiscal risks and, in the case of municipalities, public relations risks in the event that collection of recyclables must be ceased or temporarily

interrupted. Prudence in the face of these risks means suppliers are less likely to operate extensive, aggressive recycling programs.

- The fact that solid waste collection must still be provided for means that the overall costs of collection may be higher if parallel systems are running. The higher the diversion rate the less this is a factor, assuming solid waste collection services can be reduced.
- Some suppliers, particularly municipal suppliers, may not consider cost avoidance when they evaluate the economic feasibility of recycling.
- In some localities, such as in eastern Massachusetts, processors and markets are not nearby, which limits the feasibility of recycling due to high transportation costs.
- Many collection vehicles currently in use are inefficient and costly to operate.

In light of these forces, program operators themselves have two steps they can take. The first is developing greater efficiencies in the operation of recycling programs, and so reduce costs; the second is preparing higher value secondary materials (e.g., without contaminants, separated from lower quality materials) that can bring a higher price.

While such steps are necessary, they are likely to be insufficient in and of themselves. Essentially, for the state to reach its recycling goal, the base of businesses that utilize secondary materials must be expanded. This expanded base of recycling businesses, ideally, should have the following characteristics:

- Buyers capable of paying prices for secondary materials (or offering services resulting in cost avoidance) that can provide sufficient financial incentive for their collection;
- Buyers that are reliable from one year to the next; and
- Buyers that expand the scope of markets now limited in size.

These various business efforts expand the base of recycling and come under the general heading of ***recycling market development***. In summary, the primary aim of recycling market development is to maximize the amount of recyclable materials that move through markets from sellers to buyers via economically viable and stable programs. For Massachusetts to reach its recycling goal, it must pursue a strategically sound campaign of recycling market development that leads to the development of healthy accessible markets for recyclable materials, particularly those that consume secondary materials generated in Massachusetts.

Healthy markets for a secondary material have four elements:

- Sufficient quantity and quality of secondary materials supply to meet demand, available at a price buyers are willing to pay and sellers are willing to receive;
- Sufficient capacity for processing the secondary materials into a form usable as feedstock;
- Manufacturing capacity adequate to absorb the processed material and produce recycled products; and
- Final product demand adequate to absorb the recycled products at a price profitable to the manufacturer.

An action in any of these four dimensions (supply, processing, manufacturing, final product end use) that expands healthy secondary materials markets can be considered recycling market development.

However, recycling market development *does not* include activities involving the creation of greater supply for its own sake, that is, when the availability of supply is not a limiting factor in the ability to meet demand. On the other hand, supply development specifically crafted to meet the price and quality specifications of buyers is part of recycling market development.

In other words, recycling market development is a *demand-pull* activity – taking actions that stimulate materials demand and that increase the volume of actual market transactions. Market development is not a *supply-push* activity, simply adding more and more materials to the market with the hopes that someone will buy it.

## 2.2 The Potential Impact of One State on Materials Markets

Markets for secondary materials are rarely confined to the jurisdictional boundaries of a state. While weight and bulk can limit the distance at which secondary materials can be transported at a reasonable cost, most secondary materials markets are multi-state, national, or international in nature. And while states can participate collectively in regional and national efforts, an individual state's direct influence on secondary materials markets is largely confined to activities within its boundaries.<sup>5</sup> Thus, the size of the market for a particular material over which a state can have direct influence often is a relatively small proportion of the entire, often global, market.

In light of this reality, can recycling market development efforts of this or any state lead to a visible increase in its recycling rate? The answer is yes, but the path from action to impact is *complex* and *diffuse*, not simple, linear or direct. This is so for two reasons:

First, recycling market development efforts can only *influence*, and not control, the behavior of market actors (municipalities, processors, manufacturers, recycled product buyers) in terms of what is bought, sold, at what price, in what location, and so forth. For the most part, recycling market development is unlike environmental regulation, in which the state can command and control private sector actions, and unlike highway building, in which the state has direct control over the movement of materials.<sup>6</sup> Rather, recycling market development has all the certainty and control of a marketing campaign by Coca-Cola, General Motors or Seventh Generation – the hope is to influence consumers through a combination of information, price and exhortation to values, but the outcome is never certain. The target audience is being influenced by other, competing forces at the same time, and will be influenced by new, changing market forces over time. A better deal might come along at any moment.

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<sup>5</sup> Exceptions to this include mandatory buy recycled efforts and minimum content legislation which can influence secondary materials consumption by manufacturers located out of state but supplying products in state.

<sup>6</sup> Regulatory approaches to recycling market development, minimum content laws, for example, do exist but cannot be solely relied on to reach market development goals.

In addition, the effects of recycling market development efforts on recycling rates are both *direct* and *indirect*. The primary direct impact of recycling market development is the significant market stability that can be provided by in-state purchasers of secondary materials. Even in the context of global markets, a new set of secure local seller-buyer relations can allow suppliers to increase materials recovery in greater confidence. A second direct impact of recycling market development is that the state can strategically promote the export of its secondary materials to existing buyers outside the state. Third, suppliers can generate increased revenues by marketing a higher quality product for sale. Attention to the needs of purchasers, in terms of material homogeneity and level of contamination, can reap higher prices and encourage a greater level of recovery. In addition, state recycling market development efforts can help create markets for niche materials that don't have global or regional markets.

State actions to develop recycling markets can have significant indirect effects on the nature of demand across state and national boundaries:

- Massachusetts is but one of many states actively involved in recycling market development. State officials are in touch with one another regarding new market development initiatives and projects, for example through the ten-state Northeast Recycling Council (NERC), the partially revived national Recycling Technology Assistance Partnership (ReTAP), and the U.S. Environmental Protection Agency's Jobs Through Recycling program. Thus, specific market development efforts that are successful in Massachusetts have a high possibility of being emulated in other states, particularly ones close by, multiplying the impact.
- Businesses emulate one another as well. When a Massachusetts recycling business is successful, other firms and entrepreneurs in Massachusetts and elsewhere take note. Some will choose to produce a recycled product as well, further increasing the demand for secondary materials.
- With its technical workforce and research capacity, Massachusetts has some potential to be the home of newly developed recycling technologies that could increase technical feasibility and profitability of certain recycled product lines. As these technologies are purchased by firms throughout the country and beyond, the demand for secondary materials will increase.
- Small increases in demand by in-state manufacturers can have a larger long term positive impact. For many recycled products, significant market demand is constrained by a high price, which in turn is due to low volume of production. The more demand that exists for a recycled product, the more is produced to meet that demand, and the greater the economies of scale and the smaller the cost per unit, which will result in lower prices. These lower prices will further stimulate demand, increasing production and economies of scale, reducing prices, and so on. Greater production economies can allow manufacturers to absorb somewhat higher material costs, encouraging suppliers to recover and market more material.
- In several ways, a greater presence of recycled products in the marketplace can itself lead to increased demand. In the eyes of end users who may not think of themselves as environmentalists, such presence can overcome bias against the use of recycled products as a substitute for virgin material-based products. Moreover, the greater presence of recycled products can encourage further expansion of the number of end users who explicitly wish to buy "Green" and are willing to pay more to do so. The expansion of such buyers who are relatively price-insensitive may allow suppliers to obtain higher prices for their materials.

- Further, the greater presence of recycled products can be used to leverage greater participation in local recycling programs. While one factor in determining the state recycling rate is the extent to which localities have recycling collection programs, another is the level of participation in those programs. Many generators choose not to separate recyclables from non-recyclables, while others only separate some materials, such as bottles covered by deposits, or newspapers and not mixed paper. A more visible presence of recycled products in retail stores can promote positive attitudes towards recycling and, hopefully, increase participation in recycling.

In sum, then, the impact of recycling market development activities on the state's recycling rate clearly is not linear; it is complex and diffuse. Because these activities seek to influence behavior, often by indirect means, *their impacts may take some time, even years, to become visible*. Therefore, successful market development requires persistence, patience, and a willingness to deal with the unpredictable ways of capitalism and fickle, ever-changing markets on their own terms.

Beyond its impact on the state's recycling rate and a reduced need for disposal capacity, Massachusetts has further reason to promote recycling market development: economic impact – new and expanded Massachusetts businesses create jobs. In addition, the number of jobs created directly by Massachusetts recycled product manufacturers does not fully represent the total of employment for which they are responsible. For every producer of goods there are associated spin-off industries both downstream and upstream of production. According to the U.S. Bureau of Labor Statistics, for every 100 jobs in the manufacturing sector, more than 100 additional jobs are created. Secondly, if it saves costs or boosts sales, a shift from virgin to secondary feedstocks will increase the competitiveness of existing manufacturers in the state. And, with respect to secondary materials collected in Massachusetts and shipped out of state, when Massachusetts businesses can add value to these materials (e.g., through processing), greater wealth accrues to these companies, their employees, and their communities.

### **2.3 Principles of Approach – The Role of State Government in Recycling Market Development**

If recycling market development can have positive, visible direct and indirect impacts on the state's recycling rate and its economy, how should state government promote recycling market development? In this section, principles of approach for recycling market development in Massachusetts are outlined. These were developed, initially, by the project team, based upon knowledge regarding factors that contribute to the effectiveness of recycling market development efforts underway in other states and conditions and circumstances in Massachusetts. The principles were reviewed and accepted, with minor modifications, by the Project Advisory Committee. Massachusetts-specific programmatic recommendations based on these principles are presented in the two chapters that follow.

*The marketplace is the primary, and preferred, mechanism for allocating resources.* The state government recognizes that markets, with decentralized choice and decision-making based on self-interest, generally are an efficient and effective mechanism for allocating resources (e.g., secondary materials, recycled products, labor, capital, and equipment).

***State government's primary role in promoting market development is to identify and address inefficiencies in the marketplace.*** The Commonwealth of Massachusetts has an interest in seeing that secondary material markets act as efficient resource allocation mechanisms. However, markets, including secondary materials markets, often do not work with full efficiency. In addressing inefficiencies, state government does not seek to replace markets, but to make markets work better. The categories of inefficiencies in secondary materials markets include:

- Imperfect flow of information – Market players may make inappropriate decisions because of a lack of information, lack of access to existing information, or misinformation. For example, a manufacturer may not know that secondary feedstock can be substituted for virgin feedstock without negative consequences; a seller and potential buyer of secondary materials may not know of each other's existence; and a venture capitalist may not fully appreciate the profit potential of a new recycled business.
- Uncertainty about future market conditions – Unknowns regarding the quantity, price and quality of secondary material supplies, about the demand for secondary materials and recycled products, and about forthcoming regulations and their impacts on markets can inhibit investment in recycling collection, processing or manufacturing capacity.
- Risk aversion – Financial investors of venture capital and debt finance have a wide range of choices regarding the types of businesses in which to invest. Some investors may decide to avoid investing in certain recycling businesses, with a perception that they are too risky, even if the investors are adequately compensated for the risk. Recycling business development is then inhibited by a lack of capital.
- Mispricing of materials and products due to undervaluing public benefits and/or costs – In efficient markets, the prices of goods fully reflect the costs and benefits to society. However, in the real world, prices usually reflect only the costs and benefits to the buyer and seller. The benefits of recycling that accrue to the public, e.g., conservation of resources, reduced pollution, and avoided landfill costs, are not incorporated into the price, leading to prices for secondary materials that are priced below their true value. In addition, there are certain costs of recycling, for example, the unpaid labor provided by residents in source separating waste, that are not reflected in the price they receive for their efforts. Mispricing of secondary materials and recycled products (reflecting what economists call “externalities”) can constrain both supply and demand. In addition, mispricing of primary materials, by failing to internalize associated environmental and resource depletion costs and the impact of virgin subsidies, makes it more difficult for secondary materials to compete against primary materials in the marketplace.
- Inability to reach economies of scale – As discussed above, small production runs can result in high per unit costs, which can limit demand. If demand were to grow, runs can get larger and per unit costs would fall, which would further stimulate demand.
- High transaction costs – In efficient markets, the cost of carrying out transactions does not prevent these transactions from occurring. However, in the real world, high transaction costs can scuttle deals. Market actors may decide that costs of carrying out the transactions exceed the likely benefits. Transaction costs can be deemed too high for any number of reasons, e.g., the costs of researching new markets, of transporting materials and goods over long distances,

of delaying production in order to obtain state environmental permits, and of convincing financiers to support recycling-related projects.

- Unrestricted nature of technical information – Technical innovation can lead to new levels of recycling activity through developing new recycled products and new collection, processing and manufacturing technologies. However, despite the protections of the patent system, technology development can be inhibited if it is thought that competitors can replicate innovations at low cost. Technical information is a “public good,” that is, it is inexpensive or free to obtain and use unless well-hidden from competitors or guarded by legal protections. In addition, because of this, many companies are unwilling to share technical information.

***The policy and program tools designed and implemented by the Commonwealth should address specific identified market inefficiencies.*** Categories of tools that are available include:

- Information – Providing market actors with information, e.g., market data, recycling business directories, technical information and assistance, opportunity analysis, procurement training, consumer education, referrals to appropriate resources.
- Facilitation – Bringing market players together, e.g., through stakeholder forums, linking of market players, waste exchanges.
- Financial assistance – Using financial incentives to influence market behavior, e.g., through the availability of grants, investments (loans, equity), and tax incentives to encourage certain behaviors, and the imposition of taxes and fees to discourage others.
- Buy recycled programs – Using the state government’s procurement system to increase purchases of recycled products, using such tools as price preferences, set- asides, material and bid specifications, voluntary agreements, and best value contracts.
- Regulation – By fiat, requiring certain behavior and prohibiting others; examples of regulatory tools include recycled content requirements, landfill bans, and bottle bills.

Each category of market development tools is appropriate for addressing certain types of market inefficiencies. Examples of market development tools by type of inefficiency are provided in Chart 2-1. It should be remembered that any tool does not in itself constitute a strategy. ***A strategy reflects a thoughtful choice of tools designed to address specific market inefficiencies.***

For instances in which a market inefficiency can be addressed by any one of several tools, state government should utilize the most cost-effective tool. The elements of cost effectiveness include long-term cost, long-term impacts, adaptability in the face of changing market conditions, and the costs of creating a new tool versus reliance on an existing one.

In comparing tool options, information and facilitation should be given due consideration, as they often are the most cost-effective and flexible. A financing (e.g., grants and loans) program or regulatory approach should be chosen only if it is clear that other tools would not be as cost-effective.

Moreover, before creating new tools, state government should leverage existing public and private sector programs and other resources. In addition, state government should provide direct

services (e.g., loans, technical assistance) to a particular market segment only in instances in which the private sector is unable or unwilling to provide such services at affordable cost to that market segment, and would not respond to new incentives to do so.

## 2.4 Components of a Recycling Market Development System in Massachusetts

To maximize the impact on the state's recycling rate, and on economic development, the foundation of Massachusetts' market development effort should be to build its capacity to identify and address market inefficiencies as they appear over time. More specifically, the state ideally should have in place:

- A **market intelligence system** that enables state recycling market development personnel and other key stakeholders to stay abreast of market conditions and trends for the full range of recyclable materials;
- An ongoing **strategic planning effort** that identifies and determines means to address market opportunities and challenges;
- **Market development tools and staff**, with adequate funding, to address the identified opportunities and challenges;
- Means for **evaluating** the impacts of programmatic efforts, and adjusting strategies and tools accordingly; and
- A mechanism for ongoing **communication, consensus and coordination** among pertinent agencies in order to effectively guide and manage the above.

Market development success is most likely to occur if numerous and diversified market development opportunities are encouraged and supported. The state cannot proactively identify and pursue all such opportunities, though it certainly can pursue some. Rather, the state can work to put the tools in place that encourage firms and entrepreneurs to pursue recycling business development on their own initiative, whether or not they ever inform or ask assistance from the state. In addition, the state can further develop its capacity to react in a timely fashion to unexpected opportunities that businesses bring to its attention. The timeframe for business decision-making typically is far shorter than the traditional timeframe for government action; the state can work to narrow this gap.

Over the past ten years, numerous states have funded recycling market development studies that examined specific opportunities and challenges at one point in time. When market conditions changed, as they often do in a matter of months, the study findings became out of date. In its attempt to effectively influence markets, Massachusetts can work to enhance its programmatic capacity to identify and react to opportunities and challenges as they arise. In essence, Massachusetts can strive to become as flexible, creative, and entrepreneurial as the recycling businesses it wants to develop.

**Table 2-1**  
**Examples of Market Development Tools Listed by Type of Market Inefficiency**

Market Inefficiency	Market Development Tools					
	Information & Tech. Assistance	Buy Recycled	Direct Finance	Grants	Taxes and Fees	Regulation
<i>Imperfect Flow of Information</i>	Market Data, Recycling Directories, Waste Exchanges, Business Outreach, Procurement Training	Directory of Recycled Product Vendors, Purchasing Policies and Guidelines	Loans & Loan Guarantees, Bond Financing, Equity Financing, Royalty Financing	Local Government Grants		Product Labeling
<i>Uncertainty About Future Markets</i>	Market Studies/Projections, Demonstration Projects, Testing	Set-asides, Guaranteed Purchases, Cooperative Purchasing	Loans & Loan Guarantees, Bond Financing, Equity Financing, Royalty Financing			Utilization Requirements
<i>Mispricing Due to Undervaluing Public Benefits and Costs</i>	Outreach, Education	Bid & Material Specs, Price Preferences	Low Interest Loans, All Below	Local Government Grants	Tax Credits, Tax Exemptions, Rebates, Tax on Virgin Materials	Utilization Requirements, Voluntary Use Agreements
<i>High Transaction Costs</i>	Market Data, Recycling Directories, Waste Exchanges		Loan Programs, Equity Programs, Royalty Financing	Local Government Grants		
<i>Difficulty Reaching Economies of Scale</i>	Recycled Products Directory	Set-asides, Guaranteed Purchases, Cooperative Purchasing			Tax Credits, Tax Exemptions, Rebates, Tax on Virgin Materials	Voluntary Agreements
<i>Aversion to Risk</i>	Accurate Market Data		Loans and Loan Guarantees, Bond Financing, Equity Financing, Royalty Financing			
<i>Unrestricted Nature of Information</i>				Research Grants	R&D Tax Credits	

## **CHAPTER 3. MASSACHUSETTS PROGRAMS FOR RECYCLING MARKET DEVELOPMENT**

### **3.1 Overall Goal of a State Recycling Market Development Effort**

The primary aim of a Massachusetts recycling market development effort is:

*To increase the use of Massachusetts-generated secondary materials in recycled products manufacturing.*

While the focus of state-led recycling market development efforts should be on the use of such materials by Massachusetts businesses, it also is appropriate to realize opportunities for export of Massachusetts-generated secondary materials that cannot be cost-effectively consumed in the state. In addition, as appropriate, recycling market development efforts should seek to improve economic development conditions, in particular:

- Increasing the competitiveness of the state's industries,
- Reducing unemployment, and
- Creating improved job opportunities for Massachusetts workers.

### **3.2 Approach**

The approach to achieving the primary goal of recycling market development is two-pronged in nature. The first prong is a set of general (cross-material) strategies that expand the state's capacity to promote recycling market development. The second prong is a set of strategies that are material-specific in nature.

*General strategies* seek to put in place tools and resources that can identify and respond to market development opportunities across a wide range of materials. These strategies are largely “demand-pull” in nature – that is, they seek to stimulate demand for secondary materials. As discussed in Section 2.4, the rationale for this approach is as follows:

- Market development success is most likely to occur if numerous and diversified market development opportunities are encouraged and supported.
- The state cannot proactively identify and pursue all market development opportunities, though it certainly can pursue some.
- The state can work to put the tools in place that stimulate firms and entrepreneurs to utilize secondary materials and expand recycling products manufacturing on their own initiative, whether or not they ever tell or ask assistance from the state.

For the most part, the suggested strategies combine “wholesale” and “retail” efforts. Wholesale efforts provide large numbers of market players with access to a wide variety of resources (informational, financial, technical, personnel and otherwise). Retail efforts involve one-on-one

service to individual clients. Wholesale efforts involve providing standardized products (e.g., a guide to resources or access to a data base) not customized to individual clients, and serving as the intermediary for retail services provided by other organizations. A recycling market development agency can serve as a wholesaler by facilitating client access to services provided by organizations such as development agencies, universities, and consulting firms. Conversely, these other organizations can guide clients to services provided by recycling market development agencies.

A combination of wholesale and retail services is important. Wholesale services are more efficient than retail in reaching a wide audience. Retail services are more effective than wholesale in providing the type of service needed by a particular client. Wholesale services also are effective mechanisms for screening out clients with low prospects for success, allowing retail services to focus on ones with a greater probability of success.

*Material-specific strategies* are an important adjunct to the cross-material strategies. The state's efforts in identifying and realizing a small number of material-specific strategies should supplement, not dominate, its efforts to encourage markets at large to use more Massachusetts-generated secondary materials.

### **3.3 General (Cross-Material) Strategies**

It is recommended that the state pursue cross-material strategies in six specific areas of recycling market development:

1. Conversion of Massachusetts manufacturer feedstocks from virgin to secondary materials,
2. Development and commercialization of new recycling technologies by Massachusetts recycling businesses,
3. Support for the expansion and stabilization of existing Massachusetts recycled product manufacturing businesses,
4. Startup of new Massachusetts recycling businesses,
5. Promotion of the purchase of recycled products (buy recycled), and
6. Promotion of collection and processing practices and technologies that better meet the needs of secondary material users.

Each strategy is discussed in a subsection below. Each subsection describes the goal, an overview of current activities in Massachusetts relevant to that goal, and the recommended strategy and actions for addressing the goal.

### **3.3.1 Feedstock Conversion**

#### Goal:

Encourage existing Massachusetts manufacturers to convert from virgin to secondary materials to the extent that technology and markets allow.

#### Current Activities:

The Chelsea Center for Recycling and Economic Development and the Massachusetts Department of Environmental Protection (DEP) have been actively pursuing efforts that encourage Massachusetts manufacturers to convert from using virgin feedstocks to secondary feedstocks.

The Chelsea Center developed specific initiatives in the plastics and paper industries. In 1996-98, the Chelsea Center undertook four efforts to encourage Massachusetts plastics manufacturers to utilize secondary plastic resins. The Massachusetts Manufacturing Partnership (MMP), the state's industrial extension agency, served as the contractor for these efforts; MMP in turn subcontracted each effort to a different regional manufacturing partnership. Plastics were chosen as a first focus, given the state's substantial manufacturing base in this field and the difficulty in finding market outlets for certain types of secondary plastics. As a result of these efforts, two plastics firms say they are utilizing a secondary feedstock that they would not have had the resources to pursue otherwise. In addition, the Chelsea Center believes it has a better understanding of methods for approaching firms about the potential for conversion, and the conditions likely to lead to a firm to convert. In 1998, the Chelsea Center contracted with the Merrimack Valley Manufacturing Partnership for a survey and analysis of 10-12 Massachusetts paper mills regarding the nature of the constraints (e.g., technical, attitudinal, market) in using secondary feedstocks. As a result of this report, two pilot projects are underway.

DEP conducted an in depth examination of the recycled paper manufacturing industry and evaluated opportunities for aiding Massachusetts paper manufacturers in "Turning Waste Paper into Jobs." DEP developed and administers the Recycling Loan Fund which can be used to increase or establish recycling capacity and the use of recycling feedstocks. In addition, DEP recently created the Recycling Industries Reimbursement Credit (RIRC) program to provide financial incentives to Massachusetts manufacturers willing to pursue secondary materials. In September 1998, with \$400,000 in funding, DEP launched its RIRC effort, which will provide approved companies with up to \$50,000 for establishing or expanding its Massachusetts-based processing of secondary materials into feedstock or using secondary feedstocks to manufacture a recycled product. RIRC funds may be used for activities such as feedstock purchase, capital investment, research and development, and prototype production. Target materials include mixed paper, mixed color glass cullet, tires, carpet, mixed #3-7 plastics, electronics, paper aseptic cartons, paint, mercury-bearing waste, and food waste. To receive a reimbursement credit, a company must apply to DEP. The effort is too new to discuss results.

Analysis and Strategy:

Existing manufacturing operations represent a substantial potential market for secondary materials. In seeking to promote conversion, it is helpful to recognize that recycled products serve two types of markets. In the first type, product purchasers are relatively insensitive to the “recycled content” label. They are concerned first and foremost about product performance and price. For competing in these markets, manufacturers will convert if they can see a reduction in production costs or an increase in product quality.

In the second type of market, purchasers specifically seek a product with a “Green” label. These purchasers are relatively price insensitive, that is, they are often willing to pay a moderate price premium for buying recycled. Manufacturers will convert a portion of their product line if they can see an ability to make sales and profits in the “Green” segment of the market.

Following this market segmentation, it is recommended that a two-pronged strategy be pursued for expanding the volume of feedstock conversions in Massachusetts. The first strategy would use information, facilitation, and financial incentives (subsidies through RIRC and grants for product testing) to promote conversion as a means of improving product performance and reducing production costs. The aim is to convince manufacturers to change feedstocks on the basis of technical and economic considerations. The second strategy would use information tools to promote the development of products targeted to Green markets.

These strategies are based on the assumption that the first, and most important, barrier to conversion is lack of information about how the firm might benefit. So these strategies would involve the dissemination of available industry-specific and product-specific information on the potential benefits of conversion to large numbers of Massachusetts firms, through a variety of formal and informal means. Most Massachusetts manufacturers are not aware of and do not have easy access to such information at present.

The aim of the information dissemination effort is to get the target firms’ attention. While some firms may proceed to convert only on the basis of new information, other barriers will exist for many firms. One possible barrier is fear of change – from a manufacturing process that is well-known and understood to one that is not, and fear of unknown or hard-to-measure “switchover” costs (new equipment, new relationships with vendors, training requirements, etc.). Another possible barrier is that the technical feasibility of conversion is unclear. Can a similar, or better, product be made using secondary materials? The existing literature may not be sufficient to answer all questions, and further research and testing may be needed. The firm may or may not have the money, time, staff, equipment or expertise to do the necessary research and testing. A third possible barrier is straight economics – conversion may not result in cost savings. For example, the cost of purchasing and handling the secondary material may be higher than for virgin material.

The suggested strategy seeks to address each of the various barriers. The Chelsea Center would take charge of an aggressive conversion information collection and dissemination effort to reach Massachusetts firms in industries with conversion potential. Further, it would aim (as it does at

present) to bring potential converters together with recycled product manufacturers using similar materials. In the field of technological change and industrial extension, the evidence is that a new technology or material is most likely to be adopted when it is being used by others in the manufacturer's informal network of competitors, suppliers, and customers. Product research and testing would be encouraged by Chelsea Center grants to third parties (e.g., University of Massachusetts) for that purpose. DEP's new RIRC program would continue to be available to subsidize conversion costs to some degree.

Further, the Chelsea Center would continue to carry out conversion-related research efforts relevant to specific Massachusetts industries. It would continue assessments of the type recently completed on constraints to conversion in the paper industry. It also would identify gaps in the conversion literature relevant to particular industries in the state and seek to fund research to fill those important gaps.

Actions:

1. Prepare and periodically update a priority target list of Massachusetts manufacturing sectors that contain candidates for conversion, absorbing a significant amount of secondary material. Preparation of such a list would be based on:
  - An industry-specific profile of Massachusetts manufacturing establishments, based on a combination of employment data (ES-202 data from the Department of Labor and Training) and manufacturers directories (Thomas, Harris, Dun & Bradstreet, Associated Industries of Massachusetts, local chambers of commerce); and
  - Qualitative information on the manufacturing processes of individual sectors, gathered through surveys and interviews (e.g., the Chelsea Center's paper industry analysis).
2. To firms on the priority target list, disseminate information on feedstock conversion as a means for improving product performance and reducing production costs.
  - a) Develop a one-stop center for Massachusetts firms to gain access to technical information on feedstock conversion. (Consider the state's toxic use reduction effort as one model.) To a large degree, the state could act as an intermediary for accessing information held by other organizations; all information would not need to be held "in-house." Building such an information base would involve:
    - Identification of current repositories of literature on the topic (e.g., Clean Washington Center/ReTAP, Environmental Protection Agency [EPA], trade associations), their holdings across major commodities, and means for accessing them;
    - Identification of on-line literature sources;
    - Monitoring and review of important new additions to the literature;
    - Preparation of bibliographies and resource links customized to particular industries;
    - Identification of gaps in the literature pertinent to targeted Massachusetts manufacturing sectors;

- Selective funding of research to fill literature gaps relevant to Massachusetts firms through means such as case studies of recent conversions, cost feasibility studies, and laboratory research. As the value of such research would extend beyond Massachusetts, collaboration in research design and funding with market development organizations elsewhere (e.g., CWC, New York Office of Recycling Market Development, National Recycling Coalition [NRC]) would merit consideration.
- b) Prepare a companion base of information on approaches for firms to use in determining whether or not to convert (e.g., a checklist of steps) and in managing the implementation of a conversion process. For small manufacturers, technical information is rarely compelling on its own; they often need assistance in understanding how to apply that information to their own unique circumstances. Checklists could be modeled on a tool that the CWC prepared for the Chelsea Center on technical considerations for plastics conversion.
- c) Aggressively market the availability of the information resources to target manufacturing sectors and to state and local economic development agencies.
- For commodities for which there is sufficient information, prepare Web site and printed materials that discuss specific conversion pros and cons, summarize pertinent literature and expert opinion, and provide links to pertinent experts and other resources to examine specific conversion opportunities. Material could include a check list of factors for firms to consider in assessing the costs and benefits of conversion. As this information would have value beyond Massachusetts, it could be organized in conjunction with organizations outside the state (e.g., EPA, the Northeast Recycling Council [NERC], other states, NRC, CWC) to the extent possible.
  - MMP organizations should be utilized as important means to promote conversion and bring firms to resources needed to test the feasibility of conversion.
  - Dissemination should seek to strategically leverage the use of formal and informal networks in legitimizing feedstock conversion among Massachusetts manufacturers. Such networks may be found through organizations such as state and regional trade associations, manufacturing networks managed by the Massachusetts Office of Business Development (MOBD), and the New England Suppliers Institute. If a Massachusetts Recycled Product Manufacturers Network is created, as proposed in section 3.3.3, this network also would serve as a means of dissemination.
3. Continue to implement the Recycling Industries Reimbursement Credit program. To support program effectiveness, the following steps are recommended:
- a) Promote the availability of product conversion information gathered (as described above) to potential users of target materials.
  - b) Prepare regular evaluations of appropriateness of targets and effectiveness of results (including determination of substitution effects).
  - c) Adjust program targets and tools in light of evaluation findings.

4. Promote conversion as a means of increasing profits through “Green” product marketing.
  - a) Utilize the RCRA librarian in EPA Region I to gather information regarding the potential size of and profits in Green markets for recycled products (markets of consumers specifically seeking to purchase, and often willing to pay more for, recycled products).
  - b) If significant potential appears to exist, use existing information sources to prepare and regularly update an analysis of U.S. and international markets for recycled products as Green products:
    - From a variety of sources, gather and continually update trends in demand for Green products, examples of profitable firms, specific market opportunities, and information on the environmental benefits of using secondary feedstocks.
    - Identify gaps in knowledge regarding Green markets that, if filled, could further encourage manufacturers, and determine means to fill such gaps.
    - As the information gathered has value well beyond Massachusetts, consider collaborating with organizations beyond the state (including the Region I EPA office) in this effort.
  - c) Aggressively promote the results of this analysis to Massachusetts manufacturers, particularly those in target sectors. Disseminate findings in print and on the Internet. Again, seek to leverage informal manufacturer networks in the dissemination process.
5. For small manufacturers considering conversion, but short on funds to test the feasibility of doing so, continue to provide conversion feasibility grants.

### **3.3.2 Technology Development and Commercialization**

#### Goal:

To the fullest extent possible, encourage the successful development and commercialization of innovative recycled products and manufacturing technologies for recycled products in Massachusetts.

#### Current Activities:

A number of in-state efforts to promote the development of innovative recycled products and processes are managed by the Chelsea Center.<sup>7</sup> These include:

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<sup>7</sup> Technology development includes the development of innovative recycled products, innovative technologies for manufacturing recycled products, and innovative technologies for processing secondary materials. Massachusetts provides a large number of programs and resources aiming to encourage technology development and commercialization across all industries. These are too numerous to list here, but important to mention that they are available.

- Preparing a guide on service providers for recycled product manufacturers and technology developers;
- Serving as a link between technology developers and valuable technical and non-technical resources (e.g., university researchers, management assistance);
- Hosting workshops on best practices in technology development and commercialization for recycling businesses;
- Monitoring innovative recycled product manufacturing technology development around the U.S., and linking Massachusetts businesses with specific opportunities as appropriate;
- Administering a research program that offers financial support to university and other researchers who carry out research on new recycled products and recycled product manufacturing technologies that could utilize Massachusetts-generated recyclables as feedstock;
- Providing discretionary research and development grants to ascertain the feasibility of new product development (some of which were transformed from conversion feasibility grants, as described earlier);
- Providing grants to support product and materials testing; and
- Facilitating the testing of new recycled products through the Massachusetts Strategic Envirotechnology Partnership (STEP), a collaboration between MOBD, EOEA and the University of Massachusetts to provide university researcher assistance to firms and entrepreneurs seeking technical assistance in the development and testing of innovative environmental technologies with market potential.

In addition, DEP's RIRC program offers reimbursement for expenditures on the research and development of recycled products and recycling technologies.

The Chelsea Center will spend about \$300,000 in FY99 on funding its various R&D efforts (\$185,000 for university research, \$56,000 for new product development and feedstock conversion, \$49,000 for independent product testing). These efforts are only 1-2 years old. Approximately 15 projects are funded annually. The Center indicates that several projects have resulted in an increase in the use of secondary materials, and that more should have an impact over time. Experience in technology development programs across the U.S. suggests that full impacts take a number of years to come to fruition.

Development and implementation of a new recycled product or technology in Massachusetts may require a Beneficial Use Determination (BUD) review by DEP staff. A determination that a site is suitable for a "solid waste management facility" may be needed as well, since a secondary material, even if processed, can be considered a solid waste. A finding by DEP that production and end-use applications will not have negative environmental or health impacts is necessary before production can proceed.

#### Analysis and Strategy:

New competitive recycled products and manufacturing technologies will increase demand for secondary materials and provide economic development benefits. Currently, several barriers exist

that impede the development of recycled products and manufacturing technologies in the state. First, manufacturers and researchers are not always fully aware of the profit-making possibilities available. Second, product and technology developers do not always know which organizations and experts to contact for technical assistance needed for problem-solving, product testing, and commercialization engineering, and management and legal assistance needed in the non-technical aspects of the commercialization process. Experience in technology development programs suggests that, particularly for small firms, the commercialization process usually poses greater barriers than the development of the product itself. Aspects of product commercialization include intellectual property legal assistance, market assessment, access to capital, access to manufacturing engineering, and product design targeted to market needs.

A third barrier is lack of capital. Firms' ability to use outside technical and management experts, and obtain needed facilities and equipment, can be impeded by lack of funds.

A fourth barrier is regulatory. Indications are that the BUD process as currently constituted is unnecessarily impeding or discouraging new product and technology development. Several firms that have applied for a BUD review have indicated to DEP that the process is expensive, time-consuming, and uncertain. While there is a list of exempt and conditionally exempt recycled product manufacturing facilities (310CMR16.05), it is relatively short. All other efforts are dealt with on a case-by-case basis. While BUD regulations are quite detailed regarding the type of information the applicant must submit, the criteria for determining site suitability and beneficial use are stated only in general terms. Thus, applicants are uncertain what criteria must be met and DEP reviewers have much leeway in interpreting criteria. Moreover, the review process is open-ended; reviewers can require applicants to submit additional information at any time. DEP has been undertaking an evaluation of the BUD review process to address applicant concerns.

The recommended strategy for increasing the rate of recycled product and manufacturing technology development in Massachusetts is to directly address each of these barriers. More specifically, the strategy would be to provide potential recycled product developers with:

- Information regarding the market needs for such products and technologies,
- Access to the full range of information and resources needed to successfully develop and commercialize them, and
- A regulatory review process that protects environmental quality without unnecessarily impeding technology development and commercialization.

In addition, the strategy would explore the potential for taking advantage of the concentration of manufacturing engineering talent in Massachusetts and promoting the state as a center for the development of innovative recycled products and recycled product manufacturing technologies.

The recommended division of responsibilities for implementing this strategy follows that currently in place. The Chelsea Center would manage information, facilitation, and its current set of financial subsidy programs. DEP would continue to be responsible for the RIRC program and the BUD process (currently under review). It is suggested that the Massachusetts Technology Collaborative (MTC) be asked to take a lead role in exploring the potential for developing

Massachusetts as a center for R&D in recycled product manufacturing technologies, working with the four members of the Recycling Market Development Steering Committee proposed in Chapter 5 (EOEA, Chelsea Center, DEP, and MOBD).

Actions:

1. Identify Massachusetts firms, entrepreneurs and research organizations with some potential to develop new recycled products and/or recycled product manufacturing technologies. As a complement to the conversion information base described above (and using similar methods), identify and organize information regarding market opportunities for such products and technologies. Disseminate information to target organizations (again, using means similar to those described for conversion information base).
2. Expand access by recycled product developers and recycled manufacturing technology developers to technology development resources and opportunities. (The rate of success for product/technology development efforts in any field is relatively small, so it is important that a large number of potential recycled product developers be reached.)
  - a) Expand the existing service provider guide (in print and on the Web) to include additional resources for technology development and commercialization, including public and private research organizations, consultants, and testing services. Include relevant resources located out-of-state. Continue to aggressively promote the guide to small manufacturers, entrepreneurs, trade and professional associations, business assistance organizations, and economic development agencies. Continue to use trade and professional associations, business assistance organizations, and development agencies to actively promote facilitation services that link technology developers to the appropriate development and commercialization resources.
  - b) Continue to host periodic workshops on best practices in technology development and commercialization for recycling businesses.
  - c) Continue to encourage informal relations among private sector recycling technology developers, academic researchers, and resource providers. Consider utilizing the resources of the Boston chapter of the Technology Transfer Society and other appropriate professional societies.
  - d) Continue to assist recycled product and manufacturing technology developers in accessing research, development and testing assistance through STEP, other technical assistance resources of the University of Massachusetts, EPA's Environmental Technology Verification (ETV) program<sup>8</sup>, the Federal Laboratory Consortium (FLC)<sup>9</sup>, and similar

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<sup>8</sup> The ETV program seeks to "verify the performance characteristics of commercial-ready environmental technologies through the evaluation of objective and quality assured data so that potential purchasers and permittees are provided with an independent and credible assessment of the technology that they are buying or permitting." Two appropriate ETV Pilot Partnerships for recycling technologies are those for Pollution Prevention, Recycling and Waste Treatment Systems (with the State of California) and the Environmental Technology Evaluation Center (EvTEC) managed by the Civil Engineering Research Foundation.

<sup>9</sup> The FLC provides access to technical assistance and technology transfer from several hundred Federal research laboratories around the U.S. The FLC Web site can be used to identify Federal labs that have research capacities

organizations. Explore means by which STEP can become more accessible to recycled product developers.

- e) Encourage university researchers to consider spinning off business startups based on technologies they develop.
- f) Using FLC, identify Federal laboratories that are potential sources of technology transfer – that is, are carrying out research and technology development activities that may be of interest to Massachusetts recycling businesses looking for commercialization opportunities. Assist businesses in gaining access to pertinent technologies through cooperative research and development agreements and licensing.
- g) Regularly and systematically monitor innovative recycled product manufacturing technology development around the U.S. (e.g., at out-of-state universities and companies), and link Massachusetts businesses with specific opportunities as appropriate.<sup>10</sup>
- h) Using MTC, monitor Small Business Innovation Research (SBIR) announcements by the Federal government that may be of interest to Massachusetts recycled product manufacturing technology developers, and provide links to resources that can assist developers in being awarded SBIR contracts.<sup>11</sup>

3. Create a flexible, strategic research and development (R&D) financial subsidy effort.

- a) Continue to fund university research grants, product development grants, product testing grants, and RIRC.
  - To extent possible, manage the process to avoid funding firms that will undertake the R&D without state funds.
  - For the university research grant program: Identify problematic materials or market opportunities, particularly those that will serve to increase the state's recycling rate, to be targeted by the RFPs; inform appropriate recycled product firms of each RFP, so they may approach university researchers; facilitate transfer of research results, for research without a corporate partner, to Massachusetts recycling firms and entrepreneurs willing to invest in technology development and commercialization; and encourage university researchers to consider developing business startups based on the technologies they develop. (Possible means include MTC, MOBD, and university technology offices. See section 3.3.4 for further suggestions on promoting startups.)
  - To determine appropriate levels of funding and program design, periodically evaluate the results of funding efforts. (The Chelsea Center has wide latitude in setting its grant program budgets.)

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(e.g., in materials, manufacturing processes) that may be available to assist Massachusetts recycling businesses on specific problems.

<sup>10</sup> One means to track such efforts is through the patent and scientific literature data bases maintained by Chi Research, Inc. in New Jersey.

<sup>11</sup> The SBIR program is mandated by Federal law, which requires each Federal agency funding research and development to set aside a certain proportion for small business researchers.

- b) Explore creation of R&D consortia comprised of public and private sector members for pre-development research seen as of particular value to Massachusetts recycling firms (may include out-of-state parties).<sup>12</sup>
4. To the extent possible, encourage the development of Massachusetts as a center for R&D in recycled product development and technologies for manufacturing recycled products.
    - a) Examine the current competitive standing of Massachusetts as a center for R&D for a variety of types of recycled products and manufacturing technologies. (Tools include tracking technology development activity across the U.S., as discussed above, as well as selected interviews with experts.)
    - b) In light of findings, prepare a strategy for maintaining and expanding the state's competitive standing in product and technology development. Options include targeted state investment in the University of Massachusetts and private universities, and assistance in obtaining Federal funding from appropriate programs (e.g., the National Science Foundation's Engineering Research Center and Industry-University Cooperative Research Center programs).
    - c) Market Massachusetts recycled product manufacturing technology research expertise to clients beyond the state. Links with such clients will likely serve to benefit Massachusetts recycling firms.
  5. Continue to identify means by which the BUD process can be revised to better promote new recycled product development in Massachusetts without compromising environmental quality, and make changes as necessary and appropriate. A modified review process should seek to reduce costs to applicants both in terms of money and time for review, and increase the certainty of the review process outcome. Ideas to be considered for a revised BUD process include the following:
    - a) DEP could consider expanding the list of exempt operations in 310CMR16.05(2f) and conditionally exempt operations in 310CMR16.05(3). In undertaking this effort, materials for which other states do not require a case-by-case review could be examined.
    - b) For nonexempt operations, site suitability and BUD criteria could be revised to be as specific and quantified as possible, on a material-specific basis, to reduce uncertainty on the part of applicants regarding the criteria they need to meet.
    - c) Consider granting approvals based on BUDs made in other New England states and working with other states in the region to establish reciprocity – i.e., if one state in the region approves a particular beneficial use, automatic approval by other states is granted.
    - d) Instances in which reviewers can require applicants to submit additional information could be limited, and the conditions under which such a request can be made could be more clearly delineated.
    - e) The Chelsea Center could consider using a portion of its product test funds to support any testing that BUD applicants for proposed recycled product manufacturing operations must

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<sup>12</sup> R&D consortia undertake joint research and development efforts of mutual interest to members, which may include manufacturers, universities, engineering firms, and other parties able to contribute research personnel and equipment. Results are shared among all members.

undertake, and using university R&D program funds to support preliminary research on anticipated BUD materials and issues. DEP could provide input regarding which BUD applicants need financial assistance for testing, etc.

### **3.3.3 Support of Existing Recycled Product Manufacturing Businesses**

#### Goal:

Provide existing Massachusetts recycled product manufacturers with access to the financial, professional, educational, and infrastructure resources necessary for expansion of sales, profits, and jobs.

#### Current Activities:

At present, the Chelsea Center undertakes a number of efforts to assist existing recycled product manufacturers in expanding demand for their products. These include:

- Preparation of a Massachusetts recycled product manufacturers directory;
- Preparation of a Guide to Services for the Recycling Industry;
- Operation of a recycling internship program, which places students with recycled product manufacturers;
- Administration of a trade show grant program, which subsidizes the cost of manufacturer exhibits at environmental trade shows;
- Making referrals of recycled product manufacturers to technical and non-technical service providers (at least 30 firms in the past year);
- Provision of workshops on business planning;
- Provision of workshops to economic development agencies and financial organizations on the benefits of supporting recycled product manufacturers.
- Assistance to recycled product manufacturers in selling products to state under a pilot purchase program; and
- The various technology development and commercialization efforts mentioned in section 3.3.2.

To assist the expansion of existing recycling firms, DEP has capitalized the Recycling Loan Fund (RLF). Capitalization (money available for lending) currently reached \$4 million (from \$350,000 initially). The RLF offers mezzanine financing that fills the gap between equity capital and traditional bank debt, and that can be subordinated. Thus, for the most part, it seeks to fill a capital gap not addressed by the private banking sector, although funds can be used for equity investments, venture capital, or financing of start ups as well. The RLF is managed by the Massachusetts Business Development Corporation (MBDC) on a contract basis. As of the summer 1998, the RLF had provided loans to 11 Massachusetts firms, for a cumulative total of \$1.725 million. The number of new loans has been diminishing of late. As a result, DEP is working with MBDC to redesign the RLF to allow larger loans and loans to larger firms. To

date, loans have been limited in size to \$150,000 (with some exceptions) and to customers of under \$10 million in sales.<sup>13</sup>

Analysis and Strategy:

Expansion by existing recycled product manufacturers is an important means of increasing demand for secondary materials. Management of expansion can prove difficult for small and medium-sized firms of any type. Many firm failures have resulted not from an inferior product but an inability to access and appropriately deploy the resources (e.g., financial, human, physical) necessary to enable growth. In addition, some firms have difficulty in maintaining stability, that is, defending current operations against market forces.

Massachusetts has a wide array of public and private resources available to small and medium-sized firms of all kinds, including recycled product manufacturers. Not all recycled product manufacturers are fully aware of the resources available and the means to access them. While extensive resources do exist, they may not meet all needs of recycled product manufacturers. At present, complete information does not exist as to the specific needs of these firms.

The strategy for assisting the state's recycled product manufacturers in expansion and stability addresses these various issues. First, the state should create a mechanism for regularly communicating with these manufacturers regarding needs and opportunities. Creation of a Massachusetts Recycled Product Manufacturers Network as part of the MOBD Bay State Manufacturers Networks program is suggested. It is recommended that the Network and the state jointly undertake a strategic competitive analysis of Massachusetts' recycled product manufacturing industry – opportunities, threats, strengths and weaknesses – and adjust business assistance programs accordingly.

Second, active referral of firms to existing resources to meet identified needs should continue. By tracking unmet needs, existing program tools could be modified or new tools created to address them in the future. For instance, the proposed Recycled Product Manufacturers Network can be used as a means to market the state's array of recycled products. Additionally, DEP can provide information on sources and the availability of commodity supplies from municipalities and processors.

It is recommended that the Chelsea Center continue to have primary responsibility for referring firms to existing resources provided by general business assistance programs, provide advocacy on behalf of its clients to such programs, and deliver those direct services it currently provides. The Chelsea Center also should take the lead in exploring creation of the Recycled Product Manufacturers Network, in conjunction with MOBD. If a network were created, MOBD would see to the network management process, while the Chelsea Center would provide staff to work with the network on substantive and strategic issues.

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<sup>13</sup> The Commonwealth of Massachusetts offers a wide array of programs aimed at assisting firms across all industries to expand their businesses. These are too numerous to list here, but it is relevant to mention their existence.

Actions:

1. Create a Massachusetts Recycled Product Manufacturers Network (the Network), comprised of the state's recycled product manufacturers. The aim of the Network would be to provide a mechanism through which recycled product manufacturing firms in the state could develop formal and informal relations with one another, and identify and act on issues and opportunities of common interest.
  - a) Explore development of the Network as a component of the Bay State Manufacturing Networks program or other appropriate efforts that could provide network development and management assistance.<sup>14</sup>
  - b) Utilize the Network as a means of assessing and responding to needs of the members, promoting joint marketing efforts, disseminating information, raising the profile of the industry in the state and elsewhere, and promoting formal learning (e.g., workshops) and informal relations among members.
  - c) Link Network efforts to other environmentally-oriented business groups by other environmentally-focused organizations, e.g., CERES, the Buy Recycled Business Alliance (BRBA), MassRecycle Business Council, the Northeast Business Environmental Network (NBEN), and those sponsored through WasteCap. Also, link the Network to Massachusetts industry and trade associations, industry networks, and commodity networks in those industries with existing recycled product manufacturers and with significant potential to convert to secondary materials.
  
2. Assist Massachusetts recycled product manufacturers with gaining access to a variety of information, facilitation and financial resources that promote business expansion.
  - a) Continue to provide one-on-one assistance to recycling businesses, as requested, in gaining access to needed resources, including management assistance, market assessment and marketing assistance, technical assistance, debt finance and venture capital, human resource development, and environmental permitting.
  - b) Enhance the current services directory (on-line and in print) through providing information regarding access to private commercial and non-profit sector resources. Such information could include sources of financial assistance, in addition to that currently provided on public sector resources; written guidance on suggested approaches to choosing which resources to contact based on the nature of particular needs; and suggestions on resources to assist in overall management of the process of business growth.
  - c) Develop a page on the Chelsea Center web site listing potential sources of financing, with hotlinks to each of the listed financing programs' web sites, where available.
  - d) Provide workshops to recycled product manufacturing businesses regarding the management of business expansion, on an as-needed basis (working with Network members).

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<sup>14</sup> For point of reference, an Association of Recycled Product Manufacturers is currently being created in New Hampshire.

- e) Promote access to conversion and Green Markets information (discussed above) to existing recycling businesses.
  - f) As was done in 1995 by DEP, carry out a survey, interviews and focus groups with Massachusetts recycled product manufacturing businesses to more clearly identify the nature of unmet capital needs, particularly needs for access to “patient capital,” including equity. To the extent appropriate, make use of DEP’s manufacturers survey results obtained in the design of RIRC program.
  - g) In light of previous step, identify those specific capital gaps that should be addressed by the Recycling Loan Fund, and capital services for which the fund is not needed, and restructure the operations of the loan fund accordingly.
  - h) Consider whether a portion of Clean Environment Fund monies used to capitalize the RLF should be redeployed. Options may include creating a second capital fund (e.g., for equity investment).
  - i) Consider deploying funds to provide access to marketing assistance for Massachusetts recycled product manufacturers. Efforts could include a one-time workshop on marketing recycled products; an ongoing project in which participating firms (with consultant assistance) provide mutual assistance in marketing design; a recycled product marketing handbook; and a review of the type of efforts that have worked elsewhere. If and when the Network is organized, operate the marketing assistance program through the Network, and allow Network members to assist in program design. (Experience with industry networks around the U.S. suggests that the first item on the agenda of new networks is the development of programs to assist members in marketing.)
3. With participation of the Network, prepare and utilize the results of a strategic competitive analysis of the Massachusetts recycled product manufacturing industry.
- a) Carry out and periodically update a strategic analysis of the Massachusetts recycled product manufacturing industry. Through the analysis, assess the competitive positions of key sectors of Massachusetts recycling businesses through examining:
    - The nature of market and product trends, by sector;
    - The key competitive elements of Massachusetts firms (some combination of cost, quality, service) as compared to competitors in other places;
    - Opportunities for and threats to key sectors; and
    - Steps that can be taken to maintain and expand Massachusetts recycling firm competitive strengths.
  - b) Utilize the findings of the strategic analysis to organize and create greater access to resources needed to take advantage of opportunities and address threats.

### **3.3.4 New Recycled Product Manufacturing Business Development**

#### Goal:

Encourage and support the startup of new final and intermediate recycled product manufacturing businesses in Massachusetts, including non-profit and for-profit community-based enterprises (i.e., those in lower income communities that employ local residents).<sup>15</sup>

#### Current Activities:

At present, the Chelsea Center actively seeks to identify and provide assistance to persons interested in starting up new recycling businesses. It provides the range of services described in section 3.3.3, including workshops, referrals to service providers, one-on-one assistance, and grants for product development and testing.

Also, the Chelsea Center is embarking on a community-based business development initiative, hiring a community economic development coordinator to develop a new Community Economic Development through Recycling initiative. Through this initiative, the Chelsea Center plans to work with two or three communities in Massachusetts seeking to promote new business development in lower income communities. It also plans to develop and distribute materials on community-based recycled product manufacturing businesses to other communities around the state.

Massachusetts, more than almost any other state, has a rich and deep public, private and non-profit resource base designed explicitly to nurture and promote community-based businesses. The Chelsea Center plans to harness this existing resource base to the cause of recycling business development through the distribution of these materials, workshops, and other means.

DEP is involved in several types of activities pertinent to new business development. Among these, DEP provides financial assistance, through the RLF and RIRC programs. Through its BUD review process, DEP has the power to affect the startup of new recycled product manufacturers using certain secondary materials and processes. (As noted in the previous section, some firms involved in BUD review have voiced concerns that the BUD review process, as currently structured, impedes the development of new recycling business, products, and technologies in the state.) Third, DEP helps recycling related businesses navigate their way through the regulatory process of permitting, siting, and compliance. And fourth, DEP collects and provides data to recycling-related businesses on the amount and types of recyclable materials collected by municipalities and other sources.

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<sup>15</sup> Intermediate products are those marketed to other product manufacturers which in turn make other products (e.g., glass fillers), whereas final products are those which are marketed to and used by final consumers (e.g., glass abrasives).

Analysis and Strategy:

The creation of new businesses can be an important means of increasing demand for secondary materials. The difficulties of new business development are analogous to those of technology commercialization. Access to resources such as management, technical personnel, capital, and secondary materials is crucial to survival. Often, new businesses have difficulty knowing where to find and how to use such resources, and paying for them.

In poorer neighborhoods, there often exist significant market inefficiencies that can be remedied through business development (e.g., unused materials, labor, buildings). Community development corporations (CDCs), neighborhood non-profit organizations with a mission of community betterment, can be important allies in creating clean community-based recycling businesses that are good neighbors and often provide sponsorship and ownership.

The recommended strategy for addressing these issues is threefold. First, the Chelsea Center and other organizations should continue with active identification of private sector entrepreneurs, provision of direct service, and referral to existing resources. DEP can continue to offer access to capital to entrepreneurs through the RLF and RIRC programs, plus explore the unmet needs of entrepreneurs for venture capital and means of addressing them.

Second, it is recommended that work in promoting business development through community-based organizations throughout Massachusetts proceed. The Chelsea Center should continue to manage this effort.

Third, business development would be greatly aided by DEP's revision of the BUD process to encourage such development without compromising environmental quality.

Actions:

1. Stimulate recycled product manufacturing business development by Massachusetts entrepreneurs.
  - a) Via referrals from public and private service providers throughout the state, attendance at conferences, and other means, seek to identify individuals who are considering starting recycled product manufacturing businesses.
  - b) Publicize business development opportunities identified in the material-specific market analyses discussed in Chapter 4.
  - c) Through on-line and printed materials, continue to provide access to a variety of information, facilitation and financial resources for entrepreneurs seeking to start recycling businesses, and written guidance on how to make effective use of these resources.
  - d) Provide entrepreneurs with access to capital sources through:
    - Operating RLF and RIRC efforts;
    - Aiding entrepreneurs in accessing venture capital through NERC's investment forums; and

- Identifying any unmet needs for venture capital sources for startups, and taking steps to meet those needs.
  - e) Consider a variety of means for increasing access of Massachusetts entrepreneurs to venture capital, e.g., explore investment of some portion of RLF funds with a sustainable business development fund.
  - f) Revise the BUD process to better promote the development of new recycled product manufacturers in Massachusetts. (See section 3.3.3 for suggested changes.)
2. Promote community-based recycling business development in Massachusetts.
- a) As planned, select two or three communities with which to work on the development of community-based recycled product manufacturing operations.
  - b) Provide community business developers with models of successful development, including examples of success stories in the U.S. and other countries, and a guide to effective practices and pitfalls in community recycling business startup and operation.
  - c) Seek to determine effective means of using the Community Reinvestment Act (CRA) to leverage commercial bank investment in community recycling businesses.
  - d) Work with a variety of community-oriented organizations to promote recycling business development, including the Massachusetts Association of CDCs and its various members, commercial bank CDCs operating in Massachusetts (e.g., Fleet)<sup>16</sup>, the Massachusetts Community Development Finance Corporation, the Minority Business Assistance Center at UMass-Boston, and various community-oriented small and micro-business lenders.
  - e) Examine the need for creating a targeted recycling micro-business loan fund, with capitalization from a special U.S. Department of Treasury program. Facilitate access by community-based businesses and their sponsors to relevant non-Massachusetts resources, e.g., foundation grants, Federal grant programs.

### **3.3.5 Buy Recycled**

#### Goal:

Promote the purchase of recycled products by government, business, institutions, and other consumers, particularly recycled products manufactured in Massachusetts.

#### Current Activities:

The State of Massachusetts has several programs and activities (all funded by EOEA) that promote the purchase of recycled content products. Many of these are managed by DEP:

- The Environmentally Preferable Products (EPP) Branch of DEP's Consumer Program conducts various buy recycled activities of its own as well as supports many of the buy recycled activities conducted by other entities. It works closely with the Operational Services Division (OSD) EPP effort described below.

- DEP contracts with WasteCap to manage the Buy Recycled Business Alliance (BRBA) which includes the development of selected purchasing cooperatives for copier paper in cooperation with the Boston Bar Association.
- DEP is supporting a new position in MassHighway to coordinate efforts to utilize recyclable materials and supplies in highway related construction projects. Since 1995, DEP has sponsored university research on the use and specifications of recycled materials and products for MassHighway.
- DEP's municipal grants efforts now require local government grant recipients to adhere to buy recycled guidelines and goals to be eligible for funding.
- DEP provides matching grants to municipalities that purchase certain recycled products, e.g., recycled paint and re-refined motor oil.
- Through its involvement in NERC, DEP, along with EOEA, has aided in the development of agreements with newspaper publishers and yellow pages publishers to increase purchases of recycled newsprint.
- The Chelsea Center creates and promotes a Directory of Massachusetts Recycled Product Manufacturers, profiling over 170 manufacturers that use recycled content in making new products.

EOEA is the ultimate source of funds for the above efforts, and directly funds two positions in OSD to manage the state's environmental product procurement activities. This program focuses on making EPPs available for purchase on state contract and motivating state agencies, authorities, municipalities, and other entities to buy these products and other recycled content goods not available on state contract. OSD has increased the state's EPP purchasing from \$2.8 million in FY92 to \$35.2 million in FY98. OSD holds an annual recycled products fair, and offers training to state and municipal purchasing agents on EPP purchasing. EOEA and the Chelsea Center fund procurement of certain recycled and environmentally preferable products on a test basis by OSD for use by public agencies before wider promotion and procurement.

Other state entities also are playing a stronger role in recycling market development. A new buy recycled staff person has been hired by UMass to oversee UMass buy recycled activities, as well as other EPP and envirotechnology procurement efforts. MassHighway and the Division of Capital Asset Management work with OSD in evaluating buy recycled opportunities for their construction projects and recycling of waste removed from construction projects and roadside pickups. The Division of Capital Asset Management has hired someone to focus on sustainable design issues, one of the few such positions in the country.

Several non-profit entities also play important roles in promoting buy recycled in Massachusetts. The Buy Recycled Vendor Fair is sponsored by OSD and WasteCap (as part of BRBA) in cooperation with MassRecycle, the Center for Ecological Technology (CET), and the Chelsea Center. As part of the fair, WasteCap also organizes a businesses and institutions track to target private purchasers. MassRecycle sponsors or participates in a large number of public events that promote buy recycled, including Massachusetts Recycles Day. WasteCap publishes and updates

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<sup>16</sup> Commercial bank CDCs are bank subsidiaries with the mission of investing in low-income communities.

the Massachusetts Directory of Recycled Product Suppliers, a listing of over 300 vendors of recycled content products and EPPs.

Analysis and Strategy:

The aim of buy recycled efforts is to directly increase demand for recycled products, and indirectly increase demand by further legitimizing the purchase of recycled products throughout the state and increasing production volumes to lower per-unit costs, making recycled products more cost-competitive. Increasing demand for recycled content products, will help such product manufacturers operate profitably, thereby providing a stable outlet for recyclable materials.

The strategy for building on the impressive foundation described above has several elements, including:

- Increasing coordination among various state entities to promote buy recycled through establishment of a Buy Recycled Coordinating Committee;
- Through this committee, preparing a strategic plan for promoting buy recycled, with a focus on Massachusetts products where appropriate;
- Increasing efforts to encourage businesses and consumers to buy recycled;
- Carrying out research and testing that leads to making recycled products available through state contracts; and
- Integrating buy recycled efforts with recycling market development efforts, EPP efforts, and the promotion of sustainable consumption.

Actions:

1. Develop a coordinated, strategic approach to promoting buy recycled.
  - a) Create a coordinating committee for the state's buy recycled efforts, including EOE, DEP, Chelsea Center; OSD, MassHighway, the Division of Capital Asset Management and Maintenance, Executive Office of Transportation and Construction and other key state buying agencies; WasteCap; MassRecycle; EPA Region I; U.S. General Services Administration regional office, and other appropriate organizations.
  - b) Have DEP's Consumer Program EPP Branch provide staff support to the Committee.
  - c) Have the Coordinating Committee develop a buy recycled strategic plan, including a clarification of agency and organizational roles.
  - d) Hold periodic meetings of the Committee to coordinate implementation activities.
2. Promote buy recycled efforts aimed at businesses, and institutions.
  - a) Continue to support WasteCap and MassRecycle buy recycled programs.
  - b) Develop a partnership with the Massachusetts Purchasing Managers Association to inform business and institutional purchasing managers about buy recycled opportunities.

- c) Offer buy recycled training for business and institutional as well as public sector purchasing managers.
  - d) Explore opportunities for establishing more recycled product and EPP purchasing cooperatives.
  - e) Encourage the Network to develop a program to market recycled products made in Massachusetts, e.g., exhibits at buy recycled fairs and environmental expos, a catalog of products.
3. Promote EPP (including recycled product) purchasing by state and local governments, universities, and authorities.
- a) Continue with existing programs that have proven results, including allowing local governments to buy off the state contracts.
  - b) Use effective buy recycled activities at the state level to serve as a model for local government and other purchasers: universities, public schools etc.
  - c) Consider requiring agencies working with contractors to require their contractors to buy recycled on certain products, and encourage such purchases on others. Provide contractors with a list of recycled products and materials available as well as vendors, highlighting those made in Massachusetts.
  - d) Provide buyers with the opportunity to comment on product performance on a message board established on the OSD web site - in other words, make the message board interactive.
  - e) Promote buying recycled as a way to increase demand for recyclable materials to the legislature as well as to all buying agencies and institutions to ensure adequate investment in and support for buy recycled efforts. (Massachusetts is 34th largest corporation in the country, with over \$300 million a year bought just by executive agencies.)
4. Proceed with the development of an integrated approach toward promoting sustainable consumption practices by individual consumers, including buying recycled (particularly recycled products made in Massachusetts).
- a) Support DEP's implementation of its program to promote sustainable consumption on the part of the general public, currently being planned.
  - b) Leverage Massachusetts's purchasing power in influencing its suppliers to promote buying recycled.
  - c) Build on state efforts that require the use of recycled paper in proposals and bid documents submitted to the state by consultants and other vendors.
5. Conduct research to support buy recycled efforts.
- a) Assess and determine strategies for removing barriers to purchasing EPPs and recycled products.
  - b) Encourage recycled product development and testing that leads to placement of recycled products on state contracts, with special emphasis on products made in Massachusetts.

- c) Determine buy recycled activities that have the greatest impact on stimulating demand for recyclable materials as well as recycled content products.
6. Integrate buy recycled activities with other recycling market development activities.
    - a) Ensure appropriate emphasis on buy recycled as component of the state's recycling market development effort by incorporating the strategic plan of the Buy Recycled Coordinating Committee into future updates of the Recycling Market Development Strategic Plan.
    - b) Focus selected buy recycled efforts on addressing recycling market development priorities.
  7. Promote recycled products manufactured using recycling-related technologies developed with STEP assistance, by encouraging their purchase through buying recycled efforts and placement on state contracts.

### **3.3.6 Collection and Processing Best Practices and Technology Development**

#### Goal:

Promote the development and adoption of collection and processing technologies and best practices that reduce the cost and improve the quality and availability of secondary materials needed by recycled product manufacturers.

#### Current Status:

The state of Massachusetts has an extensive array of programs in operation aimed at increasing the recovery of recyclable materials. Historically, these programs have been *supply push* in orientation. That is, they have worked to maximize the tonnage diverted from disposal with the expectation that generation of ongoing supply would trigger increased demand. For secondary materials markets to be healthy, particularly those with marginal value, there also is a need for *demand pull* efforts that provide materials at a cost and of a quality attractive to purchasers. Massachusetts has one major effort in this regard – the recovery infrastructure for redeemable bottles was designed to produce material appropriate for bottle recycling. No other programs exist at present to promote the development and adoption of technologies and best practices specifically aimed at increasing the marketability of recovered materials.

#### Analysis and Strategy:

The primary barrier to improving the marketability of recovered materials is lack of information. Information has not been gathered from purchasers regarding their specific needs, nor given to material suppliers (particularly municipalities) regarding how to increase marketability of materials. Also, sufficient efforts have not been carried out to discover collection and processing technologies that will improve material marketability (i.e., reducing costs, enhancing quality).

The recommended strategy involves addressing each of these barriers – assessing purchaser needs, providing best practices information to suppliers, and establishing a research and development program aimed at addressing technical barriers to improved marketability.

Key organizations to participate in implementing this strategy include both DEP and the Chelsea Center as this strategy involves work pertaining to both supply and demand development. In addition, WasteCap and MassRecycle could play a direct role in implementing certain activities as described below and as a contractor to either DEP or the Chelsea Center. Additional potential players in strategy execution include groups such as the Massachusetts Chapter of the Solid Waste Association of North America (SWANA), E-Call as a result of their network of contacts and related services, and the EPA by providing technical and outreach assistance.

Actions:

1. Obtain input from end users on needs and issues pertaining to cost, quality, and availability of supply as well as potential strategies for lowering cost and improving materials quality and availability.
  - a) Hold periodic roundtables, discussion forums, and focus group meetings with end users.
  - b) Engage in communications with key trade association representatives known for their technical expertise pertaining to recyclable materials recovery and marketing.
2. Conduct training and educational activities aimed at aiding suppliers in reducing recovery costs and improving the quality of supply. Such activities should include teaching of best practices, dissemination of information on new technologies, and the education of generators in proper recycling methods.
3. Provide information to DEP and other organizations involved in supply development activities concerning the supply development needs of recycled product manufacturers.
4. Convene forums that bring together suppliers and end users for the purpose of improving mutual understanding of each other's needs and capabilities pertaining to addressing quality issues and lowering materials handling costs.
5. Support selected R&D projects aimed at developing technologies that improve collection and processing efficiency and lower costs. Also support prototype technology testing.

## **CHAPTER 4. MATERIAL-SPECIFIC CHALLENGES AND OPPORTUNITIES IN MASSACHUSETTS**

### **4.1 Role of Material-Specific Analysis in State Recycling Market Development**

Markets for secondary materials in Massachusetts are quite diverse, covering a large number of commodities and grades. To understand the most effective approach by which to raise the state's recycling rate, it is crucial to gain an in-depth understanding of the workings of each of these various markets, including the potential for increasing tonnage diversion and the nature of the inefficiencies that block achieving this potential.

Chapter 3 provided several recommendations regarding steps that the state can take to address market inefficiencies by providing Massachusetts recycled product manufacturers and entrepreneurs with information regarding material- and product-specific market opportunities. While stimulating market growth will have a positive impact on the recyclability of any material, it would be particularly valuable for the state to more aggressively promote opportunities for those secondary materials that have a substantial potential for increased diversion from disposal.

As noted elsewhere, the rate of success in realizing specific market development opportunities is relatively low. Thus, to have an impact, a high number of possibilities must be identified and examined. While the state has an important role in identifying and communicating market development opportunities, its long-term goal should be to encourage the private sector's ability to identify and realize market development opportunities on its own (e.g., through the development of a manufacturers network). The public sector has neither the resources nor the skills to regularly identify and recruit market players to successfully address ever-changing market inefficiencies and opportunities for over 50 recyclable commodity grades and markets for thousands of various recycled products. This is as it should be, for the hope of recycling market development is that the private sector will become increasingly adept in finding and addressing specific opportunities with minimal government intervention. If the primary aim of government is to make the market more efficient – not to replace it - this principle applies to the identification of specific opportunities as well as their realization.

At the same time, certain secondary materials markets are particularly problematic, with inefficiencies that cannot be addressed simply by providing the private sector with information and access to resources. In such instances - particularly when environmental protection needs exist - it is appropriate for the state to become more involved in finding means to address these inefficiencies. Identifying such market opportunities starts by identifying:

- Those materials with significant untapped potential for increased diversion,
- Market inefficiencies that prevent this potential from being reached, and
- Specific market opportunities that might be realized if these inefficiencies were overcome.

Therefore, as part of this strategic planning effort, an investigation was made for market opportunities for specific priority material grades. Through this analysis, 18 potential market opportunities were identified.

The purpose of this chapter is twofold:

- To present the results of an analysis to select priority secondary material grades for Massachusetts - that is, grades for which substantial increased diversion is both possible and important to achieving the state's recycling goal, and for which substantial market inefficiencies exist; and
- To identify and describe the 18 potential market development opportunities using these priority materials.

## 4.2 Priority Secondary Material Grades

Identification of material-specific market opportunities begins with the determination of priority secondary material grades – those for which market opportunities for increased diversion would be sought. This analysis was conducted in Phase I of this strategic planning project, and involved an assessment of supply and demand patterns for 35 grades of recyclable materials in eight secondary materials categories. For each grade, four broad questions were asked:

1. ***What is the potential additional diversion, in tons, above and beyond current rates of recovery?*** As a primary aim of the strategic planning effort is furthering the achievement of the state's 46 percent recycling goal, potential tonnage diverted is an important criterion for choosing priority materials. For each grade, the potential additional diversion was determined by subtracting current (1996) recovery estimates from the estimated potential maximum recovery (total generation times theoretical maximum recovery rate). Table 4-1 presents the appropriate figures for each material grade. It should be remembered that, due to lack of grade-specific state data, the current recovery rate for many grades was based on national per capita estimates, as provided by the U.S. EPA. Furthermore, the theoretical maximum recovery rate estimates are based on expert opinion as opposed to hard data; hence estimates of potential additional diversion for these grades are very rough. At the same time, the relative "order of magnitude" differences in potential diversion between the individual grades (the basis for choosing priorities for further study) should be fairly accurate.
2. ***What are the primary barriers to additional diversion, and in which stage(s) of the recycling process are they located - recovery, processing, or end-use?*** While the desired outcome of efforts implemented as a result of this project is additional diversion of materials from disposal, the focus is on means specifically involving the stimulation of additional demand, whether from processors or end-users. Therefore, priority material grades are to be selected from those with key barriers in processing or end-use.
3. ***What is the feasibility of the market being able to absorb the potential additional diversion?*** For a material grade to be selected as a priority, the feasibility of absorption of additional tonnage should be relatively high. Feasibility was discussed in three dimensions:

**Table 4-1**  
**Estimates of Massachusetts Secondary Material Generation,**  
**Current and Potential Recovery - 1996**

Materials:	Grades:	Generation	Current Recovery		Maximum Recovery		Potential Add'l Recovery	
		tpy	tpy	pct	tpy	pct	tpy	
Glass	Clear	255,900	57,600	23%	153,500	60%	95,900	
	Amber	105,600	23,800	23%	63,400	60%	39,600	
	Green	44,700	10,100	23%	26,800	60%	16,700	
	Mixed	n.a.	10,800	n.a.	28,800	n.a.	18,000	
	Other	45,800	0	0%	6,900	15%	6,900	
Plastics	PET Bottles	38,200	16,800	44%	26,700	70%	9,900	
	Natural HDPE Bottles	23,400	10,800	46%	16,400	70%	5,600	
	Pigmented HDPE Bottles	24,000	6,800	28%	14,400	60%	7,600	
	#3 - 7 Bottles & Containers	24,100	900	4%	3,600	15%	2,700	
	PET Other	23,300	1,600	7%	9,300	40%	7,700	
	HDPE Other	66,500	3,400	5%	20,000	30%	16,600	
	PVC Other	50,200	100	0%	20,100	40%	20,000	
	LDPE Other	91,300	1,100	1%	45,600	50%	44,500	
	PP Other	111,600	7,300	7%	55,800	50%	48,500	
	PS (rigid)	65,000	900	1%	19,500	30%	18,600	
	PS (foam)	14,200	200	1%	2,800	20%	2,600	
	Film	110,600	4,800	4%	33,200	30%	28,400	
	Metals	Steel cans	100,400	58,200	58%	75,300	75%	17,100
		Aluminum cans	57,100	38,300	67%	45,700	80%	7,400
		White goods	120,500	90,400	75%	102,400	85%	12,000
Ferrous scrap		187,400	121,800	65%	149,900	80%	28,100	
Nonferrous scrap		47,200	30,700	65%	37,800	80%	7,100	
Paper	ONP	462,600	254,400	55%	360,800	78%	106,400	
	OCC	1,014,700	710,300	70%	862,500	85%	152,200	
	OMG	83,500	20,900	25%	37,600	45%	16,700	
	High-grade	490,100	294,100	60%	318,600	65%	24,500	
	Mixed	446,400	111,600	25%	178,600	40%	67,000	
Wood	Pallets/containers	523,500	206,300	39%	392,600	75%	186,300	
	Tree residues	1,049,200	755,400	72%	891,800	85%	136,400	
	C&D wood	533,300	181,300	34%	293,300	55%	112,000	
Organics	Yard waste	1,070,200	670,000	63%	749,100	70%	79,100	
	Food waste	494,000	7,500	2%	148,200	30%	140,700	
Tires	New scrap tires	121,200	121,200	100%	121,200	100%	0	
	Old scrap tires	176,100	0	0%	149,700	85%	149,700	
Textiles	Clothing	260,700	52,100	20%	130,400	50%	78,300	

- **Technical feasibility** – Defined for the purposes of this project as the extent to which current and new near-term technology and techniques will facilitate and allow recovery, cleaning to specifications, and reuse (including substitution) of the additional tonnage to be diverted, and the extent to which any existing technical barriers can be overcome in the near term. For the purpose of this analysis, technical feasibility was described as high, medium, or low.
  - **Economic feasibility** – The extent to which the marketplace will readily step forward to absorb the additional Massachusetts tonnage available for diversion. Two aspects of economic feasibility considered here are, first, the *size of potential demand* for the material grade in relation to the size of additional diversion, and, second, the *market incentives and disincentives* to attract and absorb additional tonnage.
    - With regard to size of potential demand, it is valuable to understand potential demand in general (out-of-state plus in-state) as well as potential in-state demand, since recycling market development players in the state can have the most influence over the latter. Potential demand is a function of overall potential final demand (how much do final product users need), perceived demand for products with a “recycled” label, and the existing foundation of manufacturers and entrepreneurs able to use the secondary material as feedstock. In this analysis, size of potential demand was described as large (market can readily absorb all additional material recovered), moderate (market can readily absorb some, but perhaps not all of additional recovered material), or small (market cannot absorb significant amounts of additional material).
    - The analysis of market incentives focused on the extent to which the various parties (collectors, processors, users) see recycling as having positive fiscal return (benefits exceed costs), minimal opportunity costs (more money cannot be made using other materials), and reasonable market risk (costs and revenues have reasonable volatility and certainty). In this analysis, market incentives were categorized as highly positive, somewhat positive, neutral, or negative.
  - **Institutional feasibility** – The extent to which the necessary institutional capacity is in place, or could be quickly put in place, in Massachusetts to allow markets to absorb the potential diversion. “Institutional capacity” means the set of organizational capacities and relations able to gather and move materials (and information) within and between organizations smoothly and efficiently. Components of institutional capacity include: corporate infrastructure (firms in place to buy, sell, process, distribute, etc.); physical infrastructure (capacity in place to recover, process, use); skill and knowledge base (how to handle materials, how to gather and distribute information, how to be active in the market, how to expand physical capacity, how to start a new firm in the industry); and political/regulatory structure in place to allow market transactions to occur. The focus of the institutional feasibility analysis was Massachusetts, as it is the primary sphere of influence of state recycling market development efforts. In this analysis, institutional feasibility was described as high, moderate, or low.
4. **What is the feasibility of Massachusetts recycling market development entities taking action, through policies and programs, to facilitate the market’s absorbing the additional tonnage of recoverable material?** The answer to this question was based on the answers to

prior questions (In what stage are the key barriers? Is additional absorption feasible?) as well as the perception of the extent to which the key barriers are amenable to government intervention. In addition, the focus is on determining whether interventions will result in moving additional material into the marketplace as opposed to creating additional market outlets for materials that are already marketed. In this analysis, the feasibility of effective government action was categorized as high, moderate, or low. Priority material grades should have high or moderate feasibility of effective state action.

Table 4-2 presents a matrix reflecting application of the selection criteria to the material grades. The first column, Potential Additional Diversion, was the result of Table 4-1. The second and third sets of columns, Location of Key Barriers and Feasibility of Diversion, reflect findings provided in each of the materials chapters.

The final column, Potential for Effective State Intervention, represents the opinions of Dorn and Associates project team members in light of Phase I research findings, the preceding columns, and their knowledge of recycling market development policies and programs.

As shown in the table, the greatest available uncaptured tonnage of material in the MSW and C&D waste streams consists of the three wood waste grades, food waste, old newspapers, old corrugated containers, and old scrap tires. An estimated 100,000-200,000 tons per year (tpy) of each of these materials remains in the waste stream with potential for additional recovery. There is also substantial tonnage (45,000-100,000 tpy) remaining for capture of the following materials: clear (flint) glass containers, used clothing, yard wastes, mixed paper, non-film low-density polyethylene (LDPE), and polypropylene plastic (PP).

Some of these materials are under-recovered due to supply side barriers and/or market conditions that are unlikely to be influenced by state-sponsored recycling market development opportunities and therefore were not chosen for focused effort. Recycling of the following materials was determined to be limited by insufficient demand, and recycling market development challenges exist that might effectively be addressed through state intervention in the market place:

- **Wood** - pallets and shipping containers, tree residues, C&D wood
- **Organics** - food waste
- **Textiles** - used clothing
- **Paper** - mixed paper
- **Plastics** - LDPE (non-film), PP

If tonnage diversion is the primary goal, then recycling market development efforts should be aimed at expanding existing and/or finding new markets for such materials. Consequently, these materials were selected as the focus of recycling market opportunity investigations conducted during Phase II of this project.

**Table 4-2 - Assessment of Potential Additional Diversion of Recyclables in Massachusetts**

Material	Grade	Potential Additional Recovery tpy	Location of Key Barriers			Technical	Market Ability to Absorb Diversion			Institutional	Potential for Effective State Intervention	
			Recovery	Processing	End Use		Potential Market Size General	Market Size In-State	Mkt. Incentives			
Glass	Clear	95,900			X	high	large	small	somewhat +	high	low	
	Amber	39,600			X	high	large	small	somewhat +	high	low	
	Green	16,700			X	moderate	small	small	neutral	high	moderate	
	Mixed	18,000			X	low	small	small	negative	moderate	high	
Plastics	Other	6,900	X		X	moderate	moderate	small	negative	moderate	moderate	
	PET Bottles	9,900	X			high	large	small	somewhat +	high	low	
	Natural HDPE Bottles	5,600	X			high	large	moderate	negative	high	low	
	Pigmented HDPE Bottles	7,600	X			high	large	moderate	somewhat +	high	low	
	#3-7 Bottles & Containers	2,700		X	X	low	small	moderate	negative	moderate	low	
	PET Other	7,700	X			moderate	large	moderate	negative	high	low	
	HDPE Other	16,600	X		X	moderate	large	moderate	somewhat +	moderate	low	
	PVC Other	20,000	X		X	moderate	moderate	small	negative	moderate	moderate	
	LDPE Other	44,500	X		X	moderate	moderate	moderate	neutral	moderate	moderate	
	PP Other	48,500	X		X	moderate	large	moderate	somewhat +	moderate	low	
	PS (rigid)	18,600	X		X	moderate	moderate	moderate	negative	moderate	moderate	
	PS (foam)	2,600	X	X	X	low	small	small	negative	low	low	
	Film	28,400	X	X	X	low	moderate	moderate	neutral	moderate	moderate	
	Metals	Steel cans	17,100	X			moderate	large	small	somewhat +	moderate	low
		Aluminum cans	7,400	X			high	large	small	highly +	high	low
White goods		12,000	X			high	large	small	highly +	high	low	
Paper	Ferrous scrap	28,100	X			high	large	small	highly +	high	low	
	Nonferrous scrap	7,100	X			high	large	small	highly +	high	low	
	ONP	106,400	X			high	large	moderate	negative	high	low	
	OCC	152,200	X			moderate	large	moderate	negative	high	moderate	
	OMG	16,700		X		moderate	moderate	small	somewhat +	moderate	low	
Wood	High-grade	24,500	X			high	large	small	neutral	moderate	moderate	
	Mixed	67,000	X		X	moderate	moderate	moderate	somewhat +	moderate	high	
	Pallets/containers	186,300	X			high	large	large	somewhat +	moderate	low	
	Tree residues	136,400	X	X		high	moderate	moderate	neutral	high	low	
Organics	C&D wood	112,000	X	X	X	low	small	small	negative	moderate	high	
	Yard waste	79,100		X		high	large	large	neutral	moderate	moderate	
	Food waste	140,700	X		X	high	moderate	moderate	negative	moderate	high	
Tires	New scrap tires	0				moderate	large	large	somewhat +	high	low	
	Old scrap tires	149,700			X	low	small	small	negative	high	high	
Textiles	Clothing	78,300	X		X	moderate	large	small	somewhat +	high	moderate	

The following additional materials were included due to interest among Project Advisory Committee members for various reasons, a primary one being materials handling problems presented by some of these materials of concern to municipal and state officials. Grades added to the list of target materials were:

- *Paper* - high grade paper
- *Glass* - mixed color glass containers and other (non-container) glass
- *Plastic* - plastic film, mixed plastic bottles and containers #3-7
- *Textiles* - carpet

### 4.3 Identification of Market Opportunities Among Target Material Grades

In Phase II of the project, 42 possible market development opportunities pertaining to these sixteen target materials were identified and reviewed on an initial basis. Of these, 18 were deemed to have sufficient potential to warrant further investigation. Criteria utilized in selecting the market development opportunities included:

- A *sufficient supply* of the recyclable material can be obtained.
- Use of the recyclable material to make a recycled product appears to have *technical feasibility*.
- Massachusetts-based firms that would produce the recycled product would appear to have some *competitive advantage* in selling that product.
- Potential exists for *sufficient demand* for the recycled product to allow the producer to make a profit.
- Major challenges (e.g., technical, economic) that might exist for the implementation of the opportunity can be identified, have not been addressed by the market working alone, and have the *potential to be overcome* through state intervention.
- Realization of the market opportunity has the potential to result in *tangible additional diversion* of MSW.
- Realization of the market opportunity has *potential economic benefits*, for example, job creation/retention, increased competitiveness, increased entrepreneurship.
- The market is *not currently addressing* this opportunity in any meaningful way.

Of the 42 initial market ideas, 24 did not meet the above criteria. Categories of the reasons for lack of selection include: minimal market demand, currently being addressed by the market, currently being addressed by the market with active state support, and insufficient access to material supply.

Table 4-3 outlines the 18 opportunities by material category and discusses the nature of the application, possible state action, and potential benefits. The table indicates that a number of market development opportunities have potential to significantly increase the diversion of MSW

from landfills. The table also indicates that a large majority of the opportunities offer positive economic benefits, in terms of job creation and retention, increased competitiveness, and avoided disposal costs

Table4-4 organizes the 18 market development opportunities by primary category of opportunity, including:

- *Recycling business development* - The startup, attraction, or expansion of firms making recycled products.
- *Feedstock conversion* - Existing producers' substitution of the target secondary material as feedstock for another, usually virgin, feedstock. For the most part, such producers are not making a recycled product at present. The range of producers targeted by the opportunities include existing manufacturers, construction firms, and the Massachusetts Department of Highways.
- *Recycled business development and feedstock conversion* - Related to the opportunity to support the development of a glass processor, and end use applications for the output of that processing.
- *Recycled product research and development* - Investment in the development of innovative recycled products that appear to have potential for market success.
- *Increased processing capacity* - Investment in the capacity to add value to secondary materials through increased processing.

**Table 4-3: Overview of Market Development Opportunities**

<b>Market Opportunity</b>	<b>Application</b>	<b>State Action to Consider</b>	<b>Potential Benefit</b>
<b>Glass - Mixed Container, Other Glass</b> Optical Sorting	Cullet in container glass manufacturing	Work with major cullet manufacturer to find economical means of installing and operating an optical sorter.	Waste diversion: Higher value added of separated cullet strengthens demand for container glass.  Economic development <sup>17</sup> : Impacts are minimal.
Ground Glass Applications	Filler (stucco, reflective paints, non-skid surface treatments); abrasives for paint and scale removal.	Seek to support ground glass product manufacturers, and educate potential users of ground glass	Waste diversion: Successful firm would increase consumption of other glass, encouraging recovery, and offer higher value use for mixed container glass, also encouraging recovery. Tonnage impact low-moderate. Economic: Initial development impact minimal. However, the development of ground glass capability should encourage development of other Massachusetts businesses. Increased recovery of other glass would reduce business and municipal disposal costs.
Crushed Glass as Filtration Medium	Filtration medium in septic and wastewater treatment systems, water treatment facilities, pools, fish farms, and industrial filtration applications.	Educate potential users of crushed glass, work with MRFs and other suppliers to meet supply needs.	Waste diversion: Potential diversion impact is moderate-high. Increased demand for crushed glass would stimulate recovery of other glass, and encourage higher value added use of mixed color container glass, also encouraging greater recovery.  Economic: Development impact is minimal. Increased recovery of other glass would reduce business and municipal disposal costs.

<sup>17</sup> *Development* encompasses not only promoting economic growth but building the public and private institutional capacity necessary for maintaining the type of growth that allows for a sustainable high quality of life. See Chapter 6 for a more-detailed discussion.

**Table 4-3: Overview of Market Development Opportunities**

<b>Market Opportunity</b>	<b>Application</b>	<b>State Action to Consider</b>	<b>Potential Benefit</b>
Glass as Construction Aggregate	Construction aggregate in drainage, road bed, fill and paving applications.	Educate potential users of glass as aggregate (MassHighway, MassPort, etc), and work with MRFs and suppliers to meet needs.	<p>Waste diversion: Potential diversion impact is moderate-high. Increased demand for glass as aggregate would serve to stimulate recovery of other glass.</p> <p>Economic: Development impact is minimal. Increased recovery of other glass would reduce business and municipal disposal costs.</p>
Glass Brick and Tile Products	Glass brick and tile products	Seek to establish new sintered glass tile manufacturer, and/or encourage feedstock conversion and new product development among state brick and tile manufacturers	<p>Waste diversion: Potential diversion impact is low-moderate. As a high value added effort, successful implementation would stimulate increased recovery of other and mixed color container glass.</p> <p>Economic: For new facility and business expansion, potential development impact is moderate; for conversion, job impact is minimal, but competitiveness would be increased.</p>
<b>Paper - Mixed, High Grades</b> Increased Paperboard, Tissue and Medium Mill Use of Mixed Paper	Substitution of mixed paper for higher value secondary paper as feedstock.	Encourage specific mills to undertake feedstock conversion.	<p>Waste diversion: Potential diversion impact is high. Displaced higher grades would find other markets.</p> <p>Economic: Primary impact would be increased competitiveness due to lower feedstock costs. Immediate job impacts are minimal.</p>

**Table 4-3: Overview of Market Development Opportunities**

<b>Market Opportunity</b>	<b>Application</b>	<b>State Action to Consider</b>	<b>Potential Benefit</b>
Increased Specialty and Printing & Writing Mill Use of Deinked Market Pulp	Substitution of deinked market pulp for virgin market pulp and pulp substitutes as feedstock.	Encourage mills to undertake feedstock conversion.	<p>Waste diversion: Potential diversion impact is low-moderate. Consists of finding markets for planned new in-state deinked pulp production by Sirius Pulp and Paper, Fitchburg mill, plus existing tissue mills which would consume recycled paper.</p> <p>Economic : Primary impact on users would be increased competitiveness in offering recycled products. Immediate job impacts minimal. Will support deinked pulp production at in-state recycled paper mills.</p>
<b>Wood Waste</b> Milled Wood Products	Remilled lumber, flooring, wood furniture	Encourage business startups, expansion, attraction	<p>Waste diversion: Diversion potential is moderate to high.</p> <p>Economic: Job development potential is low to moderate. Commercial disposal costs would decline.</p>
Composite Wood Products	Medium density fiberboard, particleboard	Encourage business attraction	<p>Waste diversion: Diversion potential is high.</p> <p>Economic: Job development potential is low to moderate. Commercial and municipal disposal costs would decline.</p>
<b>Food Waste</b> Compost	Landscape and horticultural uses	Encourage startup and expansion of agricultural, municipal, commercial and community-based composting operations	<p>Waste diversion: Potential diversion impact is high.</p> <p>Economic: Job development potential is low to moderate. Municipal and commercial disposal costs would decline.</p>

**Table 4-3: Overview of Market Development Opportunities**

<b>Market Opportunity</b>	<b>Application</b>	<b>State Action to Consider</b>	<b>Potential Benefit</b>
Manufactured Animal and Fish Feeds	Feed for livestock and aquaculture-bred fish	Encourage startup, attraction and expansion; assist development of two planned facilities	Waste diversion: Potential diversion impact is high.  Economic: Job development potential is low to moderate. Municipal and commercial disposal costs would decline.
Food Banks and PFFPs	Surplus food for distribution by charitable organizations	Encourage food bank and PFFP program expansion	Waste diversion: Potential diversion impact is high.  Economic: Job development potential is low to moderate. Municipal and commercial disposal costs would decline.
<b>Scrap Tires</b> Civil Engineering Applications for Tire Chips	Lightweight fill for road beds, septic tank drain fill, retaining wall backfill, insulating fill, landfill construction, noise barriers	Support tire-derived product manufacturers in educating potential users, particular Mass Highway	Waste diversion: If TDF markets decline and/or Old Scrap Tires are recovered, diversion potential is high.  Economic: If TDF markets decline and/or Old Scrap Tires are recovered, job impact potential is moderate. User quality-adjusted costs would decline.
Crumb Rubber Applications	Rubber-modified asphalt, turf applications, molded and extruded products, and athletic, recreational and flooring applications	Educate potential users, particularly Mass Highway; encourage startup, attraction and expansion; support and pursue efforts (Routhier, Sears) and demonstration project (STMC)	Waste diversion: If TDF markets decline and/or Old Scrap Tires are recovered, diversion potential is high.  Economic: Job impact potential is moderate. User quality-adjusted costs would decline.

**Table 4-3: Overview of Market Development Opportunities**

<b>Market Opportunity</b>	<b>Application</b>	<b>State Action to Consider</b>	<b>Potential Benefit</b>
<b>Used Clothing</b>			
Non-Woven Applications	Facing inside of clothing, battery separators, quilt linings, bandages, diskette liners, disposable wipers, casket liners, carpet padding, automobile roof and hood linings, and stuffing	Work with existing non-woven manufacturers regarding feedstock conversion and new product development	Waste diversion: Potential diversion impact is moderate.  Economic: Potential job impact is low-moderate. Municipal disposal costs would decline. With feedstock conversion, business competitiveness would increase.
<b>Carpets</b>			
Development of New Carpet-Based Products	Carpet-based tiles from ground whole carpet, products from shoddy (e.g., carpet padding, soundproofing material for autos, furniture stuffing, sod reinforcement in athletic fields)	Assist in the development of molded polypropylene backed carpet-based products and shoddy-based products	Waste diversion: Potential diversion impact is moderate.  Economic: Potential job impact is moderate. Municipal and commercial disposal costs would decline.
<b>Plastics - Film, 3-7 Plastics</b>			
Film Plastics	Plastic film products (e.g., trash, grocery, garment bags)	Encourage state plastic film manufacturers to consider feedstock conversion and new product development	Waste diversion: Potential diversion impact is high.  Economic: Potential job impact is low to moderate. Manufacturer competitiveness is increased. Municipal disposal costs would decline.
Plastic Lumber (using 3-7 Plastics)	Landscape timber, picnic tables, pallets, non-load bearing marine uses.	Encourage business startup or attraction	Waste diversion: Potential diversion impact is moderate. Economic: Potential direct job impact is low to moderate. Presence of plastic lumber manufacturer would encourage plastic lumber furniture fabricators, with low-moderate job impact. Disposal costs would decline.

**Table 4-4: Market Opportunity, by Primary Focus of Effort**

<p><b><u>Recycling Business Development (Startup, Expansion, Attraction)</u></b>                  Milled Wood Products                  Composite Wood Products                  Compost                  Manufactured Animal and Fish Feeds                  Food Banks and PFFPs                  Plastic Lumber</p> <p><b><u>Feedstock Conversion/Recycled Product Development in Non-Recycling Operations</u></b>                  Increased Paperboard, Tissue and Medium Mill Use of Mixed Paper                  Increased Specialty and Printing &amp; Writing Mill Use of Deinked Market Pulp                  Civil Engineering Applications for Tire Chips                  Crumb Rubber Applications                  Non-Woven Textile Applications                  Film Plastics</p> <p><b><u>Recycling Business Development AND Feedstock Conversion/Recycled Product Development in Non-Recycling Operations</u></b>                  Ground Glass Applications                  Crushed Glass as Filtration Medium                  Glass as Construction Aggregate                  Glass Brick and Tile Products</p> <p><b><u>Recycled Product Research and Development</u></b>                  Development of New Carpet-Based Products</p> <p><b><u>Increased Free Standing Processing Capacity</u></b>                  Color Sorting of Mixed Glass</p>
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#### **4.4 Challenges to Realizing Recycling Market Development Opportunities**

Experience suggests that markets are relatively efficient mechanisms for the allocation of resources. Consequently, the realization of any market development opportunity that has not been successfully pursued by the private sector to date is likely to face some significant challenges. In fact, the only rationale for state intervention is the presence of instances in which the market on its own cannot overcome challenges to realizing the opportunity. The challenges identified for the 18 market development opportunities have been organized into six major categories:

- **Economic** - Lack of, or uncertain, economic viability in the use of the secondary material as an input (e.g., other feedstocks may be cheaper), or profitability in selling the recycled product produced in Massachusetts (e.g., market may be too small, too far from the state).
- **Technical** - Presence of difficult technical considerations for which more research may be needed.

- **Information** - Information exists that supports feasibility of the application, but not known by appropriate parties.
- **Attitudinal** - Organizational or individual resistance to utilization of secondary material, despite availability of information supporting feasibility of application.
- **Regulatory** – Existence of regulatory or legal requirements or process that may slow or hinder market development.
- **Recycling infrastructure** - Lack of adequate recycling collection and processing infrastructure.

Table 4-5 presents a matrix of the primary challenges to realizing the various market development opportunities. Many of the opportunities face several challenges. Findings suggested by the matrix are as follows:

- Nearly every selected market development opportunity faces some economic uncertainty. This is to be expected, for if economic returns were certain, the market would have acted on them. The only opportunity for which economic viability does not appear to be a barrier is civil engineering applications for tire chips.
- Twelve opportunities face technical challenges, ten of which involve feedstock conversion. This also is expected, for if the intent is to convince non-recycled product makers to shift to a recycled feedstock, site- and product-specific technical analysis is needed.
- Eight opportunities have informational challenges. All but one of these are in the feedstock conversion categories. Essentially, information regarding the viability of feedstock conversion exists, but is not in the hands of those who could be shifting feedstocks.
- Nine opportunities face a challenge in overcoming negative attitudes that are at odds with the facts. Again, all but two of these are in the realm of feedstock conversion.
- Six opportunities have regulatory challenges in gaining approval for use of recyclable materials, including food waste, paper, tires, and used textiles.
- Six opportunities face a challenge of inadequate recycling infrastructure. Issues exist with regard to the recovery of food waste, film plastics, and used carpet, and with regard to the processing of waste wood adequate for use in composite wood products.

In order to realize opportunities in this group, there is a need for:

- Further economic analysis of the viability of the various opportunities;
- A concerted effort to provide new technical analysis and existing information to producers unfamiliar with, or biased against, use of the secondary material;
- Review of any unreasonable regulatory impediments to the use of secondary materials;
- Assessment of means for expanding recycling infrastructure to allow greater recycling of secondary material; and
- Determination of additional information needed, as identified in the Phase II report.

After this review, the state can choose priorities for implementation.

**Table 4-5: Challenges to Market Development Opportunities**

Market Development Opportunities	Challenges					
	Economic	Technical	Information	Attitudinal	Regulatory	Infrastructure
<b><u>Recycling Business Development (Startup, Expansion, Attraction)</u></b>						
Milled Wood Products	X	X				
Composite Wood Products	X	X			X	X
Compost	X			X		X
Manufactured Animal and Fish Feeds	X				X	X
Food Banks and PFFPs	X		X	X		X
Plastic Lumber	X					
<b><u>Feedstock Conversion/Recycled Product Development in Non-Recycling Operations</u></b>						
Increased Paperboard, Tissue and Medium Mill Use of Mixed Paper	X	X	X	X	X	
Increased Specialty and Printing & Writing Mill Use of Deinked Market Pulp	X					
Civil Engineering Applications for Tire Chips		X	X	X	X	
Crumb Rubber Applications	X	X	X	X	X	
Non-Woven Textile Applications	X	X		X	X	
Film Plastics	X	X	X	X		X
<b><u>Recycling Business Development AND Feedstock Conversion/Recycled Product Development in Non-Recycling Operations</u></b>						
Ground Glass Applications	X	X	X			
Crushed Glass as Filtration Medium	X	X	X			
Glass as Construction Aggregate	X	X	X	X		
Glass Brick and Tile Products	X	X		X		
<b><u>Recycled Product Research and Development</u></b>						
Development of New Carpet-Based Products	X	X				X
<b><u>Increased Free Standing Processing Capacity</u></b>						
Color Sorting of Mixed Glass	X					

## 4.5 Recommendations for Addressing Material-Specific Market Development Needs and Opportunities

The purpose of this section is to recommend an approach to identifying and addressing material-specific market development needs and opportunities concerning:

- Review and prioritization of the market opportunities identified above;
- Means of periodic updating of the secondary materials markets analysis to revise the list of priority target materials; and
- Identification of new material-specific market opportunities.

First, prior to pursuing any opportunity, there is a need for the state to examine in further depth the feasibility and potential impacts of the various market opportunities identified above. As a result of this more detailed analysis, opportunities can then be selected which have a high likelihood for success and thereby merit pursuit by the state. In light of the time and resources involved in this analysis, it is recommended that an interagency meeting be held to select opportunities to be evaluated and to determine which agency will take the lead in doing so for each selected opportunity. It is envisioned that such a meeting would be held by the Recycling Market Development Steering Committee the formation of which is recommended in Chapter 5 of this plan. Criteria to be considered in making this determination include:

- Rough estimates of tonnage diversion potential;
- Preliminary sense of other potential environmental impacts;
- Extent to which the opportunity furthers the interests and mission of specific state agencies (eg., MassHighway's potential interest in engineering applications for tire chips);
- Knowledge of market players that have the capacity and interest in pursuing the opportunity;
- Estimated cost and available resources for performing the feasibility assessment;
- Time needed to perform the preliminary assessment;
- Projected timeframe for implementing the opportunity, and when expected results will be realized;
- Barriers to successful implementation and expected effort required to overcome them; and
- Extent to which pursuit of the opportunity will help lay a foundation for recycling market development capacity building.

These and other criteria determined through the interagency decision-making process can be utilized to categorize the 18 market opportunities as high, medium, and low priority for investigation. A strategy should then be developed for investigating each high priority opportunity. It is recommended that the agency to lead the investigation determine the nature of efforts required, including means of financing the investigation. For investigations conducted, the results should be reviewed, again through an interagency process and a decision made as to whether as well as when the opportunity would be pursued. While it is desirable that this assessment be performed once all investigation results are in, various opportunities will take different amounts of time to complete and opportunities may be fleeting. Hence if a particular opportunity appears to hold substantial promise, it may warrant immediate pursuit.

As part of this assessment it is recommended that opportunities with high feasibility and lower potential benefits, but which also require relatively low level of implementation effort and resources, be given as much consideration as those which have higher potential benefits but may be more difficult to implement.

After the decision is made to pursue an opportunity, an execution strategy will need to be developed, including delineation of responsibilities for implementation in light of staff and budgetary resources available.

As suggested at the beginning of the chapter, it is critical for the state to maintain an up-to-date Massachusetts-specific analysis of the markets for a broad range of secondary material grades. Therefore it is recommended that the state track and periodically report on the conditions of specific materials markets, and determine priority materials for focused recycling market development effort. Specific steps are as follows:

1. Put in place the means to provide bi-annual estimates regarding the generation, recovery and in-state and out-of-state demand for key grades of recyclable materials. The grades to be focused on each year may vary depending on the extent to which market conditions have changed and are of concern in a given year, and when the grade was last studied. As a foundation, use the findings of the Phase I report. However, in light of the lack of state-specific data for many grades, emphasize development of ongoing mechanisms to capture data on a grade by grade basis statewide. Weaknesses of current data system include:
  - Incomplete database covering all Massachusetts cities and towns, primarily due to lack of data for smaller towns;
  - Lack of information on the collection of secondary materials from commercial generators;
  - Lack of information on collection and sales of materials by waste haulers;
  - Lack of detail in the current materials processor survey regarding source of materials (residential vs. commercial vs. non-MSW) and destination of materials (in-state vs. out-of-state).
  - Lack of information on generation of solid waste and recyclables, and whether they are going to in or out of state markets
  - Lack of information on the composition of the Massachusetts solid waste stream, regionally and seasonally

Ideas for addressing these weaknesses include:

- Examining the potential of requiring private haulers to provide data on tons collected and sold by location;
- Encouraging the Chelsea Center and WasteCap to work together to expand the collection of feedstock tonnage figures by type of source (i.e, broker, processor, generator, etc.) for state recycling manufacturers (promising confidentiality); Considering a survey of large commercial generators;

- Expanding annual survey of processors to require information by source of materials (residential vs. commercial vs. non-MSW) and destination of materials (in-state vs. out-of-state); and
  - Conducting a waste composition study to get a baseline of the tonnage by material type available for diversion.
2. Based on knowledge of the technologies for materials recovery, generator behaviors, and additional research as needed, systematically refine estimates by material grade of potential additional diversion possible over and above current recovery levels.
  3. Organize a widespread, informal and coordinated system of market intelligence, as described in detail in the next chapter. Utilize this network, and continually update the nature of the factors that are affecting recovery and demand.
  4. Follow the methodology and criteria described earlier in this chapter (and in the Phase I report) to periodically update the list of priority material grades.

The state should periodically seek to identify new market development opportunities with potentially significant diversion impacts and that are not addressed because of problematic market inefficiencies. However, it is in the state’s interest to avoid funding a series of large, costly undertakings that take a “snapshot” of market activities at only one point in time. Snapshots are limited in their range and quickly become out of date.

Rather, the state should seek, through the use of its own staff and informal ties to market players, to take a low-cost, ongoing “video” that captures Massachusetts-specific market trends, inefficiencies and opportunities as they change over time. The result would be a “rolling” list of market opportunities, with new ones being added and old ones being dropped (whether through successful action or further examination). Preparation of this “video” will require the ongoing participation of recycling market development staff across agencies, and the sharing and review of the information gathered. A key benefit of this approach will be an increase in the capacity of state staff to perform their own analysis, rather than rely primarily on external consultants.

Suggestions for implementing this recommendation include:

1. Assign various staff members of state and non-profit recycling market development organizations with the role of tracking market trends for one or two commodities – that is, developing and using a commodity-specific market intelligence network, and reviewing commodity-specific opportunities that arise through the implementation of recommendations in Chapter 3. Opportunities identified should include both those that increase in-state utilization of secondary materials as well as those that increase secondary material exports.<sup>18</sup>
2. On an annual basis at a minimum, ask each staff member involved in tracking markets to write a short (three-four page) review of current issues and possible opportunities for each grade covered. Possible opportunities should meet the criteria identified earlier (and in Phase II report). Challenges to realizing opportunities should be identified. As each staff member

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<sup>18</sup> Identification of export opportunities is a material-specific exercise that does not fall under the cross-material programs discussed in Chapter 3.

would have several grades to review, the due dates for the various reports could be staggered. To a large extent (unless a market has changed radically), reports would be updated versions of prior ones.

3. On a semi-annual basis, convene all staff to review reports and revise list of possible short-range and long-range priority opportunities.
4. Pass possible priority opportunities for further examination and implementation to appropriate program staff and the Department of Commerce, based on the nature of each opportunity and possible state action.
5. Utilize most recent reports, and staff knowledge, of commodity markets as inputs for adding material-specific strategies in revisions of the state's recycling market development strategic plan.
6. Disseminate reports to other Massachusetts stakeholders including the municipalities, WasteCap, and MassRecycle so that suppliers can follow trends and adjust their markets if necessary.

## CHAPTER 5. RECYCLING MARKET DEVELOPMENT MANAGEMENT SYSTEM

### 5.1 Principles of Approach to Managing Recycling Market Development

Effective state-led market development is a function of effective management. The components of an effective management system and principles of approach toward the creation of such a system are as follows:

- ***Ongoing communication, consensus and coordination among state agencies and other Massachusetts-focused organizations that have a role in recycling market development.*** Communication, consensus and coordination raise the probability of success and the level of impact, and build political support in the recycling field and the legislature for future efforts. The absence of these elements will result in wasted resources. Battles over turf likely will harm the effectiveness of market development efforts. For market development efforts to be successful, some measure of trust among the principals must be developed and maintained.
- ***Agreement regarding the overall goals of the state-led recycling market development effort.*** It is not unusual for various agencies involved in recycling market development to have different goals and expectations. Business and economic development agencies, for example, seek creation of jobs and increasing the competitiveness of existing businesses, whereas agencies responsible for recycling seek diversion of waste from disposal facilities. In establishing recycling market development goals, agreement should be reached regarding the relative importance of these various desired outcomes, with the discussion addressing both environmental and economic impacts. Goals should be periodically revised to reflect changing circumstances and needs.
- ***Current, accurate market intelligence and assessment.*** Market intelligence involves tracking supply, recovery and demand trends for each of the state's key secondary materials, and identifying the opportunities for and barriers to the further development of secondary materials markets. This can be challenging in that:
  - There are a large number of markets to follow, each with its own unique dynamics;
  - Patterns of materials generation and recovery can be difficult to ascertain; and
  - Commodities markets can be very volatile – market conditions can change over night.

Good market intelligence is a function of collecting and integrating information and perspectives from a wide network of public and private sources. Up-to-date market intelligence and assessment should be used to proactively make appropriate adjustments in ongoing activities, as necessary.

- ***Focused approach to strategy and program development.*** A well designed and managed recycling market development system is comprised of programs that target key recycling market development barriers, utilizing tools that are appropriate for addressing them, and run by organizations capable of effectively utilizing the selected tools. While the programmatic and organizational structure can be fairly constant over time, program priorities and the overall strategy for using program resources should be regularly and consistently updated.

- ***Effective implementation management.*** Implementation management consists of program planning and budgeting, fulfillment of assigned roles and responsibilities, and coordinating actions of organizations and staff. Ideally, this involves the cost-effective allocation of financial and human resources available for recycling market development, overseen and guided by an appropriate coordinating mechanism that includes the key organizations responsible for market development. In order for efforts to be successful, some consistency and certainty with regard to program funding is desirable.
- ***Regular monitoring of implementation efforts in terms of their appropriateness and effectiveness, and adjusting strategies and tools accordingly.*** Appropriateness evaluation asks if the program is aiming at the right targets. Effectiveness evaluation asks how well the program is hitting its targets. Evaluation is carried out for two reasons – program improvement and program justification. Improvement of market development programs requires a systematic approach to learning about what is working, what is not working, and why. Program justification, demonstrated through impact analysis, is intended to inform program funders, participants and target audience regarding value and cost effectiveness. To the extent possible, program data and information that would facilitate evaluation should be collected as part of ongoing operations.
- ***Smart market development organizations and staff.*** Effective recycling market development requires an ongoing focus on building and maintaining institutional capacity for intelligent action. In particular, agencies should:
  - Be learning organizations, supporting staff in being proactive in identifying and responding to new information regarding markets, opportunities, program impacts and effective practices;
  - Hire and retain staff that are knowledgeable, flexible and adaptable, and eager to learn; and
  - Provide sufficient funding to develop and sustain the necessary staff capacity.

To the extent possible, market development efforts should be structured so that they can continue without interruption when staff turnover does take place.

## **5.2 Management Strategy Recommendations**

In the previous section, the components of, and principles of approach to, establishing an effective management system for recycling market development were outlined. In this section, management strategy recommendations based on the principles of approach are delineated for Massachusetts.

### **5.2.1 Communication, Consensus and Coordination, and Goal Setting**

#### Goal:

To provide for ongoing communication and joint decision-making among the state agencies involved in recycling market development work in Massachusetts.

#### Current Activities:

In Massachusetts, there are four agencies with primary responsibility for recycling market development: The Chelsea Center for Recycling and Economic Development, the Department of Environmental Protection (DEP), the Massachusetts Office of Business Development (MOBD), and the Executive Office of Environmental Affairs (EOEA). MassHighway, the Operational Services Division of the Department of Administration and Finance (OSD), the Division of Capital Asset Management and Maintenance, the Executive Office of Transportation and Construction, and to some degree all other agencies and authorities have a role to play in procuring recycled content products as well as encouraging their suppliers and contractors to do so. Some non-state Massachusetts-based organizations, such as WasteCap and MassRecycle, receive state and other funding to carry out various recycling market development-related activities. And Massachusetts collaborates with other states through the Northeast Recycling Council (NERC). Communication and coordination among agencies and organizations involved in recycling market development is desired by all and practiced to a greater or lesser extent depending on how busy are the responsible individuals involved.

#### Analysis and Strategy:

There is near unanimous agreement that a system for ongoing priority setting, planning, and coordination of agency recycling market development activities is needed. Recycling market development goals have not been clearly delineated in past years, nor agreed upon by all parties involved in recycling market development. A process needs to be established for building consensus regarding both short term and long range recycling market development goals and strategies for attaining them.

The strategy recommended to address this need is establishment of a Recycling Market Development Steering Committee for the purposes of setting annual and long range (3-5 year) goals, recommending funding and programmatic priorities, clarifying organizational roles/relationships, coordinating strategic plan implementation, and tracking progress in meeting goals outlined in the plan. State agencies and other organizations involved in implementing the recycling market development plan would seek to develop their respective programs of work in support of and accordance with the Steering Committee's recommendations.

#### Actions:

1. Through a memorandum of understanding (MOU), create a Recycling Market Development Steering Committee, comprised of representatives from the Chelsea Center, DEP, EOEA, and

MOBD. In the MOU, also clarify organizational roles and relationships and obtain the commitment of the organizations represented on the Committee to support and uphold the Recycling Market Development Strategic Plan. (See Appendix A for an outline of recommended roles and responsibilities.)

2. Designate the Chelsea Center as responsible for providing administrative and staff support to the Committee.
3. Rotate the duty of Committee Chair among the participating organizations, or designate a standing chair to serve on its behalf.
4. Charge the Committee with periodically updating the Recycling Market Development Strategic Plan and preparing annual implementation plans.
5. Enable the Steering Committee to establish work groups and subcommittees as appropriate.
6. In the creation of such work groups and subcommittees, provide, as appropriate, for the input and involvement of other key stakeholders and knowledgeable parties in the planning and decision-making process, including, but not limited to MassRecycle, WasteCap, OSD, the University of Massachusetts, and other state and federal organizations and agencies.
7. Utilizing the Steering Committee meetings and the resources of the participating organizations, ensure that good reporting, record keeping, and information exchange takes place regarding recycling market development activities.

### **5.2.2 Market Intelligence Gathering**

#### Goal:

To provide a means of maintaining up-to-date knowledge regarding factors, trends and circumstances affecting the marketplace for recyclable materials in Massachusetts and the “marketplace” for recycling market development services and programs.

#### Current Activities:

In Massachusetts, the state utilizes five primary methods of obtaining information about the conditions in the marketplace, the needs and concerns of materials suppliers, processors and end users, and market development opportunities. These are: one-on-one telephone and e-mail communications, attending/participating in meetings of advisory committees and other groups, sponsoring/attending conferences, conducting research, site visits, and reviewing reports from local government and other sectors.

#### Analysis and Strategy:

As a result of the current approach to market intelligence gathering, some agency staff receive only a portion of the picture in terms of market conditions, and needs and issues of concern. This was mentioned in several of the interviews with agency representatives. Consequently, a clear understanding of the priority needs and concerns by all parties involved in recycling market development cannot be assured through this information gathering approach.

Market conditions for recyclable materials change very rapidly, and the nature of these changes can have a direct impact on how the state should focus its recycling market development efforts as well as inform its communities about how to enhance their recycling programs. The state needs an ongoing system of information flow concerning the quantity of materials being recycled, the activities of various market players in processing and consuming recyclables, market forces and trends, market barriers, and market development opportunities presenting themselves in Massachusetts.

To address this need, it is recommended that the market tracking and reporting activities outlined in the previous chapter be undertaken and that the Recycling Market Development Steering Committee create an informal network of recycling market development stakeholders and adjunct groups to provide for two-way exchange of information concerning specific recycling market sectors. In addition, the state should continue to conduct targeted research and to develop more effective means of sharing market intelligence information among the recycling market development personnel.

Actions:

1. Maintain an up-to-date database of information on supply and demand, action steps for which were delineated in the previous chapter.
2. Expand opportunities for ongoing two-way communication/information flow between market players and market development entities: Tap communication mechanisms presented by the proposed Massachusetts Recycling Manufacturer Network (the Network), WasteCap, MassRecycle, E-Call and other business and organizational networks, as well as collectors and processors in the state and region. Tap into regional, national, and international recycling related networks to share information, etc.
  - a) In particular, tap the Network for input on the type of information and assistance needed by manufacturers to enhance their capability to consume recyclable materials, their ideas on ways to improve materials quality and lower the cost of obtaining supply, etc.
  - b) Conduct periodic commodity roundtables and topic-specific discussion forums to gather market intelligence as well as provide those participating with an opportunity for input.
  - c) Capitalize on opportunities for two-way information flow as opposed to the standard lecture-listen format at annual state recycling and environmental conferences. Sponsorship of roundtable discussions, having fewer speakers on each panel and allowing more time for facilitated discussion are two ways of fostering information exchange between participants and between recycling market development personnel in the state and the conference attendees.
3. Continue to rely upon targeted research to address specific information gaps.
4. Establish more effective means of sharing information among recycling market development stakeholders, with possibilities including establishment of a Massachusetts Recycling Market Development list serve discussion group and posting key research findings, survey results, announcements of upcoming activities, etc. on the Chelsea Center web site.
5. For each secondary material grade, place one staff person in charge of organizing and managing a relevant, yet uncomplicated, market intelligence network, utilizing the above tools, and being

responsible for organizing findings into periodic reports for use by the Recycling Market Development Steering Committee.

### **5.2.3 Ongoing Strategic and Implementation Planning**

#### Goal:

Ensure a focused, targeted, and effective approach to recycling market development in Massachusetts.

#### Current Activities:

Currently, each state division or office involved in recycling market development conducts its own planning and program development process. The Chelsea Center, DEP, and selected other agencies, also work in conjunction with the EOEA as part of the annual budget process determining the use of approved Clean Environment Fund (CEF) monies.

#### Analysis and Strategy:

While the strategic plan recommendations in this report help set the course for recycling market development in Massachusetts, the recommendations reflect information known and circumstances present at the time of this project was undertaken. Furthermore, the strategic plan can only establish a framework for more detailed planning which must be undertaken by state staff subsequent to completion of this project. The state needs to create a process for following through on the recommendations in this strategic plan, and for conducting periodic planning activities to take advantage of new information that may affect the focus and nature of the state's activities.

The recommended strategy for addressing this need is to conduct an annual strategic planning process involving all agencies represented on the Steering Committee during which long range goals and actions are revisited and annual implementation plans and budgetary needs are determined. Regular meetings of the Steering Committee throughout the year will provide further opportunity for plan fine tuning. In addition, it is recommended that recycling market development planning be integrated with other related planning processes such as solid waste master plan revision and economic development planning.

#### Actions:

1. Annually hold an inter-agency planning retreat, timed to support the budget process. During the first retreat, specific objectives and detailed implementation strategies could be developed that build upon the strategy recommendations outlined in this report. In future retreats, program evaluation results could be presented along with recommendations for revising the previous year's plan for group discussion, revision, and adoption.

2. Obtain EOEAs commitment to rely upon the Steering Committee's annual recommendations as guidance in its annual budget-setting and funding allocation process for the Clean Environment Fund.
3. Integrate recommendations of this and future updates of the Strategic Plan into Solid Waste Master Plan revisions, economic development plans and other key related planning efforts in Massachusetts.
4. Develop a sustainable consumption implementation plan with Buy Recycled strategy recommendations as an integral component targeting business, institutional, governmental, and individual consumers. In drafting Buy Recycled program recommendations, involve DEP; OSD, UMass, MassHighway, and other key state purchasing agencies; the Chelsea Center; WasteCap; and regional entities such as NERC, EPA Region I, and the U.S. General Services Administration (GSA) regional office.

#### **5.2.4 Monitoring and Evaluation**

##### Goal:

To monitor and evaluate the success of recycling market development efforts in meeting specified program goals and objectives.

##### Current Activities:

While some Massachusetts recycling market development programs have specific goals and performance measures, many do not. Two organizations with particularly noteworthy evaluation programs are OSD and WasteCap. Those monitoring and evaluation programs which are in place generally monitor customer/client use of services, and the nature and extent of services rendered. Few programs track the overall effectiveness of programs in enhancing or expanding recycling markets.

##### Analysis and Strategy:

Evaluating the effectiveness of recycling market development efforts is essential to determining how to fine tune the approach so that resources are efficiently and effectively focused in generating the desired results. A formal system is needed to periodically evaluate the appropriate and effectiveness of Massachusetts's recycling market development efforts. The recommended strategy for meeting this need is to develop and implement a recycling market development monitoring and evaluation plan that establishes measurable performance objectives, program monitoring procedures, and a process for assessing the results of monitoring efforts.

##### Actions:

1. Involve Steering Committee member agencies in establishing recycling market development performance indicators and objectives to be met by each of the key existing and planned recycling market development programs. Ideally, performance indicators for recycling market development should include such outcomes as: increase in tonnage of secondary materials

consumed, existing and planned capacity expansions, and amount of increase in recycled content products purchased by the state and other organizations. Program measures should track constituency/customer satisfaction with services provided, as well as interim outputs and final outcomes of these programs, including products generated, and market improvements made.

2. Charge each state agency involved in recycling market development to develop monitoring and evaluation procedures for key recycling market development programs (and recycling market development parts of larger programs), including the Recycling Industries Reimbursement Credit, Recycling Loan Fund, Strategic Envirotechnology Partnership (STEP), Beneficial Use Determination, the Network, and research and development support efforts.
3. Ensure that provisions are made for regular evaluation of the appropriateness and effectiveness of all the key programs.<sup>19</sup> Utilize the results of these evaluations (as well as the forthcoming STEP evaluation) to update the Recycling Market Development Strategic Plan as appropriate.
4. Include monitoring and evaluation requirements in all state grant application procedures.
5. Implement existing programs in a manner that allows for the ongoing collection of information and data pertinent to the periodic evaluation.
6. Establish a mechanism to track progress toward enhancing recycling markets based upon the performance indicators identified through Action 1 above.
7. Develop a process for benchmarking key Massachusetts recycling market development efforts with similar efforts undertaken in other states.

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<sup>19</sup> A suggested framework for examining program appropriateness and effectiveness is provided in Appendix B.

## CHAPTER 6. THE PATH FORWARD

Within its state government and non-profit organizations, Massachusetts contains a corps of professionals who are extremely knowledgeable about recycling and secondary materials, and who are highly dedicated to the goal of raising the level of recycling activity in this state over time. The purpose of this recycling market development plan is to build the capacity of the state and the tools at the disposal of these professionals, to stimulate the development and growth of markets for recyclable materials, and so help support existing recycling programs and help the state achieve its [the state's] recycling goal.

In the economic development field, a clear distinction is made between the terms “growth” and “development.” Growth signifies the quantitative expansion of economic activity, without regard for the nature of that activity. Development, in contrast, encompasses not only growth, but the development of the public and private institutions necessary for maintaining the type of growth that allows for a sustainable high quality of life. This notion of development, of building the institutional capacity, applies to use of the term in “recycling market development” as well. For growth without development can be ephemeral; the factors that allow growth of recycling markets today can be gone tomorrow without the institutional capacity to manage, guide and sustain that growth.

This strategic plan is structured around building the state's institutional capacity to promote recycling market development in three primary ways. These include the capacity to:

- Encourage and support market development across a variety of secondary materials and recycled products, through focusing on the development of program tools in six important dimensions of market development activity – conversion, technology development and commercialization, support of existing recycled product manufacturers, recycling business startups, buy recycled, and collection and processing best practices and technology development;
- Identify and pursue material-specific opportunities and priorities through maintaining a market intelligence system, assessing individual markets to identify specific opportunities (which may include opportunities for conversion, attraction, expansion and startup), and choosing and pursuing priority opportunities; and
- Create a recycling market development management system that provides for consensus, coordination, and communication around four ongoing system components – market intelligence and assessment, strategic planning, implementation, and evaluation.

This approach to capacity building is based on a recognition that:

- Markets are the most efficient mechanism for allocating resources,
- The primary function of the state in recycling market development is to develop the capacity to identify and address market inefficiencies,
- The workings of the markets for secondary materials are ever-changing, and

- To be effective, the state needs to be in touch with and flexibly responsive to changing circumstances as they occur.

Capacity-building is an ongoing, cumulative effort that takes place over a period of years. When managed well, implementation can begin generating results immediately. As capacity builds, the level of impacts grows. With regard to the sequence of capacity building implementation activities, recommendations are as follows:

1. In the near-term, put in place those management systems and action plans necessary to guide the implementation of the strategic plan. Specifically, the recommended focus of efforts in the near-term include:
  - a) Signing of a Memorandum of Understanding (MOU) among the four agencies with primary responsibilities in recycling market development (Chelsea Center, DEP, EOE and MOBD);
  - b) Creation of the Recycling Market Development Steering Committee;
  - c) Preparation of an implementation plan regarding the components of market intelligence and assessment, including the regular updating of the secondary materials markets database and the development of a market intelligence network;
  - d) Determination of priorities among cross-material strategy action items provided in Chapter 3, and preparation of agency-specific plans regarding the implementation of these priority action items. The following actions are recommended as high priority:
    - Maintain all current programs recommended for continuation. (Postpone modification of existing programs, as these are of secondary priority.)
    - Institute the “wholesale and retail” information dissemination system.
    - Complete the Beneficial Use Determination (BUD) regulation review process and make changes as determined appropriate.
    - Develop the Massachusetts Recycled Product Manufacturers Network and begin to tap the Network to determine manufacturer’s service needs, material supply issues, etc.
    - Create the Buy Recycled Coordinating Committee, and develop an implementation plan for buy recycled recommendations.
  - e) Determination of high priority market-specific opportunities identified in Chapter 4, based on the criteria outlined in Chapter 4, and implementation plans for addressing those opportunities.
2. In the intermediate range, recommended implementation activities include:
  - a) Launching of the implementation plans prepared per 1(c) through 1(e) above;
  - b) Full operation of the market intelligence system;

- c) Preparation of competitive analysis of Massachusetts recycled product manufacturing sector;
  - d) Development of a system for evaluating impacts of various market development tools; and.
  - e) Modification of existing programs in accordance with available staffing and in light of other priorities.
3. Over the long term, the nature of activities would reflect the extent to which the capacity for recycling market development had been developed, and the evolution of markets in the state. As noted above, as capacity is built and tools put in place, agencies can consider the preparation of material-specific strategies as part of a revised strategic plan.

In developing priorities and implementation plans, the Steering Committee may find it helpful to consider the following:

1. A certain action item in one strategy may be the same as, a portion of, or complementary to action items in other strategies. Thus, synergies may be found in simultaneously implementing certain action items in various strategies. Action areas in which synergies may be found include:
  - Collecting, organizing and disseminating information on conversion, Green markets, and best practices in recycled product development;
  - Providing companies and entrepreneurs with referrals to a wide variety of technical, financial, and other resource providers;
  - Operating financial capital programs for Massachusetts recycled product manufacturers, and adjusting programs in light of market assessment and program evaluation;
  - Organizing and managing the Massachusetts Recycled Product Manufacturers Network; and
  - Revising Beneficial Use Determination (BUD) regulations.
2. The material-specific market opportunities identified in Chapter 4 fall into categories (see Table 4-5) that correlate with the strategy topics in Chapter 3. Most market opportunities have the potential to be addressed by more than one strategy. For example, the plastic lumber opportunity can be addressed through expansion, startup or attraction. Many of the feedstock conversion opportunities potentially involve new product development. The Steering Committee may consider choosing to pursue certain market opportunities as a means for creating, adjusting, expanding and testing in “real time” the market development tools called for in the various strategies.

To implement the strategic plan in full will ultimately require a budget that exceeds current level funding for recycling market development in Massachusetts. However, the budgetary implications of the implementation of the strategic plan can be determined only after the Steering Committee chooses priorities and a timeframe for implementation, identifies the staff and other resources needed to implement these priorities, and decides the extent to which new staff positions and other resources are necessary.

# APPENDIX A: RECOMMENDED ALLOCATION OF PROGRAM ROLES AND RESPONSIBILITIES OF STATE AGENCIES WITH PRIMARY ACTIVITY IN RECYCLING MARKET DEVELOPMENT

## Chelsea Center for Recycling and Economic Development

### *Role:*

- Actively facilitate the development and expansion of *Massachusetts recycled product manufacturers*.
- Help *identify and overcome barriers* to increased use of secondary materials

### *Responsibilities:*

- Through *hands-on efforts* with individual companies, researchers, and economic development and other agencies, encourage:
  - new recycling business development,
  - new recycling product development,
  - new recycling production technology development,
  - the increased use of secondary materials in feedstocks (expansion and conversion), and
  - the expansion of markets for existing recycling firms.

*Hands-on efforts include a large and flexible set of tools, including information development and dissemination, facilitation and financial support.*

- Serve as a *general advocate* for Massachusetts recycled product manufacturers before other organizations and the public.

## Department of Environmental Protection

### *Role:*

- Promote *high levels of recovery* of secondary materials recovery from municipal solid waste programs and C&D sites;
- Annually update and evaluate the *State Solid Waste Master Plan*; and
- Promote recycling market development through *broadly targeted* efforts.

### *Responsibilities:*

- Design and manage the state's efforts to promote secondary materials recovery from *municipal solid waste programs* and *C&D sites* in a manner responsive to end user supply needs.
- Design and oversee *finance-based* (e.g., Recycling Loan Fund, Innovative Technologies Program) efforts to develop markets for secondary materials;

- Oversee **regulatory** (e.g., Beneficial Use Determination and landfill ban) efforts to develop markets for secondary materials;
- Coordinate and provide financial support for the state's **Buy Recycled efforts**, including those promoting the purchase of recycled content products by businesses and the general public;
- Provide assistance in **matching buyers and sellers** of secondary materials;
- Promote adoption of **materials recovery technologies and techniques** that make available high quality secondary materials to end users
- Prepare demand-side aspects of **State Solid Waste Master Plan**, consistent with the recycling market development strategic plan; and
- **Measure progress** regarding achievement of state solid waste goals.

## Massachusetts Office of Business Development

### **Role:**

- Act as **link** between environmental and economic development communities.
- Manage marketing efforts to reach **out-of-state targets** for specific recycling market development opportunities.

### **Responsibilities:**

- Facilitate **development of relations** between environmental and economic development organizations;
- Link **individual recycling businesses** with appropriate development resources, typically upon referral by DEP the Chelsea Center;
- Provide **economic development perspective** in matters of recycling market development;
- Serve as lead agency in marketing to out-of-state firms for **targeted recycling business attraction** efforts; and
- Serve as lead agency in marketing secondary materials to out-of-state buyers (**targeted export promotion**).

## Executive Office of Environmental Affairs

### **Role:**

- Represent state recycling market development organizations before the General Court and the Administration.
- Allocate resources to support recycling market development.

***Responsibilities:***

- ***Advocate*** for allocation by legislature of sufficient resources for state recycling efforts in general, and recycling market development in particular;
- Determine ***allocation of CEF funding*** to other state agencies for recycling market development;
- Consider use of CEF funding for ***special projects*** conducted by DEP or its contractors in recycling market development;
- Determine and oversee presentation of any ***legislative initiatives*** before the General Court;
- ***Ensure the coordination*** of recycling market development efforts of organizations under its purview and funding;
- Serve as ***liaison*** between recycling market development line agencies, the Governor's Office and other Secretariats; and
- Develop policies and legislative initiatives on recycling issues including demand side aspects of the Solid Waste Master Plan.

## **APPENDIX B: OUTLINE FOR APPROACH TO EVALUATION OF PROGRAM APPROPRIATENESS AND EFFECTIVENESS**

This outline is divided into two parts. The first sets out the choices to be made regarding the design of a program evaluation. The second offers a set of principles for designing and carrying out program evaluation.

### **Part One: Variables to Consider in Designing A Program Evaluation**

#### **A. Context-setting Variables**

- Rationale for evaluation
  - Program improvement (making it more effective)
  - Program justification (to funders, sponsors)
- Audience
  - Internal to agency
  - External (public [local, state, Fed], private)
- Program tool(s) to be evaluated

#### **B. Variables Concerning the Focus of the Evaluation**

- Appropriateness – are you aiming at the right targets, and with the right tools?
- Effectiveness – how well are you hitting the targets?
- Organization and management – what are the organizational reasons leading to the choice of targets and tools, and ability to hit them?

For *appropriateness evaluation*, consider whether and to what extent the program:

- Is targeted to specific, high priority market inefficiencies (material-specific, cross-material)
- Uses the appropriate tools to address those inefficiencies
- Is guided by an appropriate strategy regarding how best to use those tools
- Leverages, and does not duplicate, other existing programs and resources
- Operates on a scale commensurate with need
- Is outcome-oriented, not simply task-oriented

For *effectiveness evaluation*, consider:

- Nature of units to be evaluated
  - Inputs (e.g., requests for assistance)
  - Outputs (e.g., written reports to client, loans closed)
  - Outcomes (e.g., jobs created, tons diverted)
  
- Possible location of outcomes
  - At the program client (direct outcome)
  - At a supplier of the client (indirect outcome – backward linkage)
  - At a customer of the client (indirect outcome – forward linkage)
  - At firms that receive consumer expenditures by workers in direct and indirect jobs (outcome induced)
  - At firms competing with the client that imitate the client (leveraged outcome) and their indirect and induced impacts
  
- Status of outcomes
  - Actual
  - Committed/expected
  - Potential (outcomes need to be expressed in some timeframe; they have the potential to be open-ended)
  
- Type of outcomes
  - Final
    - Environmental – e.g., tons diverted
    - Economic performance – e.g., jobs, wages
    - Business performance – e.g., profits, sales
    - Fiscal – e.g., tax revenues
  
  - Intermediate (outcomes that influence final outcomes)
    - Business operations – e.g., improvements in productivity, production capacity, workforce skills, market share; reductions in costs; capital investment; expansion of relationships
    - Government operations (outside of program staff) – e.g., increased openness, understanding and interest on part of state economic development staff to pursue recycling economic development opportunities
  
  - Proxy (outcomes that indicate likely nature of final and intermediate outcomes) – e.g., customer satisfaction, level of reliance on a recycled markets newsletter

- Timeframe of impact
  - Immediate
  - Annual
  - Cumulative
- Nature of measure
  - Numeric
    - Absolute number (e.g., tons diverted) – precise, estimate, probable range, order of magnitude (i.e., in the tens, the hundreds, the thousands, etc.)
    - Outcome per unit input/output (e.g., jobs created per client assisted)
    - One alternative here is to compute return on investment (e.g., tons consumed per \$1,000 in program dollars or jobs created per dollars invested)
  - Relative (e.g., market intervention had substantial, moderate, or low impact)
- Level of economic substitution/attribution (i.e., extent to which outcome can be attributed to intervention)
- Correlation between outcome and specific client characteristics

Evaluative Criteria – points of reference by which to make judgments regarding relative effectiveness (e.g., in comparison to impacts of similar programs in other states, what seems possible, what is politically acceptable)

Explanations of Effectiveness

- Exploration of client perception regarding reasons for outcomes (what worked well or not well, and why)
- Exploration of client behavior and motivations regarding seeking/accepting program outputs, interactions with program staff and other actors, utilization of results
- Exploration of behavior of staff at cooperating government organizations regarding receptivity to program, initiative and incentive in utilizing program, development of relationships with program staff

For *organization and management evaluation*, consider:

- Needs assessment efforts
- Strategic planning efforts
- Efficiency of operations
- Client outreach and management
- Feedback and adjustment mechanisms
- Human resource management

- Financial management
- Leadership
- Management efficiency
- Operating culture

**C. Evaluation Process Choices**

- Frequency of data collection
  - Ongoing
  - Intermittent
  - One-time
- Data collection tools
  - Reporting form
  - Standardized survey – mail, phone
  - Interviews – phone, in-person
  - Focus groups
  - Case studies
- Consistency of format for data collected across clients
  - Required
  - Not required
- Organization responsible for conducting evaluation
  - Data collection – agency operating program, external organization
  - Analysis – agency operating program, external organization

**Part Two: Principles of Program Evaluation**

- 1) Clearly define the rationale and audience for the evaluation.
- 2) Understand the needs and motivations of the audience. Use the evaluation process and results to educate the audience regarding the best ways to meet its needs.
- 3) To the extent possible, seek to measure outcomes. Measuring outputs and inputs alone is useful, but insufficient.
- 4) In evaluating effectiveness, designate units of measurement that encourage effective behavior. When staff know how they are being measured, they focus their behavior on getting good measurements. If the wrong measures are chosen, real effectiveness suffers. Seek to "measure what you do," not "do what you measure."

- 5) Recognize that evaluation is an art, in terms of knowing how to best gather information given limited time and resources, and organizing and interpreting that information in order to tell a meaningful story to the audience for the evaluation.
- 6) In the design and implementation of the evaluation, be systematic, consistent, and objective.
- 7) Frame the discussion of appropriateness and effectiveness in terms of overcoming barriers to market efficiency.
- 8) In describing effectiveness, use to advantage that fact that most potential impacts are open-ended and cumulative.
- 9) In effectiveness evaluation, in addition to final impacts, determine intermediate and proxy impacts. Precise final impacts are often hard to capture, and intermediate and proxy impact analysis can greatly expand understanding of effectiveness. Also, freely use output measures as well, as they can give a good sense of the program's momentum.
- 10) In effectiveness evaluation, consider circumventing difficulties in measuring some numeric impacts through seeking to identify relative impacts (e.g., substantial impact, moderate impact, etc.).
- 11) In effectiveness evaluation, address issues of economic substitution.
- 12) In discussing effectiveness, use credible evaluative criteria (e.g., benchmarks from similar programs)
- 13) Indicate the steps that will be taken in light of the results of the evaluation (e.g., program improvement, adjustment in funding).
- 14) Keep in mind that the preparation of an evaluation report is more than the presentation of figures. A good evaluation report involves the presentation of a narrative that provides the context and rationale for the evaluation, and integrates and interprets in the findings in order to come to policy and programmatic conclusions.
- 15) Design the evaluation effort to be consistent with skills and available time of those responsible for generating data (e.g., client staff).