

**Recyclers/Remanufacturers Technical Assistance Program**

**RECYCLING/REMANUFACTURING IN HAWAII**

**AN INDUSTRY REPORT**

**Conducted by**

**The Hawai`i Small Business Development Center Network  
A Partnership Program between the University of Hawai`i at Hilo and  
The U.S. Small Business Administration**

**A Report to the Clean Hawai`i Center  
Department of Business, Economic Development, and Tourism  
State of Hawai`i**

**1999**

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This publication is partially supported and some material is based upon work supported by the U.S. Small Business Administration and the University of Hawai`i at Hilo under Cooperative Agreement Number 8-7620-0012-09 and by funds received for the Recyclers/Remanufacturers Technical Assistance Program funded by the Clean Hawai`i Center of the Department of Business, Economic Development and Tourism of the State of Hawai`i. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of the U.S. Small Business Administration, the University of Hawai`i at Hilo, the Clean Hawai`i Center, the Department of Business, Economic Development and Tourism, or other sponsors.

August 1999

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## I. EXECUTIVE SUMMARY

### A. General Introduction

The recycling movement originated from concerns about the environment and the rapid consumption of non-renewable resources by industrial countries. The idea that natural materials needed to be conserved gained acceptance and support. Then, in the 1980s and early 1990s, concern developed over the potential exhaustion of landfill space throughout the United States. This concern increased the urgency to develop effective recycling and comprehensive programs.

Motivated by these combined factors, many states and municipalities had developed recycling programs by the late 1980s or early 1990s. Within a short period, most areas found that a high percentage of residents participated in recycling efforts. As Frank Ackerman suggests in *Why Do We Recycle?*,<sup>1</sup> recycling participants consider themselves active contributors conserving landfill space and saving energy and materials. Recycling has gained status as “the right thing to do,” an activity that helps protect the environment.

The economic justifications for recycling have been hotly debated. When prices for recycled materials are high, recycling is easily supported from a market standpoint, but when prices plummet, as they have at various times, questions arise about other justifications for continuing to recycle. As Ackerman points out, “[a]mong the factors motivating recycling is the idea that resource conservation is essential for economic sustainability. Suppose that future generations are entitled to resources allowing them to achieve at least our level of well-being; this provides a vague but sufficient definition of sustainability.”<sup>2</sup> Thus the economic justifications asserted for recycling tend not to rely solely on current market conditions, but rather include long-term considerations and some sense of moral obligation to the future.

Benefits from recycling arise in two areas: (1) the waste management process and (2) the extractive and manufacturing industries. “Waste management benefits attributable to recycling include: (1) reduction in the need for disposal capacity; (2) lowered emissions from landfills and incinerators; and (3) reduction in litter and improper disposal. Benefits resulting from use of recycled materials in industry include: (4) reductions in energy use and related emissions; (5) reduction in extraction and manufacturing process impacts and emissions; and (6) the long-term value of conservation of raw materials.”<sup>3</sup>

In addition to diverting materials from the waste stream, recycling saves energy and conserves natural resources by decreasing the amount of raw materials used. For example, recycling saves 95% of the cost of manufacturing a new aluminum can because it takes 95% less energy to turn a used can into a new one than to refine new material from raw bauxite.<sup>4</sup> However recycling efforts

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<sup>1</sup> Ackerman, Frank. *Why Do We Recycle? Markets, Values, and Public Policy*. Washington, D.C.: Island Press, 1997.

<sup>2</sup> *Ibid.*, p. 52.

<sup>3</sup> *Ibid.*, p. 21.

<sup>4</sup> *Trash: A Commentary on a Proposal*, [Hawai'i] Legislative Reference Bureau, Report No. 1988, p 6.

are limited due to the heterogeneous nature of municipal waste and the limited market for recycled goods.<sup>5</sup> Some commentators view this second factor as a fundamental element of recycling programs:

Viable markets are an indispensable component of any successful recycling endeavor. Policymakers must develop comprehensive programs that go beyond source separation and collection; they must address the market situation at the local, regional, national and international levels as well.<sup>6</sup>

Ultimately, the overall benefit of recycling is two-fold: the reduction of waste that must be disposed of and the decrease in raw materials used for new production. Thus, Ackerman asserts, “an even better way to obtain the same environmental benefits is to simply use less material in the first place. This idea, sometimes called ‘source reduction,’ or, less cryptically, ‘waste prevention,’ has become increasingly popular in recycling circles in the 1990s.”<sup>7</sup> This point is developed later in this report, especially in relation to remanufacturing pursuits.

## **B. Background**

Since 1993 the Department of Business, Economic Development & Tourism (DBEDT) has worked with other state departments and community organizations to expand recycling efforts in Hawai`i. Programs have focused on developing a variety of alternatives for waste disposal and increasing public awareness of options. The recycling services available to local communities have been promoted, along with opportunities to buy and use products made from recycled materials.

In 1997, DBEDT contracted with the Hawai`i Small Business Development Center Network (SBDC)<sup>8</sup> to develop and implement the Recyclers/Remanufacturers Technical Assistance Program (R/RTA). The R/RTA Program incorporates several projects aimed at supporting recycling businesses and companies involved in remanufacturing in Hawai`i. The projects include business counseling, technical assistance, and company evaluation in order to aid companies in improving their practices. It is anticipated that greater profitability will enable businesses to expand and create new jobs. These projects for enhancing the recycling and remanufacturing industries in Hawai`i seek positive outcomes for both the economy and the environment.

With the pure market arguments for promotion of recycling being unreliable, another strategy for justifying recycling programs has been to emphasize their role in job generation. Ackerman states that, “there are good economic reasons to expect recycling to create jobs. Money spent on recycling leads to more employment than the same amount spent on garbage disposal. Recycling

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<sup>5</sup> Ibid. p.7

<sup>6</sup> New York State, Legislative Commission on Solid Waste Management, Incentives for Recycling, January 1988.

<sup>7</sup> Ackerman, Frank. *Why Do We Recycle? Markets, Values, and Public Policy*. Washington, D.C.: Island Press, 1997, p. 23.

<sup>8</sup> The Hawai`i SBDC Network is a partnership program between the University of Hawai`i at Hilo and the U.S. Small Business Administration.

is a labor-intensive activity, involving sorting and processing of waste materials. Disposal, in contrast, involves heavy equipment, large tracts of land, and very little labor.”<sup>9</sup> This reality is subject to certain qualifiers, one of which is that in order for recycling to create jobs, it must cost the same as (or less than) disposal.

### **C. Purpose of the Industry Report**

The Clean Hawai`i Center (CHC), a state initiative to service recycling and remanufacturing businesses, located in the Energy, Resources, and Technology Division of the Department of Business, Economic Development and Tourism (DBEDT), is due to sunset June 1999. This report has been contracted by the CHC to describe the recycling/remanufacturing industry in Hawai`i in order that the CHC can provide background information on statewide recycling/remanufacturing enterprises to the Hawai`i State Legislature.

This report on the recycling/remanufacturing industry is one of four deliverables contracted with the Hawai`i SBDC Network. It is the second part of a two-step process designed to gather and present information useful to the State of Hawai`i, to industry-companies, and to interested individuals.

The first part of the process was the collection of data on recycling and remanufacturing businesses. After formulating a mailing list of companies, a letter was sent to introduce the Hawai`i SBDC Network, the R/RTA program, and the data collection project. Subsequently, a telephone survey was conducted. Companies were requested to provide information on number of employees, revenue, description of products and/or services, materials input and output, capital investment type(s), utilization, and capacity. In addition, company representatives were asked to assess various aspects of their business specifically and the industry as a whole: strengths and weaknesses, needs, and factors affecting future growth.

The Hawai`i SBDC Network survey provided the basis for creating an industry database on businesses involved in recycling and remanufacturing throughout the state. It must be clarified that this report and the supporting survey focused on the *industry*, not the *process*, as practiced in Hawai`i. Although many companies are involved in the recycling and/or remanufacturing process to some degree (*e.g.*, reuse of waste water at a resort for their golf course and separating debris by a construction company), to include all such activities would dilute the efforts of those companies more heavily involved in recycling or remanufacturing. Whether a company included the activities of recycling and/or remanufacturing in their mission statement was a significant determinant for inclusion in the survey and this report.

The numerical data, the anecdotal offerings, the recommendations and expressions of need collected from the survey, and the interviews with county recycling coordinators, all contribute to this industry report. Company-provided figures are aggregated to indicate the size of the industries and their components, while analysis of less tangible characteristics are based on

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<sup>9</sup> Ackerman, Frank. *Why Do We Recycle? Markets, Values, and Public Policy*. Washington, D.C.: Island Press, 1997, p. 81.

answers given to the open-ended questions of the survey. The overall picture that emerges is intended to contribute to planning efforts and the promotion of business growth and increased returns. Ultimately, this report is designed to aid the Hawaiian economy and improve the handling of the state's waste stream.

#### **D. Approach**

In order to focus on the survey data and the current status of recycling and remanufacturing in Hawai'i, it is necessary to establish definitions and assumptions upon which to base the report. Definitions of recycling and remanufacturing and their related industries are presented in Appendix A: Definitions.

A summary of the national context is presented in Section II, and it provides a basis for comparing and contrasting the data on Hawai'i. Operating within the scope and limitations of this project and report, Section II describes the demographics, statistics, and relevant characteristics of the recycling and remanufacturing industries in the United States.

Sections III and IV concentrate on Hawai'i. Previously published data provide the basis for contrasting Hawai'i's progress with the rest of the nation. Most of the data defining Hawai'i's recycling/remanufacturing industry and its market conditions and characteristics, needs, and recommendations comes from the survey conducted by the Hawai'i SBDC Network. A synopsis in Section III of these market conditions and characteristics precedes the variants from the survey examined in Section IV. Included in Section IV are both narrative and qualitative responses from the survey. Metadata based on some of these responses is used in order to provide a comprehensive view of Hawai'i's industry.

Concluding remarks are presented in Section V.

#### **E. Observations**

Hawai'i has experienced an increase in recycling activities in the 1990s. Increased education of the public, government and businesses continues to be an effective means of stimulating recycling activities. Initiatives, such as the Clean Hawai'i Center, are helping recycling/remanufacturing businesses in Hawai'i to be more successful through business development assistance, technical assistance, and promoting the purchase of recycled items.

Our survey identified 94 companies actively involved in the recycling and/or remanufacturing industries in Hawai'i as of November 1997. We determined that 83 of these companies employed 1,800 people in the recycling and/or remanufacturing industries. Based on our telephone survey and secondary sources, we estimated 1997 total gross sales of \$54 million for the recycling and/or remanufacturing industry in Hawai'i.

While conducting the survey and researching this report, several observations emerged regarding recycling/remanufacturing in Hawai`i.

Activities which may stimulate recycling activities include:

- Obtain additional federal funding for recycling/remanufacturing initiatives in Hawai`i; *e.g.*, the Environmental Protection Agency's (EPA) programs for Jobs through Recycling, Business Assistance Center, and Recycling Economic Development Advocate.
- Ban certain recyclables from landfills; *e.g.*, O`ahu's ban of cars, cardboard, and green waste.
- Increase drop-off points for recyclables, since curbside programs seem cost-prohibitive, especially in low-density populated areas.
- Either deregulate existing regulations regarding solid waste disposal or enforce existing regulations more evenly.

Activities which may stimulate the development of markets for recycling/remanufacturing businesses include:

- Require governments in Hawai`i to purchase recycled goods, in addition to recycled paper; *e.g.*, mulch, compost, crushed glass for asphalt and construction fill, and plastic lumber.
- Address access to capital issues for recycling/remanufacturing businesses, which experience problems with undercapitalization.
- Address the issue of technical assistance for intermediate processors in recycling/remanufacturing.
- Negotiate preferred shipping rates for recycled commodities with Matson, Sealand, and other shipping companies.

Continued public/private-sector partnerships to increase the flow of information on recycling/remanufacturing activities will help Hawai`i continue and increase recycling activities as Hawai`i enters the 21<sup>st</sup> Century. Standardization of reporting of recycling and waste management activities statewide would provide for more accurate analysis of recycling/remanufacturing activities in Hawai`i, and ensure policy initiatives are based on the most accurate information.

## II. THE NATIONAL CONTEXT

### A. Recycling Industries in the U.S.

#### 1. Demographics and Statistics

Each April and May, the periodical *BioCycle*<sup>10</sup> publishes their annual survey on “The State of Garbage in America.” Every state provides data for the survey, including the District of Columbia. The following summaries of demographics and statistics in relation to recycling are drawn from the April and May 1997 survey.

*BioCycle* began conducting their annual survey in 1989. From that year through 1995, recycling rates grew significantly each year. The 1997 report, however, shows that “the national recycling rate for 1996 . . . only grew one percentage point from 1995 — 27 percent to 28 percent.” The leveling of recycling rates parallels a leveling in the rate of landfill closures, “showing both saturation and maturation of programs and stabilization of landfill closures”.

The 1997 survey indicates that “30 states reported an increase in their recycling rate, 12 stayed the same, and nine had a decline.” “The number of Americans served by curbside recycling programs increased from 121 million in 1995 to 135 million in 1996,” while “drop-off recycling programs grew by 19 percent.”

In order to examine trends in various areas of the nation, *BioCycle* divides the country into seven regions: New England, Mid-Atlantic, South, Great Lakes, Midwest, Rocky Mountain, and West. For 1996, the highest recycling rate was reported (for the first time) by the South, followed by the Mid-Atlantic region, New England, the West, the Great Lakes, the Midwest, and the Rocky Mountain region.

Disposal methods other than recycling are landfilling and incineration. The Rocky Mountain region, with the lowest recycling rate, had the highest landfilling rate. In the New England, Midwest, Rocky Mountain, and Western regions, landfilling rates decreased; in the Mid-Atlantic and Great Lakes regions there were increases; and in the South there was no change. “New England is the only region that incinerates more than it buries (41 percent versus 32 percent landfilled, which is the lowest landfilling rate in the country). Every other region landfills over 50 percent of its waste stream.” Overall, however, “[i]ncineration handles a small portion of the nation’s waste stream (10 percent). Interestingly, the national incineration rate has stayed at 10 percent in five out of the last six years (in the 1993 survey it was 11 percent).” It should be noted, however, that the incineration rate varies much more widely from state to state, from a low of 0% in several states to a high of 92% in the District of Columbia.

The 1997 *BioCycle* survey found that, for the first time in its history, the number of reported composting facilities for yard trimmings declined. Since yard trimmings comprise 18% of all

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<sup>10</sup> “The State of Garbage in America,” *BioCycle: Journal of Composting and Recycling*. Vol. 38, no. 4. <http://www.jgpreess.com/biocytle.htm>

municipal solid waste,<sup>11</sup> this is an important category in relation to both garbage disposal and recycling. *BioCycle*'s reported decrease was "attributed primarily to the closure of municipal sites that instead opt to send yard trimmings to agricultural or commercial operations for composting." Thus, there has not necessarily been a decline in total composting activities. On the other hand, as Ackerman points out, 'grasscycling' [leaving grass cuttings on the lawn instead of collecting them for disposal elsewhere] is one important method for decreasing the amount of waste discarded. If grasscycling has increased, presumably fewer composting facilities would be needed. Unfortunately, the *BioCycle* report does not raise this possible correlation.

*BioCycle* notes that "every state except Alaska, Arizona, Kansas, Oklahoma, Utah and Wisconsin has set a recycling and/or waste reduction goal." Many states have imposed deadlines in the year 2000 or beyond for meeting these goals. In other types of activity, "no major recycling or composting legislation was passed in 1996," and "only a few states added materials to their disposal bans in 1996. "Vehicle batteries are the most commonly banned material (41 states), followed by tires (35), motor oil (24), yard trimmings (23) and white goods (18). Fourteen states ban other items such as NiCad and mercuric-oxide batteries, carbonated beverage containers and liquor bottles with deposits, telephone books, and office and computer paper."

A majority of states (37) "reported having recycling grant programs that were funded in the most recent fiscal year.... The grant money is used for a wide array of projects. The general categories include equipment for recycling and composting programs, market development, and diversion of 'problem' materials."

## 2. Characteristics, Needs, and Recommendations

The concluding section of Part I of the 1997 *BioCycle* report reiterates the assessment expressed in the beginning: the activities they measure have reached stable levels. "Furthermore, in the big picture, there is not much on the horizon to change that steady state." The author notes, for example, that despite changes in markets related to recycling, "the overall number of recycling programs doesn't seem to rise or fall dramatically."

The question then arises regarding what could impact recycling rates toward a significant future increase. "Increased demand and use of recovered materials — as well as higher market prices that can be sustained over longer terms — definitely would have an impact. This not only applies to greater use of paper, plastic and other feedstocks in new product manufacturing, but also to demand for soil amendment/organic based products (and strains on conventional feedstocks to make these products, such as peat) . . . . Perhaps the most likely sources of increased diversion will be state, as well as institutional and private sector, initiatives to improve efforts to recycle or compost materials that still are being landfilled in large quantities."

## 3. Federal Government Legislation

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<sup>11</sup> Ackerman, Frank. *Why Do We Recycle? Markets, Values, and Public Policy*. Washington, D.C.: Island Press, 1997, p. 146.

On October 20, 1993, President Clinton signed an Executive Order on Federal Acquisition, Recycling and Waste Prevention, requiring federal agencies significantly to increase purchases of recycled products, especially paper. The significance of the Executive Order:

- Requires that all federal purchases of printing and writing paper contain 20 percent post-consumer material and will need to contain 30 percent by the end of 1998; or federal agencies may purchase paper with 50 percent recovered materials from the production of goods other than paper or textiles, but only if the materials would otherwise end up in a landfill.
- Prohibits any increase in federal spending on paper goods as a result of this order; agencies must make up any price increase that may occur by reducing waste and using less paper.
- Requires agencies to evaluate and revise or remove any unnecessary brightness specifications for paper.
- Requires agencies to consider the life cycle cost of a product in preparing procurement documents and promotes use of environmentally preferable products.
- Requires the U.S. Environmental Agency (EPA) to outline recycled and environmentally preferable products to assist agencies in purchasing the most environmentally sound products.
- Mandates federal purchasing of rerefined lubricating oils and retread tires described in EPA guidelines.
- Designates staff to carry out this order <sup>12</sup>

## **B. Remanufacturing Industries in the U.S.**

### **1. Demographics and Statistics**

The primary source of information for this section is from the 1996 report *The Remanufacturing Industry: Hidden Giant*, by Robert T. Lund, Professor of Manufacturing Engineering at Boston University<sup>13</sup> and literature from the Remanufacturing Industries Council International (RICI).<sup>14</sup> Lund determines the principal criteria that make a durable product a desirable candidate for remanufacturing as:

1. The durable product fails functionally rather than by dissolution or dissipation. Something that melts away or corrodes away is

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<sup>12</sup> *Buy Recycled in Hawai'i : A Guidebook for Hawai'i State and County Government Agencies*, n.d., p. 8-9

<sup>13</sup> Lund, Robert T. *The Remanufacturing Industry: Hidden Giant*. Boston: Boston University, 1996.

<sup>14</sup> Remanufacturing Industries Council International website, <http://www.remanufacturing.org/>

obviously not a candidate. There must be a “core”—a discarded, malfunctioning, or used product that becomes the remanufactured product.

2. The technology exists than can restore the product to its original shape, condition and function.
3. The product is factory-built, is standardized, and is made with interchangeable parts.<sup>15</sup>

Lund created a database of remanufacturing firms to determine the range of products rebuilt and the size of the industry in the United States. From thirteen trade associations, he obtained membership data, which resulted in over 9,903 U.S. companies for inclusion in the database. In addition to the 46 product areas that have been established by the *Standard Industrial Classification* (SIC), Lund found that another 40 product categories in the 1987 *Standard Industrial Classification Manual*, which he believes are applicable to remanufacturing. A 1995 telephone survey of a random sample of 1 out of 5 firms in the database was conducted. As with the Hawai`i SBDC Network survey completed in conjunction with this report, principals in firms were frequently reluctant to divulge information, particularly about sales volumes. Nevertheless, Lund was able to obtain complete information from 1003 firms, or about 10.1% of the U.S. remanufacturers in the database population. Extrapolating from this 10.1% sample produces 1995 national totals of 234,931 employees and \$28,816,219,272 in gross sales for the recycling and/or remanufacturing sector. In 1997 the Remanufacturing Industries Council International estimated there were 73,000 remanufacturing firms with \$53 billion in annual sales, employing 480,000 people. Statistics from the Hawai`i SBDC Network survey to determine overall industry characteristics show a range of gross sales from \$6,000,000 to \$10,000 and a range of employees from 1,189 to one.

Lund found that the size of the firm has an important bearing on the sales “productivity” of employees. Sales per employee for firms under \$1 million annual revenue were near \$90,000 per year, while firms above \$10 million in annual sales, the figure per person was more than 50% higher.<sup>16</sup> By asking directors of trade associations for estimates of non-members, Lund derived total industry estimates of 73,000 firms with sales of \$53 billion and direct employment of one-half million people.<sup>17</sup>

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<sup>15</sup> Lund, Robert T. *The Remanufacturing Industry: Hidden Giant*. Boston: Boston University, 1996, p. 2.

<sup>16</sup> *Ibid.*, p. 39.

<sup>17</sup> *Ibid.*, p. 43.

## 2. Characteristics, Needs, and Recommendations

Lund states that:

[P]ast analyses of remanufacturing have indicated that this labor-intensive industry is important as a source of employment and training of people in industrial skills. It contributes significantly toward the preservation of labor, energy, materials and capital equipment embodied in the country's capital base. In contrast to the huge costs of disposal, recycling, and environmental remediation borne by the public in dealing with our domestic and industrial solid waste, remanufacturing keeps goods out of the waste stream. Furthermore, the firms in this industry pay taxes on profits made while performing this service, and their employees pay taxes on incomes derived from this source.<sup>18</sup>

A result of Lund's database and survey show that the industry "is much too large an economic activity to be so completely overlooked by the American public." He asserts that the public is unaware of the economic importance in its revenue streams, its employment levels, its tax generating power, and the environmental contributions made by remanufacturing, making the public image the number one problem facing the industry. This need to win public recognition and respect, was one of the chief reasons for the formation of the Remanufacturing Industries Council International. The RICI lists among the issues facing the industry: core valuation, intellectual property and anti-trust matters, federal, state and local government recycled-content procurement procedures, design for remanufacturing, and government economic incentives.

Objective data regarding the resource conservation contributions of the industry is needed. Lund advocates sector-by-sector analysis of the energy, labor, and materials conservation implications of remanufacturing. An early attempt by Lund to measure energy savings in the automotive sector indicated energy recapture ratios of 5:1 to 6:1 (energy salvaged/energy expended).

Another need is for technological development and dissemination of technical knowledge to achieve higher levels of efficiency. Processing procedures common across the industry are disassembly, parts cleaning, measurement and testing, refurbishing, refinishing, waste disposal, and assembly. Recent efforts include the development of remanufacturing and design technology for remanufacture by academic source by the Industrial and Manufacturing Engineering Department of the Rochester Institute of Technology. Lund recommends that increased research stem from the industry as a whole as well as from governmental agencies, because individual firms are limited in personnel working on R&D.

The final recommendation is the deflection of efforts by original equipment manufacturers (OEM) and others to curb remanufacturing. Such efforts include denial of access to replacement parts, laws which limit repair or parts replacement to authorized representatives of OEM companies, and extension of patent laws in ways that restrict or prohibit remanufacture of a product.

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<sup>18</sup> Ibid., p. 3.

### III. HAWAII

#### A. Summary of Previous Reports

Hawai`i governments have designed and implemented recycling collection programs, often within the context of solid waste management at the county level, with the goal of diverting material from landfills. However, systematic market development for recycled content products has been lacking. Traditionally, market development strategies examine regional opportunities and the transportation infrastructure to facilitate the shipment of goods. Due to Hawai`i's geographic isolation and the lack of large-scale local markets, most of our recycled material of value is exported. Ninety-nine percent of Hawai`i's recycling markets are at least 2,400 miles away creating economic hindrances. Overseas shipping costs and poor market conditions promote the need for alternative local uses for recyclable material. Other than compost, local markets for recycled materials are very limited. Hawai`i does not process nor reprocess metals and paper into finished products. Glass cullet and plastics are processed locally into usable materials but the market is small – not least because the added costs of labor, land, and regulations raise the price of finished goods. In addition, large potential buyers have resisted purchasing these products because they are unfamiliar with these products and because the buyers require some changes in the remanufacturing processes for these products.

In 1988 the Legislative Reference Bureau conducted a study, *Trash: A Commentary on a Proposal*,<sup>19</sup> into the areas of litter, recycling, and waste disposal. This report was in response to House Resolution No. 455, adopted during the 1987 Regular Session to study the feasibility of establishing a statewide trash reduction program in Hawai`i. Relevant to the present report, the 1988 report did examine the feasibility of a beverage container deposit scheme and the role recycling plays in that scheme. The 1988 report also covered markets in Hawai`i for recycled materials. Selected data from the 1988 report is included in the present report to provide benchmarks in Hawai`i's development in recycling endeavors and the status of the market for recycled goods.

Most related to the present study was a 1989 report to the Legislative Auditor, *A Study of Recycling for the State of Hawai`i*, by Resource Conservation Consultants, Inc.<sup>20</sup> This Oregon-based firm was contracted to conduct a study of Hawai`i's waste streams to assess the availability of markets for recycled materials, recycling programs in other states, and the economic viability of recycling in Hawai`i. A significant portion of the report focused on ways to encourage service stations to participate in used oil collection programs. This focus was due to new regulations regarding used oil collection, which is now an established sector of the industry.

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<sup>19</sup> *Trash: A Commentary on a Proposal*, [Hawai`i] Legislative Reference Bureau, Report No. 1988.

<sup>20</sup> Resource Conservation Consultants, Inc. *A Study of Recycling for the State of Hawaii: A Report to the Governor and the Legislature of the State of Hawaii*. Submitted by the Legislative Auditor of the State of Hawaii, Report No. 89-15. 1989.

The 1989 study provided data on the amount of recycling in Hawai`i and on the volume of the waste stream. It described the market conditions for materials in Hawai`i, and it assessed the economics for collecting, processing, and shipping recyclable materials to these markets, identified the constraints of recycling in Hawai`i, described recycling programs in other states, and recommended strategies for Hawai`i.

The 1989 study determined, regarding waste generation and recycling rates, that Hawai`i's estimated waste composition did not differ dramatically from national waste composition. The other major finding was that recycling rates for commonly recycled materials were lower in Hawai`i than in the U.S. as a whole<sup>21</sup>. The scope of recycling activities were limited at that time, with private firms collecting waste paper, ferrous and non-ferrous scrap metal, and a small amount of glass containers. The major collection of recyclables occurred on O`ahu, but some collection of corrugated containers, aluminum cans, and other scrap metals were undertaken on the neighbor islands.<sup>22</sup> Then, as now, the best indicator of recycling activities can be gauged by investigating the amount of recyclables shipped from the state to export markets. This is due to the minute number of in-state manufacturers who use recyclable materials.

Another report on Hawai`i's recycling industry focused on the marketing sector of the recycling industry. The 1993 report, *Recycling Market Development Strategies & Manufacturing Options*, prepared for DBEDT by the Recycling Association of Hawai`i and Design with Nature,<sup>23</sup> identified local, small-scale manufacturing opportunities using recyclable material from four waste categories (mixed paper, glass, plastics, and compost) appropriate to Hawai`i's market. It also focused on locally manufactured products that can be sold within the state. It claimed that lacking an ingrained recycling economic program, Hawai`i has the freedom to develop programs around the manufacturing requirements of end products made from recyclable material.

This report identifies the key issues associated with the four recyclable materials presenting the challenges and the opportunities. The challenges include:

- Hawai`i's geographic isolation limits large-scale manufacturing which requires economies of scale.
- Certification requirements and public perceptions of recycled product quality limit demand.
- Low market prices for recyclable materials limit overseas marketing opportunities.
- There is a lack of consistent, reliable waste data for decision making.
- There is a lack of recycling infrastructure and source separation.

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<sup>21</sup> Ibid., p. 15.

<sup>22</sup> Ibid., p. 18

<sup>23</sup> Recycling Association of Hawaii and Design with Nature. *Recycling Market Development Strategies and Manufacturing Options*. Prepared for the Department of Business, Economic Development and Tourism, State of Hawai`i. Honolulu: Business Development and Marketing Division, Department of Business, Economic Development and Tourism, State of Hawai`i, 1993.

- Inter-island shipping fees are not structured for recyclable materials.
- There is a lack of true cost analysis for solid waste management.
- O`ahu's waste-to-energy plant (H-Power) competes for many of the materials that are targeted for recycling.

The opportunities in Hawai`i include:

- Two-thirds of the ships that supply Hawai`i with its goods and supplies return to the mainland empty, creating a potential for lower Hawai`i to the mainland rates.
- Industry and government cooperation, which is essential, will improve the situation, if achieved.
- Higher-value products can be pursued and encouraged in order to diversify markets and maximize returns to the local economy.
- Existing out-of-state businesses can be encouraged to expand their operations to Hawai`i.

## **B. Profile on Hawaiian Industries**

For purposes of comparison and contrast, this report follows a format similar to the 1989 report. The data provided in the 1989 study will be presented with similar data from the Hawai`i SBDC Network survey and database.

### 1. Demographics and Statistics

1996 statistics from *BioCycle*, April 1997,<sup>24</sup> show that Hawai`i generates 2,130,000 tons of solid waste per year. Of this, 23% is recycled, 28% is incinerated, and 49% goes to landfills. These numbers included some industrial waste. The percentage of incineration is significantly higher than the national average of 10%, which is partially due to Honolulu's waste-to-energy H-Power plant. The article shows that Hawai`i is the only state without curbside recycling programs. Hawai`i also went against national trends as the only state to respond affirmatively that there is a problem with disposal capacity. With only nine landfills, the remaining capacity ranges from two to fifty years. Each county in the State is facing a landfill closure and there are issues related to new construction. Hawai`i reported no industrial and two construction and demolition landfills and thirty-six transfer stations statewide. Current legislation requires landfills to divert 75% of commercial and 50% of residential green waste or face banning of these materials. Whole tires and scrap automobiles are also banned from our landfills.

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<sup>24</sup> "The State of Garbage in America," *BioCycle: Journal of Composting and Recycling*. Vol. 38, no. 4. <http://www.jgpreess.com/biocytle.htm>

The State Department of Health provides statistics for solid waste landfill capacity in Hawai`i. By their forecasts, with the generation of approximately 2.5 million tons of garbage annually, only two landfills will remain open on O`ahu after the year 2000 and these landfills will be full by 2003.<sup>25</sup>

Hawai`i established statewide solid waste recycling/reduction goals of 25% in 1995 and 50% by 2000. Hawai`i is one of nine states not meeting their goals. Hawai`i has received only \$370,000 or 2.3% of all grants awarded by the EPA under its Solid Waste Management Assistance #66.808 between 1994 and 1998.<sup>26</sup> Based on the current survey, about 25 percent of the solid waste generated in Hawai`i is now recycled through government programs and private efforts.

Lund's database revealed over 120 remanufacturing firms operating in Hawai`i in 1997, up from 28 in 1995. It is likely, however, that Lund derived this number for companies listed in the yellow pages, which includes remanufacturing activities, but for which remanufacturing is not their primary purpose (*i.e.*, part of their business mission statement). Our database contains three companies we could define as primarily remanufacturers. No doubt some more exist in the islands, but we were not successful in locating them.

## 2. Waste Diversion and Recycling Rates

One method of waste diversion, and perhaps the most defined measurement of goods removed from the waste stream for recycling, is through shipping compendiums. The bulk of Hawai`i's recycled materials are shipped out of state for processing. The 1989 report, *A Study of Recycling for The State of Hawai`i*,<sup>27</sup> presented the 1987 exports of three types of waste paper, ferrous scrap, aluminum cans, and other non-ferrous scrap. In 1987, a total of 32,229 tons of waste paper was shipped abroad, including 21,528 corrugated containers and 5,649 tons of newspapers. Ferrous scrap exports totaled 16,591 tons, aluminum cans were 1,273 tons, and other non-ferrous metals were 8,237 tons. The result of the present survey provided statistics for the years 1992 to 1997. Table 3.1 presents commodities-by-value-shipped-out-of-state and was compiled by the U.S. Department of Commerce, Bureau of Census and U.S. Exports of Merchandise, Statistical Month, December 1997. The total value of commodities exported for the years 1992 through 1997 was \$121,073,764.

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<sup>25</sup> *Buy Recycled in Hawai`i : A Guidebook for Hawai`i State and County Government Agencies*, n.d., p. 2

<sup>26</sup> U.S. Environmental Protection Agency, *Envirofacts* website, [http://www.epa.gov/enviro/index\\_java.html](http://www.epa.gov/enviro/index_java.html)

<sup>27</sup> Resource Conservation Consultants, Inc. *A Study of Recycling for the State of Hawaii: A Report to the Governor and the Legislature of the State of Hawaii*. Submitted by the Legislative Auditor of the State of Hawaii, Report No. 89-15. 1989.

TABLE 3.1  
Commodities by Value Shipped out of Hawai`i

<u>Commodity</u>	<u>Total Value 1992-1997</u>
Paper	\$ 21,428,204
Cloth and Rag	\$ 96,570
Ferrous Metal	\$ 88,347,633
Aluminum Waste and Scrap	\$ 6,302,220
Other Non-Ferrous Metal	\$ 4,556,529
Lead (including batteries)	\$ 130,916
Total Values	\$121,073,764

Both the 1989 survey and the present survey found information on domestic shipments, compiled by the U.S. Army Corps of Engineers, deficient in comprehensiveness for domestic shipments. The categories of materials are not as refined, with only categories such as waste paper, not the various grades shown in the export information. The likelihood of double counting is also present, because some materials may be counted once when shipped inter-island and a second time when shipped to mainland or export markets.

A commonly used measure of recycling levels is the recycling rate. The equation used by the 1989 report is:

$$\text{Recycling Rate} = \frac{\text{Tons Recycled}}{\text{Tons Recycled} + \text{Tons Disposed}}$$

The 1989 report estimated that totals from eight categories added to 1,051,200 tons disposed, 37,772 tons recycled, producing a 3.5% recycling rate. The Hawai`i State Department of Health (DOH) furnishes the figure of 529,700 tons as the total diversion for the State in 1996-1997. Hawai`i's recovery of individual materials in 1996 included 68,000 tons of paper, 45,000 tons of yard trimmings, 32,000 tons of food residuals, 300,000 tons of plastics, 13,000 tons of glass and 5,000 tons of nonferrous material which included aluminum cans. This amount may be low considering the lack of compliance with private entities in sharing their data in both value and volume. Diversion volumes by commodity for each county are presented in Tables 3.2 through 3.5.

Table 3.2  
Commodity Diversion Volume by County  
O`ahu

<u>Commodity</u>	<u>Description</u>	Tons Recycled in <u>1996</u>	Tons Recycled in <u>1997</u>
Ferrous	General Scrap	123,590	93,500
	Auto Scrap		41,800
Non-Ferrous	Aluminum	4,230	4,500
	<i>Not</i> aluminum		14,000
Glass		10,295	10,700
Organics	Green/Wood Waste	25,450	21,800
	Food/Wet Waste	12,380	13,300
Paper	Cardboard	30,315	35,100
	Newspaper	12,130	14,100
	High-grade	2,615	5,300
	Mixed-grade	4,855	4,300
	Magazines	4,825	3,100
	Phone Books		500
Plastic	Rigid Containers	75	90
	Film/Bags/etc.	N/A	20
Other	Tires	115	4,000 (est.)
	Auto Batteries	3,945	4,000 (est.)
	Used Motor Oil		4,500
Remediated Soil		31,840	
Concrete/Asphalt			130,000 (est.)
Miscellaneous <sup>1</sup>		140,175	10,000 (est.)
<b>TOTAL:</b>		<b>406,635<sup>2</sup></b>	<b>443,410</b>

<sup>1</sup> estimates of material diverted through permitted and unpermitted activities

<sup>2</sup> 407,635 reported by Dept. of Health but does not sum to detail

NOTE: The bulk of these materials are shipped out of state for processing.

Table 3.3  
Commodity Diversion Volume by County  
Maui

<u>Commodity</u>	<u>Description</u>	Tons Recycled <u>1996</u>	Tons Recycled in <u>1997</u>
Ferrous	General Scrap Auto Scrap	9,860	9,800 (est.)
Non-Ferrous	Aluminum (not aluminum)	530	500 (est.) 1,000 (est.)
Glass		1,410	1,400
Organics	Green/Wood Waste	14,200	17,600
	Food/Wet Waste	19,320	21,600
Paper	Cardboard	2,610	2,600 (est.)
	Newspaper	540	500 (est.)
	High-grade	20	200 (est.)
	Mixed-grade	505	500 (est.)
	Magazines Phone Books		
Plastic	Rigid Containers Film/Bags/etc.	185	190
Other	Tires Auto Batteries Used Motor Oil		400 (est.) 600
Miscellaneous <sup>1</sup>		1,500	1,500
<b>TOTAL:</b>		<b>58,390<sup>2</sup></b>	<b>58,390</b>

<sup>1</sup> Estimates of material diverted through unpermitted activities.

<sup>2</sup> 50,680 tons reported by the Department of Health, but does not sum to detail.

NOTE: The bulk of these materials are shipped out of state for processing.

Table 3.4  
Commodity Diversion Volume by County  
Hawai'i

<u>Commodity</u>	<u>Description</u>	<u>Tons Recycled in 1996</u>	<u>Tons Recycled in 1997</u>
Ferrous	General Scrap Auto Scrap	20,880	10,000 (est.)
Non-Ferrous	Aluminum (not aluminum)	180	530 2,000 (est.)
Glass		880	1,200
Organics	Green/Wood Waste Food/Wet Waste	1,180	2,400
Paper	Cardboard	6,575	4,200
	Newspaper	835	150
	High-grade	50	130
	Mixed-grade	55	80
	Magazines Phone Books		50
Plastic	Rigid Containers Film/Bags/etc.		
Other	Tires		
	Auto Batteries Used Motor Oil		460 800
Miscellaneous <sup>1</sup>		1,500	1,500
TOTAL:		32,135	23,500

<sup>1</sup> Estimates of material diverted through unpermitted activities.

NOTE: The bulk of these materials are shipped out of state for processing.

Table 3.5  
Commodity Diversion Volume by County  
Kaua`i

<u>Commodity</u>	<u>Description</u>	Tons Recycled in <u>1996</u>	Tons Recycled in <u>1997</u>
Ferrous	General Scrap Auto Scrap	3,970	- <sup>1</sup>
Non-Ferrous	Aluminum (not aluminum)	15	500 (est.) 800 (est.)
Glass		430	900 (est.)
Organics	Green/Wood Waste Food/Wet Waste	4,000	1,010
Paper	Cardboard	1,450	570
	Newspaper	515	100
	High-grade		10
	Mixed-grade	320	250
	Magazines Other		20
Plastic	Rigid Containers Film/Bags/etc.		
Other	Tires	10	
	Auto Batteries		340
	Used Motor Oil		180
Miscellaneous <sup>2</sup>		1,000	500
TOTAL:		11,710 <sup>3</sup>	5,180

<sup>1</sup> Auto Salvage/Scrap Metal facility shut down.

<sup>2</sup> Estimates of material diverted through unpermitted activities.

<sup>3</sup> 12,110 reported by Department of Health, but does not sum to detail.

NOTE: The bulk of these materials are shipped out of state for processing.

Aggregating these tables and factoring in the total municipal solid waste generated by each island, permits the determination of a waste diversion or recycling rate:

Table 3.6  
1996-1997  
Recycling Rates by County (Estimated Tons)  
Source: State Department of Health, Solid Waste Management

<u>Area</u>	<u>Total Municipal Solid Waste</u>	<u>Total Diversion</u>	<u>Recycling rate</u>
O`ahu	1,663,000	443,000	27%
Maui	223,000	57,000	26%
Hawai`i	160,500	23,500	15%
Kaua`i	78,200	5,200	7%
Total:	2,124,700	529,700	25%

The 1989 report estimated that 5,453 tons, or 32% of the state’s aluminum cans were being recycled. This was the only percentage that was comparable to other states without beverage container deposit laws. For the other cited materials, Hawai`i’s recycling rates were lower than the national recycling rates.

### 3. Market Conditions for Hawai`i

The lack of an established market within the state, coupled with the high cost of transportation to reach established markets around the world, stymies the recycling/remanufacturing industry. Markets are the mills and manufacturing plants that convert recyclable materials into new products.<sup>28</sup> Market conditions reflect primarily the relationship between supply and demand. When the supply of recyclable materials exceeds orders placed by the consuming mills, the price paid by mills will fall; when the supply lags behind the demand, the price offered by mills will rise.<sup>29</sup> At the time of the 1989 report, viable markets for six secondary materials from Hawai`i were identified. Three were waste paper products—newspapers, corrugated containers, and high-grade paper. The others were aluminum cans, tin cans, and glass containers. There were no viable markets for mixed waste paper, plastics, and yard wastes. Today, there are viable markets for green waste and, to a limited extent, plastics.

<sup>28</sup> Resource Conservation Consultants, Inc. *A Study of Recycling for the State of Hawaii: A Report to the Governor and the Legislature of the State of Hawaii*. Submitted by the Legislative Auditor of the State of Hawaii, Report No. 89-15. 1989, p. 25.

<sup>29</sup> *ibid.* p. 25

- *Waste Paper*

Waste paper products contribute approximately 36 percent of the volume of public landfills nationwide.<sup>30</sup> Paper contributes 40-50 percent to the U.S. waste stream. Although paper consumption has increased in the U.S., significantly less paper is going to landfills—11 million fewer tons in 1993 than in 1987. In 1993, nearly 36 million tons of paper were recovered nationwide—twice as much as in 1980. Today, Americans recycle between 25 to 30 percent of their paper.<sup>31</sup>

According to the R/RTA database, there are 15 companies in Hawai`i that recover waste paper, but only two companies that go beyond the collection stage into processing.

The National Office Paper Recycling Project's Office Guide<sup>32</sup> provides the following definitions of the types of paper that are recyclable:

- *Computer Paper* Also known as CPO (computer printout). Continuous paper printed on an impact printer, usually solid white, including blue or green-lined, pin feed printer paper that is untreated and uncoated. The category does not include laser-printed paper.
- *White ledger* Most white office paper in single sheets or continuous forms, including white computer paper, letterhead, white notebook paper and ledger paper.
- *Colored ledger* Same as white ledger, only paper is colored.
- *Filestock* A specialty grade of mixed, office-type paper that is derived from discarded files. These may come from offices, record storage, records centers, archives, libraries, etc. Mostly white and colored ledger, but may also include carbonless paper, bleached file folders, *etc.*
- *Mixed* A mixture of various grades of recyclable waste paper not limited by fiber content that includes most types of clean and dry paper. This includes: glossy, white ledger and computer papers, newspapers, magazines, catalogs, phone books, cards, laser-printed white ledger, windowed envelopes, and sticky notes, and often contains corrugated and brown paper.
- *Newspaper* Also known as ONP (old newspaper). It is used primarily for making newsprint, corrugated or folding boxes.

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<sup>30</sup> *Paper Factoids*, <http://envirosystemsinc.com/paperfac.html>

<sup>31</sup> *ibid.*

<sup>32</sup> <http://envirosystemsinc.com/terms.html>

- *Corrugated* Also known as OCC (Old corrugated cartons). It is used for shipping containers and is manufactured from a fluted paperboard, called corrugating medium, between two paperboards, called linerboard.

Foreign markets, especially Asia, play a significant role for the U.S. waste paper industry. Asian export markets, which include the ones used by Hawai`i, have nearly doubled their share of total U.S. waste paper exports—from 37.9 percent in 1976 to 66.5 percent in 1986. For the years 1992 to 1997, waste paper exports from Hawai`i to Asia totaled \$21,428,204, approximately 20% of total U.S. waste paper exports to the Asian market. In 1992 Hawai`i exported \$3,847,336 in waste paper. Table 3.7 shows the amount of total waste paper exports for the years 1992 through 1997.

Table 3.7  
Waste Paper Exported from Honolulu  
Source: US Exports of Merchandise, U.S. Department of Commerce

<u>Year</u>	<u>Short Tons</u>
1992	56,666
1993	40,029
1994	31,969
1995	33,305
1996	32,276
1997	32,276

### *Newspapers*

Americans recycle about 27% of their newspapers.<sup>33</sup> The demand for newspapers has been historically good, with the bulk of the demand from the Pacific Northwest. Since it is cheaper to use virgin material rather than recycled material for newsprint the price paid for recycled newspaper by the mills has dropped. Costs have increased for ink removal, labor, and transportation. Increased availability has also contributed to a lower price for recycled newspaper. Another factor in the diminished price paid by the mills for recycled newspaper is the supply. Newspaper was one of the first materials recycled *en masse* by the residential sector. There is now a glut of newspaper collected and shipped to mills. In fact, two processing plants in the U.S. have shut down.

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<sup>33</sup> *Paper Factoids*, <http://envirosystemsinc.com/paperfac.html>

The principal source of old newspapers is residential. Hawai`i residents drop off old newspapers at recycling sites or at specific locations for charitable organization fundraising drives. Unlike hundreds of U.S. cities, sorted newspapers are not collected from the curbside as part of municipal recycling programs in Hawai`i.

In 1988, Hawai`i processors paid \$30 to \$40 per ton to the public for loose newspaper. At that time it cost \$30 to \$100 per ton to ship the paper out. The price paid to the processor by the mill in 1988 was \$60 to \$100 per ton. Today it costs between \$640 and \$716 per ton to ship the paper to mills that pay between \$21 and \$25<sup>34</sup> per ton for baled newspaper. Historically, shipping costs can exceed the price paid to the processor by the mill. Consequently, shipping costs remain a critical determinant of the profitability of recycling newspaper. Some newspaper is recycled locally as shredding and packing material for the flower and papaya industries.

### *Corrugated containers*

The country generates 28.8 million tons of corrugated containers, contributing 28.8 percent (by weight) to the municipal solid waste stream.<sup>35</sup> Although corrugated containers realized a 73 percent recovery rate in 1996 with 21.6 million tons recovered, 18.5 million tons were recycled for a 64.2 percent recycling rate.<sup>36</sup> Per ton, old corrugated containers are the most recycled constituent of municipal solid waste. Corrugated containers are easily and highly recyclable.

The primary market for corrugated containers is the paperboard industry that uses it for corrugated medium, linerboard, recycled paperboard and other paper products. In 1996, 2.6 million tons of corrugated containers were exported from the U.S.<sup>37</sup> Processing costs range from \$20.20 to \$56.26 per ton at materials recovery facilities (MRFs) handling loads of co-mingled residential recyclables. MRFs processing commercially generated wastepaper achieve lower costs due to economies of scale.

In the 1980s, there was a strong demand for corrugated containers in California, Oregon and Washington.<sup>38</sup> In 1986 a total of 1,616 short tons were exported to these West Coast states. The present survey was unable to determine exact figures for exported corrugated containers. Shipping information defines and separates such material into the following categories:

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<sup>34</sup> *Recycling Timer*, <http://www.wasteage.com/RCT/mkt.htm>

<sup>35</sup> "Profiles in Garbage: Corrugated Boxes," *Waste Age*, December 1997, p. 66.

<sup>36</sup> *Ibid.*

<sup>37</sup> *Ibid.* p. 67

<sup>38</sup> Resource Conservation Consultants, Inc. *A Study of Recycling for the State of Hawaii: A Report to the Governor and the Legislature of the State of Hawaii*. Submitted by the Legislative Auditor of the State of Hawaii, Report No. 89-15. 1989, p. 28.

Table 3.8  
Categories of Recycled Paper Shipped

<u>US Commodity Code</u>	<u>Material</u>
470620	Pulps of fibers derived from recovered (waste and scrap) paper or paperboard.
470710	Waste and scrap of unbleached Kraft paper or paperboard or of corrugated paper or paperboard.
470720	Recovered (waste and scrap) paper or paperboard, made mainly of bleached chemical pulp, not colored in the mass
470730	Recovered (waste and scrap) paper or paperboard, made mainly of mechanical pulp (for example, newspapers, journals and similar printed matter
470790	Waste and scrap of paper or paperboard, not elsewhere specified or included (nesoi), including unsorted waste and scrap

Combining the tonnage for these categories resulted in totals of 30,214 tons for 1995, 29,281 tons in 1996 and 38,276 tons exported in 1997.<sup>39</sup> The bulk of these papers were shipped internationally to Australia, China, Hong Kong, Indonesia, Japan, Thailand, Korea, Malaysia, Marshall Islands, New Zealand, Netherlands and the Philippines.<sup>40</sup>

Unlike newspaper, the majority of corrugated containers are generated from wholesale and retail sectors, such as shopping malls, distribution centers and warehouses. The trend is to sort commercial waste loads that primarily contain corrugate containers by removing the boxes for baling. This trend has given rise to the placement of small balers to compact, strap then into bundles for easy shipping or, at the least, special drop boxes for such containers.

The processor's cost of baling and shipping the secondary fibers is the major cost element in recycling corrugated containers. As in the case of newspapers, shipping costs can exceed all other costs combined. In 1988 the price paid to the public for loose corrugated containers was \$40 to \$60 per ton. The cost of processing was \$20 to \$25 and shipping cost was \$30 - \$100 per ton. The price paid the processor in 1988 was \$80 to \$100 per ton. Contemporary prices are \$10 to \$80 to the processor and \$40 to \$180 per ton to the end-user.<sup>41</sup> Volatility in mill prices and shipping rates are significant economic impediments to making sound economic decisions.

#### *High-grade paper*

There has been an increased demand for high-grade paper. National supply of printing-writing paper increased from 23,487,000 tons in 1987 to 30,416,000 tons in 1997, a 29.5% increase.

<sup>39</sup> See Appendix E: Hawai'i Exports 1992-1997.

<sup>40</sup> U.S. Dept. of Commerce, Bureau of the Census, U.S. Exports History.

<sup>41</sup> "Profiles in Garbage: Corrugated Boxes," *Waste Age*, December 1997, p. 67.

During the same period recovery of this quality of paper increased from 5,282,00 tons in 1987 to 10,130,000 tons in 1997, a 91.8% increase. This results in an increase in recovery from 22.5% in 1987 to 33.3 % in 1997.<sup>42</sup> High-grade paper is commonly produced where business machines operate, such as in computing centers and in print shops in addition to offices. With the rise of personal computers, there is a rise in the residential sector. Lacking large-scale high volume generators in Hawai'i, most collection techniques for commercial operations are by small entrepreneurs who provide collection services and sell the material to established waste paper dealers.

*Mixed waste paper*

The demand for mixed waste paper has been historically poor. Mills pay little for this grade of waste paper and the nearest mills have more than enough supply locally. This situation makes shipping from Hawai'i economically unwise.

- *Scrap Metals*

*Miscellaneous Metal Factoids*,<sup>43</sup> a report from the Institute of Scrap Recycling Industries, reports that recycled nonferrous metals contribute the following amounts to the United States' raw material needs:

Table 3.9  
Percentage of Recycled Content of Non-Ferrous Raw Materials

Copper	43%
Aluminum	32%
Lead	55%
Zinc	19%

Most metals recycled in Hawai'i come from industrial and other sources, such as old automobiles, that do not generally contribute to municipal solid waste. Several processors collect and ship these metals. This is an established sector that has achieved economies of scale. Recyclable metals that are included in the municipal solid waste stream are aluminum cans and tin-coated steel cans.

*Aluminum Cans*

In 1996, aluminum cans reached recycling rates that made it the most recycled package in the United States.<sup>44</sup> Of the more than 10,000 recycling centers nationwide, a near record 62.8 billion aluminum beverage cans were recycled in 1997 for a recycling rate of 63.5 percent.<sup>45</sup> Recycling

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<sup>42</sup> American Forestry & Paper Association, Recycling, <http://www.afandpa.org/Recycling/paper/charts/9.html>

<sup>43</sup> *Miscellaneous Metal Factoids*, <http://ecosys.drdr.virginia.edu/othermet.html>

<sup>44</sup> *Information about the Can Industry*, <http://www.cancentral.com/enviro4.htm>

<sup>45</sup> Ibid.

aluminum cans saves 95% of the energy needed to make aluminum from bauxite ore.<sup>46</sup> Since the early 1970s, Americans have earned \$6.4 billion from their recycling of aluminum cans.<sup>47</sup>

Nationwide, seven out of ten aluminum beverage cans are recycled, diverting 2.0 billion pounds of aluminum from landfills.<sup>48</sup> Aluminum cans are the commodity with the highest percentage of post-consumer recycled content because there is no limit to the number of times an aluminum can can be remanufactured.<sup>49</sup> The recycled aluminum beverage can returns to the grocer's shelf as a new, filled can in as little as 90 days after collection, after the additional recycling activities of remelting, rolling, manufacturing, and distribution. This means a consumer could purchase the same recycled aluminum can every 13 weeks, or four times a year.<sup>50</sup>

The principal buyer and shipper of scrap aluminum cans in Hawai'i is Reynolds Aluminum Recycling Company, a subsidiary of Reynolds Metals. Reynolds operates three permanent buying sites and 15 mobile recycling locations where a trailer and employee are placed for the purchase of cans. In the 1980s Reynolds shipped most cans recovered in Hawai'i to California in flattened or baled form. The 1989 report interviewed local recycling firms and determined that approximately 8,360,000 pounds of aluminum cans were shipped to the West Coast in 1987. Reynolds is not willing to disclose their current export level or answer our survey, so most data about Reynolds Aluminum is based on secondary sources. American Business Directory lists their annual sales range at \$2.5 to \$5 million. Apparently, Reynolds ships the bulk of its aluminum to Japan, based on shipping export data. Value of cans for 1992-1997 was \$6,302,220 with \$4,175,988 (66.3%) of this shipped to Japan. Unfortunately, firm values or tonnage for shipments to the U.S. mainland do not appear to be reliable, as aluminum is categorized along with all non-ferrous material and the numbers are extremely low.

The price paid to Hawai'i's aluminum can collectors in 1988 was \$0.40 to \$0.50 per pound, approximately 60 percent of its wholesale value on the mainland.<sup>51</sup> Shipping costs to California were \$0.035 to \$0.055 or about 6 percent of the value of the material, because of the high price it commands. However, the cost of processing and inter-island transport was \$0.05 to \$0.10 per pound. In 1998 the price paid for Hawai'i's aluminum ranged from \$0.18 to \$0.32 per pound<sup>52</sup> and shipping costs were \$0.0217 per pound.

### *Tin cans*

Tin cans are actually 99% steel, with a thin layer of tin added to prevent rusting.<sup>53</sup> Recycling steel and tin cans saves 74 percent of the energy used to produce them from raw materials. At least 70-80 percent of the tin on a can is saved when it is recycled. To recycle tin cans, most of them

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<sup>46</sup> *Aluminum, Steel and Tin Factoids*, <http://ecosys.drdr.virginia.edu/alumfac.html>

<sup>47</sup> Ibid.

<sup>48</sup> *Aluminum Can Recycling*, <http://www.cancontraol.com/enviro5.htm>

<sup>49</sup> Ibid.

<sup>50</sup> *Aluminum, Steel and Tin Factoids*, <http://ecosys.drdr.virginia.edu/alumfac.html>

<sup>51</sup> Ibid., p. 31

<sup>52</sup> Prices paid by Reynolds, Hawai'i's largest exporter, which can provide the highest drop-off price. Range due to specials offered at their 19 sites and the constant fluctuations of the market.

<sup>53</sup> *Aluminum, Steel and Tin Factoids*, <http://ecosys.drdr.virginia.edu/alumfac.html>

must be detinned with a caustic solution used to strip the tin from the steel. In order for the solution to reach all surfaces, the cans must not be compacted before shipping. The removed tin is formed into an ingot and the remaining steel baled and sold as top grade scrap.

This commodity has realized a steady growing demand on the U.S. mainland in the last ten years. In 1997, nearly 19 billion steel cans were remelted into new products in the United States.<sup>54</sup> Nationwide steel can recycling rates have increased from 15 percent in 1988 to 58.2 percent in 1996, resulting in a diversion of 1.6 million tons of steel from landfills.<sup>55</sup> More than 28 percent of a new steel can is made from recycled steel.

In Hawai`i, tin cans from commercial and residential sources are just starting to be recycled. Tin cans make up 3 percent of the total recycling stream by weight. In the late 1980s Hawaiian Western Steel used a small amount of post-industrial tin can scrap to make tin ingots, but the company did not seek commercial or residential sources of tin cans. Shipping data reveals that 3,650 tons of tinned iron or steel waste and scrap (Code 720430) were exported in 1997.<sup>56</sup> Exports from Hawai`i of this commodity have fluctuated significantly since 1992:

Table 3.10  
Exports of Tin Cans

<u>Year</u>	<u>Sum of Quantity Exported</u>	<u>Sum of Value Exported</u>
1992	14,708 tons	\$1,635,750
1993	0	0
1994	12,369 tons	\$1,781,390
1995	0	0
1996	0	0
1997	3,650 tons	\$ 890,003 <sup>57</sup>

Export data show that the markets for this commodity were in China and Indonesia.<sup>58</sup> Currently, this sector is crippled by dramatically fluctuating market prices, partly due to the amount of tin in the cans.<sup>59</sup> An industry manager reports that, “The tin in tin cans has dropped by half in recent

<sup>54</sup> *Steel Can Recycling*, <http://www.canentraol.com/environ6.htm>

<sup>55</sup> Ibid.

<sup>56</sup> See Appendix D.

<sup>57</sup> See Appendix D.

<sup>58</sup> See Appendices C and E.

<sup>59</sup> “Detinning Operation in Pacific Northwest Abruptly Closes,” *Waste Age’s Recycling Times*. November 10, 1997, p. 6.

years, but the costs of processing have continued to escalate. As a result, the steel mills don't want tin cans—they're not desirable."<sup>60</sup>

- *Glass containers*

Glass containers are made from sand, limestone, soda ash, cullet (crushed bottles) and various additives, including those to color brown, green, or blue bottles. Sixty percent of the glass used in the U.S. is clear, and one-fourth is brown (amber). Almost half of the green bottles are imported wine and beer bottles. Other glass products include flat glass such as windows, fiberglass insulation, and glassware.<sup>61</sup> The end-users for glass bottles are divided with 44% for beer/soft drinks, 40% for wine/hard liquor and 16% for food/other uses.<sup>62</sup> Approximately 75 percent of America's glass is used for packaging.<sup>63</sup> Like aluminum cans, glass can be recycled countless times. For each ton of glass recycled, 1,330 pounds of sand, 433 pounds of soda ash, 433 pounds of limestone, and 151 pounds of feldspar are saved.<sup>64</sup>

Currently, glass containers contribute 1.5 million tons or 5.5% of the municipal solid waste in America.<sup>65</sup> States with bottle deposit laws have 35-40 percent less litter by volume.<sup>66</sup> Nationwide, 3.1 million tons of glass are recycled for a 27.2% recycling rate.<sup>67</sup> The glass container industry used 80% of the glass recycled in 1996 as a raw material in making glass containers. Secondary markets, such as the use of glass on road surfaces as "glasphalt" or road-base aggregate, fiberglass, filler in storm drain systems, abrasives, glass foam, and glass beads for reflective paint, comprised the remainder of the uses for recycled glass.

Collection costs range from \$54 to \$77 per ton nationwide. Recycling costs and value of glass are varied, but are relatively low in comparison to other recyclable materials. Nationwide processing costs per ton range from:

- \$37 to \$105 for clear glass
- \$70 to \$149 for brown glass
- \$58 to \$134 for green glass
- \$29 to \$ 76 for mixed-color glass.<sup>68</sup>

The prices per ton paid by end users (mills, foundries, factories, plants, *etc.*) in the western region range from:

- \$10 to \$60 for clear glass
- \$10 to \$50 for brown glass

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<sup>60</sup> Ibid., Tom Zelenka, manager of environmental affairs for Schnitzer Steel.

<sup>61</sup> "Profiles in Garbage : Glass Containers," *Waste Age*. September 1997, p. 87.

<http://www.wasteage.com/wasteage.htm>

<sup>62</sup> Ibid.

<sup>63</sup> *Glass factoids*, <http://ecosys.drdr.virginia.edu/glassfac.html>

<sup>64</sup> Ibid.

<sup>65</sup> 1995 U.S. EPA estimates

<sup>66</sup> *Glass factoids*, <http://ecosys.drdr.virginia.edu/glassfac.html>

<sup>67</sup> Ibid.

<sup>68</sup> "Profiles in Garbage : Glass Containers," *Waste Age*. September 1997, p. 88.

\$10 to \$40 for green glass.<sup>69</sup>

Hawai`i has lagged behind the nation in recycling glass containers, although it has added glass containers as an item accepted at public drop-off recycling centers in the past five years. Commercial accounts have the option to have on-site collection pick up. However, there is still no curbside collection for glass in the islands.

Since 1994 the state of Hawai`i has charged consumers a glass advance disposal fee of \$0.015 per container. These revenues are divided among the counties according to population and are used to pay the collector and/or remanufacturer \$0.06/lb. (\$120/ton) for container glass removed from the waste stream. The collector and/or remanufacturer is required to pay the public \$0.03/lb. for unsorted glass containers and \$0.04/lb. for sorted glass containers.<sup>70</sup>

Historically, the economics of glass container recycling from Hawai`i are poor.<sup>71</sup> In 1988 Hawai`i glass container collectors were paid \$10 to \$20 per ton (or approximately one-half cent to one cent per bottle). In 1997 prices paid by collectors (dealers, brokers, and municipal centers) in the western region of the U.S. ranged from \$0 to \$5 per ton. Preparation for recycling includes separation by color and crushing into aggregate cullet. The common method of shipment from Hawai`i is loading the cullet into open-topped containers or into large, pallet-size boxes which are then loaded into closed-van overseas containers. The cost of shipping to the West Coast in 1988 was \$25 to \$35 per ton. Today it costs \$541 to ship a 24 foot, dry, low cube container of crushed, ground or powdered glass to the West Coast from Hawai`i. Reporting agencies show no glass being exported out of Honolulu Harbor for the years 1992-1997.<sup>72</sup> This is not surprising when the cost of transportation far exceeds the amount paid by mainland end users.

Our survey found four companies that crush glass for end products such as sand and aggregate substitution.<sup>73</sup> Market demand, however, falls short of supply. An example of the under utilization of Hawai`i's glass processing is Aloha Glass Recycling, Inc. of Maui—one of the four companies in the islands which crush glass. Aloha Glass estimates that they process 125 tons of glass per month, far below their capacity of 375 tons per month. Their primary end-users are private firms with government contracts. Other uses of cullet in the islands are landscape media, ashtray filler, and water filtration media.<sup>74</sup>

- *Plastics*

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<sup>69</sup> *Recycling Times*, December 8, 1997. <http://www.wasteage.com/RCT/RecyclingTimes.htm>

<sup>70</sup> Personal Communication from Irobela Wreagh, City and County of Honolulu, 8/11/99.

<sup>71</sup> Resource Conservation Consultants, Inc. *A Study of Recycling for the State of Hawaii: A Report to the Governor and the Legislature of the State of Hawaii*. Submitted by the Legislative Auditor of the State of Hawaii, Report No. 89-15. 1989, p. 34.

<sup>72</sup> U.S. Dept. of Commerce, Bureau of the Census, U.S. Exports History

<sup>73</sup> *Complete the Cycle. Buy Recycled: A guide to Recycled Products Made in Hawai`i*, City & County of Honolulu Recycling Office, State Department of Health and State Department of Business, Economic Development and Tourism, 1997.

<sup>74</sup> Recycling Systems Hawai`i, Inc.

Plastics are synthetic materials consisting of molecules called polymers. The polymers that make up plastics are derived from petrochemicals, as compared to natural polymers such as cellulose, starch, and natural rubber.<sup>75</sup> In 1988 plastic made up 8 percent of U.S. solid waste for an amount of 180 million tons.<sup>76</sup> Table 3.11 lists the various types of recyclable plastics.

Table 3.11  
Resin Types of Recyclable Plastics

Type	Name	Description
1	PET	Polyethylene terephthalate
2	HDPE	High-density Polyethylene
3	PVC	Polyvinyl chloride
4	LDPE	Low-density Polyethylene
5	PP	Polypropylene
6	PS	Polystyrene
7	Other	Including multilayer

Plastics can be recycled with minimum preparation by the consumers; therefore, collection for recycling is increasing rapidly. Plastic recycling faces one difficulty: plastic types must not be mixed for recycling. Yet, it is difficult to tell one type from another by sight or touch. Even a minute amount of the wrong type of plastic can ruin the melt. The plastic industry has responded by developing a series of cryptic markers, commonly seen on the bottom of plastic containers. Virtually everything made of plastic should be marked with a code. Not all types can actually be recycled. Types 1 and 2 (see Table 3.11) are widely accepted in container form, and type 4 is often accepted in bag form. Type 7 is for mixed or layered plastic with no recycling potential.<sup>77</sup>

Type 1, polyethylene terephthalate (PET), is a plastic resin used primarily to make bottles. Soft drinks, along with salad dressings, fruit juices, peanut butter, and other household and consumer products, use PET bottles. PET is also used for film, sheeting for cups and food trays, oven-safe trays, and other uses. PET is a relatively new packaging resin, first commercialized in the early 1970s. Because it is an “engineered” resin, PET is more expensive than commodity resins such as high-density polyethylene (HDPE), and for the same reason, it is usually the highest valued plastic recyclable.<sup>78</sup> In 1995, approximately 1.13 million tons or 0.54% (by weight) of PET contributed

<sup>75</sup> *Plastic Factoids*, <http://envirosystemsinc.com/plasticfac.html>

<sup>76</sup> *Ibid.*

<sup>77</sup> *The Consumer Recycling Guide: Commonly Recycled Materials*, <http://www.obviously.com/recycle/guies/common.html>.

<sup>78</sup> “Profiles in Garbage : Polyethylene Terephthalate.” *Waste Age*. November 1997.

to the national municipal solid waste flow.<sup>79</sup> Nationwide 330,000 tons are recycled for a 34.7% bottle-recycling rate. Soft drink bottles account for 60% of the end-use of PET, while consumption of non-soft drinks make up the remaining 40%.

Its rigidity, low cost, ease of forming, and resistance to breakage characterize type 2, high-density polyethylene (HDPE). It is used to bottle milk, water, juices, bleach, detergents, and motor oil.<sup>80</sup>

Collection costs for plastic bottles range from \$987 to \$1,401 per ton nationwide. Recycling costs average \$183.84 per ton. In October 1998, prices paid by end users (mills, foundries, factories, plants, *etc.*) in the U.S. for PET ranged from \$0.08 to \$0.24 per pound or \$160 to \$480 per short ton.<sup>81</sup> HDPE gets \$0.04 to \$0.20 per pound or \$80 to \$400 per short ton.<sup>82</sup>

At the time of the 1989 report, plastics were not considered a material with a viable market in Hawai`i. Although industrial plastic scrap had been recycled for years, it is only within the last decade that commercial and residential waste plastics have been recycled to a significant scale. It was found that the only consistent recycling of commercial and residential plastics had been the recycling of plastic soft drink bottles in states with beverage container laws. In Hawai`i, with the establishment of Aloha Plastic Recycling, Inc. on Maui, and growing public awareness, this material is seeing a rise in its recycling rate. Our survey revealed that Aloha Plastic Recycling Inc. is Hawai`i's only manufacturer of recycled plastic products, manufacturing plastic dimensional lumber.

PET plastic is shipped to the Hong Kong market and HDPE is either processed at Aloha Plastic Recycling Inc. into plastic lumber or it is shipped to mainland markets. Table 3.12 shows the value of plastics exported between 1992-1997 from Hawai`i totaled \$37,009, showing considerable fluctuations in value during these years.

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<sup>79</sup> U.S. EPA estimates.

<sup>80</sup> *Plastic Factoids*, <http://envrosystemsinc.com/plasticfac.html>

<sup>81</sup> *Recycling Manager*, <http://grn.com/prices/rm-prices.htm>.

<sup>82</sup> *Ibid.*

Table 3.12  
Plastic Exports from Hawai`i

<u>Year</u>	<u>Value</u>
1992	\$5,817
1993	0
1994	\$25,792
1995	0
1996	0
1997	\$5,600

Reporting agencies also show that Hong Kong was the only recipient of these plastics exported from Hawai`i.<sup>83</sup>

- *Green Wastes*

Green waste is the second largest component (by weight) of the national municipal solid waste stream making up 20 percent of the solid waste stream.<sup>84</sup>

There has been a substantial increase in the recycling of green waste/wood waste in Hawai`i. Part of the reason for this increase is the refusal of such waste at municipal landfills. Yard trimmings, untreated wood, pallets, biosolids, animal manure and food waste are recycled into soil conditioners, compost, and soil blends. In addition to residential customers, resorts and golf courses use a large percentage of compost.

Unisyn Biowaste Technology uses a process called anaerobic digestion that recycles the broadest range of source material. The current survey identified four companies who derive the bulk of their business from green waste recycling activities. They are Maui Composting Company with annual gross sales of \$75,000; Emmerich Grosch Associates, Inc. in Kona with annual gross sales of \$300,000; Hawaiian Earth Products, Ltd. on O`ahu with annual sales of \$900,000; and Unisyn Biowaste Technology on O`ahu with annual gross sales of approximately \$1,000,000.

Table 3.13 lists the amount of green waste recycled by county in 1997.

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<sup>83</sup> U.S. Dept. of Commerce, Bureau of the Census, U.S. Exports, Summary 1992-1996, and U.S. Exports of Merchandise, Statistical Month December 1997.

<sup>84</sup> <http://envirosystemsinc.com/compostfact.html>

Table 3.13  
1997 Recycled Green Waste by County  
Source: State Department of Health Solid Waste Management

<u>County</u>	<u>Tons</u>
Hawai`i	2,400
Kaua`i	1,010
Maui	17,600
O`ahu	21,800

The closest export to green waste is vegetable materials and vegetable waste, vegetable residues and by-products used in animal feed, including products in the form of pellets (Code 230890). This commodity experiences a sporadic export rate showing recent export activity only in 1993, with 298,573 tons for a value of \$71,749, all shipped to Japan.<sup>85</sup>

#### 4. Characteristics, Needs, and Recommendations

##### *Constraints*

The 1989 report identified the major constraints to recycling in Hawai`i as shipping costs, lack of population density, the cost of doing business, the lack of collection and recovery systems, and the low cost of disposing of garbage.<sup>86</sup> The report bases the claim of low cost for the disposing of garbage on the high cost of living, and recognizes that disposal costs in Hawai`i are comparable to other metropolitan areas. These constraints have not changed dramatically in the past decade. To these previously identified constraints, however, must be added the inability to operate bailing plants cost-effectively on the neighbor islands for corrugated containers and tin.

The 1993 publication, *Recycling Market Development Strategies & Manufacturing Options*, by the Recycling Association of Hawai`i and Design with Nature,<sup>87</sup> identified the following key market development issues:

- “Due to Hawai`i’s location, many manufacturing options are not feasible. Large-scale manufacturing options are limited . . . . Even assuming an adequate quantity of recyclable

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<sup>85</sup> See Appendix D.

<sup>86</sup> Resource Conservation Consultants, Inc. *A Study of Recycling for the State of Hawaii: A Report to the Governor and the Legislature of the State of Hawaii*. Submitted by the Legislative Auditor of the State of Hawaii, Report No. 89-15. 1989, p. 37.

<sup>87</sup> Recycling Association of Hawaii and Design with Nature. *Recycling Market Development Strategies and Manufacturing Options*. Prepared for the Department of Business, Economic Development and Tourism, State of Hawai`i. Honolulu: Business Development and Marketing Division, Department of Business, Economic Development and Tourism, State of Hawai`i, 1993.

material in Hawai`i to provide feedstock to large-scale manufacturing, the end product would require costly shipping from the state to overseas markets. For these reasons, large-scale manufacturing is not likely to occur in Hawai`i.

- “Certification requirements and public perceptions present hurdles. There are many certification requirements, permitting issues and public perception problems with recycled products. Underwriters’ Laboratory will not certify many products made with recycled materials. Building codes do not allow the use of some products made with recycled materials. [A] concern for quality control (perceived and real) discourages use.
- “Low market prices for many recyclable materials limit overseas marketing opportunities. Low market prices and high transportation costs are a constraint for overseas marketing of recyclable materials. The volatility of end-markets outside Hawai`i does not assure a consistent demand for our material. Prices for some materials have dropped as much as 80 percent in the past two years [1991-1992] . . . . [M]arkets for these materials were flooded . . . .
- “Lack of consistent, reliable waste characterizations. [E]ach county is to study and characterize its waste stream [in accordance to Act 324 SLH Integrated Solid Waste Management]. However, the draft plans contain only estimates . . . . This is an expensive, time-consuming process, but one which must be done to help collectors, processors and manufacturers make investment decisions.
- “Lack of recycling infrastructure and source separation. [L]imited storage space at processing sites is considered a barrier . . . . Source separation is not yet performed on a wide-scale basis at residential and commercial collection points.
- “Inter-island shipping fees are not structured for recyclable materials. This fee structure does not recognize recyclable materials as a shipping category . . . .
- “Lack of true costs analysis of Solid Waste Management. [C]osts must include value of state-owned/county-operated land . . . .
- “Oahu’s waste-to-energy plant (H-Power) competes for many of the materials that are targeted for recycling.”<sup>88</sup>

The state has recognized businesses that actively pursue waste prevention and recycling and promotion of the recycling industry. In 1997, Hawai`i businesses, which were honored by the state for their leadership in incorporating such activities into their procedures, listed the following challenges they faced:

- Public education about the recycling process and its benefits, about the importance of source-separating recyclable materials, and about the proper preparation of recyclables.

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<sup>88</sup> Ibid., pp. 7-8.

- An increasing supply of waste glass and clean, usable plastic for manufacturing operations.
- Balancing production capacity, market size and revenue, which includes finding or developing products that can be manufactured in Hawai`i, priced competitively, and still be profitable.
- Securing start-up capital and long-term capital loans.
- Certification and other testing, which is required for inclusion in government specifications, and is expensive and time-consuming.
- Overcoming the adverse business climate in Hawai`i and its limited market.
- Obtaining suitable sites for operation.
- Building markets for recycling service and end-use.
- Developing innovative equipment and procedures for materials not commonly processed on a commercial scale.
- Testing new regulatory definitions and requirements.

### *Shipping Costs*

The cost of shipping recyclable material to end users from Hawai`i is the most significant impediment to the growth of our recycling industry. 26% of respondents to the Hawai`i SBDC Network survey stated that freight costs were too high. With few in-state end users, recycling operators in Hawai`i must export their products. Transportation costs in 1995 added between 30 to 50 percent to the retail costs of product.<sup>89</sup> Based on the current survey, the percentage remains constant and there is no preference made for recyclable materials being shipped either inter-island or to the West Coast. Shipping costs are based on cubic volume, and shipping costs to Asia are lower than to the U.S. mainland, due to the Jones Act regulating domestic shipping. Table 3.14 provides the rates for shipping various commodities from Hawai`i to the mainland West Coast.

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<sup>89</sup> Letter by Gene Burk, Chair, Clean Hawai`i Center, June 1, 1995.

Table 3.14  
Shipping Rates for Recyclables from Hawai'i to the Mainland West Coast<sup>90</sup>

<u>Type Of Recyclable</u>	<u>Item Reference</u>	<u>Rate</u>
Ferrous Metal (15 lbs./cu.ft.)	T15-130	\$3.58/cwt <sup>1</sup> 30,000 lb. minimum <sup>2</sup> \$3.20/cwt 40,000 lb. minimum
Non-ferrous Metal (Less than 15 lbs./cu.ft.)	T15-135	\$4.33/cwt 25,000 lb. minimum
Glass (crushed, ground, powdered)	T15-1048	\$541 for 24D <sup>3</sup> \$614 for 24HD <sup>4</sup> \$917 for 40D <sup>5</sup> \$1030 for 40HD <sup>6</sup>
Paper	T15-125	\$3.58/cwt 30,000 lb. minimum \$3.20/cwt 40,000 lb. minimum
Plastic	T15-125	N.A. <sup>7</sup>
Tires	T15-155	\$11.20/cwt 130,000 lb. minimum (24 D/HD only)
Auto Batteries	T15-11A	\$3.88/cwt 20,000 lb minimum (24D/HD) \$3.88/cwt 44,000 lb minimum (40D/HD)

<sup>1</sup> cwt = cost per 100 pounds

<sup>2</sup> minimum = minimum charge: rate x minimum. If weight exceeds minimum, then charge is actual weight x rate.

<sup>3</sup> 24D = 24 ft. dry low cube container (1,422 cu. ft. capacity)

<sup>4</sup> 24HD = 24 ft. dry high cube container (1,598 cu. ft. capacity)

<sup>5</sup> 40D = 40 ft. dry low cube container (2,389 cu. ft. capacity)

<sup>6</sup> 40HD = 40 ft. dry high cube container (2,684 cu. ft. capacity)

<sup>7</sup> N.A. = not available

Plus – fuel Oil Surcharge is 1% of Ocean Freight

Plus – wharfage charges per container, see Table 3.15 for details

<sup>90</sup> Personal Communication from Tony Hanley, Matson Navigation Company, 6/26/98

Table 3.15  
Wharfage Charges by Port (Per Container)<sup>91</sup>

Type of Recyclable (Reference)	Honolulu	Neighbor Island	Seattle	Oakland	Los Angeles
Ferrous Metal (T15-130-24 <sup>1</sup> )	\$32	\$63	\$148	\$84	\$89
(T15-130-40 <sup>2</sup> )	\$53	\$105	\$149	\$140	\$116
Non-ferrous Metal (T15-135-24 <sup>1</sup> )	\$32	\$63	\$148	\$84	\$89
(T15-135-40 <sup>2</sup> )	\$53	\$105	\$149	\$140	\$116
Glass (T15-1048-24 <sup>1</sup> )	\$32	\$63	\$240	\$138	\$99
(T15-1048-40 <sup>2</sup> )	\$52	\$105	\$405	\$230	\$103
Paper (T15-125-24 <sup>1</sup> )	\$32	\$63	\$88	\$84	\$87
(T15-125-40 <sup>2</sup> )	\$53	\$105	\$90	\$140	\$103
Plastic (T15-125-24 <sup>1</sup> )	\$32	\$63	\$137	\$138	\$87
(T15-125-40 <sup>2</sup> )	\$53	\$105	\$149	\$230	\$103
Tires (T15-155-24 <sup>1</sup> )	\$32	\$63	\$75	\$138	\$195
(T15-155-40 <sup>2</sup> )	\$53	\$105	\$125	\$230	\$263
Auto Batteries (T15-11A-24 <sup>1</sup> )	\$32	\$63	\$75	\$138	\$195
(T15-11A-40 <sup>2</sup> )	\$53	\$105	\$125	\$230	\$263

<sup>1</sup> 24 = 24 ft. dry cube container

<sup>2</sup> 40 = 40 ft. dry cube container

In addition, Matson Navigation Company offers a special rate for certain recyclables (paper, cardboard, dunnage, plastic trays, drums, bins, plastic bags, blankets, reels) when the shipper certifies that the material came into Hawai'i via Matson. The rate, exclusive of fuel oil and wharfage surcharges, varies from \$712 for a 24D container to \$1351 for a 40HD container. The Clean Hawai'i Center has negotiated with the Matson Navigation Company to reduce shipping rates 20% on waste paper.

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<sup>91</sup> Ibid.

The 1988 report on waste in Hawai'i cites State subsidies for shipping costs as critical to establishing a workable recycling scheme, allowing local recyclers a buffer from sharp dips in price:

The feasibility for government subsidies must not be considered solely in terms of the expenditure[, but rather] the total state benefit...In terms of overall societal costs, a subsidy actually may be less expensive than landfill and air pollution emission control costs . . . . Unless the State is willing to provide Hawai'i's recyclers with a subsidy to cover the gap between the shipping costs and the revenue from the mainland recycling firms, it appears that there is no economically viable market for Hawai'i.<sup>92</sup>

Currently subsidies are awarded on the county level. Hawai'i County provides subsidies for recyclable materials being shipped to O`ahu. These subsidies, however, fluctuate and are not set by any ordinance. This inhibits the processors from knowing the true cost of shipping for their next load.

Neighbor islands realize an added cost to ship their material to O`ahu before it is shipped to Asia or the mainland. Island Service, uses Young Brothers Barge Company, for inter-island transport. Young Brothers do provide a lower rate for shipping recycled material to Honolulu, which is approximately 16% lower than their normal shipper's-own-container rate. Unlike a decade ago, the rates are uniform from any neighbor island port to Honolulu.

Table 3.16  
Barge Rates to Honolulu from any Port  
20 ft. Container

	<u>Regular goods</u>	<u>Recycled goods</u>
Young Brothers' Container	\$436.46	
Shipper's Own Container	\$379.89	\$ 317.63

The State Public Utilities Commission has jurisdiction over intrastate motor carrier and barge traffic, including rate settings, to a limited degree. Approval of the rates is based on the rate of return. The Hawai'i Island company, Recycling Systems Hawai'i, Inc., has stated that without shipping subsidies their rate of return would be reduced to a point which would require the discontinuance of the community services aspect of their business, such as bringing drop-off containers to distant neighborhoods for non-profit fund-raising activities.

<sup>92</sup> *Trash: A Commentary on a Proposal*. Legislative Reference Bureau, 1988 p. 21.

### *Lack of population density*

Hawai`i's small, dispersed population is also a barrier to economically profitable recycling. The 1989 reports states:

The ability to efficiently and effectively acquire and move recyclable waste materials to market is hindered by population size and location. This is particularly true for the Neighbor Islands. In certain resort areas, there may be sufficient quantities of recyclable to warrant recycling, but overall economies are reduced when, for instance, those areas are as distant as Hilo and Kona.<sup>93</sup>

The relatively small population also affects the demand for recycled materials. Glass container plants around the country, for example, are sited where there is a large nearby outlet for their finished product—glass bottles and jars. Hawai`i's demand for finished products is not sufficiently large to sustain manufacturing industries that would use recyclable materials. Thus, for the foreseeable future, Hawai`i's recycling efforts will rely on out-of-state end users to recycle their waste material.<sup>94</sup>

This scenario has changed slightly over the past decade. There are now new in-state uses for recycled material; for example, shredded paper for packing perishables such as papayas and cut flowers. A small number of companies, such as Aloha Plastics Recycling and Recycling Systems Hawai`i, actually manufacture goods out of recycled products in Hawai`i. Nevertheless, most recycled material is still shipped out of state.

### *Overall operating costs*

Interviews conducted both in 1989 and in 1997 with recycling processors indicate that the high cost of doing business in Hawai`i is a major factor in the success or failure of businesses in the recycling industry. In addition to the higher cost of land and facilities, worker compensation rates were identified as a limiting factor. 24% of respondents surveyed for this report cited the cost of doing business (including employee costs) as a problem.

The 1989 report acknowledges that:

“Although similar conditions exist for many other Hawai`i businesses compared to their mainland counterparts, the difficulty in recycling is that the Hawai`i operators must compete in the same markets with

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<sup>93</sup> Resource Conservation Consultants, Inc. *A Study of Recycling for the State of Hawaii: A Report to the Governor and the Legislature of the State of Hawaii*. Submitted by the Legislative Auditor of the State of Hawaii, Report No. 89-15. 1989, p. 40.

<sup>94</sup> *Ibid.* p. 40

other recycling operators whose costs are lower. Hawai`i recycling companies have to operate on a smaller margin. As an example, a waste paper dealer in Oregon may use some of the revenues from the sale of high-grade paper to establish a collection route to pick up the material from office buildings. In Hawai`i, revenues may be used entirely to process and ship the material. Collection of paper from offices may be left to individuals who deliver it to the waste paper dealer for the door price.”<sup>95</sup>

### *Lack of collection and processing systems*

Hawai`i lacks a comprehensive statewide system to gather recyclable materials, whether residential or commercially generated. Although there has been an increased number of recycling drop-off containers (many at public schools) for residential materials, collection programs to increase the convenience of recycling to residents are not offered. “Nearly all residential recycling collection systems in the U.S. are a result of municipal action (either operating the collection service directly or aiding its development). This type of action has not occurred in Hawai`i.”<sup>96</sup>

Curbside recycling has traditionally been viewed as an exorbitantly expensive method of collection. However, curbside recycling programs can be economically competitive with landfilling and incineration through careful, objective testing of truck designs, vehicle routing, public education, collecting of new materials, and setting fees for residential waste management services in order to reward households that produce less waste. Redesigning collection trucks and scheduling trash and recyclable materials collection so that systems work efficiently, minimizes the costs associated with curbside recycling. Less trash to collect will allow trucks to travel longer routes, or recycling collections may be substituted for some garbage routes altogether. Some cities use trucks that can pick up garbage and recyclable materials simultaneously.<sup>97</sup>

There are even fewer organized collection activities for the commercial sector. Commercial recycling systems are constrained by lack of storage space and the high cost of land. Hawai`i also lacks the large industrial customers for large volumes of clean, segregated scrap material. Hawai`i’s dominant economic sectors—agriculture and tourism—generate some opportunities for recycling from industry and business, while the lack of a more sizable manufacturing sector reduces opportunities for scrap processors. Recycling efforts in the tourism industry in Hawai`i have chiefly focussed on waste reduction and the composting of green waste.

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<sup>95</sup> Ibid. p. 41

<sup>96</sup> Ibid.

<sup>97</sup> Assessing the Full Costs and Benefits of Curbside Recycling, see Appendix F.

### *Marketing Support by the State*

The major state initiative to support marketing has been the creation of the Clean Hawai`i Center (CHC), a state program housed in the Division of Energy, Resources and Technology of the Department of Business, Economic Development and Tourism, with the mission of expanding the state's recycling industry. An initiative of the Clean Hawai`i Center is a "Buy Recycled Hawai`i" campaign, with the goal of increasing use of recycled content products and recycling services by government, the building, retail and visitor industries. To achieve this, a directory, *Buy Recycled in Hawai`i: Where to Find Recycled Goods and Services*, was published in 1995 and updated in 1997. Auxiliary publications such as, *Buy Recycled in Hawai`i: A guidebook for Hawai`i State and County Government Agencies*, have been produced by the CHC. Government purchase of goods and services are a significant factor in the market. In Hawai`i, government purchases represented about 20 percent of the Gross State Product, 8 percent by state and local government and 12 percent by the federal government.<sup>98</sup>

The State government has established rules for increased use and purchasing of recycled products to be observed by state and county public purchasing agencies.<sup>99</sup> It establishes percentages of preference, the method of determining the recycled content to qualify various products for preference, and the application of the preference. The rules apply to all competitive sealed bids; however, they do not apply whenever the application will disqualify a government agency from receiving federal funds or aid.<sup>100</sup> The rule S3-124-26, *Mandatory purchase of office paper and printed material with recycled content*, urges the purchase of paper and printed material with recycled content.

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<sup>98</sup> *Buy Recycled in Hawai`i : A Guidebook for Hawai`i State and County Government Agencies*, n.d., p. 3.

<sup>99</sup> Hawai`i Administrative Rules Subchapter 4, Chapter 3-124, Recycled Products, effective November 4, 1993.

<sup>100</sup> Ibid.

#### IV. OBSERVATIONS BASED ON DATA GATHERED BY SURVEY

The data from the Hawai'i SBDC Network survey is presented in two sets of databases. The first set contains all companies with gross sales (derived from the survey of Dun & Bradstreet and the American Business Directory). It provides the following data: demographics of companies, gross sales, number of employees per company (distribution), and types of services (roles). This provides a portrait of the recycling and remanufacturing industry in the state.

The second database contains companies that were actually interviewed, excluding consultants (most of whom are advisors on hazardous waste removal). It shows all of the data in the first set and the degree of involvement (expenditure of effort vs. gross income from recycling/remanufacturing activities), and recommendations. These recommendations include narratives and statistics (*i.e.*, how many of the companies suggested lower shipping rates for raw material to centers of processing).

The survey reveals that most companies active in the industry fit the profile of small businesses; *i.e.*, less than 500 employees in the manufacturing industry and less than \$6.0 million in annual sales for the transportation/refuse system industry. Scrap metal purveyors did not respond to the survey. However, as evidenced earlier, their commodity enjoys a healthy market price, and marketing is not a problem shared with the rest of the industry.

##### A. Economic Impacts on Industry

###### 1. Current Benefits

The recycling and remanufacturing industry generates \$137,000,000<sup>101</sup> in gross sales (including salaries and wages for labor) in the State of Hawai'i.<sup>102</sup> The industry employs 1,050<sup>103</sup> people throughout the state with an average distribution of 17 employees per company. The most common service is that of the collector, who accepts material at drop-off centers from residential and business clients. Excluding H-Power on O`ahu, which accepts the bulk of mixed material for incineration, most recycled material of value in Hawai'i is exported—\$22,292,811 worth of recyclable materials was exported in 1997.<sup>104</sup> The following graph provides the distribution of commodities by value exported in 1997.<sup>105</sup>

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<sup>101</sup> Omits marginal recyclers.

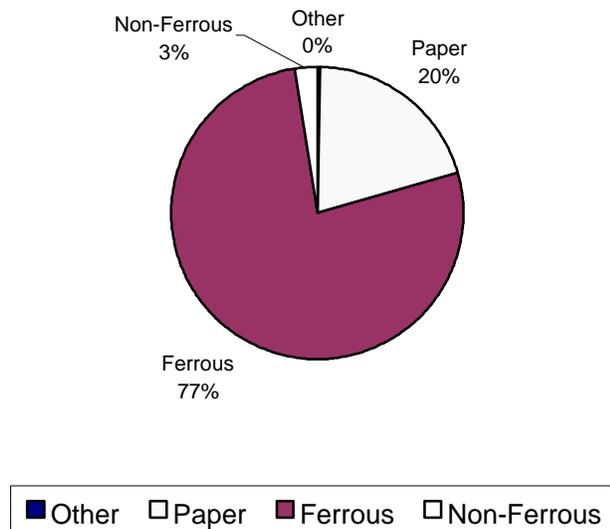
<sup>102</sup> Based on data provided by Dun & Bradstreet and the American Business Directory.

<sup>103</sup> Omits marginal recyclers.

<sup>104</sup> See Appendix B and D

<sup>105</sup> U.S. Dept. of Commerce, Bureau of the Census, U.S. Statistical Month December 1997.

## 1997 Hawai'i Exports of Recycled Commodities



Materials shipped from neighbor islands which were re-exported from Honolulu after importation and without any local processing were valued at \$149,449 for the same year.<sup>106</sup> The greatest tonnage was of copper waste and scrap with 237 tons valued at \$301,399. The greatest tonnage of a common residential business material was aluminum waste and scrap with 228.6 tons valued at \$262,594. Unlike copper waste which was not imported from neighbor islands, 45.2 tons of aluminum, valued at \$149,449, were shipped to Honolulu from neighbor islands.<sup>107</sup>

On O`ahu 44 percent of residential and commercial waste is disposed of at H-Power, the City's waste-to-energy plant. H-Power produces 5 percent of O`ahu's electricity and reduces the volume of refuse going to landfill by 90 percent. H-Power, the cornerstone of O`ahu's integrated waste management system, converts more than 2,000 tons of waste per day.<sup>108</sup> Neighbor islands lack the population to warrant expending the capital needed to create similar enterprises, and with the exception of green waste which is usually processed into compost locally, the neighbor islands rely on shipping the bulk of their recyclable solid waste material.

During the 1996-1997 time period, recycling efforts in Hawai'i have diverted 529,700 tons from the waste stream, resulting in a 25 percent recycling rate. This is a greater than seven-fold increase over the 3.5% recycling rate reported in the 1989 survey.

### 2. Potential Benefits

Reduction of waste sent to landfills is the most immediate benefit to recycling. This report focuses, however, on economic benefits. For every 100 jobs created by recycling, an estimated 13 jobs are lost in solid waste and virgin material extraction (based on a study within the state of California).<sup>109</sup> This ratio is common throughout the country. Since 1989, recycling jobs have

<sup>106</sup> See Appendix D

<sup>107</sup> See Appendix D

<sup>108</sup> *You can Recycle on Oahu*, City and County of Honolulu, Department of Public Works, Recycling Office, 1997.

<sup>109</sup> "Recycling Impact on Jobs," BioCycle, April 1995.

been growing much faster than employment in general, and have been created mostly in the private sector. Recycling adds value to materials by sorting, processing and marketing them to industry for feedstock. That economic activity creates jobs.

Jobs required to move material along the recycling path include: collectors who gather and transport materials and processors who transform recyclables to make them more easily transported or utilized (*e.g.*, crushing, baling, shredding, sorting, cleaning; and end-users who utilize recyclable materials to make new products). Both blue and white-collar jobs are created in the private, government, and nonprofit sectors. A 1994 study in North Carolina<sup>110</sup> surveyed 504 recycling businesses and 360 local governmental recycling programs. It was found that recycling supported an estimated 8,867 jobs statewide, 7,757 (87 percent) in the private sector and 1,110 (13 percent) in government.

The North Carolina study showed that growth in recycling jobs does not significantly increase or decrease wages. The average wage for all recycling employees is \$9.04 per hour compared to landfill jobs averaging \$9.16 per hour. This amount is below the national average of \$11.50 per hour.

Since Hawai`i lacks jobs related to extraction of virgin material, there is no loss of jobs in those industries, which will offset employment gains from recycling. It was shown in the North Carolina study, insofar as it is applicable to Hawai`i, that replacing virgin materials extracted outside the state with recycled feedstock generated in state gives the local economy a boost.<sup>111</sup>

## **B. Government Policies**

It has long been advocated that recycling efforts be enhanced in Hawai`i by state involvement.<sup>112</sup> The basic infrastructure for recycling in Hawai`i is not sufficiently well developed to achieve its full potential in reducing solid waste. In 1989, proposed state actions included institutional and financial support, technical assistance, education, the provision of government facilities, strengthening solid waste management programs, providing funding, lowering shipping rates, and setting goals. Many of these have been realized (*e.g.*, education, establishment of recycling offices, and goal setting). However the state needs to continue to focus on state-enforced policies to stimulate both recycling activities by the residential public and the market for recycled goods.

### **1. Identification of Policies to Stimulate Recycling Activities**

- **Enforcement of Regulations:** Many of the collectors and processors cited uneven enforcement of regulations affecting recycling activities by the state as a major problem.<sup>113</sup> The present level of enforcement gives rise to non-approved dumpsites. The Hawai`i State DOH has set more stringent regulations than the EPA, and the rules are not always

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<sup>110</sup> North Carolina was chosen because their Solid Waste Management Act, passed in 1989, is viewed as being responsible for job growth in recycling.

<sup>111</sup> "Recycling Impact on Jobs," BioCycle, April 1995.

<sup>112</sup> *A Study of Recycling for the State of Hawai`i*, Resource Conservation Consultants, Inc., 1989.

<sup>113</sup> 13 of 17 respondents proffering comments listed improved regulation as a factor to support the industry.

viewed as appropriate by the small businesses striving to comply. Several recycling businesses advocate either increasing or relaxing enforcement for recycling businesses, whichever would lower the cost of compliance.

- Make recycling regulation a priority: Progressive management of solid waste, which places a priority on recycling and provides for strong environmental regulation of waste disposal practices, has been a catalyst to increased recycling in many states. When the true costs of waste management are realized (including planning, current operations, replacement facility costs, and environmental protection), recycling becomes a more cost-effective solid waste management function. One way of achieving this is requiring recycling services at waste disposal operations.
- Fees and surcharges: The increase of permit fees on disposal sites and the imposition of per-ton landfill surcharges which would in turn be reflected in user charges, is another policy which could stimulate recycling activities. Counter to this approach is the method of taxing specific products (*e.g.*, packaging and paper) if a stipulated recycling rate is not achieved. This method, called advance disposal fee, provides a direct stimulus for industry development of recycling efforts and provides a means of funding state activities if private programs are insufficient.
- Financial assistance: The State or Counties can also provide financial assistance in the form of loans, grants, and tax credits for collection equipment, including storage containers and trucks; processing equipment, such as balers and crushers; and land or facilities. In many cases, capital funding may be sufficient.
- Deposit refunds: Individual commodities can be addressed, such as glass containers with “bottle bills.” To comply with such a policy, consumers are required to pay a deposit to be refunded on return of the beverage container, in order to alleviate litter and encourage recycling.

## 2. Identification of Policies to Stimulate the Market

Most businesses interviewed have resigned themselves to the fact that there will be few manufacturing activities in state, except for green waste. This is the only sector that has “closed the loop” by collecting, processing and utilizing the recycled product all within the State. The banning of green waste from landfills promotes the use of it for recycled products. A similar approach could be taken with other materials that can be recycled here. Currently demand is so small and inconsistent, that economies of scale cannot be achieved. By banning these products from local landfills, the flow of material will increase, creating a larger supply for manufacturers, who could then realize economies of scale in their production.<sup>114</sup> An example of this is Aloha Plastics Recycling which must import plastic from the mainland to manufacture its products.

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<sup>114</sup> Thirteen of the respondents listed mandated recycling and advance disposal fees as factors to increase the industry.

For the majority of material that is exported, there is a resounding call for lowering the shipping costs, either through governmental subsidies or preferred status.<sup>115</sup> The CHC has negotiated reduced shipping rates for recycled paper and a Matson Navigation Company spokesperson has indicated that they are willing to discuss further the movement of recyclable material to the mainland United States.<sup>116</sup> Some advocate that shipping subsidies be set by ordinance or any other method that is not volatile. A stable diversion credit is another approach to offset shipping costs, although support for a system of diversion credits is not widespread.

Another possible scenario is direct payment from the government (either State or county level) to recycling operators on a per-ton basis for the recycling of commodities such as glass, tin or plastics. In effect, the recycling operators would receive a credit for diverting the material from disposal, which would offset recycling collection and processing costs. Most businesses interviewed advised against the government creating or managing their own facility, since this would harm existing businesses and prevent further growth.

For those companies that do manufacture recycled products in state, the survey respondents suggested creating incentives through policies; for example, changing building codes to make recyclable products a cost-effective substitution. It is feasible to improve the market for glass by mandating its increased use as a road paver or a substitution for sand for filtration purposes.

The State mandates the use of paper with recycled content in its departments. Also they must use recycled motor and lubricating oil unless it is more expensive than virgin oil. The State has developed a policy giving a 5% bid preference when recycled content items are used. However, the Department of Health has yet to develop the necessary specifications to implement this bid preference policy.<sup>117</sup>

## **C. Marketing and Business Development**

With the factors facing Hawai`i's recycling industries (high shipping costs and poor market conditions), alternative local uses for recyclable material must be found in the recycling equation. The problem with exporting most of our recyclable material for processing is that double importing will still exist and not benefit local markets. For example, government, one of the largest sectors in Hawai`i's economy, primarily purchases paper, which is re-imported. Steel is another example of a highly valued commodity. The major use of steel in Hawai`i (other than in finished goods like cars and trucks) is for construction projects, especially non-residential buildings and roads. Hawai`i does not, and is unlikely ever, to have manufacturing plants that can recycle steel locally.<sup>118</sup>

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<sup>115</sup> Thirteen of the respondents listed this as a major contributor to preventing industry growth.

<sup>116</sup> Personal Communication from Tony Hanley, Matson Navigation Company, 6/26/98.

<sup>117</sup> Personal Communication from Justin Fo, Purchasing Analyst, State of Hawai`i, 8/10/99.

<sup>118</sup> There are two metal fabricators: BE Welding Company & Pacific Railings and Architectural Metals. Both appear to be small businesses according to the project database.

By developing local markets, economic benefits are realized from the reduction in shipping. Local manufacturing opportunities then create employment and reduce dependency on imports. Opportunities for creating local markets include:<sup>119</sup>

- Two-thirds of the ships that supply Hawai'i with its goods and supplies return to the mainland empty. Empty ships could be used to transport recyclable material to mainland markets at a relatively low cost.
- Industry and government cooperation is essential. Ongoing efforts, such as the CHC, to educate, research, develop product specifications and promote purchase of recycled-content products are essential to the success of any manufacturing venture in the use of secondary materials.
- Higher-value products should be produced and encouraged in order to diversify markets and maximize returns to the local economy. High-value end products are a prerequisite to successful small-scale manufacturing (which is the scale of most Hawai'i industries).
- Existing out-of-state businesses should be encouraged to expand their operations to Hawai'i. One reason for companies to take this action is that Hawai'i provides an excellent, contained test market or incubator for small-scale operations and new products.

Approaches used by other states and counties can also provide Hawai'i with examples of successful programs and policies.

In response to President William Clinton's 1993 Executive Order 12873 and Resource Conservation and Recovery Act (RCRA), the Environmental Protection Agency (EPA) developed the Comprehensive Procurement Guidelines (CPG) and Recovered Materials Advisory Notices (RMANs). Using the CPG and RMANs, many state and local governments have examined their purchasing practices. The following two examples show how a focus was placed on the government employee or the user of the products, not just on the products themselves.

Example 1: In 1989 in Washington State, King County solid waste officials and the citizen's Solid Waste Advisory Committee established a policy requiring all agencies to use recycled-content products whenever practical. Their approach was to work closely with employees through creative education and incentive programs to purchase such products, resulting in successful institutional purchasing practices. The county has a Recycled Product Procurement Coordinator who asked their 23 agency managers to elect a recycled product procurement liaison. These liaisons had a working knowledge of the types of materials their divisions needed, and the coordinator's job was to identify products made with recycled-content materials. In 1997, 93 percent of their paper purchases were recycled-content paper. The Recycled Product

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<sup>119</sup> Recycling Association of Hawaii and Design with Nature. *Recycling Market Development Strategies and Manufacturing Options*. Prepared for the Department of Business, Economic Development and Tourism, State of Hawai'i. Honolulu: Business Development and Marketing Division, Department of Business, Economic Development and Tourism, State of Hawai'i, 1993.

Procurement Coordinator also worked with private contractors, such as landscape architects who used wood mulch for a county park project. Other tactics included site visits to facilities that manufacture recycled-content products and a bimonthly newsletter that highlights new recycled-content products.<sup>120</sup>

Example 2: The Commonwealth of Massachusetts' Solid Waste plan outlines three programs: state agency governmental purchasing, local municipality purchasing, and the state's buy-recycled business alliance. Using their governmental purchasing power, the Commonwealth also provides monies to departments through grant programs to purchase, test, and evaluate products for a year. At the local level, recycled product procurement is linked to the Municipal Recycling Incentive Program, in which the Commonwealth provides local municipalities with annual performance-based grants. The municipalities must meet a set of eligibility criteria designed to increase access and participation in recycling programs and to stimulate the demand for recycled products. After a buy-recycled policy is implemented, a municipality must add another component every six months to continue to receive funding. These next steps could include establishing a procurement tracking system, testing and evaluating two recycled-content products, or adopting the federal 20 percent minimum recycled-content paper standard<sup>121</sup>.

Even though Hawai'i does not depend on large scale industrial activity for its economic base, a study for eco-industrial development in Trenton, New York, can provide useful approaches to achieve and coordinate recycling activities for the economic benefit of Hawai'i. The Executive Summary of the *Trenton Eco-Industrial Complex; Baseline Analysis*, provides this definition:

“Eco-industrial development is a new way of thinking about economics and the environment. It is a *strategic orientation* [emphasis added] for realizing sustainable economic growth, enhanced communities, continuous improvement in environmental performance, and business retention and recruitment.”<sup>122</sup>

Remanufacturing is a sector identified in the report's section: “Opportunities for Eco-Industrial Job Growth.” Two of the opportunities and proposals are:

Opportunity No. 1: Reuse Network. Communities across the nation are implementing “reuse” networks which target household as well as commercial waste streams. Trenton might consider establishing reuse networks that fit with the regions particular material flows. One opportunity is a nonprofit or a for profit “Deconstruction Reuse Center.” The Reuse Center would operate as a retail outlet for materials that have been recycled from homes and businesses. Types of materials might include doors, window frames, flooring, exterior shingles, and just about anything else that can be stripped from a building slated for remodeling, reconstruction, or demolition. The materials can be used for housing

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<sup>120</sup> A synopsis of the King County's Recycled product Procurement Policy in Appendix G

<sup>121</sup> *WasteWise: Closing the Loop*

<sup>122</sup> *Trenton Eco-Industrial Complex; Baseline Analysis*, [http://www.cfe.cornell.edu/weil/tmtsum.htm#Grow\\_local](http://www.cfe.cornell.edu/weil/tmtsum.htm#Grow_local)

rehabilitation or sold as retail goods. A fully functioning Reuse Center is located in the Phillips neighborhood of Minneapolis, Minnesota.

**Opportunity No. 2: Refurbished Commercial and Residential Appliance Equipment.**

Another important sector of the reuse/remanufacturing sector is the reconditioning of large appliances and equipment such as refrigerators, washers and dryers, and stoves. A number of companies specialize in reconditioning used appliances for resale.

Other opportunities presented include the remanufacturing of recycled plastics, rubber materials, glass, wood products and paper, and the remanufacturing and reuse of electronics and textiles.<sup>123</sup>

A more specific illustration of statewide coordination is the California Integrated Waste Management Board (CIWMB), which has several programs that offer assistance to businesses interested in recycled product manufacturing or use. They have compiled the Recycled Content Product (RCP) Database which is accessible on-line and can be searched for information about manufacturers and suppliers of over 5,000 recycled products.<sup>124</sup> This is akin to the Clean Hawai'i Center's publication *Buy Recycled in Hawai'i*. Promoting financial support, the CIWMB has designated forty specific geographic areas as Recycling Market Development Zones (RMDZs). The CIWMB offers low interest loans, financial assistance, product marketing, and permitting assistance to businesses located within a zone. Local governments offer additional incentives, including assistance in building codes and zoning laws, streamlined local permitting processes, reduced taxes and licensing, and increased and consistent secondary material feedstock supply.

The RMDZs also provide direct loans to businesses who use recycled content feedstock in their manufacturing process and are located within a designated RMDZ, or to local governments in the zone to finance public works infrastructure which directly supports businesses who use post-consumer or secondary waste material. Funds may be used for real property, equipment, and working capital or refinancing of current debt.<sup>125</sup>

Counties in Hawai'i do designate enterprise zones which provide reduced taxes in addition to other incentives. CHC has compiled publications listing the various zoning and environmental permits required before starting a recycling-related business. These publications, *Permit Requirements for Recycling and Related Activities*, are prepared for each of the four counties in the state.<sup>126</sup>

A possible extension of efforts by the Clean Hawai'i Center is the establishment of a Recycling Business Assistance Center (RBAC). Sponsored by the EPA, these centers seek to bolster a state's economy by capturing the maximum share of recycling's potential to create jobs and to increase manufacturing. North Carolina is one of four states that have established an RBAC. Its

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<sup>123</sup> Ibid.

<sup>124</sup> <http://www.ciwmb.ca.gov/mrt/rcp/rcpdbint.htm>

<sup>125</sup> Reduce, Reuse, Recycle, Chapter 7 – Buy Recycled: Closing the Recycled Loop, <http://www.scvmg.com/guide/ch7.html>

<sup>126</sup> *Permit Requirements for Recycling and Related Activities for the County of Hawai'i*, 1997

mission is to promote environmentally sound economic development through reuse and remanufacture of recyclable materials. To achieve this objective, the RBAC:

- Provides technical assistance to recycling businesses with sourcing, processing, and remanufacturing secondary materials and with marketing their end products.
- Provides business development assistance by identifying funding sources, funding demonstration projects and negotiating cost sharing arrangements.
- Develops policies that address the barriers to collecting, processing, remanufacturing and reusing secondary materials.
- Aggressively promotes to potential customers the need to purchase products with recycled content.
- Promotes the need to develop, transfer and apply technologies that will increase the use of recycled materials.
- Promotes partnerships between government and industry to stimulate and facilitate the recovery and use of secondary materials.
- Fosters the development of a supply infrastructure that is capable of providing industry with clean, readily usable and available raw materials.
- Promotes waste prevention and reuse within both the public and private sectors to reduce business costs and the consumption of virgin materials.<sup>127</sup>

RBAC is one of the initiatives supported by the EPA's Jobs through Recycling (JTR) Program, which provides grant funding and information to recycling market development staff nationwide. Grants are distributed to state governments to assist in funding recycling market development programs, investment forums, and recycled commodity demonstration projects. JTR facilitates cooperation and communication among solid waste officials, economic development organizations, and businesses involved in collecting, processing, and remanufacturing recovered materials.

Another initiative supported by JTR is a Recycling Economic Development Advocate (REDA). REDA grantees are generally staff within economic development agencies who are responsible for working within their state to promote the establishment and expansion of the recycling industry. In many cases the grantees have developed financial assistance programs for the recycling industry, sponsored events to bring industry and financiers together or published documents on

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<sup>127</sup> The Recycling Business Assistance Center, <http://owr/ehnr.state.nr.us/rbac/rbac2.htm>

the state of recycling industry or available resources within the state.<sup>128</sup> Hawai`i, through the CHC, received funding for a REDA in 1995.

Other types of support include sales tax exemption on purchase of recycling equipment by processors and manufacturers,<sup>129</sup> tax credit to businesses worth 50 percent of the purchase price of recycling equipment,<sup>130</sup> and transportation rate incentives.<sup>131</sup>

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<sup>128</sup> *Jobs Through Recycling: Frequently Asked Questions*, <http://www.epa.gov/epaoswer/non-hw/recycle/jtr/seonds/faq/faq.htm>

<sup>129</sup> Florida

<sup>130</sup> New Jersey

<sup>131</sup> Oregon. All three states and other reported in *A Study of Recycling for the State of Hawai`i*, Feb. 1989

## V. CONCLUSION(S)

The Institute for Local Self-Reliance (ILSR) in Washington, DC conducted a study of the 100 most efficient municipal recycling programs in the country. They found that five times more jobs are created through recycling activities than through disposal activities.<sup>132</sup> Similar statistics were evident throughout the literature. There has been an increase in the number of jobs that recycling and remanufacturing activities have created in the last decade in Hawai`i. However, Hawai`i is far from the potential in terms of revenues and jobs created.

One of the dominant facts in the Hawai`i SBDC Network survey was that most of the people involved in recycling make their profit through collection, with no profit from recycling activities. What keeps the industry from succeeding economically or expanding: High capital costs, space requirements, location issues, and shipping were the immediate concerns of collectors and processors. Isolation from markets, lack of scale, low market prices, and lack of consistently reliable material sources were cited by processors.

The State has performed a commendable task in education by promoting recycled goods with the development of buying guides and informational packets.<sup>133</sup> Most notable are the efforts of the Clean Hawai`i Center (CHC), a state program located in the Department of Business, Economic Development and Tourism, which encourages recycling and remanufacturing business investment and expansion in Hawai`i. By providing services to the industry relating to business development, financing, and product development and demonstration, CHC has taken the primary steps cited by most successful programs across the nation. Counties have contributed by means of tax diversions, subsidies, education programs and collection sites. Non-profits have provided support and encouraged growth of the recycling industry with publications, financial assistance, education, and technical assistance. The Rural Community Assistance Corporation (RCAC), which is based in California, published a guide, *Financial and Technical Assistance for Solid Waste/Recycling Projects for the State of Hawai`i*.<sup>134</sup> RCAC continued their efforts with a survey of industry participants entitled, *Recycling and Reuse on the Big Island of Hawai`i*.<sup>135</sup> Nonprofits such as Green Star Kaua`i and Recycle Hawai`i provide educational services, networking and workshops, and the maintenance of websites.<sup>136</sup> However, a comprehensive strategy to enforce existing laws and to promote increased recycling activity is still lacking in Hawai`i.

It has been debated whether instituting policies such as “bottle bills” or increasing tipping fees at landfills would be the catalyst to increase recycling. While many of the respondents in the Hawai`i SBDC Network survey advocated increased enforcement of existing rules and regulations, few

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<sup>132</sup> *Recycling: Surviving & Thriving through the Down Times*. Washington, D.C.: Institute for Local Self-Reliance.

<sup>133</sup> Seven of the respondents call for even more public education to support the industry.

<sup>134</sup> *Financial and Technical Assistance for Solid Waste/Recycling Projects for the State of Hawai`i*. Rural Community Assistance Corporation, March 1997.

<sup>135</sup> *Recycling and Reuse on the Big Island of Hawai`i*. Rural Community Assistance Corporation, May 1998 (Draft in progress).

<sup>136</sup> Recycle Hawai`i is the local coordinator for the Hawai`i Materials Exchange, <http://www.kohola.net/recycle>

sought increased governmental management of their businesses. It was agreed, however, that diversion credits, subsidies for shipping costs and favorable financing for capital investments should all be supported by the government. Mandatory recycling of approximately a dozen commodities exists. This is recognized as the most powerful incentive to recycle. Several of the respondents indicated that government should lead the way in purchasing more recycled goods and services, thereby setting an example to private industry and making a significant contribution to the industry.

In order to improve the economic health of the state through recycling activities, certain measures must be examined. For instance, the County of Hawai`i, in order to achieve the recycling rate mandated by the State, is planning on the placement of a “dirty MRF” (materials recovery facility). This MRF will be placed at the existing landfill in Hilo to divert recyclable goods from the mixed waste that comes in. A mainland company that will export all of the recyclable material operates this MRF. No local businesses will benefit from this procedure, as it will divert the recyclable products from local manufacturers such as Aloha Plastics and Recycling Systems Hawai`i. The collectors and haulers will be charged an additional cost of \$70 per ton for the MRF, which will be passed on to their customers. Still more unfortunately, this alternative does not encourage residents and commercial entities from separating their waste, degrading the benefits of recycling and reuse.

Every effort to support local recycling businesses through contracts, coupled with the support previously described, should be pursued by Hawai`i’s local governments. Educational activities should be continued. Collection sites should be increased and supported by the government. Government purchasing and service requirements should be mandatory, not merely urged. Hawai`i should establish and enforce new policies in the use of recycled products manufactured in the islands, such as glass cullet. And, Hawai`i should encourage marketing incentives to promote the use of recycled commodities that cannot be manufactured in the islands.

Unless you buy recycled products,  
You are not recycling.

-Evergreen Industries, c. 1997

## DEFINITIONS

### A. Recycling

#### 1. Defining the process

The term “recycling” is part of everyday language; it is used constantly without there being any necessity for defining it. Yet to pinpoint an exact definition of recycling can be a challenge.

The Global Recycling Network (GRN) provides the following definition in their “Glossary of Recycling Terms”: Recycling is a “process by which materials that would otherwise become solid waste are collected, separated, or processed, and returned to the economic mainstream to be reused in the form of raw materials or finished goods.”

In its “Introduction,” the website of the U.S. Environmental Protection Agency (EPA) states that recycling “...means separating, collecting, processing, marketing, and ultimately using a material that would have been thrown away.” While these two definitions are very similar, note that the EPA’s statement includes “marketing,” which is not mentioned in the GRN version.

Under the heading “Standards for Recycling Facilities,” the Hawai`i Environmental Law Handbook specifies that “Recycling facilities include the following activities: on-site separation of recyclables from nonrecyclables, processing of source separated materials such as metal sludges, motor oil and batteries, and collection, purchase, brokering, baling, compacting or shredding of recyclable materials.” This statement is similar to the previous definitions in including separation, processing, and collection of materials, but it differs in its inclusion of “baling, compacting or shredding” and includes marketing.

In a 1995 report called *Manufacturing from Recyclables*, the EPA sets forth the images that typically spring to mind in association with the word “recycling”: setting bottles, cans and newspapers on the curbside for pickup, delivering such items to a local drop-off center, and buying products that have recycled content. These steps, however, are “only parts of the whole, only links in the recycling chain.” The report goes on to suggest that:

“Communities first understood recycling as the collection of materials. Later, the intermediate processing center was recognized as an integral part of the whole, and more recently ‘buy recycled’ campaigns have added to the growing definition of recycling. Now as recycling assumes a prominent role in municipal infrastructures, it must be understood as it exists — an entire system. Material — whether paper or plastic, glass or metal — is not recycled until it flows through the complete recycling process . . . .”<sup>1</sup>

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<sup>1</sup> *Manufacturing from Recyclables*. Environmental Protection Agency, p. 1.

The EPA report subsequently details the importance of manufacturing in relation to effective recycling. The manufacturer of recycled products benefits a community economically in several ways: by creating skilled industrial jobs, bringing in sales revenue, and paying local taxes. In addition, such a factory diverts materials from the local waste stream by purchasing them as input for manufacturing.

These factories also preserve some of the value that has been added to the material through the original manufacturing process — value that would otherwise be destroyed through disposal. Often smaller than virgin-based mills, a scrap-based manufacturer tends to locate near sources of feedstock. In fact, manufacturing of recycled products offers a community the opportunity of self-reliance, as manufacturing feedstock is mined from a local source — the community recycling collection programs. In addition to the economic gains that new factories bring to a community, manufacturers of recycled products offer environmental benefits as well. Scrap-based enterprises require less energy, water and natural resources, and create less solid waste, air and water pollution than their virgin-based counterparts in nearly every case. Additionally, users of recycled feedstock reduce the need for, and the adverse impacts of, mining and harvesting virgin feedstock<sup>2</sup>(p.2).

At a later point, the EPA report refers to scrap-based manufacturing as “remanufacture.” However, this usage differs from the concept of “remanufacturing” as utilized in this report (see below for definition).

One sees the difficulty, then, of reaching one conclusive definition of “recycling.” For the purposes of this report, the GRN definition will be used: Recycling is the “[p]rocess by which materials that would otherwise become solid waste are collected, separated, or processed, and returned to the economic mainstream to be reused in the form of raw materials or finished goods.”

## 2. Commonly used Recycling Terms

The website for EnviroSystems Inc.<sup>3</sup> provides concise definitions for commonly used terms. Some of these terms are from the Institute of Scrap Recycling Industries:

*Bale* - A large bundle, usually rectangular, of compressed or densified recyclable materials such as plastic beverage bottles.

*Buyback Centers* - locations where consumers can drop off recyclables and receive payment for them.

*Closed Loop Recycling* - The process of collecting an item like a bottle and processing it back into another bottle.

*Commercial Scrap* - Recyclables that result from business sources such as restaurants, stores, theaters, stadiums, airlines, trains, demolition companies, and similar enterprises.

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<sup>2</sup> Ibid., p. 2.

<sup>3</sup> [Http://envirosystemsinc.com/terms.html](http://envirosystemsinc.com/terms.html)

*Commingled Materials* - Recyclables, all mixed together, such as plastic bottles with glass and metal containers. Commingled materials require sorting after collection.

*Curbside Recycling* - A process of collection in which separated or commingled recyclables are set out in containers at residential curbsides for pickup.

*Densification* - The process of packing recyclables closely together, such as in a bale, to facilitate shipping and processing.

*Drop-Off Centers* - Locations where discards can be left for recycling.

*End User or Consumer* - An industrial plant or other facility where recyclables are used as feedstock for the manufacture of new products.

*Ferrous metals* - iron and steel, from the Latin ferrum meaning iron.

*Nonferrous metals* - those metals that contain little or no iron.

*Handler* - A company that performs at least one of the following recycling processes: sorting, baling, shredding, or granulating.

*HDPE - High-density polyethylene* - Colored or opaque plastic used in laundry product bottles and milk jugs. Its recycled life: more laundry product bottles, trash bins and base cups for plastic soft drink bottles.

*Industrial scrap* - Recyclables generated by manufacturing processes, such as trimmings and other leftover materials, or recyclable products that have been used by industry but are no longer needed, such as buckets, shipping containers, signs, pallets, and wraps.

*MRF - Materials Recovery Facility* - A recycling operation that sorts materials by type, then cleans and compresses the recyclables before shipping them to reprocessors.

*Municipal Solid Waste* - The combined residential and commercial waste material generated in a given municipal area.

*PETE or PET - Polyethylene terephthalate* - Clear plastic used in some household cleaning product bottles, as well as in soda bottles. Its recycled life: new cleaning product bottles, carpets and insulation for winter jackets.

*Pre-Consumer Waste* - Scraps and trash created during the manufacturing process, such as paperboard trimmed away when making cartons.

*Post Consumer Waste* - Used materials, such as empty detergent bottles and aluminum cans, that go into the trash if they are not recycled.

*Process Scrap* - Residues from plastics manufacturing processes, such as trimmings, etc., that are reused in manufacturing; also called home scrap.

*Reclaimer* - A company that performs at least one of the following recycling processes: washing/cleaning, pelletizing, or manufacturing a new product processes (typically for plastics).

*Sanitary landfill* - An area where waste is dumped, then buried beneath a layer of earth. Landfills are usually equipped with a liner to reduce soil and water pollution from contaminated seepage.

*Source Separation* - Any method that separates recyclables from waste at the point at which they are generated. Such methods include curbside collection, buyback programs, and drop-off programs.

*Virgin materials* - Any basic materials for industrial processing that have not been previously used, such as petroleum for plastics manufacture, iron ore for steel manufacture, wood pulp for paper manufacture, or bauxite ore for aluminum manufacture.

*Waste* – *n.* The act of using, consuming, or expending thoughtlessly or carelessly, needless squander. 2. Failure to take advantage of or to use for profit 3. Loss or devastation. 4a. A useless or worthless by-product. 4b. Something, as steam, that escapes without being used. 5. Garbage; trash.

*Waste stream* - The total waste material output of a community, region, facility, private residence, etc.

### 3. Identifying the Industries

The website for “Recycler’s World” lists the following general categories of recycling and some of the specific items that fall into each category:

Automotive Recycling: used vehicles, used vehicle parts, automotive cores/rebuilding, auto-wrecking services

Battery Recycling: lead/acid batteries, nickel/cadmium batteries

Computer Recycling: used computer items, used computer cartridges, computer scrap and dismantling

Iron & Steel Recycling: used and reusable iron and steel (not scrap), scrap iron and steel, ship breaking and railroad scrap

Non-Ferrous Metal

Recycling:	scrap copper, brass, bronze, aluminum, zinc, magnesium, tin, lead; non –scrap above metals
Precious Metals Recycling:	gold, silver, platinum mixed
Exotic Metals Recycling:	nickel, cobalt, stainless steel alloys, mercury, titanium, tungsten, other
Plastics Recycling:	PET, HDPE, vinyl, LDPE, PP Polypropylene, PS Polystyrene, other plastics (polycarbonate, acrylic, ABS, mixed); products made from recycled plastics (plastic lumber); polyester, & polyester fiber; nylon & nylon fiber; polyurethane foam
Tire & Rubber Recycling:	scrap tire, used tire, retreat tires and casings, tire parts, shredded tires, non-tire rubber, granulated rubber, tubes and flaps, products made from recycled rubber, tire pyrolysis
Paper Recycling:	used (reusable) paper, loose waste paper, baled waste paper, paper services, products made of recycled paper
Wood Recycling:	wooden pallets, waste wood, used/reusable lumber and wood, wood fuels; wood chips, shavings, sawdust; products made of recycled wood
Textile & Leather Recycling:	cotton; wool; burlap, jute & sisal; polyurethane foam; polyester & polyester fiber; nylon & nylon fiber; other synthetic fiber; carpet fiber; rags & wipers; used & recycled bags; used clothing; used footwear; leather
Glass & Fiberglass Recycling:	glass, windshields, CRTs, fluorescent lights, fiberglass
Mineral Recycling:	aggregates (brick, block, stone, etc.); asphalt & tar; carbon/graphite & silicon; gypsum & drywall; lime & calcium; refractories & abrasives; salt recovery; other minerals
Liquids, Oils/Chemicals:	oils & petrochemicals; pigment, paint & ink; solvents; acid; coolants & refrigerants; soap & detergents; gasses & compressed gas; other chemicals

Composting & Food Waste Recycling:	home composting; central composting; rendering & protein wastes, processed/packaged food wastes
Multi-material Recycling:	Curbside separation; wet/dry recycling, drop-off recycling depots, buyback depots, central resource recovery; other multi-material recycling <sup>4</sup>

Again, if the components of the above categories are examined closely, it obvious how easily the distinctions between recycling and remanufacturing become blurred.

## **B. Remanufacturing**

### 1. Defining the process

The GRN glossary defines remanufacturing as “the process of disassembly and reassembly of products during which time parts are cleaned, repaired or replaced.”

For its most basic description, the Remanufacturing Industries Council International (RICI) describes remanufacturing similarly, with only a slight difference, as “the process of disassembly of products during which time parts are cleaned, repaired, or replaced, then reassembled to sound working condition.” However, RICI prefers to emphasize a more detailed definition that clarifies several aspects of their concept of remanufacturing:

A product is considered remanufactured if:

- Its primary components come from a used product.
- The used product is dismantled to the extent necessary to determine the condition of its components.
- The used product's components are thoroughly cleaned and made free from rust and corrosion.
- All missing, defective, broken or substantially worn parts are either restored to sound, functionally good condition, or they are replaced with new, remanufactured, or sound, functionally good used parts.
- To put the product in sound working condition, such machining, rewinding, refinishing or other operations are performed as necessary.

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<sup>4</sup> Recycler’s World, <http://www.recycle.net/>

- The product is reassembled and a determination is made that it will operate like a similar new product.

According to the RICI, there are other terms that are sometimes used in the manner they intend for “remanufacturing”: “‘Rebuilt’ is synonymous with remanufacturing when used in connection with motor vehicle parts and systems but not the entire vehicle. ‘Recharged’ is synonymous with remanufacturing when used in connection with imaging products, such as laser toner cartridges.”

The RICI emphasizes that the process utilized is the most important factor to be appraised in order to assess accurately whether an item is genuinely remanufactured. In addition, the differences between remanufacturing and other processes are detailed:

Remanufacturing is *not*

- |                                     |  |
|-------------------------------------|--|
| <i>Recycled.</i>                    | A "recycled" product may very well meet the minimum remanufacturing requirements, and many legitimate remanufacturers use this term to describe their product. However, many times a recycled product may be, as in the automotive sector, removed from a scrap vehicle and resold with little or no work performed on it. Some recycled products are superficially cleaned, boxed and sold. Thus, <i>recycled</i> would not be considered manufactured and its reliability is questionable. |
| <i>Repaired.</i>                    | Essentially this means that the product has had enough work done to it to make it operational again, but ... a holistic root cause analysis is generally not performed in the repair process, which means the product may not perform like a new product.  |
| <i>Restored/<br/>Reconditioned.</i> | generally applied to antique or classic goods.   |
| <i>Used.</i>                        | Generally, this is a product that has been subjected to previous use and is not new. Nothing has been done to repair it or correct any problems it may have. Therefore, its useful life is unknown.  |

The RICI focuses particularly on the distinctions between remanufacturing and recycling, describing their pursuits as “the ultimate form of recycling.” “Remanufacturing differs from recycling because remanufacturing 'recycles' the value originally added to the raw material. Remanufacturing differs also because it makes a much greater economic contribution per unit of product than does recycling. The essential difference arises in the recapture of value added. Recycling destroys the value added because it reduces a product to its elemental value, its recoverable raw material constituents.”

2. Identifying the industries

There are hundreds of distinct products that comprise the remanufacturing industry. A shortened list includes the following:

motor vehicle parts	office furniture	compressors
electrical apparatus	vending machines	photocopiers
laser toner cartridges	data communication equipment	gaming machines
musical instruments	bakery equipment	aircraft parts

Utilizing the GRN definition of recycling and the RICI's definition of remanufacturing, the survey and resulting report have operated on an inclusive basis in the products which are produced in the Hawai'i market.

## RESOURCES FOR FUNDING BUSINESS ENTERPRISES

A common obstacle to the growth and increase of recycling businesses is funding and financial support. Grants and loans are available nationwide for “social causes” or environmental businesses in need of financial support.

Electronic sources of grant information were sought. Those presented here are available at the University of Hawai`i’s Hamilton Library through their Foundation Center Cooperating Collection and the Internet. The search for funding resources has to be tailored to specific recipients. Determinate factors include whether the recipient is an individual or an organization. If organization, are they private or government affiliated? Other determinants are where they will be located and how the funds would be used.

Electronic Sources for Grant Information at Hamilton Library:

### CD-ROMS

FC-Search profiles 45,000 U.S. foundations and corporate givers and includes descriptions of nearly 200,000 associated grants. FC-Search is produced by the Foundation Center in New York City. This resource is user friendly yet allows for sophisticated searching. You can mark, customize your output format, print or download records. The user manual contains a variety of sample searches you can use to model your own search strategy. Ask for the CD and manual at the CIS/BHSD reference desk.

Chronicle Guide to Grants is a product of the publishers of the Chronicle of Higher Education and the Chronicle of Philanthropy. Over 10,000 foundation and corporate grants of \$10,000 or more previously listed in those two publications are covered. It is searchable by state, foundation, topic, amount and recipient. Records can be marked, printed and downloaded. Ask for CD and manual at the CIS/BHSD reference desk.

### UH Library Web Pages Access

Community of Science Funding Opportunities: don't be put off by the Science label, this database contains information about almost all subjects. You can search the entire database or through specific academic disciplines. This international resource serves researchers in universities, government agencies, federal laboratories, foundations and professional societies. It is updated continually. One way to get to this is via Hamilton Library's Science and Technology home page-<http://www2.hawaii.edu/~sciref/welcome.html> then click on Funding Opportunities Web Page. The direct route is: <http://cos.gdb.org/repos/fund/> A valuable exercise is to search the types of awards that have been bestowed previously by searching the Community of Science’s *Small Business Innovation Research Awards* (<http://fundedresearch.cos.com/sbir/sbir-intro.html>). Many U.S. Government agencies award Small Business Innovation Research Awards (SBIR) to small U.S. companies in an effort to promote their growth and development. In effect, the SBIR program is the Federal Government’s venture capital investment program.

IRIS- Illinois Research Information Services- This database has records on over 7,000 funding possibilities in the sciences, social sciences, arts and humanities. Allows for both quick search and a fine-tuned search. Provides links to web sites of sponsoring agencies or to the actual announcement of the grant if it is available on the Internet. It is updated daily and has been in operation since 1979 as a service of the University of Illinois Library at Urbana-Champaign. UH's subscription to it is funded by the Office of Research Services. To reach the site go to the University of Hawai'i Libraries' Home Page--<http://www2.hawaii.edu/lib/>. Choose the heading Tools & Resources, go to Subjects & General Reference, then click on Funding Opportunities. IRIS is one of the choices. The direct URL is: <http://www.library.uiuc.edu/iris/>

Opportunities Web Page. The direct route is: <http://www.library.uiuc.edu/iris/>

The two web sites described above are subscription based and are restricted to work with hawaii.edu domains. Hamilton has five public web computers in our first floor reference area, but they are not connected to printers--you could e-mail your search results.

### UH CARL

Federal Domestic Assistance Catalog (Grants) is a description of approximately 1300 financial and non-financial programs, projects and services sponsored by federal government agencies. The database is updated annually and is available from the UHCARL Public access Catalog (PAC) Main Menu. Choose #9 Other Information Sources and then choose #55 Federal Domestic Assistance Catalog. Word or name searches can be done.

### Additional Web Sites To Explore

Federal Information Exchange (FEDIX). Grants and RFP notices of selected federal agencies are available here.

<http://web.fie.com/>

Foundation Center. Check out "Online Library" and "Grantmaker Information". Called the premier online source of information on fundraising and the philanthropic community.

<http://fdncenter.org>

Grants And Related Resources. This is a useful site of links and "how-to-do-it" papers set up by a librarian at Michigan State University Libraries.

<http://www.lib.msu.edu/harris23/grants/grants.htm>

National Endowment for the Humanities. Click on "Applying for a Grant" heading.

<http://www.neh.fed.us/>

NETSource. Link to selected sites for prospect research on the web compiled by the University of Southern California Development Research Department.

<http://www.usc.edu/source>

To locate additional online information for grants especially in specific subject areas, be sure to check out the latest print sources in Hamilton Library's Foundation Center Cooperating Collection located in the first floor reference area. Look for the shelves labeled "TOPICAL". Many of the newest editions suggest electronic resources to consult in gathering data. One general guide to browse through follows:

Guide to Funding Databases & Resources On-Line by Patricia Hamilton Reed. Arlington, VA: Government Information Services. 1995. 57pp.  
HMLT REF HG 177.5 .U6 R44 1995

One of the web pages provided specific funding groups. *Sources of Capital for the Recycling Industry* (<http://grn.com/library/capital.htm>), allows geographic region specific searches in addition to a reference library. Of the five pages of groups which fund recycling industries, the most relevant were:

EnviroCapital Management Inc.  
2540 Boul. Daniel Johnson, #910  
Laval, PQ H7T 2S3  
Tel. 1-515-687-2040, Fax. 1-514-687-9283  
Contact: Raymond Brouzes, Vice President

Technical and management support, extensive international networks, and strategic alliances with other venture funds in North America and Europe make this company a solid source of leads, information, and capital. It invites in environmental technology companies with a preference in Quebec. Fields of interest: recovery and treatment of gaseous and liquid emissions, waste management, recovery, and recycling; research and development; clean technologies; and technology transfer.

Investors' Circle  
3220 Sacramento Street  
San Francisco, CA 94115-2007  
Tel. 1-415-929-4910, Fax. 1-415-929-4915  
Contact: Dhyana Bohnet

Non-profit membership network includes private investor's in sustainable development. A socially responsible company raising private capital may submit a two page executive summary to the Circle's 140 members (cost \$300). These companies may be considered for presentation at the Social Venture Capital Fair. Consideration given for investments including energy efficiency, environmental, recycling. Deals range from \$100,000 to tens of millions.

Technology Capital Network at MIT  
201 Vasser Street, Building W59  
Cambridge, MA 02139  
Tel. 1-617-253-7163, Fax. 1-617-258-7264  
Contact: Neil Rodberg, Director of Operations

A nonprofit program that introduces start-up and growth companies to potential investors through a confidential, computerized matching service. Initial Submission for database: application, two-page summary of business plan, one page summary of financial plan.

The EPA's *Jobs Through Recycling: JTR Annotated Resource Bibliography* is available on-line at [www.epa.gov/epaoswer/non-hw/recycle/jtr/thirds/resosource/biblio.htm](http://www.epa.gov/epaoswer/non-hw/recycle/jtr/thirds/resosource/biblio.htm). Financing Strategies is one of the seven sections in the bibliography. One of the sources listed:

*A Financing Guide for Recycling Businesses: Investment Forums, Meetings, and Networks* 1996, 74 pp., Free. Available through RCRA Hotline Phone: 800-424-9346 or the homepage: <http://www.epa.gov/epaoswer/non-hw/recycle/finguide/>.

This publication discusses the planning and financing strategies that go into running a recycling business. In addition, it describes what recycling investment forums are and how to get the most out of them. Finally, it provides a directory of investment forums, meetings, networks, and association, as well as financing programs. KirkWorks prepared the document under a grant from the National Recycling Coalition.

Appendix I contains the search results utilizing “recycling or remanufacturing,” and “recycle” for granting sources in DIALOG.

## SURVEY METHODOLOGY

The Hawai`i SBDC Network survey of the recycling industry was conducted in November and December 1997. Its purpose was to gather information about companies active in the recycling or remanufacturing industries in Hawai`i. A company active in the industry was defined as one that would include “recycling” or “remanufacturing” as part of its mission statement.

The initial list of 120 companies was created from:

- 1) Clean Hawai`i Center’s “Buy Recycled in Hawai`i” pamphlet;
- 2) The State of Hawai`i Department of Health’s “Environmental Services in Hawai`i” booklet; and
- 3) Newspaper searches and yellow pages listings of waste reduction/disposal/recycling services, recycling and scrap categories.

Toxic and hazardous waste handlers were not included as these companies are considered beyond the scope of this report.

Our first contact with these companies was a letter requesting their participation in the Hawai`i SBDC Network survey. Then we made up to three attempts at a telephone interview during November 1997. Many companies had ceased operating, or were only very marginally involved in recycling or remanufacturing. For example, a dry cleaning company was listed as a recycler because they were willing to take used coat hangers and plastic covers from their customers. We also excluded consultants, architects, and some retail stores because they did not consider themselves in recycling or remanufacturing, nor could they estimate the portion of their resources allocated to recycling or remanufacturing efforts.

We contacted 94 companies. Eight declined participation. Of the remaining 86 companies, only 57 provided relevant information. After excluding inactive businesses, we were left with 42 interviewed companies.

We augmented this information with additional data from secondary sources selected for their accuracy and extensive coverage. Employee and sales data from Dun & Bradstreet and American Business Information supplemented the interview data. Since both sources expressed employee and sales data in ranges, we used the midpoint of these ranges. This probably results in overestimation of sales and employees for smaller companies. Twenty-two companies could be included in the database by using secondary sources.

In the end, we identified some 64 companies for which recycling or remanufacturing was a current part of their operations. Only 27 of them specialized or were primarily involved in recycling and/or remanufacturing. Gross sales estimates for 24 of these companies were approximately \$32 million, about 58% of the approximately \$54 million in total gross sales of companies that had recycling or remanufacturing as a primary or major portion of their business. However this \$54 million in gross sales also includes revenues from activities other than recycling or remanufacturing. Eleven companies were involved in recycling as a major, but not primary, portion of their business. Nineteen companies were only marginally involved in recycling and we

found none marginally involved in remanufacturing. We did not have enough information on the remaining companies to classify them.

We were able to interview 16 of the 27 companies that were primarily involved in recycling/remanufacturing. Seven of the eight scrap metal wholesalers declined our interviews, however we were able to obtain sales data for all but one from secondary sources. Their revenue totaled \$16 million or 53% of the gross sales revenues of approximately \$54 million earned by the 24 primary recyclers and/or remanufacturers. This represents the largest single segment of recyclers and/or remanufacturers in terms of sales. Two of the primarily recycling and/or remanufacturing companies also operated on the wholesale level. The nine largest companies accounted for 80% of the total gross sales revenue for this group, with about \$7 million in gross sales revenue generated by the smaller 15 companies.

We are only confident about the recycling and/or remanufacturing sales data showing revenues of \$32 million for the 24 companies primarily involved in the recycling and/or remanufacturing industry. The other \$22 million total sales for the companies involved in recycling as a major portion of their business cannot all be attributed to recycling. It includes activities like collection of garbage or recyclable materials, rather than the sale of recyclables after collection or processing.

Most companies interviewed had not accounted specifically for their labor and capital investment in recycling and/or remanufacturing. It is too difficult for small businesses that are not subsidiaries of large companies to keep records in this manner. Therefore, it is very difficult to make reliable estimates about small business recycling and/or remanufacturing activities based on our survey.

Using SIC codes to identify companies and determine their overall revenues greatly exaggerates the size of the recycling and/or remanufacturing industries because sales from both recycling/remanufacturing and non-recycling/remanufacturing are combined. This probably explains the difference in remanufacturing industry size in Professor Lund's study. A helpful approach might be to use anecdotal information to determine industry changes since the recycling and/or remanufacturing industries are so small in Hawai'i. Most companies interviewed were cooperative and willing to provide information and discussion about their industry.