US Virgin Islands
Integrated Solid Waste Strategy
(Sustainable Materials Management)

IMPLEMENTATION OPTIONS: OVERVIEW

April 25, 2011

PROCESS SUMMARY: DEVELOPMENT OF OPTIONS

The integrated solid waste management options outlined in this document were formulated as a result of an intensive and collaborative citizen participation process started in the spring of 2010 through the Virgin Islands Recycling Partnership (VIRP). The overall goal of this process is to develop a Sustainable Materials Management (SMM) program for the Virgin Islands, one that will help solve the solid waste crisis, but that will also work to improve the economy of the islands (see Appendices A and B for more information about the VIRP and SMM).

The VIRP was formed by the US Environmental Protection Agency's (EPA) Regional Administrator, Judith Enck, and has been facilitated by Mark Lichtenstein, Principal Investigator of the Environmental Finance Center (EFC), located at Syracuse University. The Syracuse EFC is independent from the US EPA; but since 1993, it has been charged with serving governments, communities, organizations, and citizens of EPA's Region 2, which includes the US Virgin Islands. Lichtenstein also serves as President of the National Recycling Coalition, Inc., is an experienced solid waste management and recycling practitioner, and has extensive citizen participation and facilitation expertise. He compiled this document.

This report has not been vetted by VIRP, but does represent at its core a summary of options generated from VIRP dialogue that occurred at a number of meetings since May 2010. It also reflects Lichtenstein's independent analysis, and perspectives he formulated as a result of a number of site visits to St. Croix, St. John, and St. Thomas. These perspectives were generated through general observations, but also – and more importantly – through numerous discussions he had with native and "recently settled" Virgin Islanders, as well as visitors. This included shopkeepers, college students, taxi-drivers, government officials, on-island technical experts, members of local academic institutions, secondary school children, tourists, tour guides, contractors, and many others. It also includes the input and work products of many others, including:

- EPA officials from the Region 2 office in New York, as well as the EPA in Washington, DC
- Staff members from The Institute for Local Self Reliance (Washington, DC)
- Interns and staff members at the EFC
- Citizens, businesses, community and environmental groups, academic representatives, and waste management officials from St. Croix, St. John, and St. Thomas

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CONTENTS

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SUMMARY OF INTEGRATED SUSTAINABLE MATERIALS MANAGEMENT GOALS

Goal 1: Mandate Specific Materials for Reuse, Recycling & Composting

Goal 2: Develop Markets for Recycling

Goal 3: Reduce Waste through Progressive Source Reduction Initiatives

Goal 4: Address Financial Barriers through New Revenue Models

Goal 5: Influence Behaviors through Comprehensive Education Programs

Goal 6: Enhance Implementation & Infrastructure Development

Goal 7: Integrate and Expand Current Planning & Citizen Participation

SPECIFIC OPTIONS AND ASSOCIATED STRATEGIES

Goal 1: Mandate Specific Materials for Reuse, Recycling & Composting

1.1 Enact a Comprehensive Source Separation Law (with Associated Landfill Ban)[1]

1.1.1 Include at the minimum the following materials:

- Yard Waste
- Food Waste from Commercial and Institutional Sources
- Aluminum, Glass, Plastic and Steel Containers (combined with market identification)
- Newspaper, Magazines, Cardboard, Aseptic Containers, Writing Paper (combined with market identification)
- Tires
- Clean Construction and Demolition Wood
- Uncontaminated Dirt and Soil

[1] Based on a "highest and best use" analysis of each commodity.

- Uncontaminated Asphalt, Concrete and Masonry
- Steel/Metal Appliances
- Electronic Waste (E-waste – old computers, TVs, cell phones, etc.)
- Household Hazardous Waste, Paints, and "Sharps"

1.2 Immediately Target "Low-Hanging Fruit"[2]

1.2.1 Compost yard waste and food waste[3] at central locations on all three islands.
1.2.2 Require participation in the food composting program in order to get operating permits.[4]
1.2.3 Facilitate cooperative food waste composting programs.[5]
1.2.4 Develop a home composting program (see education section below).
1.2.5 Implement a tire recycling program (see market development section below).

1.3 Develop Reuse and Repair Programs[6]

1.3.1 Encourage fix-it shops, reuse/repair businesses for appliances and furniture.
1.3.2 Establish new rules such that these products are segregated for repair enterprises.
1.3.3 Develop a materials exchange program.
1.3.4 Expand food banks.
1.3.5 Encourage the shipping industry to use reusable pallets.

Goal 2: Develop Markets for Recycling

2.1 Complete an Intensive Market Study

Follow a *market development strategy* (developed either by an economic development agency or other expert) that includes:

2.1.1 Identified options for on-island market development (first step).[7]

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[2] These are items that are homogenous, easy to identify, and that make up a substantial component of the waste stream.
[3] From commercial and institutional sources.
[4] This could accelerate the commercial food-waste composting program (such as the Atlanta Zero Waste Zone).
[5] Products like the *Bio-Bin* allow for inexpensive and efficient commercial composting – one bin can serve several restaurants.
[6] See Appendix C for more information.
[7] This includes an understanding of existing island businesses that could transform operations to accommodate recycling feedstock; for instance, glass, many organics, and C&D materials should stay "on island".

2.1.2 Exploration of cooperative market development as a way to harness the economic pull of materials and to attract local and "islands-wide" investment by the private sector (second step).[8]
2.1.3 Development and reveal of non-traditional/"invisible" markets ("cottage industries") for particular materials, and replication throughout the VI (third step).
2.1.4 Analysis and development of export options (last step).[9]
2.1.5 VI Waste Management has the authority to procure RFPs for services related to the first three items above and should do so (e.g. with compost operations, glass processor).

2.2 Investigate Legislative Options to Address Market Development Barriers

2.2.1 Particularly look at those relating to importing from and exporting to the States.
2.2.2 Investigate all option including legislation, executive orders, rules & regulations, and preferred bidder status.

2.3 Develop Unique Market Opportunities[10]

2.3.1 Acknowledge that glass, tires, and composted yard waste are valuable materials that do not have to be shipped off island.[11]
2.3.2 Engage in cooperative marketing of collected materials (as noted above).[12]

Goal 3: Reduce Waste through Progressive Source Reduction Initiatives

3.1 Directly Target Imports[13]

3.1.1 Create a *Governor's Task Force on Waste Reduction* to look at the problem of importing packaging and challenging materials, and to promote product stewardship.
3.1.2 Recognize that in order to be successful at source reduction, a priority will be to look "up-stream" at the production and packaging stages.[14]

[8] The product of this effort will be a cooperative marketing plan for the islands.
[9] Puerto Rico, Columbia, Mexico, Florida, etc.
[10] To address materials that pose particular challenges, such as organics, glass, sewer sludge, plastics, and tires (these items make up half the waste stream).
[11] See Appendix D for recycled glass, tires and compost uses.
[12] See Appendix E for examples.
[13] The intent is to reduce the import of excessive plastics, paper, and other packaging.
[14] Thus the need to work with the VI business sector, focusing on the point of entrance, where the VI could take advantage of the fact that many companies consider the VI an important market.

3.1.3 Partner with the Puerto Rico Recycling Partnership on issues such as Extended Producer Responsibility.
3.1.5 Mobilize industry and business take-back programs (e.g. computers and other E-waste).

3.2 Implement a Returnable Container Law ("Bottle Bill")[15]

3.2.1 Enhance existing container tax structure.
3.2.2 Promulgate new regulations and update legislation to fully implement a deposit for a combination of beverage and food containers.

3.3 Legislate Green Procurement[16]

3.3.1 Develop new VI legislation to address green procurement, tax/tariff on various goods, etc.
3.3.2 VI government should lead by example with new green procurement policies.[17]

3.4 Enact a Plastic Bag Law[18]

3.4.1 Phase-out the use of non-biodegradable plastic grocery bags.
3.4.2 Encourage use of reusable bags through a number of programs (such as the existing *Paradise Partners* program).

3.5 Require Sustainable Property Development and Building Practices

3.5.1 Encourage building "deconstruction" instead of demolition.
3.5.2 Offer contractor training to target reduced construction debris generation.
3.5.3 Provide incentives for targeted reductions of construction debris.

3.6 Provide *Service Opportunity Analysis* Assistance for Institutions and Businesses[19]

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[15] See Appendix F for examples of similar legislative initiatives elsewhere).
[16] Green procurement is the practice of purchasing products and services, taking into account environmental and health concerns – many green products are cost-effective and of equal or higher quality than regular products (see Appendix G for program examples).
[17] Many states offer price preferences for the purchase of items composed of recycled materials.
[18] See Appendix H for examples of similar legislative initiatives elsewhere.
[19] See Appendix I for more information about this comprehensive process for achieving major waste reduction targets in businesses and institutions.

Goal 4: Address Financial Barriers through New Revenue Models[20]

4.1 Share Current VI Solid Waste Management Financial Data[21]

4.2 Explore and Implement New Revenue Mechanisms[22]

Consider the following options:

- 4.2.1 A *RecycleBank* program
- 4.2.2 Tax credits and low interest loans (as well as permitting and end-product marketing assistance)
- 4.2.3 Solid waste service fees
- 4.2.4 Payback system for recyclable deliveries to a recycling drop-off location
- 4.2.5 Deposit on tires
- 4.2.6 "Bottle Bill" (as noted earlier)

4.3 Determine Average Household Monthly Costs for Recycling Services[23]

Goal 5: Influence Behaviors through Comprehensive Education Programs

5.1 Develop a Variety of Strategies[24]

- 5.1.1 Understand audiences, cultural dynamics, and the need for convenience.
- 5.1.2 Value culture and have programs reflect and preserve the local "way of life".
- 5.1.3 Make the business case for recycling, and then follow with the environmental case.
- 5.1.4 Support existing recycling/reuse businesses and other positive behaviors.
- 5.1.5 Develop ideas about how to articulate to the general population the vision of building a sustainable materials economy.
- 5.1.6 Create a working group to look at barriers (socio-economic, cultural, etc.) toward changing behavior, including how to engage groups at the community level.

5.2 Create Community Advisory Groups

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[20] See the section on Perceived Barriers later in this document.
[21] This will help guide the development of new financing structure.
[22] Described further in Appendix J.
[23] Then spread costs out over multiple years based on useful service lives of systems and processes.
[24] The purpose: change behaviors for a broad spectrum of people.

5.3 Hold a Series of Recycling, Composting and Sustainable Economic Development Workshops[25]

5.4 Invest More Funds into Education Programs

5.5 Encourage Back-yard Composting and Offer a Master Composting Program[26]

5.6 Identify and Inventory Existing Tools & Programs

Goal 6: Enhance Implementation & Infrastructure Development

6.1 Develop Public-Private Partnership Solutions as a Foundation to Infrastructure Development

6.2 Focus on Private Sector / Business Recycling[27]

6.3 Define Performance Metrics to be Sure New Systems are Operating Optimally

6.4 Redesign / Reengineer Drop-off Bin Sites[28]

6.5 Develop Infrastructure for Separated Trash, Recyclables, Organics, and Other Commodities[29]

- 6.5.1 Develop a Materials Recovery Facility (MRF) on each of the three islands.
- 6.5.2 Refine inter-island materials transportation systems.
- 6.5.3 Develop new organics and food waste collection systems and composting sites.
- 6.5.4 Design transfer facilities with recycling and composting in mind (expand these to "Resource Conservation Parks").

[25] In cooperation with UVI, chamber of commerce, and/or VIWM.
[26] See Appendix K for more information.
[27] The intent is to achieve major reductions rapidly, and this is a way to educate employees who are also residents. In addition, all businesses that do business with city should be required to recycle (Guaynabo, PR is an example of a community that does this).
[28] To improve health and safety, and to address costs, revenue and savings potential – see Appendix K for more information.
[29] See Appendix K for more information.

6.5.5 Connect with cruise ship industry for assistance.
6.5.6 Develop facilities at major events.
6.5.7 Provide new household hazardous waste collection facilities.
6.5.8 Encourage creation of buy-back centers.

6.6 Use Land Leases for Infrastructure Siting

Goal 7: Integrate and Expand Current Planning & Citizen Participation

7.1 Embark on an Integrated Sustainability Strategy for the Islands

7.1.1 Develop a master sustainability / resiliency plan for the VI.[30]

7.1.2 Include sustainable materials management, waste management, energy development, and sustainable economic development as part of the plan.

7.2 Expand and Empower VIRP

7.2.1 Strive for more inclusion.[31]
7.2.2 Open-up the review process for the overall VI Solid Waste Management Plan and current plans for tires, transfer stations, etc.
7.2.3 VIRP should review current solid waste and recycling financial data.
7.2.4 Empower and engage existing VIRP working groups/committees (e.g. Composting, Education, and Glass).
7.2.5 Develop a solid and clearly understood vision (a smaller task force should work on this challenge).

PRIORITY IMPLEMENTATION STEPS AND TIMING

An outline of a project management implementation action-plan needs to be developed that positions options in three stages: Immediate, Mid-term, and Longer-term. Table 1 is but one rudimentary example.

[30] Consider broader elements of sustainability and resiliency, but avoid getting bogged-down on this planning effort.
[31] Involve more citizens, the hospitality and tourism industry, other agencies, and other industries and businesses, as they all will be key elements to meeting the broad goals defined.

Implementation Staging	
Steps	Option (examples only)
Immediate	Develop centralized composting facilities.
	Provide intensive education for voluntary organics separation.
	Start process for Source Separation Law, Bottle Bill Implementation, Plastic Bag and other legislation (comprehensive law).
	Perform detailed examination of current fiscal structures and cost-centers for redirect and efficiency analysis.
	Etc.
Mid-term	"
	"
Longer-term	"
	"

PERCEIVED BARRIERS

Perceived Barrier 1: "The VI needs energy, but it is likely that the current energy development plan will limit sustainable materials management options. Aggressive reduction, reuse, recycling and composting are not compatible with the current plans for waste-to-energy."

This perceived barrier looks to be valid.

It is clearly understood that there are at least two major challenges occurring at the same time – that "on-island" waste management and energy development issues are intrinsically linked and intertwined in a manner that makes it extremely difficult to address the waste management issue in isolation. However, when designing the most effective solid waste management program possible, each component of the waste stream needs to be analyzed for its reduction, reuse, recycling and composting potential first and foremost before other options are explored, such as energy development and landfilling. This is a true "highest and best use" analysis.

An analysis of the components, tonnages, and volume of material available in the waste stream, and the market development opportunities explored in this document, speak to the potential of major diversion through reduction, reuse, recycling and composting, such that materials (discards) available for waste-to-energy should be insufficient.

The current plan for waste-to-energy includes development of an approximate 16.5MW facility. Consider the following regarding this issue:

- Municipal solid waste – including refused derived fuel – is not an optimal source of energy from a cost per BTU standpoint (including externalities in the cost-benefit analysis).
- Waste-to-energy is not the most effective method available for access to energy on the islands.
- A 16.5MW facility is roughly equivalent to eight to 12 wind turbines (for sake of production capacity comparison only, not looking at issues of dispatchable power).
- There are likely more effective integrated energy options that the islands could explore that include options for both baseload and dispatchable power, including addressing issues such as load and peak matching, and energy storage.
- There remain environmental and public health issues to be explored regarding the waste-to-energy facility.
- As depicted in this document, and from the results of numerous programs in other locations, the associated benefits of development of a comprehensive reduction, reuse, recycling and composting program outweigh the perceived benefits from current energy development plans.
- There is not enough waste on the islands for both aggressive sustainable materials management (which first includes reducing that waste) and waste-to-energy.

As noted in a recent report from a number of VI environmental and community groups:

> "As we evaluate solutions for managing our solid wastes in the Virgin Islands, meeting our energy supply needs and cultivating renewable energy supplies, a number of very relevant facts are important to keep in mind. There has been the tendency to assume that the most efficient way to solve our solid waste and ominous energy situations is to combine the two to attempt to produce energy from trash. The reality is that cost-effective and environmentally responsible solutions to our waste management problems and challenges aren't necessarily the same solutions we need for developing the most reliable, affordable and renewable energy supplies. [In addition,] recycling and composting operations will also contribute to local jobs, as well as generate revenues that help offset those operational costs. We must forge ahead as fast as we can toward recycling and composting all of the wastes we possibly can, along with adopting waste reduction practices into and within the territory."[32]

Recent media accounts in the Virgin Islands mentioning that "green waste" and other materials better targeted for reduction, reuse, recycling and/or composting could augment a

[32] From an unpublished report of Virgin Islands environmental/community groups forwarded to VIRP.

waste-to-energy facility depict a management strategy that is not focused on working to develop the highest and best use for all components of the waste stream.

Perceived Barrier 2: "Mandatory recycling and materials separation cannot happen before markets are identified: 'We have no markets, so we can't recycle'!"

Materials like compost and glass cullet can be marketed on the islands. In these two examples (as depicted in Appendix D), there are a number of fallback options for stockpiles of crushed glass and finished compost. However, as exemplified by numerous programs elsewhere, markets do not need to exist prior to the availability of a steady flow of a variety of materials, but rather, once the product is readily available, experience shows that individuals and businesses begin to count on its availability as a resource, and begin to use it. For many recycling commodities, the following adage is valid: "If you build it, they will come!"

Perceived Barrier 3: "Recycling markets are cyclical (or non-existent!). When the markets are up, opportunists come out of the woodwork and others set unrealistic expectations about what can be recycled. But, when the markets drop, the bottom falls out from under recycling programs!"

For some commodities, current pricing is very good, for others, prices are low. In addition, it is acknowledged that the cost to do business in the Virgin Islands is higher than other locations (related to Gross Receipts Taxes, high energy and transportation, etc.). Historically, it has been apparent in the scrap metal business on the islands that opportunists have come and gone, thus hurting legitimate businesses and circumventing the system. What is not needed are "one-timers", but rather, the islands need to develop a sustainable system.[33]

The ebbs and flows of recycling market prices and the unique challenges of the islands are acknowledged, but with a well designed sustainable materials management program as outlined in this document, all these challenges can be overcome. The key is to implement the program in a comprehensive and integrated fashion, with the full weight and support of the Virgin Islands government behind numerous efforts – from legislative and market development initiatives, to education, financing, and infrastructure development solutions.

[33] Summarized from comments of Virgin Islands recycler and resident Kevin Ruffler.

Perceived Barrier 4: "Mandatory recycling and materials separation cannot happen before people are fully educated: 'Without comprehensive education programs and obvious outreach successes, we can't recycle!'"

Again, as shown by numerous programs elsewhere, source separation and recycling can start while education program rollout.

Perceived Barrier 5: "People on the VI don't currently pay for solid waste disposal, so new fee structures cannot be implemented."

One could ask how individuals in the VI transition from not paying for solid waste management, and from relying upon an environmentally un-sustainable and damaging approach, to one that's responsible and sustainable and still able to pay for itself. Options to help address that question were explored earlier in this document, but inherent in the question is the fact that while individuals might not currently see a direct bill for solid waste charges, the cost to them and to the VI is immeasurable considering the current methods employed to deal with solid waste disposal. These costs are reflected in stressed ecosystems, poor air quality around the landfills, risks to the tourism-based economy, potential health impacts, and threats to a valuable VI way of life and unique island culture. The list goes on. In sum, the current costs for solid waste management are very high.

Perceived Barrier 6: "Regulation, education, and enforcement alone will provide for a stable recycling program. No new financial structures need to be put in place."

The VI government needs to target real barriers to increasing recycling rates by incentivizing programs and implementing new financial mechanisms. As noted earlier, this includes looking at "pay as you throw" (PAYT) programs, container deposits, mechanisms to increase access to capital for start-up and maintenance of new programs and companies, other revenue options (e.g. there needs to be a reasonable / workable fee structure), and an analysis of the current cost centers for potential redirect of resources.

Perceived Barrier 7: "Recycling is not possible because of increased costs."

Many, if not all, of the program options noted are approximately the same cost as current solid waste management practices, and could be less expensive than the capital and operating costs of a waste-to-energy facility. This document is based on the valid premise that the VI can reach major waste diversion targets (from landfills or waste-to-energy facilities) through a combination of laws, regulations, incentives, procurement policies, and education, enforcement, reuse and repair, recycling, and composting programs. The overall program should be based on the principles of keeping as much material, and as many products on the islands as possible.

Perceived Barrier 8: "The VI is different than the mainland, so high diversion rates through reuse, reduction, recycling and composting can't be done on the islands."

As noted already, indeed, the islands have unique characteristics and challenges. However, recycling programs can and do work in communities of all types, including low-income areas, self-contained areas (like islands), the agriculture sector, small businesses, and others. VIRP acknowledged that the VI can learn from models from around the country and world, but also understands that there are infrastructure and collection and processing challenges related to recycling on the islands, such as topography, transportation costs, limited fresh water, etc. VIRP believes that all of these can be overcome.

Considering the population, number of households, and industrial and business activities, the VI's waste characterization is comparable to US averages. Options in the VI immediately support glass, organics, construction and demolition (C&D) debris, and potentially other materials staying on the islands where they are generated. Curbside pick-up is feasible in a number of communities in the VI (e.g. various locations on St. Croix), but some form of continued roadside drop-off stations / roll-off bins for waste, coupled with recycling and composting drop-off facilities, would be optimal. However, if everything is done exactly like programs in the continental US, there indeed could be program implementation challenges. It is feasible to adjust best practices generated elsewhere for the VI.

Perceived Barrier 9: "Source separation can be replaced by materials separation at final disposal facilities."

A sustainable materials management program in the VI should be built on the foundational premise that successful recycling needs to based on source separation, and not on picking out materials later. Lessons learned in countless other communities across the globe point to the fact that recycling works if it is given priority over other management methods (like landfilling and waste-to-energy). Also, it is important to note that in these successful communities, there is a very high level of commitment by the government. In addition, materials that are mixed at the curb generally have higher rates of contamination, and thus, more residue is created, and the value of the material is diminished.

Perceived Barrier 10: "A lack of basic infrastructure makes it impossible to implement a comprehensive recycling program."

It is acknowledged that the lack of basic infrastructure on the VI indeed makes it challenging to move sustainable materials management forward (e.g. the lack of local government revenue collection and management systems). Implementation of many of the options in this document will help to alleviate this challenge.

Perceived Barrier 11: "A lack of trust among key parties makes it impossible to establish holistic sustainable materials management programs in the VI."

Again, it is acknowledged that there has been an historic, chronic and systemic erosion of trust among a number of key parties in the Virgin Islands and this has severely hampered program development. Through open and transparent engagement of citizens, continued employment of a collaborative problem-solving process, and immediate gains with new program implementation, trust can be reestablished.

Perceived Barrier 12: "The topography of the islands makes it impossible to implement curbside collection programs."

While it is true that the steep grades, hairpin turns, lack of roadside shoulders, blind driveways and intersections, and narrow roads add a level of complexity, it does not negate all curbside options. This is particularly true considering that some areas currently have curbside waste pick-up. In addition, there are some very large expanses of land (and associated roads) – particularly on St. Croix – that are relatively level, accessible and amenable for curbside collection programs.

Perceived Barrier 13: "The islands are too hilly, and the land too valuable: 'There is no land for building compost sites and other similar facilities!'"

Numerous plots of "flat" land exist for the footprint needed for compost / recycling facilities of the type needed on the islands. These include sites near the Bovoni Landfill on St. Thomas, numerous locations in the southeast of St. Croix, and other areas in St. Thomas, like Tutu.

Perceived Barrier 14: "There are existing problems with pervasive littering and other associated individual behaviors; so, how does the VI embark on a major behavior change such as asking people to separate and transport their recyclables?"

Indeed, littering and associated "less than desirable" environmental stewardship behaviors are evident; however, similar attitudes have been overcome in many other communities. In addition, as a result of numerous interactions with many Virgin Islanders over the last year, there is great faith in the positive attitude and obvious willingness to "do their part" to help with this challenge. There is great awareness about the problem, and many people of all walks of life, and of great character and energy, are ready to step up to the plate. Also, asking people to recycle helps make them think about the value of the material.

Perceived Barrier 15: "Many people are challenged with simply making do – with living day-to-day – and thus, it will be very hard to encourage participation in something like separating trash."

The examples of diverse communities far-and-wide that have achieved great recycling successes are numerous. From phenomenal inner-city programs in Chicago and the South Bronx, and rural, conservative, and impoverished communities in Upstate New York, to the Martin Pena neighborhood in San Juan, countless people have rallied around the need to manage waste differently. In fact, recycling programs have created a sense of pride, hope, and community-building in these and other areas. The same can happen on the VI.

Perceived Barrier 16: "Supporting recycling programs through new fees is not sustainable in a community with economic challenges."

New financial mechanisms, including potential new revenue programs, are explored in detail in this document. However, the most important – and viable – exercise in this regard is to analyze the existing funding structure for solid waste management looking for efficiencies and cost/revenue-center shifts. In addition, thinking about numerous waste components in a new way – as commodities rather than waste – will help the VI get to a place where eventually revenue can be generated from these new materials. Many programs explored in this document can be done with minimal budget impact.

Perceived Barrier 17: "'Highest and Best Use' means different things."

A valid "highest and best use" analysis starts with analyzing each component of the waste stream for its capability for reduction, reuse, recycling and composting – in that order. It does not first look at the components for their capability to generate energy. However, it is important to understand the carbon footprint and other environmental considerations for a variety of recycling options, and this should help guide decisions about what products to target for waste reduction, and what local markets can be developed.

APPENDIX A: US VIRGIN ISLANDS RECYCLING PARTNERSHIP (VIRP)

VIRP Objective

Finalize a detailed action plan / set of recommendations intended to increase waste reduction, reuse, recycling, and composting on the US Virgin Islands.

VIRP Charge

The VIRP was established by the US EPA to promote waste reduction, reuse, recycling and clean composting through a working partnership including government (at all levels), non-profit organizations, citizens, environmental groups, and the private sector.

VIRP Mode of Operation (Rules of Engagement):

The VIRP uses a distinctive Collaborative Governance / Problem Solving process to lead the activities of the Partnership. This is a "systems thinking" approach to problem-solving that takes into consideration diverse and complex relationships and associations, the unpredictability of complex systems, both the qualitative and quantitative nature of VIRP's challenge, and importantly, the emergence and transformative nature of major endeavors, such as that defined by VIRP's charge. The Collaborative Governance model is recognized as an optimum leadership and management tool best suited for facilitating and operating in multi-organizational arrangements. It is particularly useful to solve problems that cannot be solved, or solved easily, by single organizations. Where traditional administration historically relied primarily on hierarchical decision-making structures to shape administrative action, collaborative governance is more fluid, with a heavy emphasis on process over structure. It employs tools and competencies such as negotiation, facilitation, mediation, and collaborative problem solving. Some of its guiding principles include active involvement of all the key parties, balanced representation, effective stakeholder participation, and maintaining transparency in all deliberations. Some Collaborative Governance methods that will be employed by VIRP, as needed, include working groups, task forces, monitoring committees, process facilitation, advisory groups, and joint fact-finding.[34]

Agreed Upon Goals & Operating Principles

Overarching Program Goals:

- Manage solid waste while reducing harm to the environment.
- Dispose of waste in a cost feasible manner (considering external, environmental, and long-term costs in addition to "first", or capital costs).

[34] Adapted from the work of Dr. Rosemary O'Leary, *Syracuse University*.

- Develop locally-focused solutions (the leadership needed to address the challenges should be locally-driven).
- Identify the "highest and best use" for each component of the waste stream.
- Transform the solid waste crisis into an opportunity to build a sustainable materials economy in the VI.
- Create jobs on the islands.

VIRP Guiding Principles:

- Collaborative
- Inclusive
- Integrated
- Transparent
- Participative

VIRP Membership:

Open to anyone from the US Virgin Islands, as well as other subject matter professionals from outside the islands.

Addendum: Citizen's Criteria

The following select criteria have been developed by a coalition of concerned citizens and NGO members to serve as a basis for the planning and implementation of a comprehensive and integrated solid waste management program for the VI that will be environmentally sound, but that will also provide impetus to economic development initiatives beneficial to all. A sustainable and resilient long-term solid waste strategy for the VI must meet the following basic criteria:

- Compliance with federal regulations and laws
- Long-term cost-effectiveness and feasibility, including peripheral and external costs
- Long-term environmental protection and sustainability (including absence of harmful emissions or by-products)
- Minimum practicable reliance on off-shore solutions (e.g. barging of waste)
- Effective integration of a comprehensive recycling program
- Encourages development of local reuse and recycling markets to maximize VI economic development
- Established and reputable experience in accepted solid waste management operations for those administering technologies used in the VI's waste processing
- Technology transfer and education necessary for professional implementation of best resource management practices
- Full transparency of operations and operational costs by both the VI Waste Management Authority and any of its current or future private sector partners[35]

[35] From an unpublished report of Virgin Islands environmental/community groups forwarded to VIRP.

APPENDIX B: SUSTAINABLE MATERIALS MANAGEMENT (SMM)

Elements of Sustainable Materials Management (SMM) and a Sustainable Materials Economy

Hierarchy of "Highest and Best Use" SMM Options (in order of priority):

1. Waste prevention
2. Reuse
3. Composting of biodegradable material (e.g. yard and food waste)
4. Comprehensive recycling
5. Beneficial use/redirect

Goals of Virgin Islands SMM:

- Minimize waste generation
- Advance product and packaging stewardship
- Maximize reuse, organics recovery, composting and recycling
- Make decisions based on life-cycle analysis of materials
- Create jobs
- Re-emphasize importance of comprehensive local materials management
- Minimize need for residual waste
- Energize and engage all Virgin Islanders - government, industry, NGOs, and the public
- Strive for full public participation, fairness, and environmental justice
- Prioritize investment in reduction, reuse, recycling and composting over disposal
- Maximize efficiency in infrastructure development
- Foster technological innovation
- Ensure that waste management facilities are designed and operated in an environmentally sound manner

APPENDIX C: REUSE AND REPAIR PROGRAM NOTES[36]

Enterprise Development

Reuse and repair enterprises are the most labor intensive and well paying in the recycling and composting sector. Reusable and repairable products represent about 5% of the waste stream, but could return as much value as the remaining raw materials in the municipal waste stream; especially if markets are far away, as is the case of the VI. For instance, at St. Vincent de Paul in Eugene, Oregon, hundreds of jobs have been created from appliance, furniture, and mattress repair and refurbishing. They have demonstrated the feasibility of these programs and are available to work with local entrepreneurs to replicate these self-sustaining enterprises.

Repair and reuse enterprises can be started as new rules mandate that appliances, computers, etc. be banned from landfill disposal. New rules can establish that such products be segregated for repair enterprises (as is required in British Columbia, Canada under an Extended Producer Responsibility law – in this case, this provides a steady inventory to companies such as Gibson's Recycling Depot in that jurisdiction).

Materials Exchange Programs

A materials exchange program is where people and companies post what they need to dispose of and what they need to receive, be it a one time or a continuous offer/request, all with the overall plan to make matches (similar successful programs exist around the US).

Food Banks

An expanded food bank can be utilized as a major focus of primary organic resource management implementation. The goal is to "feed people, not landfills," and there are numerous examples of programs like this that redirect excess food to others.

[36] Much of this material produced by *The Institute for Local Self Reliance*, Washington, DC.

APPENDIX D: GLASS, TIRES, AND COMPOST MARKETING OPTIONS

Glass

Small glass companies ("cottage industries") are making objects of art from recycled glass – and this market should not be undervalued for potential expansion in the VI (Maho Bay is one example of this potential). Recycled glass objects from the VI could have great niche market potential. However, there are a number of potential larger-scale, "on-island" uses, including:

- "Glassphalt" paving applications (aggregate base, asphalt base, and asphalt surface courses)
- Aggregate for concrete ("glasscrete")
- Art glass
- Beach sand replenishment
- Bottle manufacturing
- Building foundations
- Clean fill/backfill for construction projects
- Decorative marbles (e.g. countertops)
- Drainage medium (choker grit, drain pipe bedding, backfill, drainage aggregate, onsite wastewater systems, drain-field beds and trenches, under drains, French drains, golf course green drainage, etc.)
- Embankment stabilization
- Filtering medium (swimming pool filter sand, wastewater treatment plant filter medium, onsite wastewater/septic systems filter sand, etc.)
- Glass/sludge tile
- "Glasscrete" architectural surfacing
- Golf course sand traps
- Hydroponics
- Industrial flooring and marbles
- Jewelry
- Landfill cover material
- Oil spill cleanup
- Road base
- Roof tiles
- Sandblasting material
- Sidewalks
- Sintered mosaic tile
- Solar heat storage
- Termite barrier
- Terrazzo (cement and aggregate)
- Utility bedding and backfill
- Vibratory-cast wall panels
- Weighted bags (for truck beds)

An important point is that for most of the applications above, a ready supply of crushed glass could be less expensive than local construction materials (aggregate, sand, soil, etc.), and would help preserve the limited amount of these materials on the VI. Other concepts to explore include encouraging the hotel and resort industry to help underwrite a glass crusher, the VI government helping to subsidize glass recycling, and coordination with the British Virgin Islands and even Puerto Rico.[37]

[37] A large portion of the material in this glass section was developed by Susan Parten, P.E.

Tires

Most states have passed legislation banning the landfilling of whole tires. Some states require that landfilled tires be cut into four to eight pieces, while others require that landfilled tires be chipped. Some states have banned the landfilling of scrap tires altogether, which is recommended for the VI. In addition, most states require tire retailers to collect a fee for every new tire sold. Fees range from $0.50 - $2.00 per tire, with the vast majority set at $1/tire. A few states charge the fee on new vehicle sales, vehicle title transfers, or vehicle registration instead. Exemptions are sometime offered for tires that can be reused. After keeping a portion of the fee, retailers give the remaining amount to the state's tire cleanup fund. Some states also stipulate that retailers must accept used tires in at least a 1:1 ratio to every new tire sold.

Tire cleanup funds are designated for a variety of purposes. Chief among them are:

- To fund the cleanup of abandoned tire piles/dump sites
- Establishing and/or subsidizing tire recycling programs and recycling companies

Some State Examples:

Hawaii. In Hawaii, motor vehicle tires cannot be disposed in the solid waste system. The Dept. of Health's Solid and Hazardous Waste Branch issues permits to authorized recyclers, preferring "higher ends of recycling" (e.g. feedstock for manufactured product, over land application). Hawaii tire recycling, especially for land application as ground cover, drain rock, or fertilizer, is often used as a guise to avoid disposal costs. Because tire shreds do not decompose like organic mulch, it does not need to be replaced, which could lead to market saturation of tire shred products. Eventually unsold product may need to be disposed of.

New York. New York established the Waste Tire Management and Recycling Fund, fed by a management and recycling fee of $2.50 per new tire sold, including tires on new motor vehicles. Tire services collect the fee from the purchaser at the time of the sale. The tire service keeps 25 cents per tire from fees collected. No monies from the waste tire management and recycling fund can be used to dispose of waste tires in a landfill unless the NYS Dept. of Environmental Conservation (DEC) has determined that it is not feasible to convert the waste tires to a beneficial use. It is also mandatory for tire service centers to accept used tires from customers. Customers may return tires in approximately the same size and in a quantity equal to the number of new tires purchased or installed.

Rhode Island. Since 1988, Rhode Island has required $5 deposits on all types of replacement vehicle tires. Customers can recover their deposits by returning old tires within 10 to 14 days after they purchase new tires. Their refund payments are limited to one tire for every tire purchased, and the refunds can be obtained only at the point-of-sale of the new tire. In addition to the deposit, Rhode Island – along with most other states – imposes product charges on tires to finance the cleanup of piles of old tires.

Market/Usage Example for the VI:

There are many engineering benefits of using chipped tires in place of, and in applications calling for a quarried aggregate (in addition to avoiding that amount of virgin quarrying activity). These include lighter weight material having to be moved and placed along hillsides (sometimes steep), and less compaction needed after placement, resulting in less sealing of soil infiltration surfaces where effluent needs to percolate into the ground. In addition, chipped tires would be suitable for replacing quarried aggregate for use in decentralized, or "onsite" wastewater systems. This includes use for subsurface dispersal field trenches. There have been credible studies done on the use of chipped tires for this type and other subsurface effluent dispersal methods, as well as other types of wastewater treatment system elements (e.g. media replacement and subsurface effluent dispersal trenches).

In the VI, the unfortunate reality is that almost no decentralized / onsite systems have proper drain-fields / dispersal systems. A common practice is to install a short run of pipe or hose to run from either just a septic tank or an energy intensive aerated tank unit over to a banana tree or cluster of bushes.

Approximately 10 tires (passenger) equate to one cubic yard. Residential wastewater system dispersal trenches would require around 60 tires. Commercial projects would need around 500 chipped tires. Virgin aggregate of the type needed for jobs like these on the VI costs around $35-45 per ton ($28-36 per cubic yard). One wouldn't charge by the ton for chipped tires used for aggregate; the charge would be done by volume. Because there is a certain amount of steel protruding from the chips, creating some added handling care and "hassle factor", it is possible for chips to be sold for $15-20 per cubic yard. Were the VI to adopt a set of sound decentralized wastewater rules, there could be an instant market for as many chipped tires as the territory and surrounding islands could provide.

This is just one example of an interconnected set of win-win situations relative to one single example of a recyclable material that could be prepared and marketed locally.

Other Potential Uses:

- Rubber from ground tires can be used as a binder to improve durability (California Asphalt Pavement Association).
- Porous asphalt can be made with rubber bitumen (but only for lighter volume traffic areas), and this will help with groundwater recharge and reduced stormwater flow and contamination.[38]

[38] Research for the information on state examples is courtesy of Evan Newell, and for the other uses, Elysa Smigielski, both from the *Environmental Finance Center at Syracuse University*. The specific, and detailed "on-island" example was developed by Susan Parten, P.E. (VIRP member).

Compost

Composted materials have many uses on the VI, including:

- Topping material for athletic fields, around the two airports, roadsides, etc. These are also areas that are in great need of "greening up", and could use periodic applications of soil amendment. Using composted product as a soil amendment would also avoid use of fertilizers, and their accompanying impacts on watersheds, and helps to retain water and reduce erosion. In general, the material is in high demand on St. Croix and St. Thomas for areas needing to establish vegetative cover for erosion control.
- General topsoil amendment (helping to address the limited access to topsoil on the islands).
- Retaining wall and other backfill material. Composted product could be mixed with pulverized glass to make an excellent backfill material. Compost could also be mixed and used for utility trench backfill. Since quarried ("manufactured") sand on St. Thomas costs about $42.5 per ton, there is a huge market potential for compost. As already noted, there is also a huge need for the installation of proper onsite wastewater drain-fields (trench or bed, but mostly trench due to terrain) in the VI, and it is often necessary to construct retaining walls to terrace out areas on sites to do that. This was done recently at a mountaintop residence on St. Thomas.[39]
- There are many applications at the numerous hotels and resorts on the islands.

[39] Most of this information on compost was produced by Susan Parten, P.E.

APPENDIX E: COOPERATIVE MARKETING

Communities and business can individually market the recyclable material they collect. Buyers, however, are usually most interested in large communities and businesses that generate relatively large quantities of material in a small geographic area. Buyers are often less enthusiastic about dealing with sparsely populated communities or small businesses because they typically spend more money on transportation and education of local program employees while receiving less material. Smaller communities and businesses can attract more secure markets by marketing their recyclables jointly through a cooperative marketing organization.

Master contracts or agreements can be developed between markets and the group of communities or business that form the cooperative organization. Cooperatives can also share education programs, transportation and storage. Organization staff saves participants' time and money by arranging contracts, handling bookkeeping duties and maintaining current information on markets. If a full-blown cooperative is not possible, it might still be beneficial for small communities and business to work together on cooperative storage, transportation and/or education.

One option for the VI (after exploiting all local market opportunities) is with Puerto Rico markets and deadhead container trips. This could reduce costs of marketing the materials. Materials that must leave the island for markets (plastic, paper, metals) can be shipped in deadhead loads on intermodal containers to ports in Puerto Rico or Jacksonville, Florida for marketing. The VI would establish marketing cooperative with brokers to insure volume prices for materials even if they are shipped separately from St. Croix and St. Thomas. This system could also accommodate materials from other Caribbean countries, which face similar pressures on landfilling.

Some Existing Programs:

Cooperative Teamwork and Recycling Assistance – Texas (recyclingassistance.org/). CTRA consists of 60 rural recycling cooperatives representing more than 500 public, private and nonprofit entities.

Headwaters Cooperative Recycling – Montana and Wyoming (headwatersrecycle.com/). A 501(c)(3) non-profit entity, HCRI is the largest recycling cooperative in the US, covering 35,000 square miles. Each year, HCRI serves approximately 190,000 Montana and Wyoming residents, plus over 3.2 million visitors to Yellowstone National Park. HCRI has made recycling economically viable for remote, low population communities. Participating communities have experienced a steady increase in the volume of recyclables and an associated decrease in landfill and/or transfer costs. From 1997 through 2009, participating communities have experienced a total diversion of 45,000+ tons for a net savings of over $250,000.

Orange County Recycling Cooperative – Indiana (orangecountyrecycle.org/). This is a very simple setup with drop-off bins for:

- All paper products (newspaper, cardboard, junk mail, magazines, office paper, shredded paper, brown bags, feed sacks)
- Steel cans and other scrap metal
- Aluminum cans
- Plastic containers
- Plastic grocery bags
- Stretch wrap
- Foam peanuts
- Wearable shoes
- Used clothing (wearable)[40]

Oregon Beverage Recycling Cooperative (obrc.com/default.aspx). OPRC is a member-owned, cooperative corporation, collecting material from nearly 3,000 grocery stores and then counting, sorting, crushing, baling and recycling millions of containers a day. The entire process is handled by beverage distributors and the retail industry – at no cost to the taxpayer. OBRC is now picking up and processing over 90% of all containers redeemed throughout Oregon.

Recycling Marketing Cooperative for Tennessee (rmct.org/home.html). Tennessee's RMCT is funded in part by grants from: Tennessee Department of Environment and Conservation, USDA Rural Development and US EPA.

South Shore Recycling Cooperative – Massachusetts (www.ssrcoop.info/). SSRC was established in 1998 to help its 13 member towns improve their recycling programs, and reduce the quantity, toxicity and cost of disposal. SSRC assists towns in:

- Managing their solid waste programs efficiently
- Providing economy of scale through regional procurement of services while allowing member towns to maintain full control over solid waste management
- Educating residents about how and why they should manage their waste materials thoughtfully
- Advocating for funding, sensible laws and regulations that accomplish the goal of minimizing waste and cost and maximizing recovery at the municipal level

[40] *The Institute of Local Self Reliance*, developed most of this information on Cooperative Marketing.

APPENDIX F: RETURNABLE CONTAINER LAWS ("BOTTLE BILLS")[41]

A major reason for a "Bottle Bill" for the VI – in addition to gaining substantial reductions in the waste stream – is to give economic incentive for the public to recycle and see value in the materials they would otherwise throw away.

Some Other Examples

Connecticut Container Deposit and Redemption Law. This law was enacted ion 1978 and provides for a 5¢ deposit on any individual, separate, sealed glass, metal or plastic bottle, can, jar or carton containing a beverage (beer, malt, carbonated soft drink, or bottled water). Excluded are containers over three liters containing noncarbonated beverages, and HDPE containers. The state also has a 1.5¢ handling fee on beer and 2¢ on other beverages:

- Each retailer pays the beverage container distributor 5¢ for each beverage container delivered.
- The consumer, in-turn, pays the retailer 5¢ for each beverage container s/he purchases from the retailer.
- The retailer or redemption center pays the consumer 5¢ for each container returned by the consumer.
- The distributor then reimburses the retailer or redemption center 5¢ for each beer, carbonated soft drink and noncarbonated beverage container plus a handling fee of 1.5¢ for each beer container and 2¢ for each carbonated soft drink and noncarbonated beverage container returned.

In 2009, the law was amended to include a system for distributors to report income from deposits and return unclaimed deposits (5¢) to the state, and it added noncarbonated beverages (water, including flavored water, nutritionally enhanced water and any beverage that is identified through the use of letters, words or symbols on such beverage's product label as a type of water, but excluding juice and mineral water) to the deposit system. Any manufacturer who bottles and sells less than 250,000 noncarbonated beverage containers may seek an exemption from the law by filing a form and affidavit with the Commissioner of Environmental Protection no later than November 1st of each year.

Hawaii Deposit Beverage Container Law. This law was enacted in 2002 and provides for a 5¢ deposit on aluminum, bi-metal, glass, plastic (PET and HDPE only) containers up to 68 oz. of all nonalcoholic drinks, except for milk or dairy products, and limited alcoholic drinks (beer, malt beverages, mixed spirits, mixed wine). Unredeemed deposits become the property of the state. There was a redemption rate of 76% in 2010.

[41] Shane Nelson, *US EPA*, developed this information on Bottle Bills.

Hawaii charges a nonrefundable "deposit beverage container fee" in addition to the 5¢ refundable deposit. This fee is used to pay the redemption centers' handling fees, which are equal to the container fee except in the case of glass. The container fee is set at 1¢, but the law requires it to be changed to 1.5¢ should the redemption rate any given year exceed 70%. However, the Director of the program is authorized to suspend any increase in this fee if the size of the deposit beverage container fund is sufficient to maintain operations. This has been done, and the fee stays at 1¢.

In September 2008, the Department of Health changed the handling fee that is paid out to redemption centers for glass containers. After the change, glass containers that were destined for remanufacturing applications receive a 4¢ fee, and glass containers destined for industrial or agricultural applications receive a 2¢ fee.

Maine Returnable Beverage Container Law. This law was enacted in 1976 and provides for a 15¢ deposit on wine/liquor and 5¢ on all other beverages except dairy products and unprocessed cider. It covers all sealed containers made of glass, metal or plastic, containing four liters or less, excluding aseptic. There is a 4¢ handling fee unless the entity is part of a qualified commingling agreement. Unredeemed deposits become the property of the state.

Distributors who initiate deposits have the obligation to pick up containers from the dealers they deliver to or from the licensed redemption center that serves those dealers. There is a per container fine of $100 for tendering containers purchased out of state for redemption. To prevent out-of-state redemption fraud, rules were added in 2009, requiring people wishing to redeem more than 2,500 beverage containers at a time to provide their name, license plate number, and address each time they return containers in bulk. Exceptions are made for nonprofit organizations. Other changes made at this time include a limit on the number of redemption centers in a municipality, based on population, and a requirement for dealers or redemption centers to accept plastic wrap used for beverage containers.

Provisions for "commingling agreements" exist in the Maine legislation to increase the efficiency of this process. The following information is from a study by the Maine Department of Agriculture:

- "Commingling groups," which represent approximately two-thirds of the beverage industry, are two or more initiators of deposit (distributors) of beverage containers for which they have initiated deposits to be commingled by dealers and redemption centers. The advantages of comingling agreements allow for the commingling of beverage containers by like product group (beer, wine, spirits and soft drinks etc.) material and size.
- Distributors who are members of a commingling agreement pick up all other beverage containers subject to the agreement in assigned geographical locations. The end result is less sorting for redemption centers and less handling and transportation costs for distributors."

New York (NY) Returnable Container Law. This law was enacted in 1982 and establishes a 5¢ deposit on airtight metal, glass, paper, plastic, or combination of the above containers under one gallon of beer, malt, carbonated soft drinks, water, and wine coolers. Containers must have a NY refund label to be redeemed at retail stores and redemption centers. The law requires bottlers and distributors to report on number of containers sold and redeemed, and to pay a 3.5¢ handling fee to the dealer/redemption center. 80% of unredeemed deposits are returned to the state's General Fund and the distributor retains 20%. Redemption rates:

- Overall: 67.8%
- Beer: 76.5%
- Soda: 58.7%
- Wine: 77.1%

Over the last 26 years the NY Bottle Bill has achieved significant impacts to create a cleaner and healthier New York. The Bottle Bill has:

- Reduced roadside litter by 70 percent
- Recycled 90 billion containers, equal to six million tons of materials, at no cost to local governments
- Saved more than 52 million barrels of oil
- Eliminated 200,000 metric tons of greenhouse gases each year

In 2010, the bill was amended to include deposits on water containers, and to provide for unclaimed deposits to be returned to the State coffers (as noted above).

In 2011, two bills have been proposed to amend this law:

- A3630 to add fruit juices, ice tea beverages, milk, wine and liquor
- S2877 to reduce the number of reverse vending machines required

APPENDIX G: GREEN PROCUMENT

Responsible Purchasing

The VI should create a web site for purchasing agents with information about green products and services. A good resource to assist with this is the *Responsible Purchasing Network* (RPN). Government agencies, businesses, higher education institutions, and non-profit organizations have joined RPN to secure purchasing tools, to be aware of current news, and for networking opportunities. The RPN website (responsiblepurchasing.org) contains resource information for both general viewers and for members. In addition, the Institute of Local Self Reliance can help the VI government access a number of Zero Waste organizations, such as the Zero Waste Procurement Team, which is comprised of experts from across the US.

A Case Study: The King County Success Story

King County, Washington has a very successful environmentally preferable purchasing program in place that provides county personnel with the information and technical assistance needed to effectively purchase these products. King County reported that its agencies purchased 54 million dollars of environmentally preferable products in 2008 resulting in a savings of $837,000 when compared to the cost of traditional products.
According to King County, effective programs require:

- Environmentally preferable policy
- Readily available information about products and services
- Specifications and knowledge of how to evaluate bids
- Contracts for products and services
- Tracking and reporting system for purchases
- Training for purchasing agents is important to assure project success
- Establishment of a "green team"
- Identification and empowerment of key purchasing department staff and others (building and grounds, fleet, park, public health, environmental departments)
- Establishment of goals
- A focus on products that save money
- Consideration of a cost value analysis that factors in maintenance cost savings from green products and services
- Starting with one product per department and with "low-hanging fruit" (easier items)
- Setting-up a tracking and reporting system (may be included as part of the vendor report)[42]

[42] *The Institute of Local Self Reliance* developed most of this information on Green Procurement.

APPENDIX H: PLASTIC BAG LAWS[43]

Community Examples

Washington, DC. On January 1, 2010, Washington, D.C. implemented a 5¢ tax on consumers for each disposable carryout bag (paper and plastic) taken at the time of checkout through the Anacostia River Clean Up and Protection Act. In its first month, the 5¢ bag tax brought the city about $150,000, and totalled almost $1 million from January through May 2010. By September 10, 2010, carryout bag consumption decreased by at least 50%. Most citizens were unaware of new requirement until informed at the register.

Ireland. When Ireland levied a 15-euro cent (21¢) tax on single-use plastic bags in 2002, bag usage fell immediately by more than 90%, from an annual level of 328 plastic bags per capita to just 21. Revenue from 2002 to the end of 2004 was almost 30 million euro ($40 million). By 2007, per capita consumption had risen to 31 a year, and the tax was raised to 22-euro cents (30¢). "This had an immediate benefit to our environment – with a decrease in excess of 95% in plastic bag litter. Surveys indicated that up to 90% of shoppers used long-life bags in 2003, compared with 36% in 1999," said Dick Roche, environment minister at the time. A large part of the success of this program is attributed to a long-term public awareness campaign.

Maui and Kauai Counties, Hawaii. On January 11, 2011, both counties enacted plastic bag bans. Aside from Kauai's exception for biodegradable plastic bags, Kauai's and Maui's ordinances both prohibit the distribution of plastic bags at all retail establishments or businesses. Last July, Maui County's Office of Economic Development started up a *Bring Your Own Bag* campaign to encourage consumers to refuse plastic bags at the checkout aisle. The County visited all types of businesses in an effort to market its campaign thereby preparing the public for the change. While paper bags are more expensive for retailers to supply, the ban is expected to motivate consumers to bring in their own reusable bags. Furthermore, under the Maui and Kauai bans, retailers are neither precluded from nor mandated to provide consumers either paper or reusable bags.

Australia. On May 4, 2009, South Australia was the first Australian state to implement a ban on polyethylene plastic bags less than 35 microns thick. Compostable and biodegradable bags are exempt from the ban. The ban was hailed a success with 200 million bags stopped from ending up in landfills in the first six months. Tasmania is expected to be the second Australian state to enact a bag ban. The Tasmanian seaside tourist town Coles Bay led the nation by banning distribution of free HDPE shopping bags in April 2003, and reduced plastic bag use by 1.8 million bags in six years.

[43] Shane Nelson, *US EPA*, developed this information on Plastic Bag Laws.

China. On June 1, 2008, China banned the production of ultra-thin plastic bags and ordered shops, supermarkets, and sales outlets to stop giving away free plastic bags and Styrofoam carriers. One year later, plastic bag use in China had dropped by two thirds (40 billion fewer plastic bags than in previous years) and the China Chain Store and Franchise Association reported that the nation had saved the equivalent of 1.6 million tons of oil during the first year. There have been many reports on the renewed distribution of free plastic bags to shoppers as vendors have stopped charging.

Italy. On January 1, 2011, the Italian law banning stores from giving out non-biodegradable plastic bags took effect. The law allows some time for retailers to adjust to the new law, allowing them to use up existing supplies of plastic bags. Italy used more plastic bags than any other European country (about 25 percent of all plastic bag consumption in Europe). It is possible that the ban may face a legal challenge; for instance, the Carrier Bag Consortium has stated that the ban violates European Union laws.

Philippines. On January 18, 2011, Muntinlupa City, located on the south end of the Manila metro vicinity, became the first major urban center in the Philippines to ban the use of plastic bags. Ordinance 10-109, which also bans polystyrene containers, is stricter than many laws in other countries in that it prohibits the offering of bags for wet meat and fish products. Numerous bans have excluded plastic bags for such use, citing health justifications for packaging meat and fish separately in order to prevent cross-contamination with other food items. Many street vendors selling drinks see no viable alternative. Small shops who sell fresh meat and fish cannot afford the expensive paper often used as a packaging substitute for plastic, and many consumers cannot afford to purchase reusable bags.

San Francisco, California. In 2007, San Francisco became the first city in the US to ban plastic bags in chains or large stores grossing more than $2 million yearly. New and improved legislation is pending, which would extend the bag ban to every store in the city, while exempting small produce bags and dry cleaning bags, and introducing a 5¢ fee on paper bags. If the new bill passes, it will take effect in March 2011.

Telluride, Colorado. An ordinance passed in October 2010, to have been effective January 2011 for grocery stores and March 2011 for all other businesses. This bans plastic carryout bags (including compostable plastics) and implements 10¢ fee on "permitted paper bags."

Westport, Connecticut. The town of Westport enacted a plastic bag ban in 2008 and other Connecticut cities are currently considering similar bans. In March 2011, the environmental committee of the State Assembly met to discuss a possible bag tax. A state bill was also proposed during January 2009, but never reached the floor of the legislature.

Pending Laws

- Vermont and Maryland – Bag fees
- Oregon and City of Portland – Bag bans

APPENDIX I: ZERO WASTE AND SERVICE OPPORTUNITY ANALYSIS[44]

Service Opportunity Analysis

One step toward achieving Zero Waste (goal: >90% diversion from waste-to-energy and landfill facilities) is to perform a Service Opportunity Analysis for each commodity in the waste stream. This analysis is done by exploring the point of waste generation. Following are some examples of types/locations of generation:

- Warehousing & Distribution
- Offices
- Food Services
- Grounds
- Construction
- Manufacturing, etc.
- Vehicular Maintenance
- Retail
- Housing & Hospitality

Service Opportunity Analysis Process:

- Consider and Support a Precautionary Principle
- Return to Vendor
- Lease, Rent and Share Equipment
- Reduce Packaging
- Reuse Shipping Containers
- Buy Recyclable, Recycled and Compostable Items
- Buy Remanufactured Equipment
- Purchase Durables
- Buy Less Toxic Products

Some Zero Waste Business Examples (all have pledged and are making progress toward the >90% goal):

- Anheuser-Busch, Fairfield, California
- Apple Computer, Elk Grove, California
- Epson, Oregon
- Hewlett-Packard, Roseville, California
- New Belgium Brewery, Fort Collins, Colorado
- Pillsbury
- Xerox
- Ricoh

[44] Some of this material is from the *Grass Roots Recycling Network*.

- Toyota

Some Zero Waste Community Examples (all have pledged and are making progress toward the >90% goal):

- Canberra, Australia
- Buenos Aires, Argentina
- Seattle, Washington
- Boulder, Colorado
- Central Vermont Waste Mgt. District
- San Luis Obispo, California
- San Diego, California
- Nelson, British Columbia

APPENDIX J: FINANCING MECHANISMS

Recycle Bank

The *RecycleBank* program, which rewards households based on community-wide recycling (dividing the coupon value equally per household in the community), can provide an incentive for each household of up to $400 per year. Community based *RecycleBank* rewards do not require as much equipment as individual household systems.

Tax Credits and Low-Interest Loans

Tax credits and low-interest loans (as well as permitting and end-product marketing assistance) could be given to organic resource management companies to help make them economically viable. A tax credit program could also be established for businesses that generate substantial volumes of organics and invest in composting programs and equipment to process them onsite. Such businesses include, but are not limited to, hotels and resorts, food processors, and farms.

Payback Systems

A "payback" system could be implemented for persons delivering recyclables to a recycling drop-off location. There could be three on St. Croix, at least two on St. Thomas, and one on St. John, with possibly a small one on Water Island. Despite the islands being relatively small, it can take an hour or more to get through traffic to get to the other side of St. Thomas. Payback could either be on the spot (there upon delivery), or be credited to annual property tax bill (assuming property taxes are collected) somehow. Reasonable solid waste fees, and payback schedules (based on type of material and weight, or volume for certain items will need to be calculated.

Others

- New MRF and transfer stations can be designed to encourage haulers to recycle through education, but also through variable rates at the facilities.
- As noted earlier, revenue from unredeemed deposits can be returned to the general fund, and appropriate to support sustainable materials management programs.

APPENDIX K: INFRASTRUCTURE IMPROVEMENTS[45]

Reconfigure Roll-off Bin Locations

One option calls for the number of roadside centers potentially remaining the same on each island, but each one would be reconfigured so that containers would be divided for trash and recycling. In addition, households are provided a recycling bin and would proceed to bring trash and recyclables separated for drop off at the assigned roadside center. Each container would have a cover with spring adjustment to ease dropping materials. Detailed signage will be added to each drop-off site, and extensive public awareness and in school education would reinforce behavior at the sites. Sites would not be attended on a full time basis, but regular site visits could be scheduled for monitoring and data gathering purposes.

Recycling Centers / Resource Conservation Parks

Containers would be collected with recyclables and organics going to processing centers to prepare materials for industry, agricultural, and others (this might require new routes and worker assignments). New transfer stations for region should be designed with recycling and composting in mind (San Francisco and Berkeley, California have excellent models, where hundreds of tons per day are recovered). Small businesses could be allowed to use recycling containers but not trash containers unless under contract with VIWM. Each one, or selected centers ("resource conservation park"), could have composting, mulching, C&D, and glass processing facilities adjacent to it. These facilities would process materials for on-island end use: compost (and compost derived products), mulch, aggregate, and cullet.

Typical Compost Site Instructions:

The following materials could be accepted at all locations:

- Palm fronds
- Tree and hedge cuttings
- Grass clippings and other plant residuals
- Untreated and unpainted wood pallets
- Logs less than 18" in diameter & 5' in length
- Untreated pallets
- Various types of food from commercial/institutional establishments (potentially)

The following materials probably wouldn't be accepted:

- Garbage bags and rubbish

[45] Material adapted from the work of *The Institute of Local Self Reliance*, *Environmental Finance Center at Syracuse University*, and Susan Parten, P.E.

- Lumber (including sawdust, and treated / painted pallets)
- Plastics
- Rocks and dirt (these would be banned from the landfill, but other beneficial uses can be identified)
- Glass and metals

Attendants should be trained to guide residents and business owners in proper procedures. Tub-grinder and other similar equipment technologies need to be investigated and acquired (direct purchase, or contracted services).

On-site Composting

In addition to centralized composting, a master composter program should be established for training residents and small business owners on small-scale, onsite composting. This program has been working well throughout the mainland and elsewhere, and done professionally, is economical, effective, and vital. Once an initial program is established, certified master composters commit to annual service and lead workshops, staff composting booths, help establish and maintain demonstration exhibits, and become stewards of sound resource management. Training sessions and guides in print and web formats should be developed to encourage and educate farmers, landscapers, developers, contractors and others on the benefits of sustainable agricultural and site-development practices including composting and amending soil with compost. Training should also include clear, concise interpretations of rules addressing composting. A similar program should be developed for the hotel / resort sector and other large generators of organics.

Backyard composting of appropriate food scraps and yard clippings should be encouraged by new incentives. Small businesses should be required to keep organic material segregated for composting at the central recycling sites (resource conservation parks). Sites will be owned by government but could be operated by private companies. Finished compost will be marketed to homeowners, grounds management companies, farms, and others.

Household Hazardous Waste

Household hazardous waste collection "safe centers" are drop off facilities for households and some small businesses to deposit materials. These include medicines, chemicals, sharps, batteries, paints, solvents, etc. Drop off of these materials helps eliminate these materials from the solid waste stream. Model safe centers can be found from large cities like Los Angeles, to smaller, rural communities like Oswego County, NY. They are attended at all times when they are open to the public. Businesses may be asked to pay for their use of these facilities. Brand name product manufacturers may also be asked to contribute support for these facilities, either by providing money or taking back the hazardous materials that they produce, through Extended Producer Responsibility arrangements, or through special centers such as the Center for Hard to Recycle Materials (Eco-Cycle, Boulder, CO).

APPENDIX L: REVIEW OF OTHER "ISLAND" PROGRAMS[46]

Hawaii

In 2007, the Hawai`i County Council passed legislation to adopt the goals of Zero Waste. Zero Waste involves mindfulness of the triple bottom line: profit, people, and the environment. A Zero Waste system encompasses economic growth and sustainability, a strengthening of community and social endowment, and enhancement of both local and global environmental quality. The Hawaii Electronic Waste and Television Recycling and Recovery Law require manufacturers of covered electronic devices (CEDs) and televisions to operate recycling programs. Covered electronics include computers, printers, monitors and televisions. There is mandatory recycling for commercial and government sectors. Recycling of targeted materials is required by law for most businesses and government agencies. City agencies must recycle anything that is recyclable and are required to purchase recycled paper products.

Materials Banned from Landfill Disposal:

- Green waste (but trucks at Hawaii-POWER / transfer stations are limited to 10%/load)
- Electronic waste
- Tires, auto batteries, white goods and scrap metals
- Glass bottles from bars and restaurants
- Paper, newspaper, and cardboard from office buildings with > 20,000 sq. ft. of space
- Food waste from hotels, restaurants, grocery stores, food courts, food manufacturers, and hospitals meeting certain size criteria

Materials Restricted from Landfill Disposal:

- Cardboard - max 10% per truck load unless certain criteria above mandate recycling (local paper recyclers pay for cardboard)

Enforcement:

There are disposal bans and restrictions on high volume recyclable materials, including green waste, cardboard, tires, auto batteries, "white goods" (e.g. appliances) and scrap metals, and this is enforced at the City's disposal sites by inspectors who monitor trucks unloading at the landfill, H-POWER and transfer stations. By visual assessment, an inspector determines if a truckload is over the limit on restricted materials or contains any amount of banned materials. The offending vehicle can be denied access to City disposal facilities for up to two weeks per violation.

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[46] This material developed by Tracy Verrier, student intern with the *Environmental Finance Center at Syracuse University*.

Mandatory recycling affecting specific types of businesses is enforced at the point of generation. The City conducts annual site inspections of businesses that are required to recycle. If a business is not in compliance with the City's mandatory recycling ordinances, a Recycling Specialist will work with management to set up a recycling program or improve/correct a failing system.

Taiwan

While Taiwan is magnitudes in size larger than the VI, it is interesting to note their current thinking in regards to solid waste management. The Environmental Protection Administration of the Executive Yuan (Taiwan government) has switched the focus from end-of-pipe treatment to source reduction and resource recycling after reviewing the situation of domestic waste management. It is also advocating the building of a resource recycling-based society with Zero Waste and complete recycling through green production and green consumption to effectively recycle and reuse resources.

Martinique

The inhabitants of Martinique are French citizens with full political and legal rights. As such, French legislation has put forth two main decrees:

- *92-377 Decree* sets an obligation to each producer and importer, placing on the French market packaged goods meant for household consumers to take in charge or contribute to the disposal of all its packaging waste.
- *94-609 Decree* deals with packaging of which the end-user is not a household. Each end-user of non-household packaging waste has to sort its packaging waste separately from other types of waste and has to insure the recovery of it. The only way to dispose this kind of packaging waste is reuse, recycling or any operation aiming at getting reusable material or energy.

Producers are responsible for the organization and financing of collection and treatment of household Waste Electrical and Electronic Equipment (WEEE) they place on the market. They can either set up their own system or contribute to a compliance scheme. Distributors have to accept to take back WEEE free of charge when selling a new product of the same type. The three groups of municipalities on the island have chosen a “bring-sites” system of collection, which is a network of big containers, rather than individual bins. However, the government is testing a door-to-door collection system (with individual bins) on pilot sites, for about 15,000 people. This door-to-door system should be extended to the whole territory in the next year. Contrary to the mainland, paper packaging such us beverage cartons, newspapers and magazines are not collected in Martinique because there is no current outlet.

In Ducos, the sorting centre opened in 2000 and was modernized at the beginning of 2008, so as to have a bigger capacity. Materials are sorted out and baled in the centre before being exported.