



ACTIVITY REPORT

No. 68

Solid Waste Audit of Hotels in Dominica,
St. Lucia, and the Dominican Republic
(Punta Cana Region)

June 1999

by

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Prepared for the Caribbean Alliance for Sustainable Tourism and the U.S. Agency for International Development, Bureau for Latin America and the Caribbean under the Hemispheric Free Trade Expansion Initiative and the Caribbean Region Program. EHP Activity No. 521-CC.

Environmental Health Project
Contract No. HRN-C-00-93-00036-11, Project No. 936-5994
is sponsored by the Bureau for Global Programs, Field Support and Research
Office of Health and Nutrition
U.S. Agency for International Development
Washington, DC 20523

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ACKNOWLEDGEMENTS

The authors wish to thank the following organizations and people for their support in preparing this audit.

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History, Government Policies and General Information

Mr. Jose Miguel Mirtiniz Guridy
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Government D.R. – in charge of Natural Resources

Mr. Jose R. Minino
Secretaria de Estado de Turismo
Arquitecto Asesor/Director Dpto. Control y Desarrollo
Government D.R.

Hotel Information, Stats and History

Mr. Alan Ramirez Risk,
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Frank R. Rainieri,
Presidente, Grupo Punta Cana, S.A.

Punta Cana Beach Resort, Punta Cana Airport and Punta Cana Marina

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Organization of Eastern Caribbean
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Solid and Ship – Generated
Waste Management Project and
the OECS Staff

III. Dominica

Government

Dominica Conservation Association
National Development Corporation

Dominica Hotel Association

Henry Shillingford
Stanton L. Carter,
Tourism Director
Wilbert O. Bascom

Hotels

Castaways Hotel
Fort Young
Anchorage Hotel and Dive

Linda Harris and staff
John Birtwisle and staff
Andrew Amour and staff

Solid Waste Authority of Dominica

Director Solid Waste Authority
Landfill Manager Site

Oliver Brown
Ivon Pacal

Private Sector

Luke Sanitation
Green Lantern Restaurant

Julies Luke
Maureen Walsh

EXECUTIVE SUMMARY

This report analyzes current practices and potential improvements in solid waste management in the tourism sector on the islands of Dominica and St. Lucia, and in the Punta Cana region of the Dominican Republic. The study reports results from solid waste audits conducted at selected hotels and describes the status of solid waste management infrastructure, practices, and policies at each location. It identifies a series of actions hotels could take to reduce the amount of waste they generate and steps that governments should take to improve infrastructure and regulations. Based on this information and anticipated rates of growth in the tourism sector, the authors project the volume of waste that will be generated by the tourism sector at each location over the next twenty years, compare this with the total volume of waste that will be generated by all sectors combined, and estimate the potential reductions in waste generation that could be realized if the recommended program of actions is implemented.

The analyses support four principal conclusions. First, at all three locations, organic wastes are the largest fraction of the waste stream; this is especially true when “yard waste” from landscape maintenance and beach cleaning are included in the analysis, but remains true even when such wastes are excluded. This indicates that composting programs could divert a substantial proportion of the waste currently being generated by hotels.

Second, there is a dramatic difference among the three locations with regard to the role that the tourism sector can play in improving solid waste management. In Dominica and St. Lucia, where there are mostly small and medium sized hotels, the tourism industry contributes a relatively small proportion of the total solid waste being generated on the islands. In these two nations, the government must provide the necessary infrastructure and regulatory framework (including tipping fees) to improve solid waste management across all sectors -- and, in fact, the governments have begun to do so. Once these changes are underway, hotels will be able to rely on licensed haulers and sanitary disposal sites for disposing their waste responsibly and will have a financial incentive for reducing the amount of waste that they generate. This will motivate further progress on waste reduction and resource recovery.

The Punta Cana region of the Dominican Republic presents a different situation. Here, the tourism industry dominates the local economy; the hotels are large, all-inclusive facilities; they generate a large volume of waste, accounting for about 70% of the total waste stream for the region; and the government has no current plans to provide infrastructure or strengthen the regulatory framework. Under these circumstances, the industry must create its own mechanisms for improving solid waste management and its incentives for doing so are more internal: eliminating the nuisance that improper storage and disposal of solid waste presents to guests, reducing operating costs, and demonstrating responsible behavior in order to capitalize on the marketing advantages of “green” programs. The presence of many large hotels in the region and the large volumes of waste being generated create opportunities for cooperative ventures to establish common landfills, composting operations, hauling companies, and other elements of an integrated, efficient solid waste management system.

Third, the report concludes that hotels in all three locations can substantially reduce their long-term costs for solid waste management by implementing waste reduction programs in purchasing and other operations. Where individual hotels are small, joint action may be required to convince suppliers to provide consumables in bulk quantities, reduce packaging, or collect packaging and shipping containers. Each hotel will need to develop a plan appropriate to its size, resources, and other characteristics. The report recommends starting small with simple measures and building a thorough program over time. To maximize return and minimize costs, hotels should coordinate with one another to share ideas and services.

Finally, the report suggests that recycling will play a very limited role in improving solid waste management in the locations studied. The economic viability of recycling depends on having markets for recycled materials: the high costs of transportation off-island and the relatively small volumes of material that can be accumulated limit the economic potential of this strategy.

Nonetheless, each island is different, and it may be possible to develop recycling programs for some materials (e.g., aluminum, non-ferrous metals, cardboard, and some plastics), particularly if governments can find ways of reducing or subsidizing transportation costs.

This study was undertaken as part of a joint effort by the Caribbean Tourism Organization (CTO) and the Caribbean Alliance for Sustainable Tourism (CAST) to develop and implement a regional policy on sustainable tourism. The work was funded by the U.S. Agency for International Development, Bureau for Latin America and the Caribbean, under its Hemispheric Free Trade Expansion initiative. The study was planned and conducted in collaboration with USAID's Caribbean Regional Program, which provides technical and financial support to CTO and CAST. The study was prepared by staff at Hurco-Jomco, LLC, of Buffalo, New York, with management and technical oversight from USAID's Environmental Health Project.

1. INTRODUCTION

This study included performing audit wastes at hotels and large tourist related areas on the three islands and estimating the volume and composition of the waste stream. Meetings were held with local government officials and hotel association representatives to gather background information on existing waste facilities, volumes of waste generated, policies, regulations, fees and proposed changes to regulations. Research showed that the Organization of Eastern Caribbean States (OECS) is quite far along in the proposed management of solid waste with new disposal facilities scheduled to open within the next decade.

It should be noted that the audit provides just a “snapshot” of the solid waste being generated on Dominica, St. Lucia and the Punta Cana region of the Dominican Republic. Most of the information gathered was based on conversations with hotel employees and observance of the waste stream. All volumes were adjusted to reflect daily rates of generation and projected annually to allow for seasonal fluctuations. In this short visual stream, it was not possible to get accurate amounts of recyclables in the mixed waste stream. Where possible, amounts of recyclables were recorded or estimated.

2. METHODOLOGY

Survey forms completed during each audit are presented in Attachment I. The steps taken during the audit process include:

1. Hotel or resort management personnel were interviewed to establish the number of rooms and current occupancy levels. Waste collection processes were discussed, and all waste storage areas on the property were identified. Details of waste removal methods and frequency of removal were recorded. A staff person was designated in each case to assist the auditor and participate in the audit process.
2. Each waste collection area was visited prior to removal of the day's waste from the property. If necessary, the waste areas were visited at different times during a 24-hour period to make sure all waste generated was accounted for. The volume of waste at each location was determined by the following methods:
 - a) For containerized or bagged waste, the number of containers or bags and level of filling were recorded.
 - b) For waste stored in a room or compound, the dimensions of the room or compound were recorded and the approximate fill level was estimated from visual observation and physical measurements.
 - c) For waste piles, the base dimensions and height of the pile was measured.
3. The character of the waste was determined by visual inspection of the contents of waste storage piles, rooms, compounds, containers and bags. Categories used for waste characterization are listed in the Material column of the audit form presented in Attachment I.
4. The relative proportion of waste types was calculated for each waste storage location.
5. Based on volumes calculated in step 4 and proportions of waste types determined in step 6, the volume of each material observed in each of the waste storage areas was calculated and recorded on the audit forms.
6. Volumes of waste observed were converted to weights by using conversion factors presented in the forms contained in Table I. These conversion factors are consistent with generally accepted weight:volume ratios used in the solid waste management industry.

Table I
Conversion from Measurable Volume to Weight

Classification	lbs/Yd³	kg/m³
General Trash	80	48
Food Waste	300	178
Yard Waste	200	119
Wood Waste	200	119
Office Paper	400	238
Newspaper	450	268
Magazines	500	297
Cardboard	75	45
Steel (Cans)	120	71
Aluminum (Cans)	60	36
Glass	540	321
PET	25	15
HDPE	50	30
Furniture	150	89
Other	100	59

3. AUDIT RESULTS

The following charts and tables outline the various hotels audited, type of service, number of rooms and volumes and characteristics of solid waste generated. On Dominica there were only small hotels assigned to audit and conversely in the Punta Cana Region of the Dominican Republic, there were only large all-inclusive hotels.

**Table II
Hotels Audited**

Hotel Size	Dominica		St.Lucia		Dominican Republic (Punta Cana Region)		
	Hotel	Guest Rooms	Hotel	Guest Rooms	Hotel	Guest Rooms	Employee Rooms
Small	Anchorage - 25 Castaways - 26 Fort Young - 53		Bay Gardens - 50		No small hotels in the region.		
Medium	None available for Audit		Le Sport* - 102		No small hotels in the region.		
Large	No large hotels on the island		Sandals* - 272		Punta Cana Beach Resort - 386** -- 50		
					Iberostar Bavaro* - 596 - 0		
					Melia Bavaro All Suite* - 686 - 64		

* All Inclusive Resort

**Includes 370 Rooms in hotel and 16 apartments at marina

On Dominica and St. Lucia there are no major tourist related generators of solid waste outside of the cruise ships, and these totals are included in graphic and table presentations. In the Punta Cana region of the Dominican Republic, the major generators of tourist related solid waste are the airport and the marina at the Punta Cana Resort. The totals for these two locations are included with the Punta Cana Beach Resort as they were collected and processed together. The other major generator of solid waste in the area is the Manati Theme Park, generating approximately two cubic meters of general trash per day. This total was not included in the following graphs and tables. All organic waste at the theme park goes to animal feed or composting.

Hotel Information: Dominica

All inclusive	0
Large hotels	1 (Dormitory)
Medium hotels	5
<u>Small hotels/guest houses</u>	<u>25</u>
Total hotels	31
Total hotel rooms	623* (Not all tourist ready)

*An estimated number of 350 tourist ready rooms was used for the graphics in this report.

Government room growth projections are +800 rooms by 2010 and +1500 additional rooms by 2020.

Hotel Information - St. Lucia:

All inclusive	9
Large hotels	8
Medium hotels	5
<u>Small hotels/guest houses</u>	<u>49</u>
Total hotels	71
Total hotel rooms	3,758

The above hotel information for Dominica and St. Lucia is from local Hotel Association and Caribbean Tourism Organization.

Hotel Information: Punta Cana Region, Dominican Republic

Total number of existing hotels: 21

Number of rooms 1/99: 13,000 existing + 4,000
projected for 1999 with 2232 approved to date

This is approximately one-third of the hotel rooms in the Dominican Republic.

Average occupancy rate all hotels is 80%, with an average of two guests per room.

The room growth rate from 1984 to 1998 was 15% per year.

The above hotel information for Asonahores is from the local hotel association and the Caribbean Tourism Organization.

There were no government or hotel association projections for future room growth rates available.

The World Bank Project ID DOPE59511 projects overall room growth in the Dominican Republic from 43,000 rooms in 2000 to 109,000 in 2010.

The results of the island audits were substantially different than data included in two other reports.¹ The consolidated information is indicated on Tables III, IV and V. Of note, Dominica displayed the smallest waste flows per guest, and the Dominican Republic displayed the greatest waste flows. This is mainly a result of the size and level of service.

From the consolidated information, averages per island were calculated for waste generation with and without yard waste. As will be noted, there is significant variation with this inclusion.

Table III
Total Weight Flow per Island per Guest per Day (with Yard Waste), kg

	St Lucia	%	Dominica	%	Dominican Republic	%	Average	%
Metal	0.032	0.7%	0.000	0.0%	0.067	0.9%	0.033	0.7%
Paper	0.122	2.7%	0.052	1.6%	0.438	5.9%	0.204	4.0%
Glass	0.093	2.0%	0.000	0.0%	0.540	7.3%	0.211	4.2%
Plastics	0.008	0.2%	0.000	0.0%	0.042	0.6%	0.017	0.3%
Organics	3.502	76.5%	2.877	89.4%	5.711	77.3%	4.030	79.6%
Remainder	0.818	17.9%	0.290	9.0%	0.593	8.0%	0.567	11.2%
Total	4.576		3.219		7.391		5.062	

Table IV
Adjusted Weight Flow per Island per Guest per Day (without Yard Waste), kg

	St Lucia	%	Dominica	%	Dominican Republic	%	Average	%
Metal	0.032	1.1%	0.000	0.0%	0.067	1.9%	0.033	1.1%
Paper	0.122	4.0%	0.052	2.3%	0.438	12.1%	0.204	6.8%
Glass	0.093	3.0%	0.000	0.0%	0.540	14.9%	0.211	7.1%
Plastics	0.008	0.3%	0.000	0.0%	0.042	1.2%	0.017	0.6%
Organics	2.003	65.1%	1.947	85.1%	1.934	53.5%	1.961	65.5%
Remainder	0.818	26.6%	0.290	12.7%	0.593	16.4%	0.567	18.9%
Total	3.077		2.289		3.615		2.994	

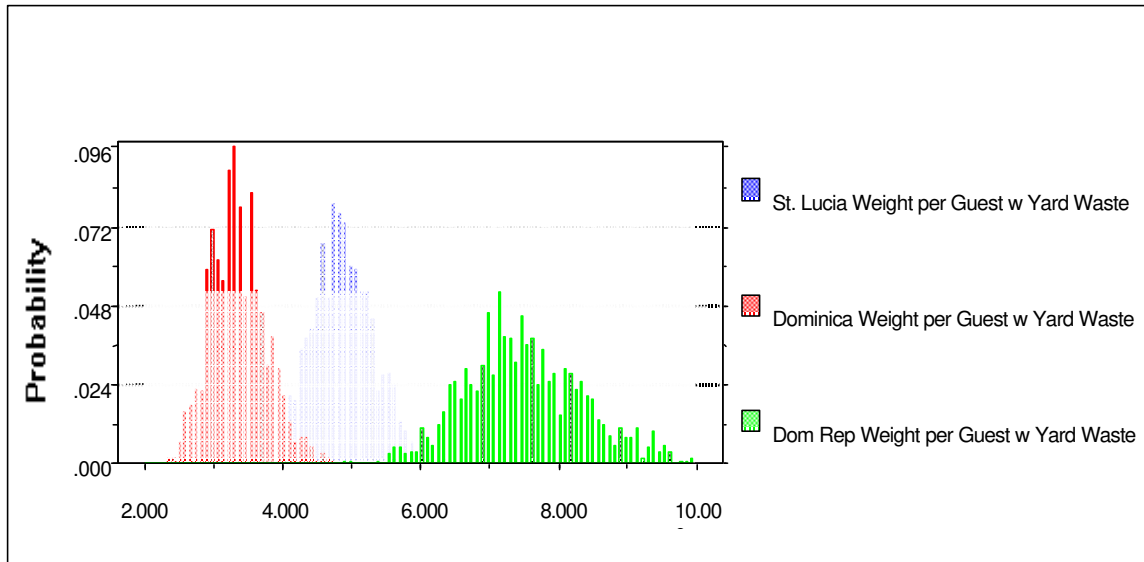
The waste generation can be better viewed in Charts III, IV, V and VI. Charts V and VI are an average of the three islands. From these results, it should be noted that some materials were not observed differentiated from the “trash stream” since there was no opportunity for the audit team to separate the recyclable streams. On the Dominican Republic, the specific waste quantities were more measurable. Recyclable and reusable this report utilize the Dominican Republic breakdown of recyclable materials exclusive of the organic materials (food and yard waste).

The average for the Dominican Republic was particularly higher due to the large size of the properties on the island and from large generation of seaweed at one specific site (Punta Cana Beach Resort).

¹ Dillon and Simmons

Based on a statistical analysis, Chart I indicates the variance that each respective island has per overnight guest, in kg. per day.

Chart I
Statistical Distribution of Weight per Overnight Guest - with Yard Waste (kg)



Excluding the yard waste, the results are considerably similar.

Chart II
Statistical Distribution of Weight per Overnight Guest - w/o Yard Waste (kg)

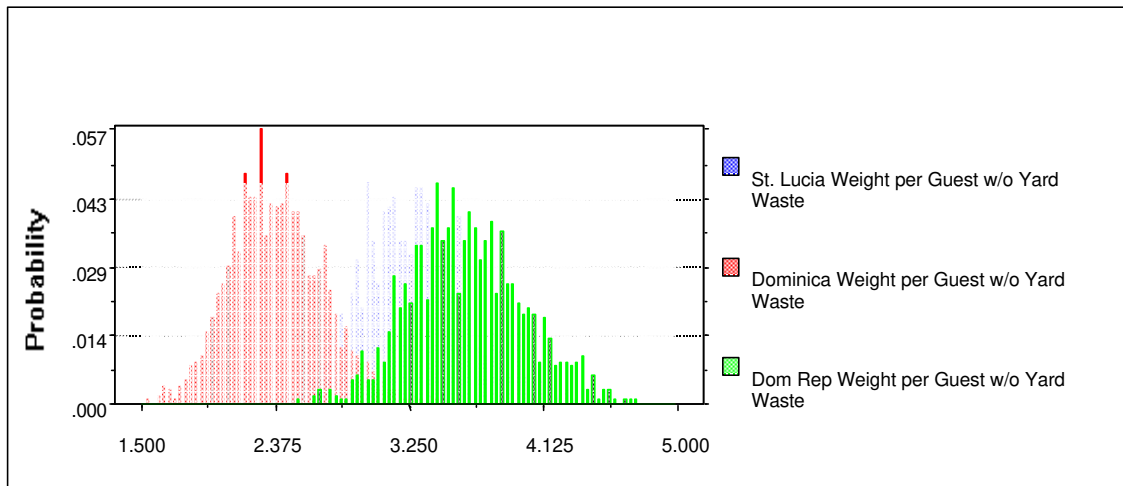


Table V
Volumetric Waste Flows per Guest, kg

	St. Lucia			Dominica			Dominican Republic			Average
	Le Sport	Bay Gardens	Sandals	Fort Young	Anchorage	Castaways	Punta Cana	Iberostar Bavaro	Melia Bavara All Suite	
Metal	0.001	0.000	0.001	0.000	0.000	0.000	0.001	0.001	0.001	0.001
Paper	0.004	0.002	0.002	0.002	0.000	0.0002	0.007	0.007	0.013	0.004
Glass	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.001
Plastics	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.004	0.003	0.001
Organics	0.024	0.013	0.038	0.013	0.014	0.032	0.077	0.018	0.036	0.030
Remainder	0.034	0.011	0.006	0.004	0.007	0.007	0.026	0.005	0.006	0.012
Total	0.063	0.027	0.048	0.020	0.022	0.039	0.112	0.040	0.040	0.048

Table VI
Total Weight Flows per Guest

	St. Lucia			Dominica			Dominican Republic			Average
	Le Sport	Bay Gardens	Sandals	Fort Young	Anchorage	Castaways	Punta Cana*	Iberostar Bavaro	Melia Bavara All Suite	
Metal	0.051	0.016	0.030	0.000	0.000	0.000	0.049	0.089	0.064	0.033
Paper	0.170	0.087	0.109	0.980	0.000	0.058	0.324	0.381	0.610	0.204
Glass	0.153	0.049	0.078	0.000	0.000	0.000	0.000	1.543	0.077	0.211
Plastics	0.007	0.002	0.015	0.000	0.000	0.000	0.017	0.060	0.050	0.017
Organics	3.174	1.974	5.359	1.987	2.339	4.305	9.869	2.439	4.824	4.030
Remainder	1.636	0.546	0.273	0.192	0.345	0.333	1.221	0.271	0.286	0.567
Total	5.190	2.674	5.864	2.277	2.684	4.696	11.481	4.782	5.911	5.062

*survey for resort and marina

**Table VII
Total Weight Flows without Beach Waste per Guest**

	St. Lucia			Dominica			Dominican Republic			Average
	Le Sport	Bay Gardens	Sandals	Fort Young	Anchorage	Castaways	Punta Cana*	Iberostar Bavaro	Melia Bavara All Suite	
Metal	0.051	0.016	0.030	0.000	0.000	0.000	0.049	0.089	0.064	0.033
Paper	0.170	0.087	0.109	0.980	0.000	0.058	0.324	0.381	0.610	0.204
Glass	0.153	0.049	0.078	0.000	0.000	0.000	0.000	1.543	0.077	0.211
Plastics	0.007	0.002	0.015	0.000	0.000	0.000	0.017	0.060	0.050	0.017
Organics	1.355	1.512	3.143	1.497	2.339	2.005	2.635	1.294	1.873	1.961
Remainder	1.636	0.546	0.273	0.192	0.345	0.333	1.221	0.271	0.286	0.567
Total	3.371	2.213	3.647	1.787	2.684	2.396	4.247	3.637	2.960	2.994

In examining the variation of waste generation rates among the islands, it is also interesting to note that the character of the hotels/resorts varied between islands. The lowest generation rate (Dominica) coincided with the smallest hotels, while the largest generation rate (Dominican Republic) was observed at the largest resorts. Factors associated with the hotels/resorts themselves may have influenced these findings:

- The larger all-inclusive resorts may provide more upscale meal and beverage services, resulting in higher waste generation rates.
- The larger all-inclusive resorts typically offer more amenities. Guests are less likely to participate in off-property activities, resulting in a higher capture of the total waste generation associated with each guest. Guests at smaller hotels and resorts may seek more off-site meals and activities resulting in incomplete capture of all waste generated by guests during the survey.
- Differences of the waste handling on all three islands may also be indicative of the level of waste management planning, availability of recycling markets, and cultural differences between the three islands.
- Each hotel has different characteristics that affect waste generation, such as size of property, amount of beach front and prevailing winds and tides that cause beach debris.

The authors find it interesting to note that the waste generation rates recorded at the Dominican Republic resorts (large all-inclusive facilities) compare well with generation rates recorded by cruise lines. By their nature, cruise lines have a captive guest population and capture all guest generated wastes while at sea.

While this study did not collect sufficient data to analyze how hotel size and character may correlate with tourist waste generation and capture, the actual tourist waste generation rate may be closer to that observed in the Dominican Republic than that determined in Dominica and St. Lucia.

From the statistical analysis of waste generation of the three islands, the following values were used to model total waste generation from the hotel sector of each respective area.

**Table VIII
Total Waste Generation**

	St. Lucia	Dominica	Dominican Republic	Average
Total Average Waste Generation from Study Group	4.58 ± .47 kg per guest per day	3.22 ± .41 kg per guest per day	7.39 ± .87 kg per guest per day	5.06 ± .35 kg per guest per day
Average Waste Generation from Study Group without Yard Waste	3.08 ± .36 kg per guest per day	2.29 ± .31 kg per guest per day	3.62 ± .38 kg per guest per day	2.99 ± .20 kg per guest per day
Predicted Range of Waste Generation per current Guest for rest of island	4.58 ± .47 kg per guest per day	3.22 ± .41 kg per guest per day	5.199 ± .36 kg per guest * per day	

* The over all average was used to correct for the unusually high level of seaweed in the Punta Cana Resort

Waste Distribution

The distribution of waste differed on each island as well. This variance can best be explained by the means by which data were collected, the size of the hotel, the type of hotel, and the availability of commodity products at that particular location.

Chart III
Total Weight Per Guest Per Day

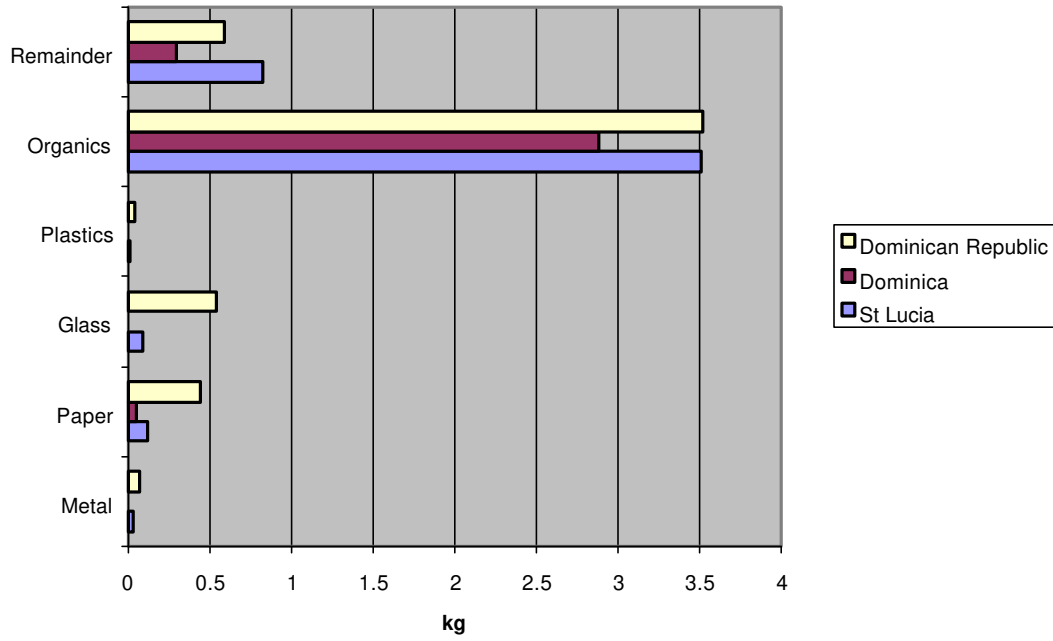


Chart IV
Weight Per Guest Per Day w/ o Yard Waste

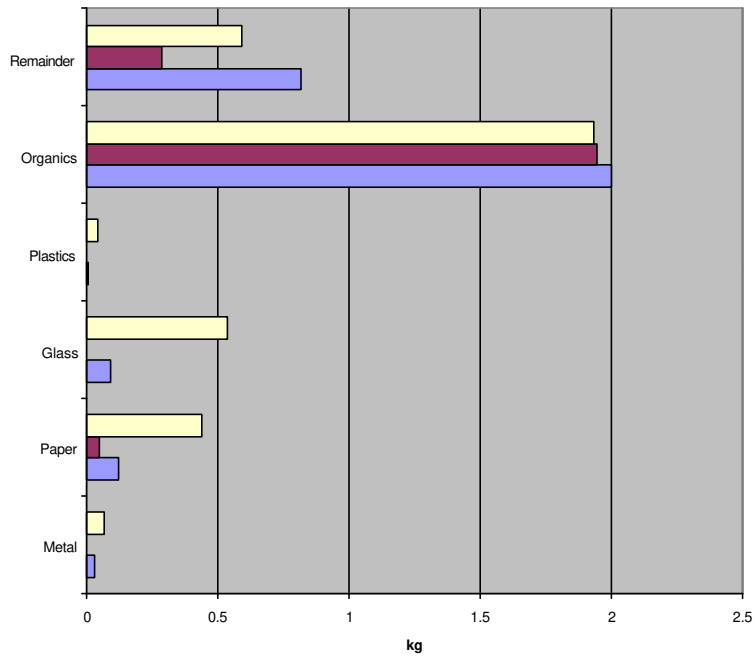


Chart V
Average of all three Islands Waste Composition without Yard Waste

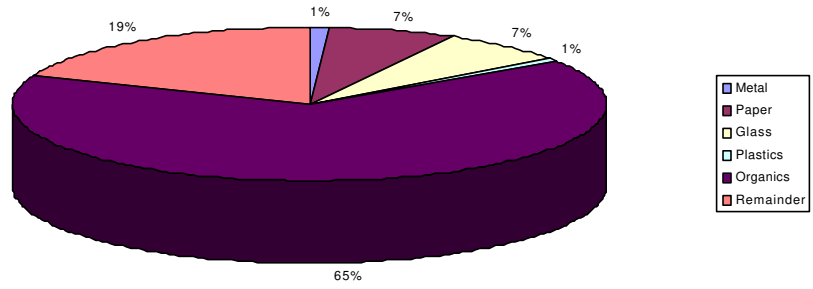
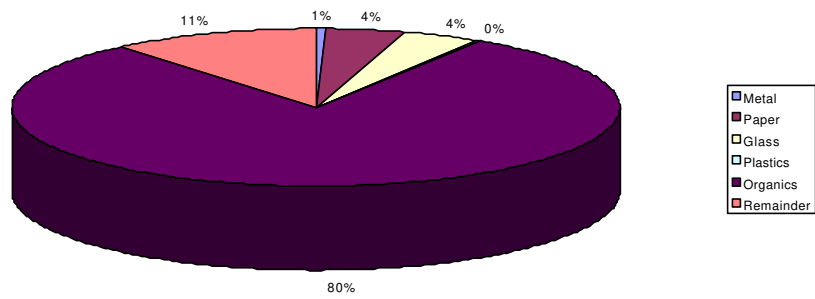


Chart VI
Average of all three Islands Waste Distribution with Yard Waste



4. DISCUSSION

4.1 Island of Dominica

The Dominica Solid Waste Management Corporation was formed by Act 17 of Parliament on July 1, 1996. The Corporation functions are to:

- Provide storage facilities for solid waste;
- Procure equipment for the collection, transportation and disposal of solid waste;
- Provide collection and storage facilities at ports, harbors and anchorages for the reception of ship-generated wastes;
- Procure the equipment necessary to transport ship-generated waste to the final disposal site;
- Convert existing dumps into sanitary landfill sites;
- Develop and manage new sanitary landfill sites and other disposal methods;
- Provide facilities for the treatment and disposal of medical and hazardous wastes;
- Introduce measures to encourage recovery of recyclable items from solid waste;
- Introduce cost recovery methods for services provided by the corporation.
- Prepare plans and programs to address the problems of solid waste management in the state;
- Oversee the management of all solid waste collection and disposal systems in the state; and
- Manage and direct the implementation of the Organization of Eastern Caribbean States (OECS) waste management project and any other regional and international project activities.

The Corporation has the authority to set environmental fees as outlined in Schedule 1 below. The environmental levy per tourist was started on May 1, 1998. The haulage and disposal fees are scheduled to start with the opening of the new landfill.

Schedule 1. Environmental Fees*

	US\$	EC\$
Environmental levy: Per visitor	1.50	4.00
Haulage fee: Per ton	35.00	94.50
Tipping fee: Per ton		
For disposal of ship or aircraft generated waste	40.00	108.00
For individual, commercial and institutional waste, except special waste such as waste generated by hospitals, doctors, clinics or laboratories	20.00	54.00

*Dominica Government Printery, Roseau, 1996

A current initiative and implementation review report is outlined in attachment II to this report.

Existing Conditions

Presently there are more than 100 – 4,6 and 8 cu. yd. pocket containers located throughout the island and collected by container delivery trucks with revolvers. These trucks then dump into open top roll-off containers placed strategically throughout the island, which are then taken to landfill.

There are more than 20 solid waste haulers in Dominica, utilizing various trucks to transport solid waste from generators to containers or to the landfill. None of the haulers, however, are licensed to provide this service.

New solid waste equipment is being purchased by the Solid Waste Authority, which will allow for the curbside collection of wastes in the three most populated areas and the continuation of the container system in rural areas.

A new solid waste landfill (the Fund Cole facility) and transfer station system has been approved and is in the development stage. This system includes scales and a material recovery station.

Existing initiatives include²:

- Continuing deposit/return system for some beverage containers.
- Continuing the promotion of composting by Environmental Health Department for schools and rural communities.
- Small scale composting by some hotels/resorts.
- Exploring opportunities for collection of used oil and potential markets by Texaco.
- Separating derelict motor vehicles from the waste stream and stockpiling them at Jimmit site for potential future use.
- Sending paper wastes from box making process to Venezuela. Winera is sending back paper from Future Information and OCC from Dominica Coconut Products.
- Promoting and composting in rural areas by Dominica Conservation Association.
- Reusing blue banana sleeves occurring.

Government

There has been no legislation passed regarding waste reduction, reuse, recycling, or recovery (4Rs) programs. No specific staff position has been identified for managing 4Rs programs. A position has been identified for education and awareness. Composting is being promoted by Environmental Health Department. No waste diversion facilities currently exist under the Solid Waste Management Corporation.

Population:

Local residents	73,755
Tourists per year	71,000 est. ³
Visitors per year	230,000 (Cruise Ships)

Waste Generation⁴

Residents-	22,912 Tonnes
Commercial-	14,178 Tonnes
	37,090 Tonnes/Year

Note: (World Bank Report No. 13554 LAC 2/95 estimated 15,000 Tonnes/Year by 2000).

² Dillon Diversion Strategy Report 10/98, Table 3-2.

³ Average of Dillon and CTO reports.

⁴ Dillon Diversion Strategy Report, 10/98, Table 4-5 and 4-6.

Tourist waste (avg. stay 8.9 days) = 989 Tonnes/Year.
(Included as part of commercial above).

Visitor waste (from ships – avg. stay 1 day) = 267 Tonnes/Year
(Included as part of commercial above).

4.2 Island of St. Lucia

The St. Lucia Solid Waste Management Authority (SWMA) was established to implement the national component of the regional OECS project. This authority was proclaimed into operation in 1996.

The SWMA Act mandates the authority to:

- Manage, regulate, control and treat waste either alone or in conjunction with private companies or organizations;
- Establish, maintain, improve and regulate the use of sanitary landfills and facilities, in accordance with established scientific principles and practices;
- Establish and maintain facilities for the collection and treatment of hazardous waste;
- Establish and maintain transfer stations;
- Establish and promote a resource recovery system;
- Oversee scheduling, safety and maintenance issues associated with solid waste management;
- Promote and oversee public education related to solid waste management in collaboration with the relevant ministries; and
- Develop a network to receive, monitor and respond to public complaints.

The authority has the power to implement fees. The environmental levy per tourist was started on May 1, 1998. The haulage and disposal fees are scheduled to start with the opening at the new landfill.

A Current Interim Report and Implementation Schedules are included in Attachment III to this report.

Government

The Authority has initiated the task of improving the island population's general awareness of the significance of waste management issues through presentation to various associations and sourcing of information. Its public education/promotion officer

is developing an initial awareness program focusing on responsible waste management and diversion.⁵

No significant waste diversion facilities identified. The process of privatizing solid waste collection on the island is underway. Municipal collection will be privatized first, followed by industrial/commercial collection. Presently both private and municipal systems are operating for municipal solid waste collection. There are approximately 22 companies pre-qualified to bid on the privatization contracts.

The Stock Farm and Portsmith Landfills have been upgraded and operating contracts are in place. New operational hours have been established for the landfills. The new Deglos sanitary landfill is scheduled to open in 2001. There are also proposals to upgrade handling of bio-medical and special waste.

Bottle scavenging continues to be a strong reuse activity. Noted private sector diversion efforts include establishing a new metals salvage facility near the Ciceron Landfill (SCP Corporation). St. Lucia distillers are blending waste oil from electricity services, select garages and two ships with virgin fuel for burning in their boiler (approximately 2000 gallons/wk). Pig farmers use food wastes from many hotels/restaurants as feed.⁶

Recycling activities at select resorts are continuing. Cruise vessels reportedly delivering source separated recyclables (i.e., aluminum cans) to dockside only to have them hauled to disposal sites due to a lack of a follow-up recycling capability.

Population:

Local residents	158,891
Tourists per year	268,000 Est. ⁷
Visitors per year	285,000 (Cruise Ships)

Waste Generation⁸

Residents-	47,598 Tonnes
Commercial-	<u>35,251</u> Tonnes
	82,849 Tonnes/Year

Tourist waste (avg. stay 8.7 days) = 3,642 Tonnes/Year
(included as part of commercial above)

Visitors' waste (from ships-av. stay 1 day) = 302 Tonnes/Year.
(Included as part of commercial above)

⁵ Dillon Diversion Strategy Report, 10/98, Table 3-5.

⁶ Dillon Diversion Strategy Report, 10/98, Table 5.

⁷ Average of Dillon Report and CTO Report.

⁸ Dillon Diversion Strategy Report, 10/98, Table 4-6.

4.3 Punta Cana region of the Dominican Republic

The tourism industry is one of the most important economic activities of the Dominican Republic. It relies heavily on the quality of the coastal environment. The number of hotel rooms in the nine most important tourism centers is projected to increase to about 43,000 in 2000, and 109,000 in 2010. However, the tourism industry is threatened by the environmental pollution caused by inadequate management and disposal of solid waste. A large portion of solid wastes generated in tourist centers is either dumped in clandestine and improper sites, open spaces, along roads and watercourses, or burned. Rivers and creeks transport the solid waste to the ocean thereby contaminating beaches used by the hotels.⁹

Government

No formal governmental policies or regulations are in place. General guidelines refer to Memorandum Number 216-98, which was not available. The local mayors set policies and administer their areas with minimal funding from the Federal Government.

Proposed Changes

The Dominican Republic's version of the Environmental Protection Agency is in the initial organizational stage. The new agency, INPRA, is the consolidation of four prior government agencies that were not coordinated. INPRA's function is to act as an intermediary between the Federal Government and local municipal organization and set, coordinate and enforce waste policies. To date there are no formal policies or regulations from INPRA. Initial funding is US\$1,000,000 in the Federal budget.

The government's goal is to eliminate duty and tariff on environmental equipment by 2005. There is no data to support the advisability of this action.

The World Bank is currently preparing a Learning and Innovation Loan (LIL \$5.2m), for the northern Dominican Republic. The project is to apply and demonstrate the viability of disposal of solid waste of small and medium-size towns through the use of sanitary landfills, and to prepare and implement an innovative model for incorporating the private sector in the provision of solid waste services in a tourism center.

The project will finance the construction of a sanitary landfill to serve Puerto Plata/Sosua/Cabaret; the preparation and implementation of private sector participation in the provision of Solid Waste Management Services (jointly with the water supply and sewerage services) for Puerto Plata/Sosua/Cabarete; pilot health care waste management, recycling and composting of residential wastes; manage the orderly closure of existing disposal sites; train and disseminate information on the solid waste management technology; and establish community participation and education programs. If successful, this project could provide a model for other tourist areas including Punta Cana.¹⁰

⁹ World Bank Project ID-DOPE59511 PID 6 Jan 1999.

¹⁰ World Bank Project ID-DOPE59511 PID 6 Jan 1999.

Existing Solid Waste Facilities

Currently there are no governmental or formal regulated disposal facilities in this region. Therefore regional volume records or past history data do not exist.

Each hotel and facility decides individually how to handle and dispose of waste. Collection and disposal methods vary among the hotels. At the Iberostar Bavaro and Melia Bavaro Hotels, for example, waste is manually collected and stored daily. They contract with a local hauler who manually loads waste onto open trucks and dumps into nearby open burning dumps. Some dump sites attempt to cover, others do not. The hotels supplement this by hauling overflow and some grounds waste via their own open trucks to the dumps. Local scavenging for recycling is being done at the dump sites.

Punta Cana Beach Resort hauls most organic food waste via their own open truck on a daily basis. Waste is dumped on-site in an open pit which is covered bi-monthly. They also haul grounds and beach waste (seaweed) to the Punta Cana Group Golf Course (under construction) and process it through a chipper for reuse as ground cover on the course and resort properties. They have most housekeeping, office, and general trash collected via rear load packer truck and transported to the airport site for incineration. Recycling of aluminum cans is done by employees at the airport incinerator. Reuse of some glass and plastic containers is also done by hotel employees.

All waste from the Punta Cana Airport is collected via their packer truck and burned on-site in a propane fueled incinerator (capacity 300 lbs. per hour, when operational). The ash is hauled to the open pit for disposal.

Existing Recycling Activities

There are no governmental or formal recycling facilities in this region. Some recycling, as well as reuse of certain items, does get done by the hotels, their employees and scavengers at the dumps.

Reuse:

Hotels return glass bottles in their original cases to the local soft drink and beer suppliers. The large water bottles from water coolers are returned to the supplier. Most one gallon plastic containers are reused on-site or taken by employees. The same is true for bulk bags (rice and flour) as well as some cardboard boxes, cartons and smaller individual plastic water bottles. Most uniforms are reused. Some pallets are returned to suppliers or used on-site as temporary sidewalks in high rain season. Sawdust and wood shavings from furniture manufacturing shops at Iberostar Bavaro are distributed to local farmers for animal bedding. Most furniture, mattresses and linens are reused or distributed locally.

Recycling

Most hotels recycle cooking oils. Punta Cana Beach Resorts compost grounds and beach waste (seaweed), along with some paper and cardboard. This material is shredded, then composted and used on the grounds.

Aluminum cans and some glass and metals are recycled by employees at the airport incinerator site, at some hotels and by scavengers at the dumps.

Punta Cana has an office paper return for a recycling program with their supplier, which is currently inactive. Their supplier of individual water bottles takes back the shipping cartons but not the small plastic bottles.

Iberostar Bavaro has employees inspect their clear plastic trash bags and retrieve dishes and flatware prior to disposal.

Waste Generation

Total volume of yearly waste currently being generated in the study area of Punta Cana/Playa Bavaro.

Population:

Local residents	20,000
Hotel employees	10,000
Tourists/year	560,000

Waste Generation based on “El Reciclajeyel Vertido”

Residential/commercial	18,874	Tonnes
Hotel Employees/tourists	<u>48,373</u>	Tonnes
(Est. Avg. Stay 8 days)	67,287	Tonnes

There are no cruise ships in the Punta Cana Region.

5. RECOMMENDATIONS FOR SOLID WASTE MANAGEMENT

How initiatives will impact the hotel industry will depend upon the commitment of each individual location and the economic incentives for achieving positive results. On the low end of the spectrum, hotels have the option of doing nothing. This will not change existing costs, but it is almost certain to contribute to an already growing problem that will ultimately impact the hotel association financially.

The hotels can work with the OECS Project to support its initiatives. Specific actions that hotels can take include:

- Commit themselves to establishing and maintaining a solid waste management program.
- Designate a purchasing/recycling coordinator. Larger hotels may justify a full time position and for smaller hotels it will be an additional duty.
- Conduct an internal audit of incoming purchases and outgoing wastes.
- Make a plan and establish policies that fit the needs of the hotel, both environmentally and economically. Start small and simple and build the program.
- Educate all employees on an ongoing basis. Get employee feedback on improving and expanding program.
- Practice continuous follow-up and monitoring.
- Coordinate with other hotels to share ideas and services in order to maximize return and minimize costs.

Areas to consider in order of priority:

1. Waste reduction: The most important area to concentrate on. (If it's not shipped in, you don't have to dispose, re-use or recycle it.) Review all purchasing for items that can be purchased in bulk. Purchase concentrates whenever possible and economical. Notify all vendors that suppliers of bulk products and waste minimization in packaging will receive preference. Ask them for suggestions. Establish a vendor return program for containers, cases and/or pallets. Establish good operating practices to reduce waste generation and monitor on an ongoing basis. Establish e-mail systems.
2. Recovery: The second priority – composting – attacks the largest portion of the waste stream, avoids future disposal costs, and makes a useable product. Make use of organic waste, both kitchen and landscaping, through composting. Some wood products and low grade paper may be used as bulking agents with composting.

3. Re-use: This option avoids or delays future disposal costs. Purchase items that are reusable or packaged in recyclable material. Use vendors who ship in returnable, reusable or recyclable containers. Re-use packaging and shipping containers for out-going materials. Establish programs with local organizations for reuse of items, such as used furniture, bedding, and office and sports equipment. Donate surplus supplies. Establish programs with food banks, farms or onsite composting. Reusable flatware and dishes. Reusable cleaning supply containers.
4. Recycling: The last option is to avoid future disposal costs. Recycling must be done on a scale that justifies the economics. Recycle metals, mainly aluminum; cardboard and high grade paper; and glass and plastics where practical.

Actions that governments can take:

From a governmental perspective, solid waste management in the Caribbean must be improved. To do so, a management frame work implementing the points previously outlined must be established. On the three islands surveyed, this framework has or is in the early stages of being formed. The degree to which waste will be reduced will vary depending upon implementation, participation and enforcement.

Recycling initiatives in the U.S. have shown that many states have stated goals of 50% reduction or reuse and have achieved over a 30% success rate on an annual basis. While this reduces the amount of solid waste going to landfills, there is also a corresponding increase in collection and processing costs. Recent reports have put recycling collection and processing costs at approximately US\$130.00 per ton versus collection and disposal costs at US\$90.00 per ton. Recycling efforts on the islands under study should be limited to what makes economic sense, metals, mainly aluminum, and high grade papers and corrugated cardboard.

In general, governments need to create an environment that encourages environmental improvements. Specific actions include establishing an integrated solid waste system with tipping fees to support system. Governments should also provide economic incentives for private sector landfill development and reduction, reuse and recycling initiatives, including elimination of taxes and duties on equipment. There should be a strong legislative framework with enforcement.

Building and operating permits should be tied to responsible solid waste management programs. Public education programs should be primarily based in schools.

The bureaucratic barriers to private sector investment in recycling should be reduced. The principles of reduction, reuse and recycling at government facilities should set an example, and the government should purchase reusable and recycled content products.

Government-to-government cooperation with other islands should be organized to develop markets for recycled products. A public/private oversight committee to monitor programs should also be established.

Specific initiatives for governments to consider include mandating source separation and collection of separated items. Bottle bill laws should also be considered (deposit on containers). Incentives for off-island shipment of recyclables in empty sea containers or barges should be explored, as should package labeling stating recycled content.

Other measures governments could take include landfill bans, i.e. hazardous waste, yard waste and liquid wastes; deposit for disposal of goods, i.e. tires, white goods, automobiles and batteries; incentives for recycling; and establishment of front-end recycling and composting operations at modernized landfill sites.

Hotel Industry

For the hotels in this study, the key will be to find on-island uses for compost and reusables and off-island markets for recycled commodities. To some extent this was being accomplished at the Punta Cana resort prior to Hurricane George. By re-establishing their programs and including food waste composting, recycling rates in excess of 50% could be achieved.

Hotel Recommendations for Solid Waste Management: Dominica/St. Lucia:

The hotels can also work with the OECS Project to support its initiatives.

Policy actions that can be taken by hotels:

1. Commitment by management to establish or upgrade current solid waste management programs.
2. Designation of a purchasing/recycling coordinator. Larger hotels may justify a full time position and for smaller hotels it will be an additional duty.
3. Conduct an internal audit of incoming purchases and outgoing wastes.
4. Make a plan and establish policies that fit the needs of the hotel both environmentally and economically. Start small and simple and build program.
5. Combine responsibilities for both solid waste and sanitation into the recycling and solid waste committee or coordinators position.
6. Provide direction and goals to the committee and/or coordinator.
7. After establishment of goals by the committee, coordinated projects should be chosen to show cost justification and payback to the property.
8. A percentage of savings realized by the property should be returned to the committee or coordinator's budget for community activities as approved by management.

9. Establish contracts between solid waste hauling companies and the property to assure disposal of wastes in government approved solid waste or recycling facilities.
10. Establish service contracts between vendors and property management outlining the property's environmental policy to ensure that all work performed on the property adheres to the policies (including disposal of wastes generated).
11. Establish a medical waste dispository and make available medical waste containers to the guest for sharp-edged deposits and related wastes.
12. Provide for an ongoing audit of incoming purchases and outgoing wastes.
13. Provide education and training to the committee and to include handling, containerization and sanitation procedures and why such procedures are important.
14. Provide incoming guests with a written solid waste and recycling policy for the property.
15. Provide for periodic outside examination of the program and written evaluation to management.
16. Through purchasing, attempt to simplify the wastes generated within the property into categories that can be handled within the recycling/disposal infrastructure of the island or the property.
17. Install rodent proof containers on property to reduce the chemical baiting process.
18. Establish contracts with waste haulers for additional containers or more frequent collection to reduce odors and overloading of containers on site.
19. Re-examine waste rooms to make them rodent proof and redo outside waste areas to prevent liquid runoff from waste, to reduce odors and the contamination of the area by vectors.
20. Examine pick-up schedules of solid waste on property and container placement for guest convenience and use.
21. Examine labor practices and match to systems available to provide the best possible handling procedures at the least amount of labor costs.
22. Provide for an emergency solid waste plan in the event of a hurricane or other natural disaster, including handling, storage area, disposal options and equipment required.
23. Keep abreast of current and proposed solid waste legislation and directives and periodically invite representatives of the Solid Waste Authority to environmental meetings.

Additional Areas To Consider:

Waste reduction:

1. Utilize mulching lawn mowers on grounds to eliminate grass clippings.
2. Utilize chippers to create mulch from trees and shrubbery waste.
3. Establish a program to notify the chef or kitchen staff of the number of guests leaving the property for tours and other day long activities so meal preparation can be planned accordingly and excess food wastes reduced.
4. Establish a donation program with homeless shelters or the Salvation Army for a daily pick-up of usable food.
5. Where possible provide re-usable baskets to vegetable and produce vendors in lieu of bags to help eliminate plastic and burlap bags and reduce potential breeding ground for insects, roaches and rodents.
6. Establish copier use guidelines and institute a departmental control system over the use of copy paper.
7. Establish a memo board for employee notices and information to eliminate need for multiple copies to employees.
8. Establish a sign-out and return policy for oils, solvents and paints and any other chemicals used on property.
9. Consider the use of volume reducing, environmentally improved incineration systems.

Re-Use And Recycling:

1. Establish an asset management system where all discarded equipment or supplies go through the recycling committee or coordinator before entering the waste stream. The committee or coordinator, along with accounting personnel, would determine the value of the discarded equipment or supplies. If possible the equipment would be donated to a re-use program like the Salvation Army or homeless shelter. If applicable, receipts can be retained for tax purposes. This program also helps avoid duplicate purchasing and provides for life cycle tracking.
2. Clean and re-use containers for planting of greenery or use in child-care centers and schools.
3. Re-use old or damaged linens as rags for kitchen and maintenance areas.
4. Make excess or used equipment available for employees with guidelines as to removal from property and policy toward resale.

5. Re-use packaging materials for outgoing shipments.
6. Whenever possible use re-usable flatware and dishes.
7. Utilize refillable cleaning solvent containers from bulk dispensers.
8. Coordinate with schools, day care and community organizations to provide for recycling of selected wastes generated on property.

Recovery:

1. Establish a composting program either on property or with an outside contractor to provide either compost or possibly organic grown vegetables back to the property.

Recommendations for the Punta Cana Area

Actions that can be taken by Hotels

Because Government action for this area is years away, hotels should form an association or corporation for solid waste management. This is necessary for the development of an infrastructure to facilitate environmentally and economically sound collection, storage, transportation, processing and/or disposal of solid waste. The hotels, in their own best interests, should foster the reduction, recycling, re-use and recovery of waste, because further environmental degradation will only depress the tourism industry.

Hotel Association options to be considered in priority order

1. Containerize waste in order to enhance property appearance.
 - Use 64 & 95 gallon roll out carts with lids for:
 - Kitchen, restaurant, food and bar areas to help reduce odors, rodent infestation and liquid runoff.
 - Housekeeping areas, waste from rooms.
 - Grounds areas, guest litter, minor food waste.
 - Office areas, common building areas (lobby, hallways).
 - Large volume (roll off type) containers for the majority of grounds, beach (seaweed), construction and demolition waste.
 - Where applicable, use on-site self-contained compaction systems and vertical balers for old cardboard containers.

Note: Carts can be color coded for different applications.

Plastic bags can be used as cart inserts.

2. Reduction:

By working through an association, hotels can use their purchasing power to influence suppliers. Hotels should obtain better pricing on items purchased as well as being able to negotiate with more suppliers to take back cartons and containers for reuse instead of disposal. Volume purchasing will also influence suppliers to provide more goods in bulk quantities.

3. Disposal:

- Develop solid waste landfill operation for the area. Control of costs and quality of operation is better achieved by private enterprise prior to government intervention.
- Investigate alternatives to landfill, i.e. environmentally acceptable incineration.

4. Recovery:

- Establish a common compost facility, either in-vessel or windrow, for food waste, organics, beach and grounds wastes. Redistribute compost to hotels for ground cover for local golf courses or commercial establishments.
- Utilize individual hotel and property facilities' processing equipment and resources. For example, Punta Cana group has a chipper that the association could use. Iberostar Bavaro has wood chips and sawdust from its wood-shop-furniture manufacturing facility that hotels could use as a bulking agent for composting.

5. Recycling:

- Develop recycling operation (if possible in conjunction with a landfill) where economics dictate for:
 - Old cardboard containers, bale
 - Aluminum cans, bale or flatten
 - Plastic waster bottles, bale
 - Glass bottles, crush
 - Metals
 - High-grade office paper, bale
- Develop and expand policies requiring suppliers to take back, cardboard cartons, plastic containers, glass bottles and office paper, etc. similar to existing programs with local soft drink and beer suppliers. Some hotels currently have return and reuse programs on a limited basis.

6. Form waste collection company to collect on-site and transport waste.

7. Reuse:

With an association, individual hotels can share their policies with others. One hotel in Punta Cana has its supplier take back the cardboard cartons that the plastic water bottles (.350, .5 & 1. Liter) come in, while other hotels do not.

8. Provide solid waste hauling vehicles:

- Either front end load, rear end load or side load type with hydraulic cart lifters to handle roll out carts outlined above. These collection vehicles are all enclosed and compact waste for hauling to processing or disposal site.
- Roll off type to handle open containers and self contained compactors.
- Bale collection trucks or trailers to collect and transport cardboard bales to common storage site for recycler pick up.

9. Help to establish and coordinate with the government for proposed regulations and policies.

10. Provide for periodic independent outside evaluation of programs and policies.

11. Establish a medical waste depository with medical waste (sharps type) containers.

12. Improve handling, storage and disposal methods for chemical-hazardous-cleaning products and waste.

Areas for future consideration as environmental regulations, mandates and costs evolve:

- Install on-site self contained compactor systems, with cart dumper attachments, for volume reduction, thus reducing hauling and on-site handling cost.
- Operate 6 to 9 cu. yd. mobile refuse packer trucks with cart dumper attachments to collect waste on-site.
- Install 60" vertical hydraulic balers for OCC in order to reduce volume and handling cost and to produce "mill size" bales for maximum re-sale revenues.
- Add color coded 64 & 95 gallon roll out carts for recyclable items.
- Add collection, storage and possible processing equipment for other recyclable items as economics dictate.

6. ANALYSIS AND PROJECTIONS

The tourist sector represented a varying percentage of waste compared to total waste generated in each area of study. As noted in Table IX, every region had unique demographics to waste generation (Table X).

**Table IX
Population and Hotel Data**

	St. Lucia	Dominica	Dominican Republic Punta Cana Area
Population of Study Area	155962*	73520*	43520**
Estimated # of Hotel Rooms by end of 1999	3428	350	17000
Stay over Tourist Days per Year	2327200	158410	9555700
Average Occupancy Rate of Hotels in Service	93%	62%	77%

* Dillon

** El Reciclaje y el Vertido ...

**Table X
Waste Generation**

<u>Tonnes</u>	St. Lucia	Dominica	Dominican Republic Punta Cana Area
Residential Waste Generation	46721*	22839*	18874**
Non Hotel ICI*** Waste Generation	31597*	12882*	(included above)
Hotel Waste Generation	10650	510	48373
Total	88968	36231	67287
Percentage Hotel Generated Waste to Total Waste	12%	1.4%	71.8%

* Estimated or derived from Dillon ** Estimated from "El Reciclaje y el Vertido

***ICI is industrial, commercial and institutional waste

Of note, waste generation derived from this audit was higher than the Dillon estimates, or from general North American studies. This shows a marked difference in the volumes and types of wastes produced by hotels.

Utilizing the information derived from the current waste estimates, waste flows are projected up to the year 2020. These projections assume hotel growth at an average of

5% per annum (with the exception of Dominican Republic, which has a 10% growth rate in the first 3 years and 5% thereafter. It is impossible to assess a real growth rate, since annual hotel growth most likely will be uneven and based on the overall world economies and the emergence of competing tourist attractions both within and outside of the Caribbean. Population growth and the respective waste growth from the non-hotel-based waste generation are assumed to increase at an average of 1.8% as derived from the Dillon report.

Because of the significant uncertainty that surrounds the 20-year projection, statistical boundaries were created around the assumptions, and the uncertainty associated with the 10- and 20-year results increases over time. Furthermore, the outcomes include estimates of uncertainty derived from the projection of actual waste per tourist and the derived annual waste generation from the hotel industry derived therefrom. The boundaries used for the assumptions are listed in Appendix ??.

The results of the projections are shown in Charts VIII through XVI. Charts VIII, IX and X show the central tendency (mean) projections for the three areas respectively. Charts XI – XVI show the same projections with the uncertainty bounds included. Overall, the 1999, 2010 and 2020 years projections of hotel waste flows are as follows:

**Table XI
Hotel Generated Waste Flows***

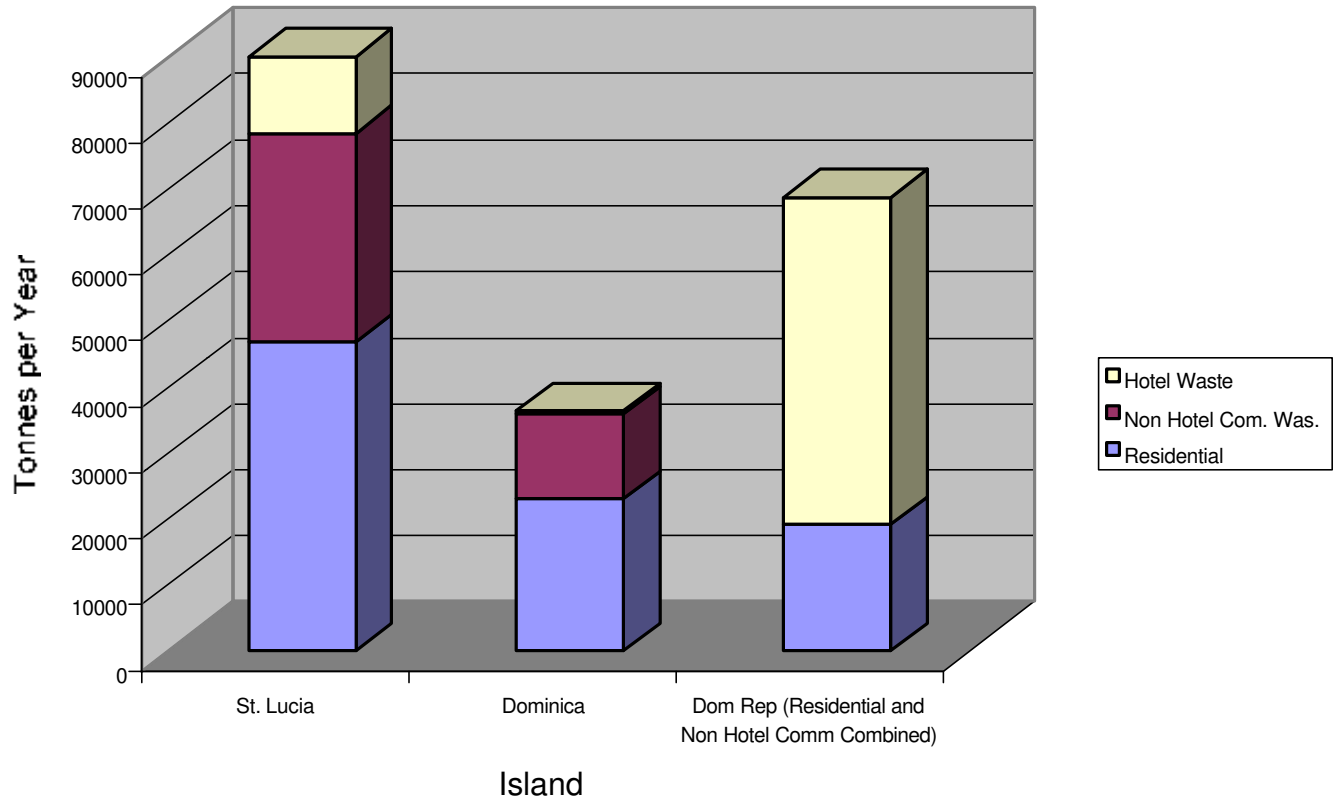
Tonnes per Year	St. Lucia	Dominica	Dominican Republic (Punta Cana Area)
1999	11675 ± 24.2%	510 ± 20.8%	49684 ± 18.2%
2010	19968 ± 41.5%	872 ± 38.4%	97703 ± 46.3%
2020	32525 ± 79.4%	1421 ± 74.0%	159147 ± 89.7%

*Statistical results were measured as average first standard deviation, whereas final curves for the resultant 2010 and 2020 are actually skewed toward the higher end

These results, although not surprising, show that the hotel waste generation has a significant potential variant as one projects further into the future.

Table XII indicates the potential reductions to the waste flow for the hotel-generated wastes from the respective islands that could be realized if the reduction and recycling programs noted in the previous section of the report were implemented. The main component for the programs will be the construction and operation of a waste management system, which carries both legislative and economic incentives for the reduction of waste to the landfill. Most programs are therefore predicated on the completion of a proper landfill for the respective study areas.

Chart VII
1999 Waste Generated by Sector



For the purpose of projection, the following landfill completion dates were assumed:

St. Lucia	2000
Dominica	2001
Dominican Republic (Punta Cana area)	2005

Reduction values and the respective timings of the programs was based on the practical experience of the authors and published results.

Table XII assumes the following:

- Separated collection of components and processing at MRF's (Material recovery facility) located at new landfills.
- Implementation of tipping fees and enforcement of new regulations.
- The percentages represent the maximum attainable diversion rates.

Table XII
Potential Reductions From Implementation of Solid Waste Management Programs

Program	St. Lucia	Dominica	Dominican Republic (Punta Cana area)
Waste Reduction of Glass and Paper products through revised purchasing policies.	30% - Year 2000	30% - Year 2001	30% - Year 2005
Yard Waste Composting	30% - Year 2001 at new landfill	30% - Year 2002 at new landfill	80% - Year 2005 at each respective hotel*
Food Waste Composting	75% - Year 2002 at new landfill site	75% - Year 2003 at new landfill site	75% - Year 2007 at new landfill site ¹¹
Paper Recycling (includes cardboard)	20% - Year 2002 at MRF at landfill	10% - Year 2003 at MRF at landfill	80% - Year 2005, from each respective hotel
Glass recycling	10% - Year 2000 on site	10% - Year 2001 on site	10% - Year 2005 on site
Aluminum recycling	80% ongoing	80% ongoing	80% ongoing
All other recycling	20% - Year 2002 at MRF	20% - Year 2003 at MRF	20% - Year 2007 as Hotel Association

¹¹ It should be noted that with the absence of a legitimate landfill, some composting of food and yard waste already occurs at some sites. This may continue especially at the larger hotels in Punta Cana.

The impact of the above detailed programs is shown on Charts VIII-X. Further statistical analysis is shown on graphs XI, XII, and XIV. The net analytical results of the programs, and their impacts, are shown in Table XIII.

Table XIII
Waste Generation with Programs

Tonnes per Year	St. Lucia	Dominica	Dominican Republic (Punta Cana Area)
1999	11660 ± 25.1%	510 ± 21.0%	49622 ± 18.0%
2010	9771 ± 42.2%	359 ± 40.9%	27726 ± 46.0%
2020	15916 ± 74.3%	584 ± 80.8%	45162 ± 91.0%

Again it should be noted that the accuracy of the waste generation rates will decrease over time and with the success of the program.

Final results of the waste generation as a comparison to total waste generation are shown on Charts VII to XXII. Of note, hotel generated waste rates for Dominica represent a very small portion of the total waste load, while in the Punta Cana Region of the Dominican Republic it dominates the total waste load. A formal waste reduction program for the hotel sector would clearly have the greatest desired impact. Under assumed rates of growth and reductions that are achievable with the recommended measures (Table XII), hotel-generated solid waste will remain a relatively small proportion of total waste for St. Lucia and Dominica. Thus the prospects for improving solid waste management on these islands depend on actions the government will take to address the overall solid waste management scheme. In the Punta Cana region of the Dominican Republic, hotel-generated waste is the primary component of the total waste for the region. Therefore, the hotels in this region could potentially work together to develop a common set of solid waste management measures for the region.

Chart VIII
St Lucia Waste Projections

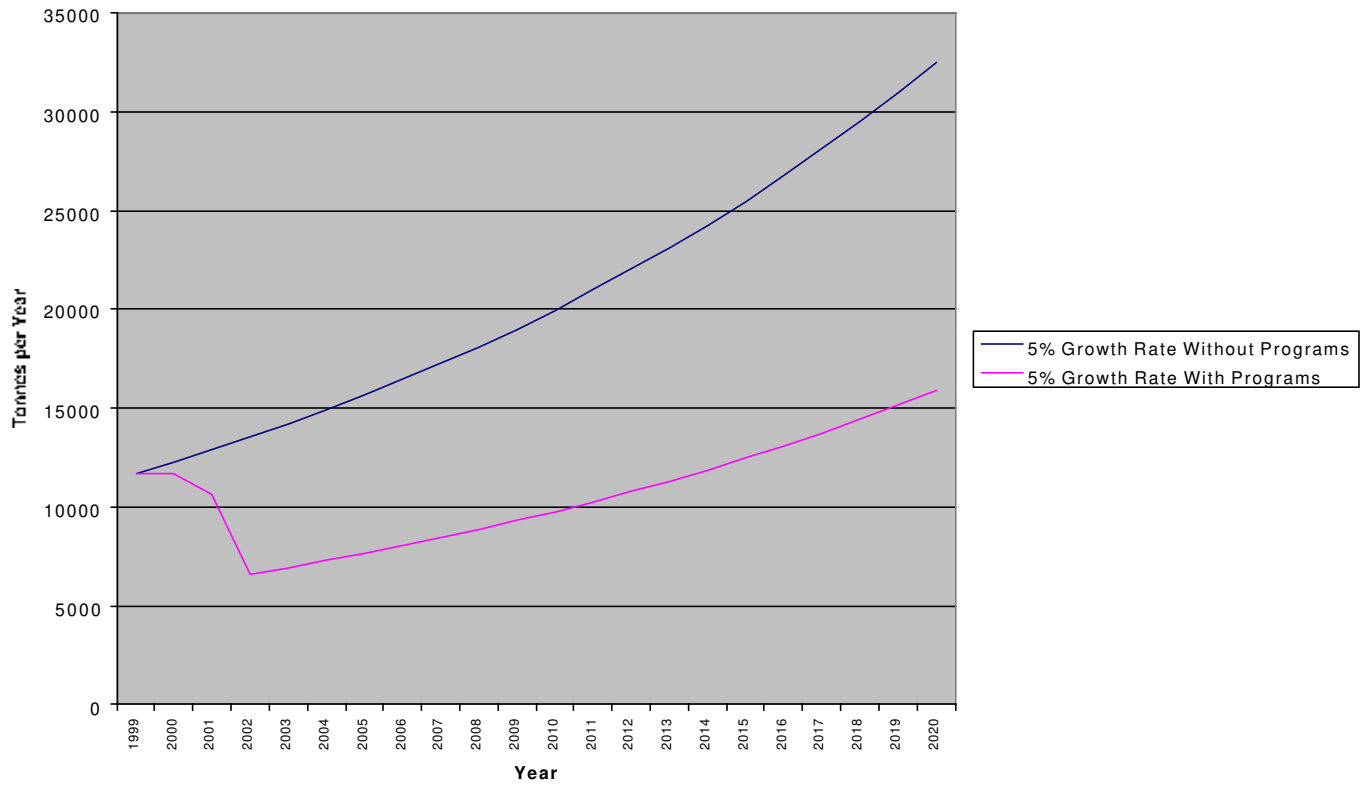


Chart IX
Dominica Hotel Waste Generation

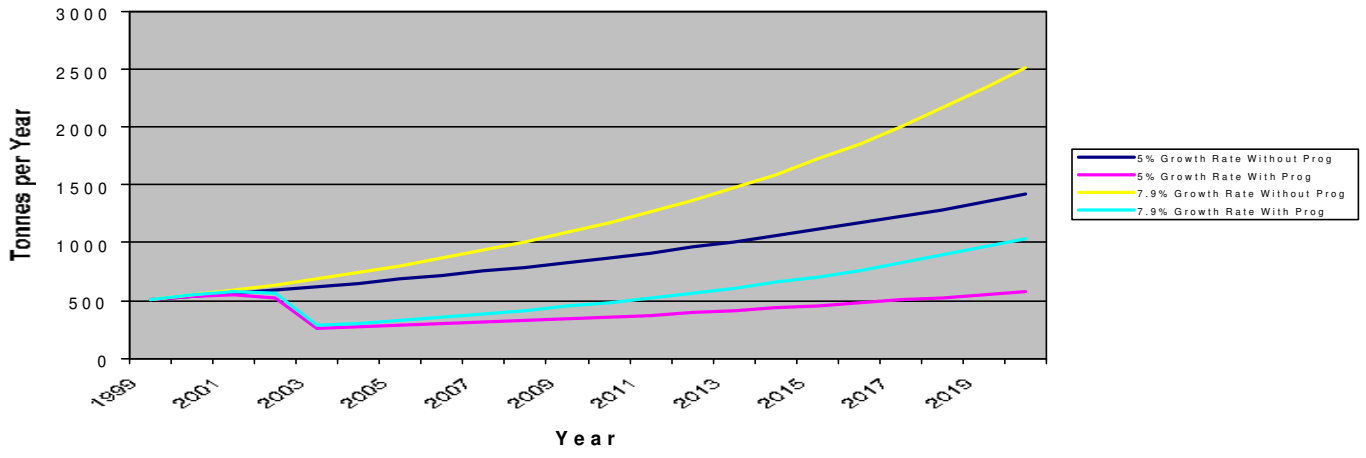
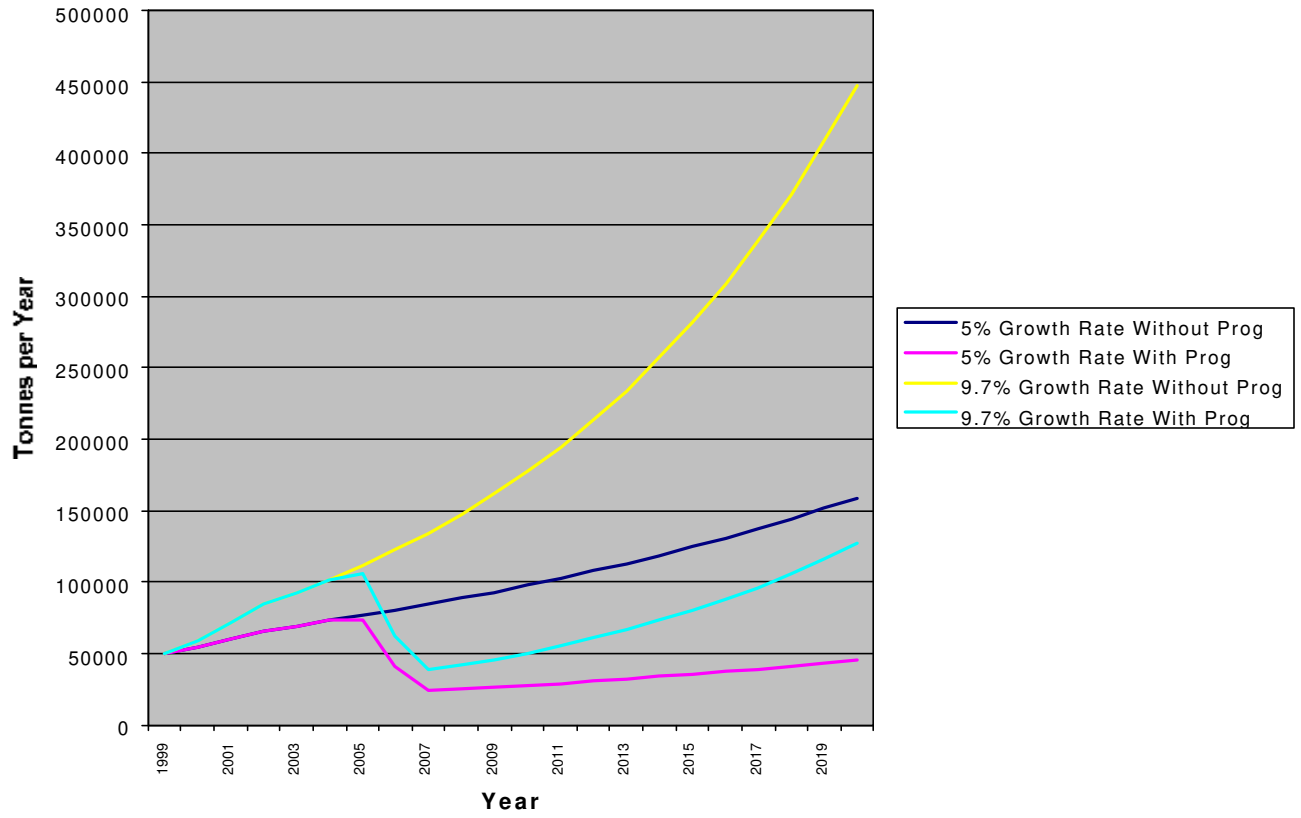
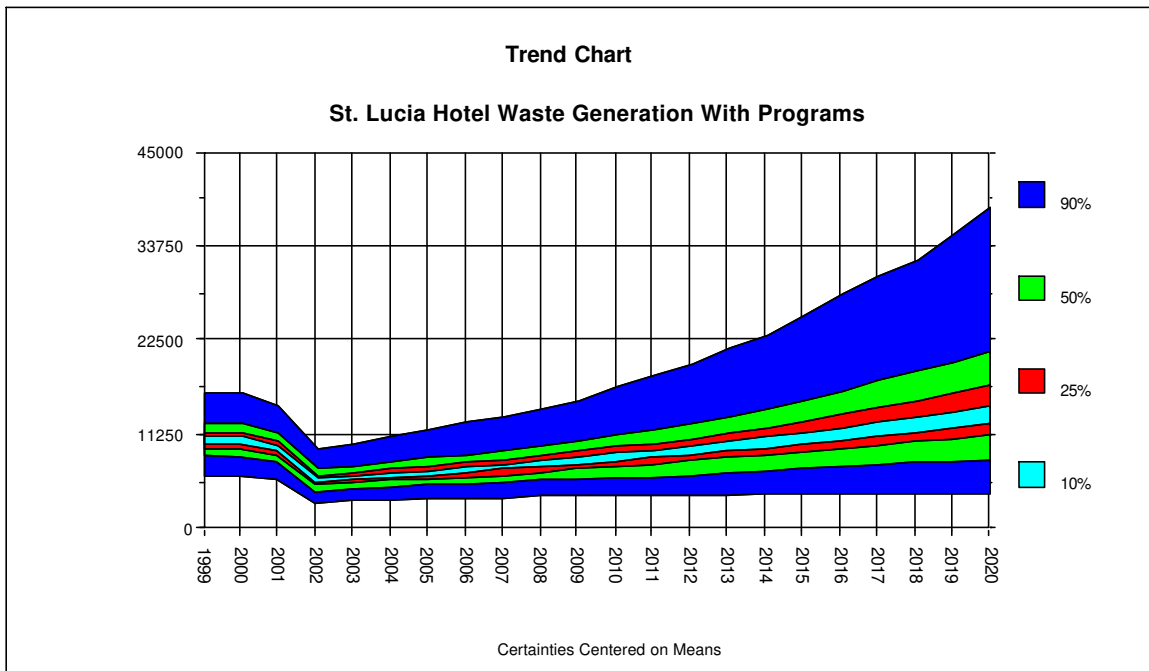
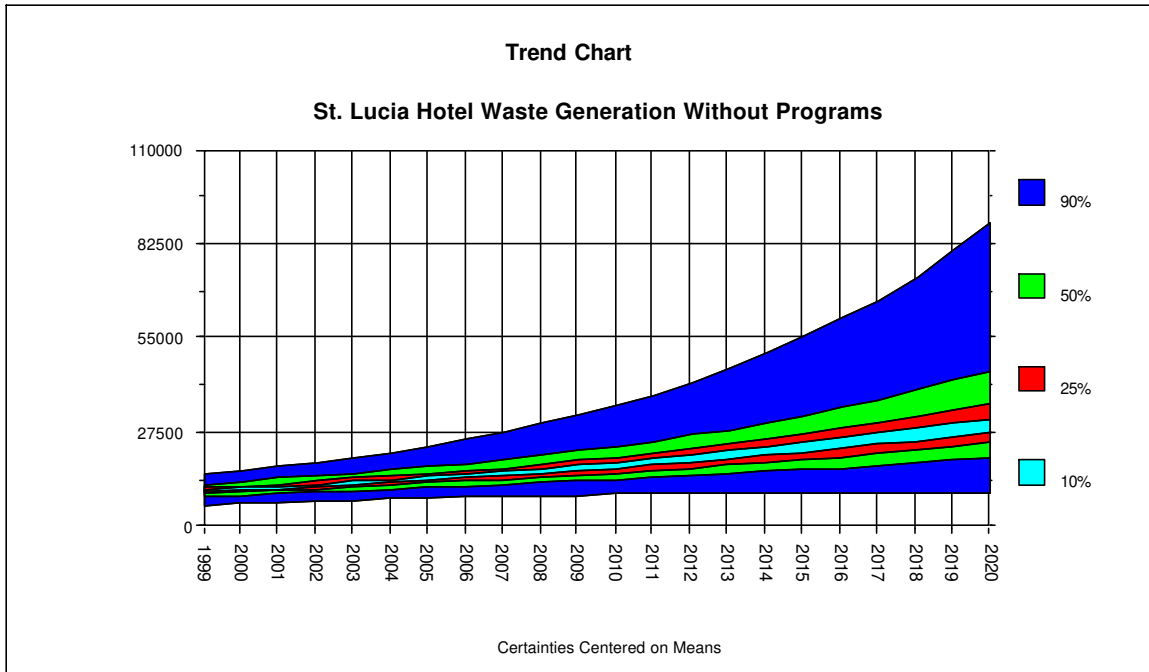


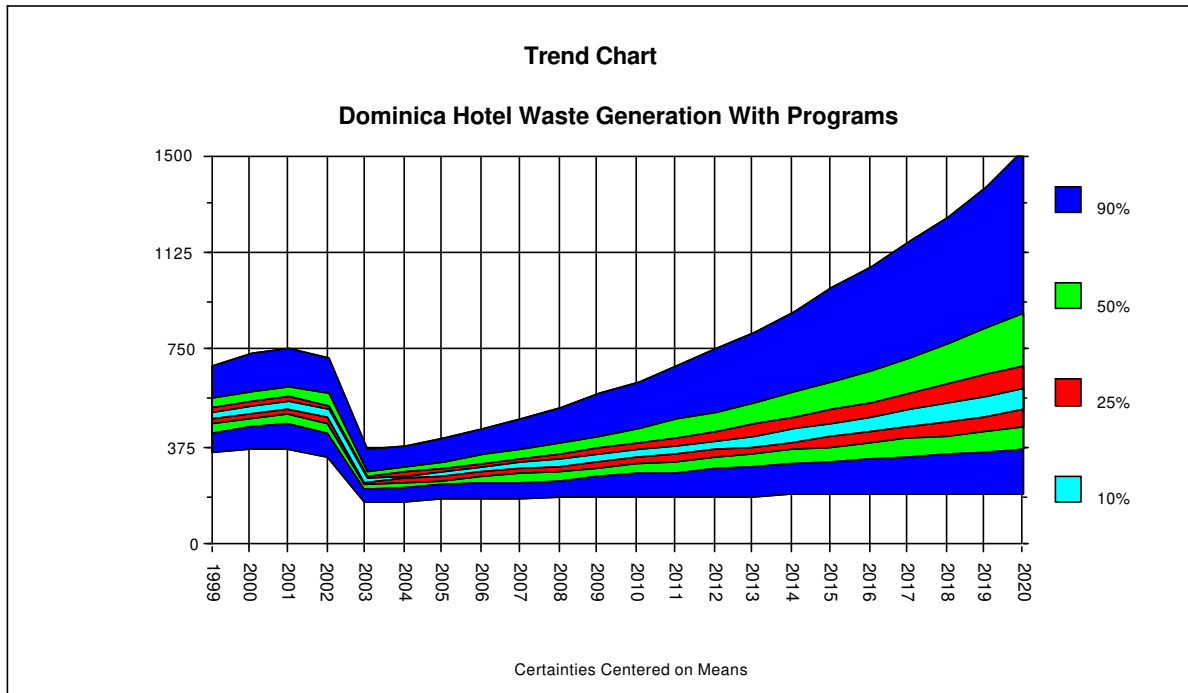
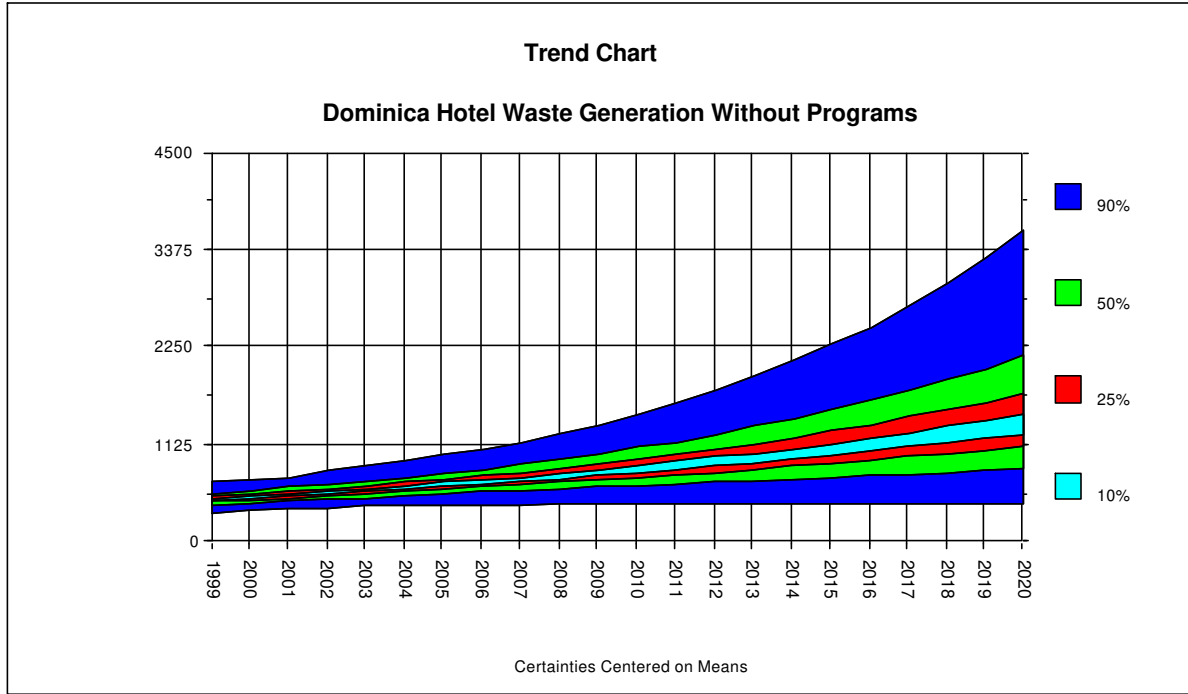
Chart X
Dominican Republic (Punta Cana) Hotel Waste Generation



Charts XI & XII St. Lucia Statistical Annual Waste Analysis (Tonnes per Year)



Charts XIII & XIV Dominica Statistical Annual Waste Analysis (Tonnes per Year)



Charts XV & XVI Dominican Republic (Punta Cana) Statistical Annual Waste Analysis (Tonnes per Year)

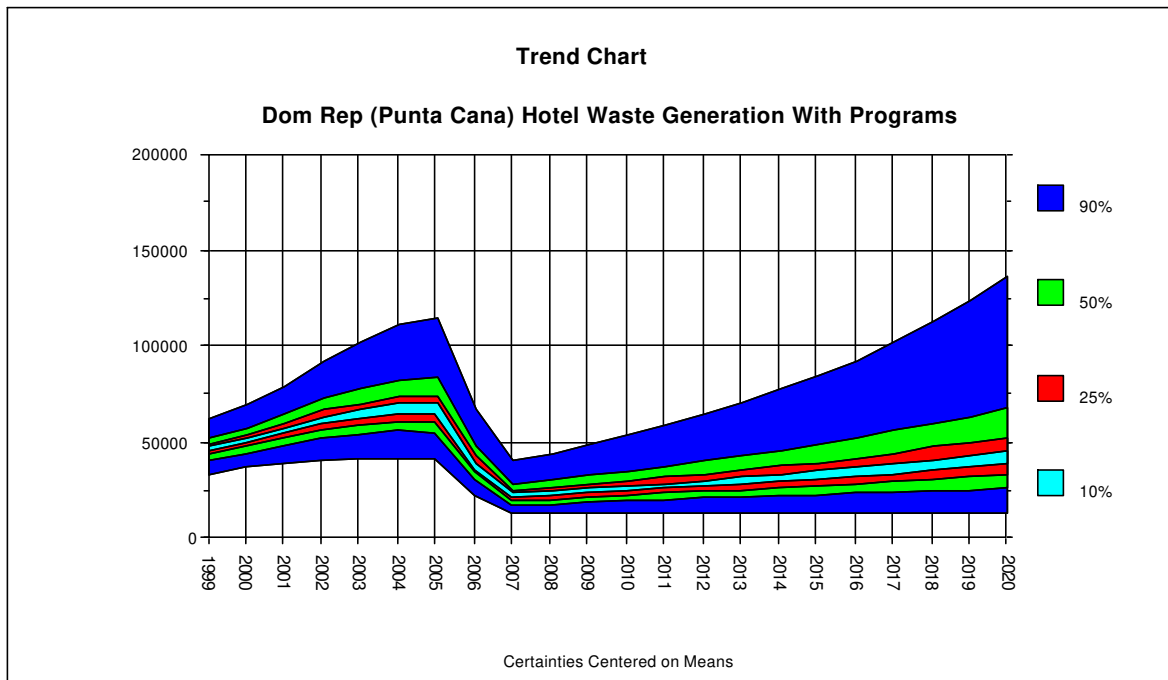
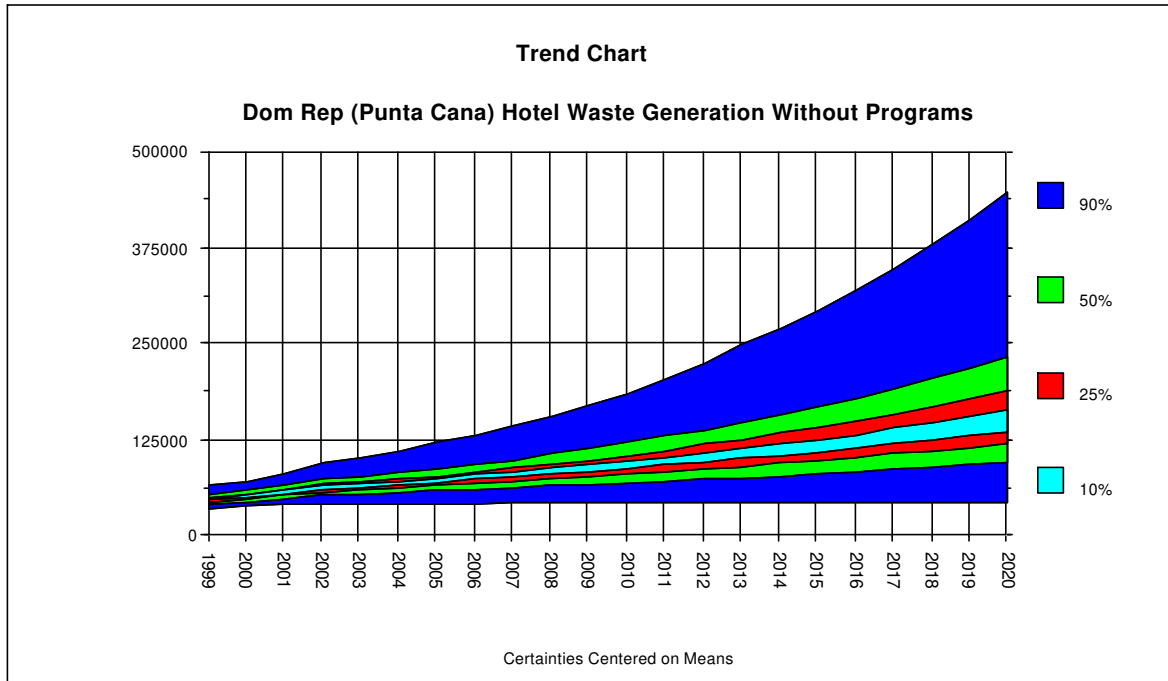


Chart XVII
Dominica Total Annual Waste Generation (Without Program)

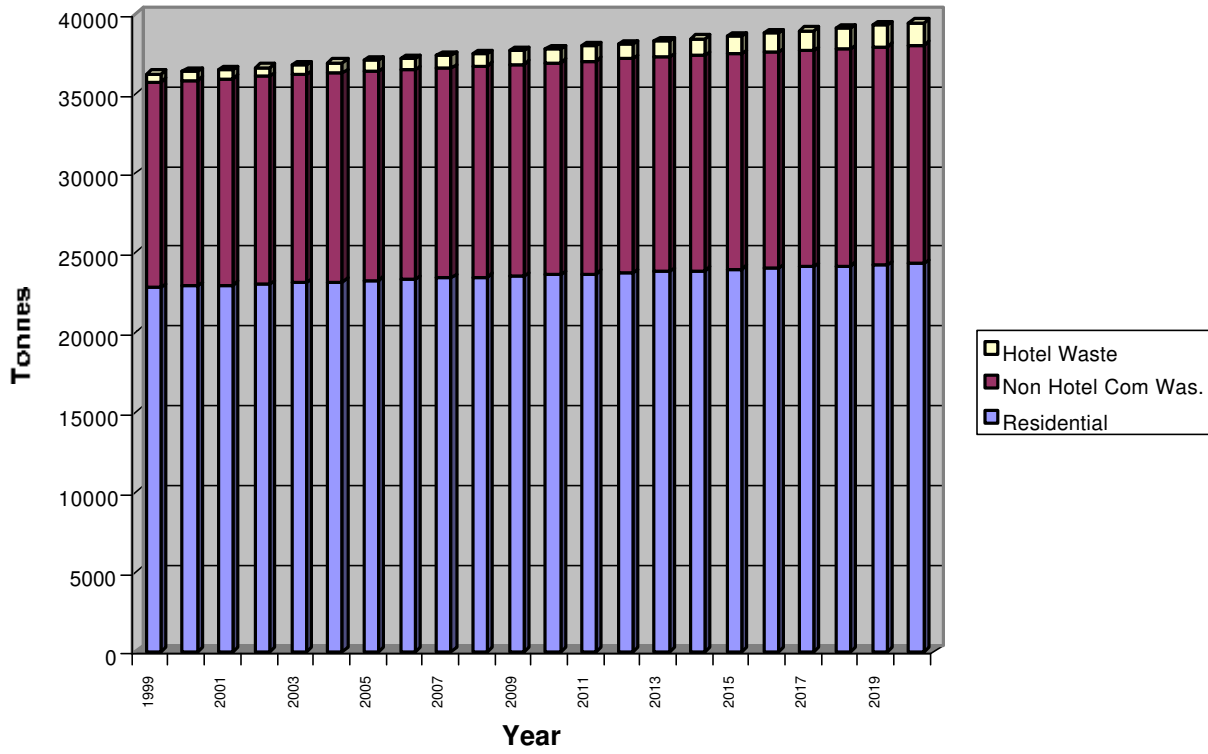


Chart XVIII
Dominica Total Annual Waste Generation (With Program)

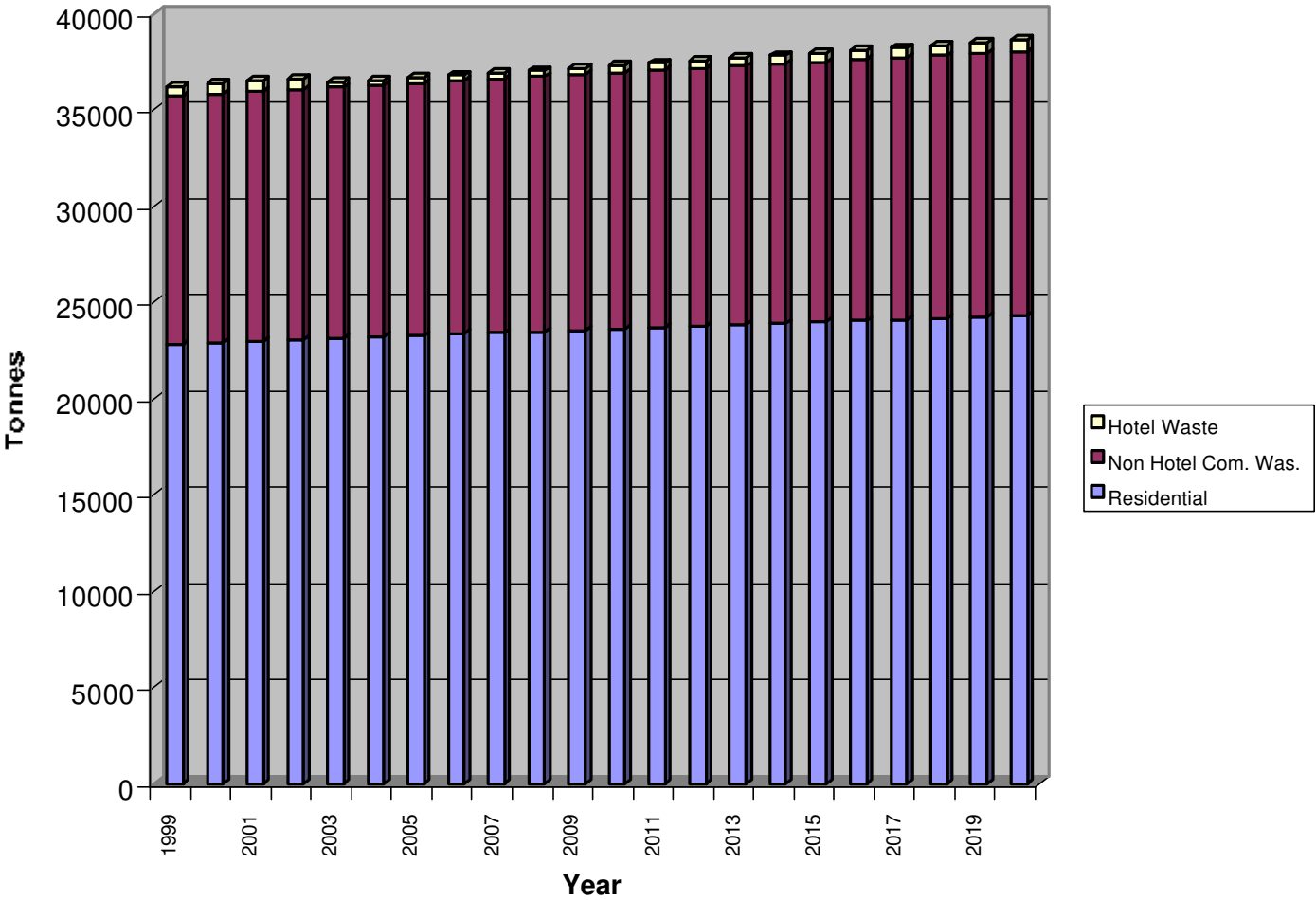


Chart XIX
St. Lucia Total Annual Waste Generation (Without Hotel Program)

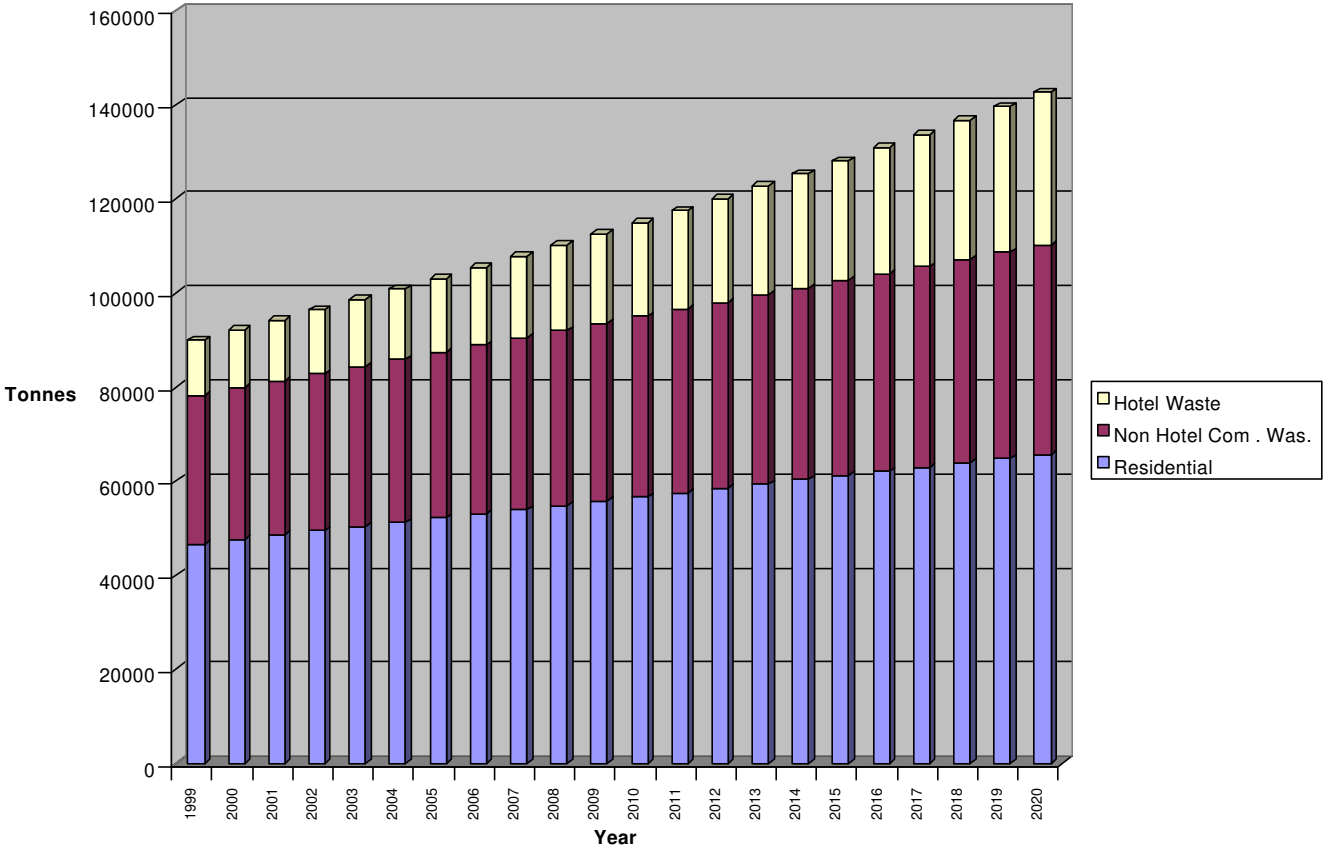


Chart XX
St. Lucia Total Annual Waste Generation (With Program)

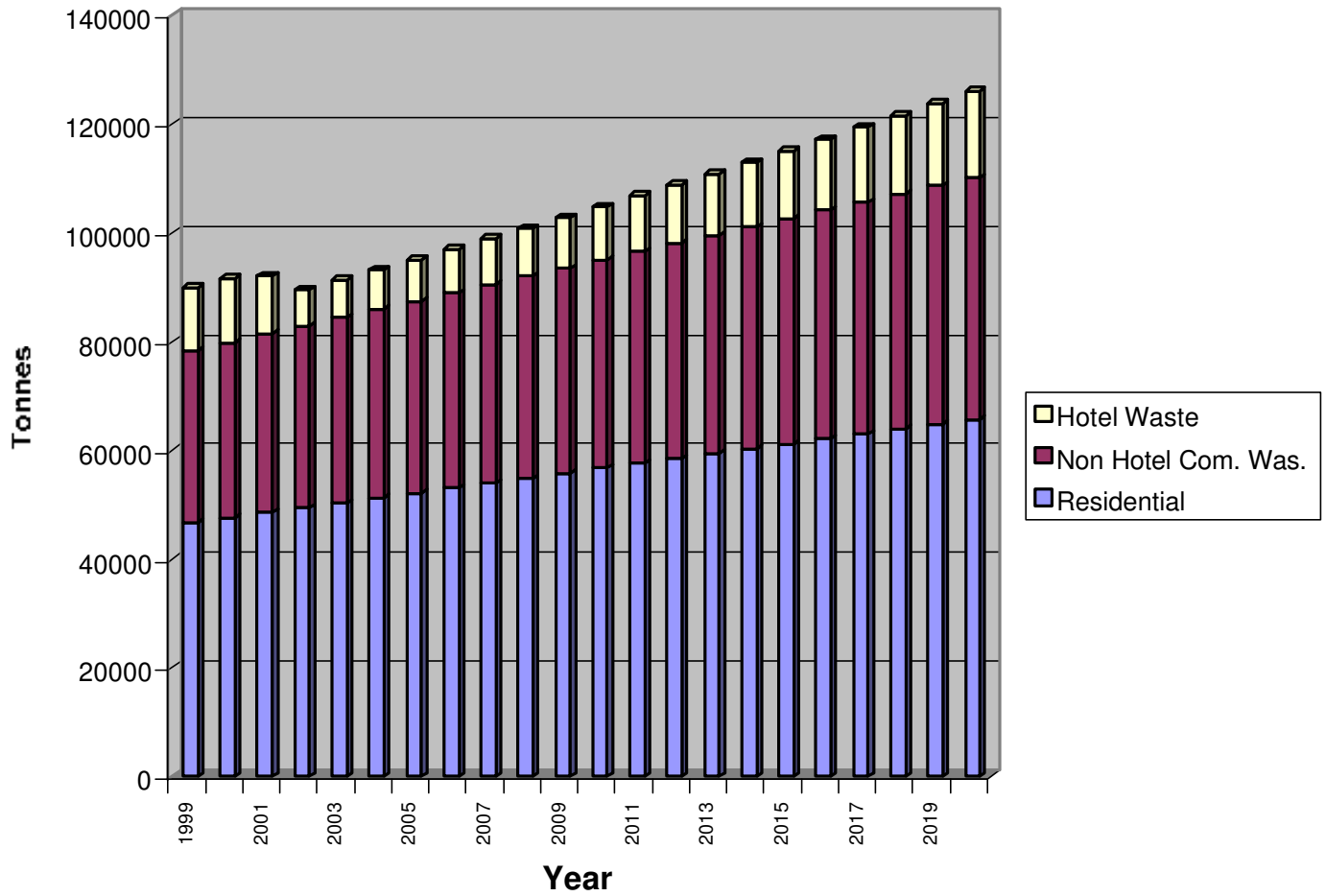


Chart XXI
Dominican Republic, Punta Cana Area Total
Annual Waste Generation (Without Program)

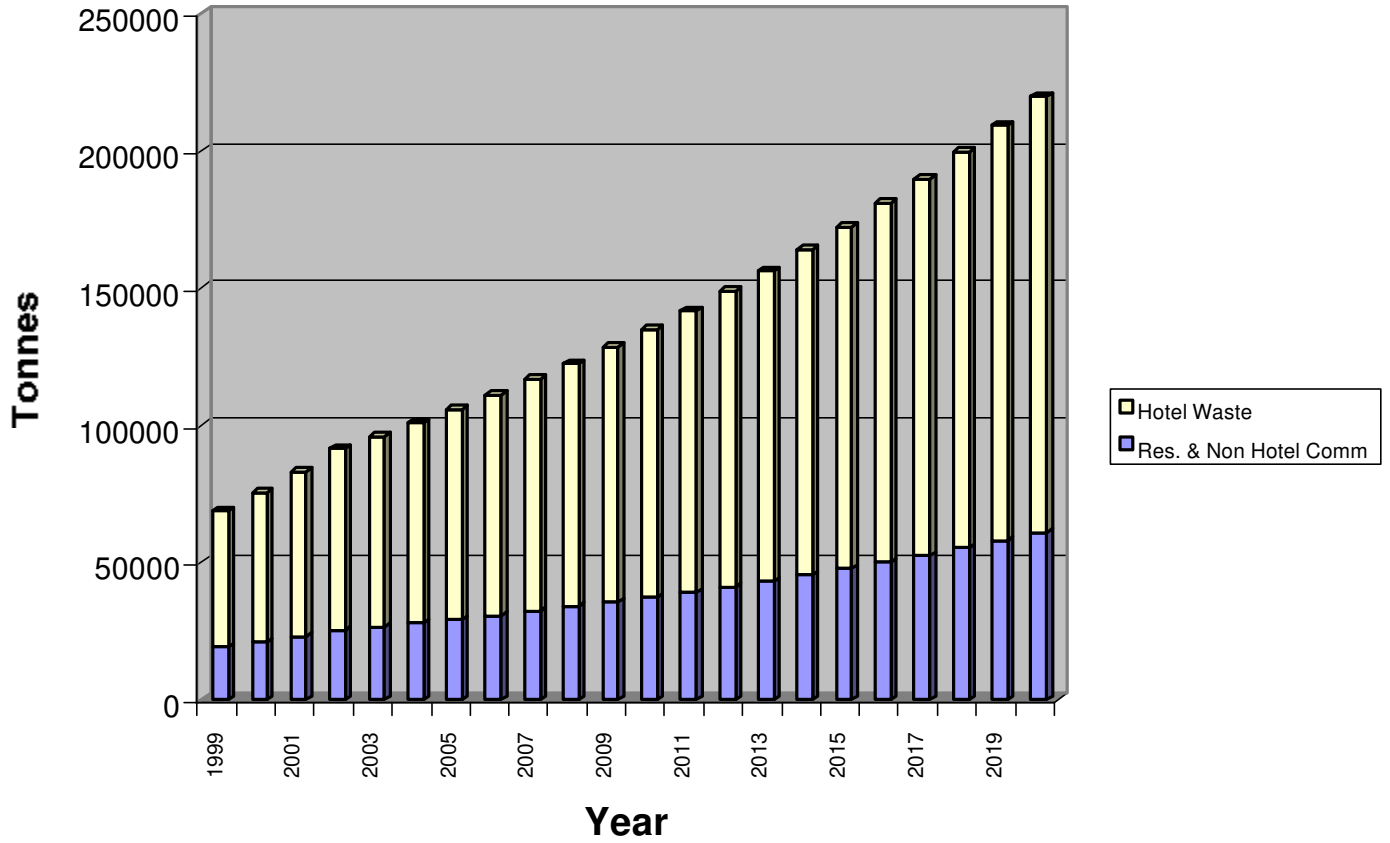
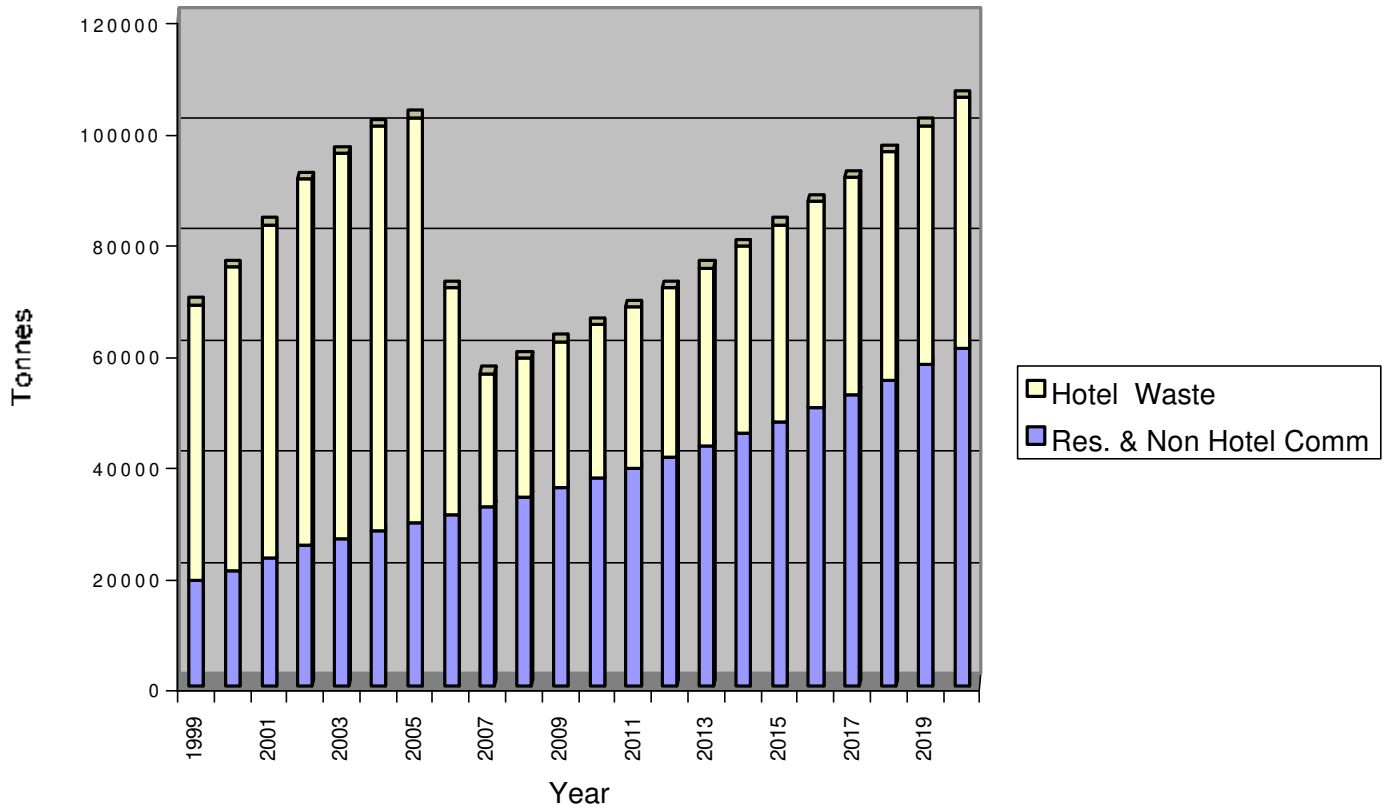


Chart XXII
Dominican Republic - Punta Cana Area
Total Annual Waste Generation (With Program)



Public sector policy options:

These have previously been outlined in the Section, “Actions that can be taken by Government.”

7. POTENTIAL FOR THE PRIVATE SECTOR INVESTMENT IN THE SOLID WASTE AND RECYCLING INDUSTRY

The following factors in the area of collection and haulage are favorable for private sector investment:

- Government licensing and long term contracts or franchised areas for municipal solid waste collection by the private sector.
- Introduction of waste wardens by the solid waste authorities to curtail illegal dumping and illegal dump sites.
- The introduction of fines and civil actions for illegal dumping.
- Establishment of tipping fees at disposal sites and the passing of these fees onto industrial, commercial and institutional customers. These fees will help to establish a sound financial base for the solid waste industry.
- Instituting container/compactor service systems for the industrial, commercial and institutional sector.
- The establishment of fees based on cubic yards or tonnage of waste produced by the customer.
- The institution of hauling and disposal fees will create competition and the upgrading of present solid waste storage, handling, and disposal systems.
- Significant volumes of waste could attract competitive bidding.

Factors not favoring private sector investment in collection and haulage include:

- The solid waste industry is capital intensive and many existing companies will not be able to update and grow as the solid waste industry becomes more of a reality.
- High duties and tariffs on solid waste handling and recycling equipment discourage private sector investment.
- Lack of qualified solid waste professionals to train and educate will hamper the growth of the industry.
- Lack of trained drivers and mechanics with a hydraulic and electrical background will place a burden on the private sector to keep equipment in good operating order.
- Lack of funding for growth from traditional or lease financing sources.

- Inability of the hotel and tourist industry to update or re-engineer current locations for new waste systems which correspond to proposed equipment and infrastructure.

In recycling, the following factors make private sector investment favorable:

- Reduces amounts of waste to disposal.
- Creates a new industry and source of employment.
- Focuses attention on the need for education on conservation of resources.

With the levying of a hauling (US\$35 ton) and landfill (\$20-\$50 per ton) tipping fees on Dominica and St. Lucia, the economics for recycling by the hotel and tourist industry improves. There is an abundance of materials available to be collected at a relatively low cost, i.e., cardboard, high-grade paper, aluminum and non-ferrous materials. Recycling provides material to local end-users at low cost and without need for long distance transportation. Low processing labor cost combined with the abundance of non-skilled labor for sorting of materials may contribute to favorable investment opportunities, as does the availability of land and equipment on St. Lucia and Dominica through the OECS solid waste project.

Negative factors for private sector investment in recycling include:

- High tariffs and duties on recycling equipment
- Lack of available traditional financing and leasing options
- Lack of cooperation to source separate materials by generations
- Lack of understanding of the island recycling markets
- Lack of controls on scavenging or unlicensed processors by the government means that sufficient volume may be impossible to obtain
- Expectations that large amounts of monies can be paid for recyclables in a very cyclical industry
- Lack of on-island markets for recyclables
- High cost of shipping commodities to off-island markets
- Cost of storage of commodities awaiting shipment
- Duplicates costs of collection and processing

The favorable conditions for private sector investment in composting include:

- Produces compost for use on island and reduces amount of material associated with disposal
- Improves quality and yield of garden and agricultural soil
- Avoids new proposed tipping fee for landfill disposal

The disadvantages for composting include:

- Engineering design for odor and sanitary controls required
- Lack of education and difficulty in training operators of composting systems
- Cost of equipment to convert solid waste to compost
- Lack of available financing
- Need for control mechanisms for operation and testing during processing of compost.

In regard to disposal and processing, factors favoring private sector investment include:

- Modern solid waste disposal protects the environment
- Provides a cornerstone for the establishment of tipping fees based on usage
- Preserves beach area and resources and encourages tourism

The disadvantages include:

- High initial capital costs
- High operational costs
- Relatively low disposal volumes to sustain a modern system
- Lack of trained solid waste professionals

ATTACHMENT I

SURVEY FORMS

ESTIMATED VOLUMES AND WASTE COMPOSITION

Island	Dumfries	No. of Rooms	2													
Resort	Port Young	Occupancy(A.L.O.A)	58%													
Address	Resort	Total Guests	104													
Date Of Audit	Feb 99	Employees (if in W.S.)	10													
		Total Persons in food W.S.	114													
Material (in Kg)	Kitchen	Beverage	Housekeeping	Ship/Rec	Bag/Grds	Office	All	Total	% by Vol	Conversion	Weight	Weight	% by Weig	Kg/Guest	kg/Guest	
General Trash		0.228	0.10					0.419	20.0%	0.55	80	44	20	7.9%	0.19	0.19
Food Waste	0.955							0.658	47.0%	1.25	300	375	170	67.8%	1.50	1.96
Yard Waste								0.428	21.1%	0.58	200	112	51	20.2%	0.48	0.00
Wood Waste								0	0.0%	0.26	200	0	0	0.0%	0.00	0.00
Office Paper								0	0.0%	0.00	400	0	0	0.0%	0.00	0.00
Newspaper								0	0.0%	0.00	450	0	0	0.0%	0.00	0.00
Magazines								0	0.0%	0.00	500	0	0	0.0%	0.00	0.00
Cardboard	0.229							0.229	11.3%	0.30	75	22	10	4.1%	0.10	0.10
Steel (Cans)								0	0.0%	0.00000	120	0.00	0.00	0.0%	0.00	0.00
Aluminum (Cans)								0	0.0%	0.00000	80	0.00	0.00	0.0%	0.00	0.00
Glass								0	0.0%	0.00	540	0	0	0.0%	0.00	0.00
PET								0	0.0%	0.00	25	0	0	0.0%	0.00	0.00
HDPE								0	0.0%	0.00	50	0	0	0.0%	0.00	0.00
Furniture								0	0.0%	0.00	150	0	0	0.0%	0.00	0.00
Other								0	0.0%	0.00	100	0	0	0.0%	0.00	0.00
Total	1.184	0	0	0	0.428	0	0	2.031	100%		583	252	100.0%	2.28	1.79	

Island	Dumfries	No. of Rooms	25													
Resort	Anchorage	Occupancy(A.L.O.A)	95%													
Address	P.O.Box 34	Total Guests	48													
Date Of Audit	Feb 99	Employees (if in W.S.)	5													
		Total Persons in food W.S.	53													
Material (in Kg)	Kitchen	Beverage	Housekeeping	Ship/Rec	Bag/Grds	Office	All	Total	% by Vol	Conversion	Weight	Weight	% by Weig	Kg/Guest	kg/Guest	
General Trash		0.110	0.229					0.344	33.3%	0.45	80	36	18	11.8%	0.34	0.34
Food Waste	0.573	0.575						0.588	68.7%	0.90	300	270	123	68.2%	2.34	2.34
Yard Waste								0	0.0%	0.00	200	0	0	0.0%	0.00	0.00
Wood Waste								0	0.0%	0.00	200	0	0	0.0%	0.00	0.00
Office Paper								0	0.0%	0.00	400	0	0	0.0%	0.00	0.00
Newspaper								0	0.0%	0.00	450	0	0	0.0%	0.00	0.00
Magazines								0	0.0%	0.00	500	0	0	0.0%	0.00	0.00
Cardboard								0	0.0%	0.00	75	0	0	0.0%	0.00	0.00
Steel (Cans)								0	0.0%	0.00000	120	0.00	0.00	0.0%	0.00	0.00
Aluminum (Cans)								0	0.0%	0.00000	80	0.00	0.00	0.0%	0.00	0.00
Glass								0	0.0%	0.00	540	0	0	0.0%	0.00	0.00
PET								0	0.0%	0.00	25	0	0	0.0%	0.00	0.00
HDPE								0	0.0%	0.00	50	0	0	0.0%	0.00	0.00
Furniture								0	0.0%	0.00	150	0	0	0.0%	0.00	0.00
Other								0	0.0%	0.00	100	0	0	0.0%	0.00	0.00
Total	0.573	0.115	0	0	0	0	0	1.032	100%		306	139	100.0%	2.68	2.68	

Island	Dumfries	No. of Rooms	26													
Resort	Castaways	Occupancy(A.L.O.A)	95%													
Address	Resort	Total Guests	49													
Date Of Audit	Feb 99	Employees (if in W.S.)	5													
		Total Persons in food W.S.	54													
Material (in Kg)	Kitchen	Beverage	Housekeeping	Ship/Rec	Bag/Grds	Office	All	Total	% by Vol	Conversion	Weight	Weight	% by Weig	Kg/Guest	kg/Guest	
General Trash	0.115	0.089	0.357			0.115		0.348	18.0%	0.45	80	36	18	6.8%	0.33	0.33
Food Waste	0.573	0.038						0.611	31.8%	0.80	300	240	108	45.1%	2.00	2.00
Yard Waste								0.855	49.6%	1.25	300	250	114	47.0%	2.30	0.00
Wood Waste								0	0.0%	0.00	200	0	0	0.0%	0.00	0.00
Office Paper						0.012		0.012	0.8%	0.02	400	6	3	1.2%	0.08	0.08
Newspaper								0	0.0%	0.00	450	0	0	0.0%	0.00	0.00
Magazines								0	0.0%	0.00	500	0	0	0.0%	0.00	0.00
Cardboard								0	0.0%	0.00	75	0	0	0.0%	0.00	0.00
Steel (Cans)								0	0.0%	0.00000	120	0.00	0.00	0.0%	0.00	0.00
Aluminum (Cans)								0	0.0%	0.00000	80	0.00	0.00	0.0%	0.00	0.00
Glass								0	0.0%	0.00	540	0	0	0.0%	0.00	0.00
PLT								0	0.0%	0.00	25	0	0	0.0%	0.00	0.00
HDPE								0	0.0%	0.00	50	0	0	0.0%	0.00	0.00
Furniture								0	0.0%	0.00	150	0	0	0.0%	0.00	0.00
Other								0	0.0%	0.00	100	0	0	0.0%	0.00	0.00
Total	0.573	0.038	0	0	0.056	0.012	0	1.024	100%		532	242	100.0%	4.70	2.40	

ATTACHMENT II

DOMINICA INTERIM IMPLEMENTATION REVIEW REPORT

Dominica

Institutional and Legal Framework

Issue	STATUS	DATE	COMMENTS
Establishment of the PIU (Staffing and physical Entity)	Ongoing	Nov '98	Efforts are being made to accommodate the Accounts Clerk and Public Relations Officer
Establishment of the SWMA Authority/ Entity (Staffing and Physical Entity)	-do-	-do-	-do-
Government/Board/PIU/SWMA Relationship	-	--	The permanent Secretary/Health and social Security is Chairperson of PIU/DSWMC
Plans to strengthen the SWMA/Entity services of a Technical Expert	Ongoing	--	The European Union has been requested to provide the
Plans for and role of the Private Sector/ Other Interest Groups	Ongoing	--	Plans are being developed to privatize the collection System of certain zones
Creation of "Special Accounts" for: - Government funds - World Bank/GET funds - CDB funds - EIB funds - EDF funds	Completed Completed -- -- --	Jul '98 Oct '98 -- -- --	All payments are made directly by donor Agency N/A All payments are made directly by Donor Agency
Arrangements for transfer of Environmental Levy to "Special Accounts"	Implemented	May '98	Arrangements have been implemented for the transfer of Environmental Levy to the Bank Account of the DSWMC
Compliance with the Legal agreement With the World Bank	Fulfilled	Nov '96	
Any need to revise the legal agreements With the World Bank (give justification)	NO		
Other legal issues	Ongoing	Jul '98	Model policy, legislation and regulations for the Management Of Solid and ship-generated waste are being developed by Consultants

Dominica

OECS Solid and Ship-Generated Waste Management Project
Mid-Term Review Report Form

Financial Issues

Issue	Status	Date	Comments
<p>Cost Recovery Plan</p> <ul style="list-style-type: none"> • Governmental Contribution • Environmental Levy • Haulage and Tripping Fee • Other Measures 	<p>Implemented Implemented -- --</p>	<p>July '98 May '98 -- --</p>	<p>To be implemented when new landfill is operational</p>
<p>Adequacy of project funds</p> <ul style="list-style-type: none"> • World Bank • CDB • ELB • EDF 	<p>--</p>	<p>--</p>	<p>Not yet known – Consultants retained by the PMU have just began work on the procurement process</p>
<p>Plans to fund the revised cost of the project (GEF) constrained by expenditures related to Maritime activities</p>	<p>--</p>	<p>--</p>	<p>Plans are subject to the findings of the Consultants Funds are which are pending</p>
<p>Plans for balancing Revenue with Expenditure During implementation and after implementation Of the project</p>			<p>Revenue inflows are sufficient to meet expenditure</p>
<p>Plans to identify new sources of revenue for Solid Waste Management Activities</p>	<p>Ongoing</p>	<p>July '98</p>	<p>New Sources of revenue related to waste recycling and reuse</p>

Dominica

OECS Solid and Ship-Generated Waste Management Project
 Mid-Term Review Report Form

Issue	Status	Date	Comments
Land acquisition	Completed	July '98	All Lands are State-Owned
EA for each of the proposed landfill sites	Completed	Nov '92	Executed by CELL -GTZ Institutional Strengthening Project
Landfill design contracts	Completed	Oct '98	Final Design received from consultants
Contracts for construction of the landfills	Ongoing	Nov '98	Contract Document is being prepared by consultants
Rehabilitation and closure of current dump sites	-	--	To be executed on opening of the New Sanitary Landfill

Equipment Procurement

Issue	Status	Date	Comments
Plans to revise the list of Equipment – Each beneficiary country should provide a revised list of equipment in view of the role of the private sector in collection and transport of waste	-	--	No revision required as it is proposed to lease to the private sector, equipment procured under the project
Procurement plans <ul style="list-style-type: none"> • Incinerators • Barge • Landfill Equipment • Other Equipment 	Ongoing	Oct '98	Consultants have been retained by the PMU to undertake the procurement of equipment on a joint basis

Dominica

OECS Solid and Ship-Generated Waste Management Project

Mid-Term Review Report Form

Overall Project Implementation

ISSUE	COMMENTS
Implementation Delays	None Anticipated
Risks that may delay project completion by December 31, 2000	None Currently Identified/Anticipated

Comments on Regional Activities

Environmental Policy, Legislation, and Regulations	Consultants commenced work in July 1998
Waste Reduction, Recycling, Recovery and Reuse	- do -
Equipment Procurement	Consultants commenced work in October 1998
Assistance with TORs and Specifications	- do -
Wastewater Management	--
Project Benefit Monitoring and Evaluation	To commence shortly
Public Awareness and Education	To commence Shortly
Training	To commence Shortly
Marine Waste Documentation's	To be developed
General Assistance to PIUs	Ongoing

ATTACHMENT III

ST. LUCIA

INTERIM STATUS REPORT

IMPLEMENTATION PLANS FOR OECS PROJECT ACTIVITIES

IMPLEMENTATION SCHEDULE
(from Dillon Action Plan Report, December 1998)

Saint Lucia
OECS and Ship – Generated Waste Management Project
Mid – term Review Report Form
Institutional and Legal Framework

Issue	STATUS	DATE	COMMENTS
Establishment of the PIU (Staffing and physical Entity)	Complete	Continuous	PIU is SWMA (SLECL ST.Lucia Env. CO. Ltd Contractor)
Establishment of the SWMA Authority/ Entity (Staffing and Physical Entity)	Complete	Continuous	SWMA declared into operation under SI#20 of 1996 (See attached org chart for staffing status) SWMA occupies dedicated office space (approx. 1925 s.f.)
Government/Board/PIU/SWMA Relationship	N/A		Relationships defined under SI No. of 1996. SWMA is statutory body reporting to a 12 member board comprising Member's representing the public and private sectors and And nominees of the Minister.
Plans to strengthen the SWMA/Entity	Ongoing	Continuous	Ongoing training of professional staff ; recruitment of Enforcement Officers (2) in the north and south in early '99
Plans for and role of the Private Sector/ Other Interest Groups	Ongoing	Continuous	All services to date are contracted out to private sector entities.
Creation of "Special Accounts" for: - Government funds - World Bank/GET funds	Complete		Special accounts only applicable for World Bank and GET Funds. Accounts established but not yet active. Government subvention is deposited in a current account at NCB.
Arrangements for transfer of Environmental Levy to "Special Accounts"	In Place	Continuous	Levy funds are deposited in NCB current account
Compliance with the Legal agreement With the World Bank	Compliant	Nov 15 th '98 Continuous	Outstanding conditions precedent to declaration of effectiveness (deadline Nov 15 th '98) are completion of land Acquisition and submission of revised cost recovery plan. The borrower is committed to compliance with all covenants of the various agreements , throughout project implementation and beyond.
Any need to revise the legal agreements With the World Bank (give justification)	Required		Legal agreement to be revised to reflect revised funding allocations proposed
Other legal issues	N/A		No other legal issues anticipated

ST. Lucia
OECS Solid and Ship-Generated Waste Management Project
Mid-Term Review Report Form

Financial Issues

Issue	Status	Date	Comments
<p>Cost Recovery Plan</p> <ul style="list-style-type: none"> • Governmental Contribution • Environmental Levy • Haulage and Tipping Fee • Other Measures 	Substantially Complete		<p>Revised cost recovery plan to be submitted to agencies summarizes all proposed revenue streams. Further adjustments expected after GOSL approval of Dillon recommendations for 4R initiatives in 1999. Audit Report, 1998/99 budget and summary of levy receipts (May to September 1998) have been submitted under separate cover.</p>
<p>Adequacy of project funds</p> <ul style="list-style-type: none"> • World Bank • CDB 	Ongoing		<p>Re-allocations of project funds has been requested and approved in principle by both agencies. Proposed CDB funding to be increased from US\$1.96 MN to estimated US\$3.96 MN (firm figure pending) Receipt of DB bids, to be submitted to CDB board). Proposed WB funding has decreased from US\$4.56 MN to estimated US\$3.40 MN. Total project cost has increased from US\$12.19 MN</p>
<p>Plans to fund the revised cost of the project (GEF Funds are constrained by expenditures related to Maritime activities</p>	Substantially Complete		<p>Proposed revised project funding allocations (CDB & WB) previously submitted.</p>
<p>Plans for balancing Revenue with Expenditure During implementation and after implementation Of the project</p>	Substantially Complete		<p>Addressed in revised cost recovery plan.</p>
<p>Plans to identify new sources of revenue for Solid Waste Management Activities</p>	Complete		<p>New sources (beyond those proposed in the cost recovery plan) will be limited to those to be recommended in the Dillon final report in the first instance.</p>

OECS Solid and Ship-Generated Waste Management Project
Mid-Term Review Report Form

Issue	Status	Date	Comments
Land acquisition	Substantially Complete		Two consecutive declarations of acquisition to be published prior to Nov 15 th , 1998, at which point the land will vest absolutely in the Crown
EA for each of the proposed landfill sites	Complete		ERM June '98 report addressed deficiencies (vis a vis WB requirements) in the GTZ funded EIA of Deglos
Landfill design contracts	Ongoing	May 1999	A Design-Build Contract will be issued prior to CDB May 11 th , 1999 Deadline for commissioning of landfill consultants
Contracts for construction of the landfills	do.	do.	do.
Rehabilitation and closure of current dump sites	Ongoing	Dec 2000	Rehabilitation and closure plans for Vieux Fort and Ciceron will be Prepared in-house (D/VD TCO responsibility), and associated agency funded activities to be implemented in accordance with agency guidelines.

Equipment Procurement

Issue	Status	Date	Comments
Plans to revise the list of Equipment - Each beneficiary country should provide a revised list of equipment in view of the role of the private sector in collection and transport of waste.	Substantially Complete		Await cost and information from equipment procurement consultants, subsequent to workshop on Oct. 1998. Anticipate ongoing refinements as plan develops in collaboration with regional equipment procurement consultants
Procurement plans <ul style="list-style-type: none"> • Incinerators • Barge • Landfill Equipment • Other Equipment 	Ongoing	Varies with Package	Many of these items will be procured on a regional basis. Others will be as per revised implementation plan provided.

ST. Lucia

OECS Solid and Ship-Generated Waste Management Project
Mid-Term Review Report Form

Overall Project Implementation

ISSUE	COMMENTS
Implementation Delays	The primary delay has been on Deglos land acquisition. However, all other activities related to the Deglos site developments are progressing unimpeded.
Risks that may delay project completion By December 31, 2000	None (with the exception of force majeure occurrences).
Comments on Regional Activities	
Environmental Policy, Legislation, and Regulations	Ongoing; Outputs satisfactory to date.
Waste Reduction, Recycling, Recovery and Reuse	Ongoing; Outputs satisfactory to date. Would prefer to have larger number of documents and more time for review. This comment has been taken on for the next phase review
Equipment Procurement	Ongoing; Outputs satisfactory to date.
Assistance with TORs and Specifications	Requests for such assistance have been limited. The suggestion that incineration Facilities be incorporated under the regional procurement package has been taken On by the PMU. WE anticipate that further appropriate assistance will be available
Wastewater Management	Implementation in ST. Lucia has been deferred to date.
Project Benefit Monitoring and Evaluation	Not yet implemented.
Public Awareness and Education	Limited PMU activity in this regard to date. It's been suggested (at the October 3 R's workshop) That generic guidelines as recommended by the 3R's component be developed under this activity
Training	None to Date.
Marine Waste Documentation's	Limited to the work under the Environmental Policy, Legislation and Regulations by de Romilly to date.
General Assistance to PIUs	Satisfactory to date. PMU must start reporting (financial and otherwise) to PIUs, as historical And proposed PIU contributions to PMU operations should be reflected in national budgets.

