



WASTE MANAGEMENT BLUEPRINT FOR THE GALÁPAGOS ISLANDS

March 2010





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- promoting the reduction of pollution and wasteful consumption.

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Index

1. Introduction	3
2. Current Waste Management Situation in the Galápagos Islands	5
2.1. Main Causes of Marine Pollution in the Galápagos Islands	5
2.2. Waste Generation by Sectors in the Galápagos Islands	6
2.3. Summary of Current Waste Management Activities, by Island	7
2.4. Characterization of Waste in the inhabited islands of Galápagos	8
3. WWF and Toyota Activities	10
3.1. WWF and Toyota Activities in Santa Cruz Island, Galápagos	10
3.2. Results of Activities	11
3.3. Lessons Learned	11
4. Waste Management Blueprint	12
5. Sustainability	14
5.1. Technical Sustainability	16
5.2. Financial Sustainability	16
5.3. Social Sustainability	16

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1. Introduction

The Galápagos Islands have achieved worldwide significance and global recognition because of their marine and terrestrial endemic uniqueness; their geological formations; and because of their geographic location at the convergence of five important marine currents. The islands are also known worldwide as the inspiration for Charles Darwin's theory of natural selection.

Key milestones in the modern history of the Galápagos include:

- 1934 Galápagos designated a wildlife sanctuary
- 1959 97% of its terrestrial area declared a National Park
- 1978 Galápagos declared a World Natural Heritage Site by UNESCO
- 1984 Galápagos declared a Biosphere Reserve by UNESCO
- 1986 Galápagos Marine Reserve created
- 1998 Galápagos Special Law created
- 2001 Marine Reserve declared a UNESCO World Natural Heritage Site

The national and international attention has attracted many visitors, primarily tourists and Ecuadorian immigrants in search of new employment opportunities. In the late 1960s there were approximately 2,000 visitors to the islands each year; by 2007, this number had increased to more than 160,000 per year¹. The continuous growth in tourism and its associated economic opportunity has also caused a steady growth in immigration. The current population growth is greater than 6% annually². If this trend continues, the population of the islands will double within 12 years.



This growth in tourism and population has severely impacted the islands, including the introduction of invasive species and increased pressure on the natural resource base from agriculture and fishing. There has also been an increase in the demand for infrastructure, goods and services. This has led to unsustainable levels of energy and water consumption; contamination of air, soil, and fresh and seawater resources; and public health problems, among others.

1. Epler Bruce (2007). "Tourism, the Economy, Population Growth and Conservation in Galápagos." Charles Darwin Foundation, Santa Cruz, Galápagos, Ecuador. 75 pp.

2. WWF (2003). "Migration and Environment in the Galápagos Islands." Quito, Ecuador. 135 pp.

In 2007, recognizing these increasing pressures on the islands and their associated negative impacts on the natural resource base, the Ecuadorian government and UNESCO made two key decisions:

April 2007 Emergency Decree issued by the President of Ecuador declaring the conservation and environmental management of the Galápagos ecosystem at risk, and declaring the islands a national priority.

June 2007 UNESCO placed the Galápagos Islands on its Endangered World Heritage Site list.

Currently, one of the most critical environmental threats to the Galápagos is the increased generation of waste and improper waste management practices. These threats affect not only the terrestrial areas of the inhabited islands but also the unique ecosystems of non-inhabited islands and Galápagos' fragile marine ecosystems.



2. Current Waste Management Situation in the Galápagos Islands

The management of municipal solid waste in the Galápagos is complex, and has not evolved at the same pace as the islands' urbanization and economic growth. Although solid waste disposal was identified as an issue several years ago, the Municipalities of the four inhabited islands have not had sufficient resources or local technical expertise to adequately address the problem to date.

The waste collection and transportation systems in the Galápagos Islands are not well-organized and do not extend to all inhabited areas.

In areas where a collection mechanism does exist, old or inadequate equipment is used, and there are no sanitary landfills on any of the inhabited islands for the final disposal of waste. The places for final disposal can be characterized as dumpsites, where waste gets dumped and openly burned. In addition to household waste, the dumpsites contain chemicals and bio-hazardous hospital waste. These chemicals and toxic materials leach into the ground, contaminating scarce groundwater sources, and create toxic gases when burned. The dumpsites attract and provide breeding ground for parasites, rats and insects and help to spread these invasive species. Illegal dumping of waste also takes place.

Litter is also a problem. This is primarily due to a lack of awareness of the population, but also due to waste dropped from waste collection trucks and light waste blown away from open-sky dumpsites.



2.1 Main Causes of Marine Pollution in the Galápagos Islands

While some of the marine pollution in the Galápagos is from litter blown to sea from the inhabited islands, the primary source is tourism ships. While it is legal for the tourism ships to dispose of their organic waste in the waters surrounding the islands, plastics that are not completely separated from the organic waste also often end up in the water. These plastics include bags, bottle caps/stoppers, labels and small bottles. Finally, due to a lack of treatment facilities, all ships dump their wastewater and highly contaminated bilge waters directly into the sea.

Small fishing boats that dump fishing lines and nets overboard, rather than disposing of them on land, are another source of marine pollution. These nets can become deadly traps for sea birds, mammals and turtles.

2.2 Waste Generation by Sectors in the Galápagos Islands

Table 1
Waste Generation by Sectors in the Galápagos Islands

Sector Waste Generation	Santa Cruz Island (including Baltra Island) 16,000 inhabitants About 10 tons/day	San Cristobal Island (including Floreana Island) 8,000 inhabitants About 6,4 tons/day	Isabela Island 3,000 inhabitants About 2,4 tons/day
Households	Recyclables, Organics, Non-Recyclables. Major Producer of Non-Recyclables, Scraps and Special Waste.		Recyclables, Organics, Non-Recyclables. Major Producer of Waste.
Commercial	Major Producer of Recyclables.		Major Producer of Recyclables.
Bars and Restaurants	Big Producer of Recyclables and Organics.		Producer of Recyclables and Organics.
Tourism: Hotels	Big Producer of Recyclables and Organics.		Big Producer of Recyclables and Organics.
Tourism: Ships and Boats	Major Producer of Waste Oil.	3 rd largest Producer of Waste Oil.	No detailed information.
Electric Power	2 nd largest Producer of Waste Oil. Producer of Special and Toxic Waste (PCB's).	Major Producer of Waste Oil. Producer of Special and Toxic Waste (PCB's).	Major Producer of Waste Oil. Producer of Special and Toxic Waste (PCB's).
Transport	3 rd largest Producer of Waste Oil.	2 nd largest Producer of Waste Oil.	No detailed information but significant.
Fishing	Waste Oil and Sea Debris.		
Handcraft and Semi-Industrial	Big Producer of Scraps, Toxic and Special Waste.		No detailed information available.
Hospitals, Medical Assistance and Pharmacies	Hospital Waste, Bio-hazardous Waste, Drugs.		No detailed information available.
Agriculture	Producer of Special Organic Waste.		No detailed information available.

Source: Environmental Department of the Municipality of Santa Cruz, Galápagos 2008.

2.3 Summary of Current Waste Management Activities, by island

Table 2
Summary of Current Waste Management Activities, by island

	Isla Santa Cruz (including Baltra Island)	San Cristobal Island (including Floreana Island)	Isabela Island
Waste Collection	Separated, 100% coverage.	Separated, 90% coverage.	Not separated. No detailed information available
Final Waste Treatment	No Sanitary Landfill. Basic management of dumpsite.	No Sanitary Landfill. Open-sky dumpsite.	
Reciclaje	Recycling System since 2006. Estimated Efficiency (2008): - Non-Recyclables: 10m ³ -12m ³ /day - Recyclables: 10m ³ /day - Organics: 1m-2m ³ /day	Recycling System since 2007. Efficiency: No information available. Estimation: less than 10% in weight.	No Recycling System.
Scrap Metal and Used Tires	Basic Scrap Management System - Separated Collection - Primitive Scrap yard - Exportation of scrap metal and used tires to the mainland	No Scrap Management System. Scraps and used tires get dumped at the dumpsite.	
Hospital and Bio-hazardous Waste	Separated and weekly collection of Hospital and Bio-hazardous Waste. Incineration in special incinerator.	No reliable information available Incinerator existing.	No collection of hospital and bio-hazardous waste. No incinerator.
Special Waste (Computers, Cell phones, Air Conditioners, etc.)	No Separation, No Collection, No Treatment.		
Toxic Waste	No Separation, No Collection, No Treatment.		
Waste Oil Collection	Oil Collection System since 2000 (RELUGAL). No Collection of Oil Filters, Brake Fluids, Cooking Oil.	Oil Collection System since 2007 (RELUSAN). No Collection of Oil Filters, Brake Fluids, Cooking Oil.	No Oil Collection System. No Collection of Oil Filters, Brake Fluids, Cooking Oil.
Environmental Education Campaign on Recycling Practices	Continuous Environmental Education Campaigns on Recycling Practices since 2007.	Sporadic Environmental Education Campaigns on Recycling Practices since 2007.	No Environmental Education Campaigns on Recycling Practices.
Monitoring and Control System	Continuous Monitoring and Control of Waste Separation. Continuous Monitoring and Control of Waste Separation.	Sporadic Monitoring and Control of Waste Collection System. Continuous Monitoring and Control of Waste Separation.	No Monitoring and Control.
Municipal Ordinance on Waste Management and Recycling	Existent, has to be revised and improved.	Existent, has to be revised and improved.	Non existent.
Street Cleaning/Sweeping/Litter	Municipal Street Cleaning System existent. Has to be improved. Lack of basic equipment: Public dustbins, efficient equipment for street cleaning. Environmental Campaign on Not-Littering is missing.	Municipal Street Cleaning System existent. Has to be improved. Lack of basic equipment: Public dustbins, efficient equipment for street cleaning. Environmental Campaign on Not-Littering is missing.	Municipal Street Cleaning System existent. Lack of basic equipment: Public dustbins. Environmental Campaign on Not-Littering is missing.

2.4 Characterization of Waste in the inhabited islands of Galápagos



A study carried out by WWF in 2008³ shows that, currently, waste in the Galápagos Islands is mainly composed of organic materials. In Santa Cruz Island, approximately 40% of all collected waste is organic. This is low in comparison to cities in mainland Ecuador, where the organic material comprises 50%-60% of total waste collected. The reason for this may be that many products arrive in Galápagos semi-processed or clean, thereby reducing the volume of food scraps for disposal, and also that much of the organic waste that is produced, such as leaves, fruit, and vegetable skins, is used to feed animals (e.g. pigs). In contrast, non-organic waste has comparatively high collected amounts compared to mainland Ecuador, including cardboard (6.83% of total collected waste), glass (7.85%), plastic (2.8%) and disposable baby diapers (5%).

The results for San Cristobal and Isabela Islands differ from those for Santa Cruz Island. For example, in San Cristobal Island, organic materials account for 61%, cardboard 6.23%, glass 5.8% and plastic 3.53%; while in Isabela Island organic materials comprise 85.71%, cardboard 1.36%, glass 2.59% and plastic 2.99%.

Projections showed that every ten years the amount of waste generated in Galápagos doubles. This is not only due to population growth but to new and increased consumption patterns.

These data will help to inform the Municipalities of the three islands as they look to create sustainable, long-term waste management practices and systems.

3. De la Torre, Francisco (2008) "Characterization of Solid Waste in Santa Cruz, San Cristobal and Isabela, Galápagos." Internal WWF Report.

Table 3
Household Waste Produced in the Galápagos Islands

Amount produced	ISLANDS		
	Santa Cruz	San Cristobal	Isabela
Producción per cápita	0.617 Kg/person/day	0.559 Kg/person/day	0.598 Kg/person/day
Solid waste total	11.21 tons/day	4.17 tons/day	1.43 tons/day
Commercial	26 %	20 %	15 %
Residential	58 %	67 %	73 %
Rural	16 %	13 %	12 %
TOTAL	100%	100%	100%

Source: De la Torre, Francisco (2008) "Characterization of Solid Waste in Santa Cruz, San Cristobal and Isabela Islands, Galápagos," Internal WWF Report.

Table 4
Waste Produced on Tourism Boats and Disposed on Santa Cruz, San Cristobal and Isabela Islands

Amount produced	ISLANDS		
	Santa Cruz	San Cristobal	Isabela
Total barcos de turismo	2.1 tons/day	0.8 tons/day	0.3 tons/day

Source: De la Torre, Francisco (2008) "Characterization of Solid Waste in Santa Cruz, San Cristobal and Isabela Islands, Galápagos," Internal WWF Report.



3. WWF and Toyota Activities

The first formal recycling effort in Galápagos started in Santa Cruz Island in the late 1990s, supported by the Galápagos National Park Service, the Galápagos Foundation and the Municipality. Since that time the Galápagos Foundation has provided ongoing funding for the staffing and administration of the Municipal recycling center. Between 2003 and 2006, with funding from the European Union (URB-AL-Program), the Municipality built a recycling plant and a compost area, purchased a waste compactor truck, and hired a consultant for the Municipality of Santa Cruz to coordinate the project's launch and implementation.

Having worked together on conservation issues in the Galápagos for several years, in 2006 WWF and Toyota began to focus on the critically important area of waste management. The work built upon the efforts already started by the Municipality of Santa Cruz. We chose to focus on Santa Cruz because there was already an existing structure to work with, and because 60% of the waste generated in the archipelago is generated on Santa Cruz. One of the first activities was to improve the waste collection system by requiring households to separate waste into three categories: recyclables, organics and non-recyclables. Other activities are detailed below.

3.1 WWF and Toyota Activities in Santa Cruz Island, Galápagos

Recycling

- ⇒ Expanded the existing recycling center
- ⇒ Donated a mechanical composter (to process the larger volume of organic waste)
- ⇒ Created the Municipal Environmental Department to serve as program coordinator
- ⇒ Donated 7,500 colored containers for waste separation (3 per household)
- ⇒ Funded and assigned an international environmental expert to the Municipality of Santa Cruz to manage the recycling program
- ⇒ Funded and assigned a local expert to the Municipality of Santa Cruz to assess and manage the program
- ⇒ Funded and implemented a 3-year education and outreach campaign on recycling practices
- ⇒ Supported the oil recycling projects RELUGAL in Santa Cruz Island and RELUSAN in San Cristobal Island (including training, donation of equipment, infrastructure and technical assessment, and funding of operating costs)
- ⇒ Funded the design and the environmental impact assessment of the sanitary landfill

Waste Collection

- ⇒ Replaced existing waste compactor truck
- ⇒ Donated a truck scale to weigh the waste streams
- ⇒ Expanded service to rural inhabited areas
- ⇒ Expanded service to tourism boats
- ⇒ Installed GPS-monitoring of the collection trucks
- ⇒ Redesigned street-cleaning service to reduce litter
- ⇒ Implemented a continuous monitoring program in combination with zoning of the urban areas
- ⇒ Held training workshops for the Municipal street cleaning team

3.2 Results of Activities

- 260% increase in waste recycled between January 2007 and August 2009.
- 35% reduction in per-capita waste generation (from 0.62 kg/person/day to 0.4 kg/person/day) between January 2007 and August 2009.
- 400% increase in composting and recycling system efficiency between January 2007 and August 2009.



3.3 Lessons Learned

- a) Assuring the long term conservation of the Galápagos is only possible by involving the local population - creating the political will and commitment of the local decision-makers and stakeholders, and then educating and engaging the community.
- b) It is critical to build local knowledge, expertise and capacity. This was achieved by providing technical assistance and training to local technicians by temporarily integrating technical experts into local institutions.
- c) Success is measured over a period of years, and in increments.
- d) There is a need for on-going community education, as 1) the concept of waste classification is still very new; and 2) the population continues to grow.

4. Waste Management Blueprint



WWF and Toyota's vision is that by the year 2020, an integrated waste management and recycling system will be implemented on all inhabited islands of Galápagos. The system will ensure an efficient and complete collection of all waste types, with significant reductions in the quantities of waste generated through effective waste minimization programs, including elimination of waste at the source, improvement of current recycling activities, and the development of recycling, disposal and treatment options for other types of waste.

The mission of this waste management blueprint for the Galápagos Islands is to achieve significant progress toward the 2020 vision, by:

- Raising awareness at the community, government and political levels about the need for proper waste management in the Galápagos Islands.
- Significantly reducing the quantities of waste generated, particularly waste that needs to be treated and disposed in sanitary landfills.
- Upgrading current waste collection and disposal systems.
- Addressing the current financial, regulatory, institutional and social barriers to effective waste management in the Galápagos.
- Reducing the potential for adverse environmental and health impacts from on-going waste collection and disposal activities.
- Establishing permanent waste management positions at the three Municipalities, and training these personnel.
- Establishing financial, regulatory and other relevant mechanisms within each Municipality to ensure effective and sustainable integrated waste management for the Archipelago.
- Educating the local populations about the need for and methods of proper waste management.

Table 5
Short Term Actions (~2010 – 2013)

	Santa Cruz Island (including Baltra Island)	San Cristobal Island (incl. Floreana Island)	Isabela Island
Detailed Analysis of Waste Production and Waste Composition	Recyclables, Organics, Non-Recyclables, Scraps, Special Waste, Toxic Waste, Waste Oil 2010 – 2011		
Final Waste Treatment/ Sanitary Landfill	Design and Environmental Impact Assessment 2010 – 2013		
Waste Collection	Purchase and Donation of a Waste Compactor Truck and a Truck Scale Completed in 2008.	Completed 2013.	To be analyzed.
Recycling	Improvement of the Recycling Centre by 2011.	Improvement of the Recycling Centre by 2013.	Design and Construction of a Recycling Centre 2010 - 2013.
Waste Oil Collection	Improvement of the Existing System by 2010.	Improvement of the Existing System by 2010.	To be analyzed.
Environmental Education Campaign on Recycling Practices	Continue existing campaign on recycling practices. Create and Augment existing campaign with information on avoiding waste and litter.	To be analyzed.	
Hospital and Biohazardous Waste	Improve the existing system by 2012.	Improve the existing system by 2012.	To be analyzed.
Transportation Improvement and Extension of Sea Transport Capacity for Recyclables, Scraps, Used Tires, etc.	Urgent.	To be analyzed.	

Table 6
Mid Term Actions (~2014 – 2016)

	Santa Cruz Island (including Baltra Island)	San Cristobal Island (incl. Floreana Island)	Isabela Island
Final Waste Treatment/ Sanitary Landfill	Construction and Operation 2014 - 2016	Construction and Operation 2014 - 2016	Construction and Operation. 2014 - 2016
Scrap Metals, Used Tires and Special Waste	Design and Construction of a Centre for Scrap Metals, Used Tires and Special Waste 2014 - 2015	To be analyzed.	
Toxic Waste	Design and Construction of a Toxic Waste Treatment System 2014	To be analyzed.	
Institutional Strengthening	Periodic Assessment.	To be analyzed.	Implementation of a Municipal Environmental Department.
Monitoring and Control	Periodic Assessment on Environmental Regulations.	To be analyzed.	
Municipal Ordinance on Waste Management and Recycling	To be improved by 2014.	To be improved by 2014.	Established by 2014.
Street Cleaning/Sweeping/Litter Including avoid Sea Debris/Litter	To be analyzed.		

Long Term Actions (~2017 – 2020)

- Establish inter-municipal waste and recycling cooperation.
- Establish a provincial ordinance on waste management and recycling.
- Establish a common transportation and commercialization system for recyclables, metal scraps, used tires, etc.
- Establish a common environmental education campaign on waste management and recycling.
- Establish a common waste management and recycling system including waste oil collection and recycling.
- Reduce the volume of waste generated per person.

With this blueprint, we have identified the most significant steps that need to be addressed in order to put the waste management systems in the Galápagos on more sustainable footing. However, we recognize that the scope of this task is beyond anything one or two organizations might be able to achieve, and that any successful effort will require the full assistance and participation of a wide range of stakeholders.

5. Sustainability

The goals and actions of this waste management blueprint are based on the proven/commonly accepted principles and strategies of sustainable waste management. Using these, we aim to implement an integrated waste management and recycling system by the year 2020, which will improve the quality of human life on all inhabited islands of Galápagos while living within the carrying capacity of the supporting insular eco-systems.

Our concept of a sustainable waste management and recycling system in the Galápagos is based on strategies and principles mentioned below.

Waste Minimization: Waste minimization is the process and the policy of reducing the amount of waste produced by a person or a society and is the basis of any sustainable waste management system. Waste minimization is aimed at reducing the generation of waste through education and improved consumption patterns. This approach is the most economical, environmentally friendly and sustainable method of waste management but also represents the toughest challenges. It requires changes in the local consumption patterns, paradigms and behavior on the part of the population and decision-makers as well as political will and commitment. This can only be achieved through long-term environmental campaigns and institutional strengthening and can be combined with a culture of hygiene, public health and quality of life.

Reuse: Reuse can be defined as recovering value from a discarded item without completely reprocessing it. This will typically mean that an item is re-used in its original (or similar) capacity / function, but can also include use for another purpose. For example, construction scraps can be reused as filling material on construction sites, and crushed glass can be used as a substitute for sand in construction.

Recycling and Composting: If waste cannot be prevented or re-used, it should be recycled or composted, as in the case of organic waste. A system to separate and recycle packaging waste has already been successfully implemented in Santa Cruz Island. This effort, however, must be intensified and expanded to include other items such as electrical and electronic waste. The final goal is to implement and operate one recycling and compost system for all inhabited islands in Galápagos.



Recovering energy from waste is another form of re-use: Currently, this approach is difficult to implement in the Galápagos, as the amounts of waste generated on the islands are not large enough to implement a cost-efficient plant by applying currently available technology. In Galápagos, however, the recovery of energy from waste is done on a small scale by collecting used oil from tourism boats and mechanics in Santa Cruz and San Cristobal and using the energy from its incineration in the production of cement on the mainland.

Disposal/Landfilling: Final disposal or landfilling should be the last possible option in waste management and should be applied only for materials that have no practical use at all in a way that guarantees that the disposal site has no impact on the environment. The actual disposal sites in the Galápagos don't fulfill the minimum standards for environmental and health safety. Improving these sites requires a) the development and enforcement of strict guidelines and norms for landfill management; and b) the creation of monitoring systems to guarantee an environmental friendly management of these sites.

5.1 Technical Sustainability

It is essential to build technical capacity and proficiency in local institutions in the operation and management of a modern waste management and recycling system by providing **continuous technical assistance onsite**. Several initiatives and projects have shown that transferring technology and concepts alone is not sufficient and must be combined with continuous training and technical assistance. Our experience in Santa Cruz Island demonstrates that sustained technical assistance within the existing municipal structure can create lasting and transferable local knowledge. Working within existing structures allows for flexibility to adapt the implementation of modern waste management and recycling systems to the local realities.

It also provides an opportunity for local authorities and the population to learn and recognize the benefits provided by the new initiative. These benefits do not come up immediately with the project's implementation but need time to arise and to get recognized.

5.2 Financial Sustainability



Creating financial sustainability of a waste management system in the Galápagos is challenging, and probably will be not possible in the near-to-mid term. Commercializing recycled material alone can contribute, but is insufficient by itself. However, there are promising instruments for creating sufficient revenue to cover the operational costs of a waste management system and urge/stimulate the consumers to change their habits to a more sustainable attitude.

The **Polluter Pays Principle** requires that waste producers assume the costs for waste processing and management. It also requires those who pollute the environment (e.g. by littering or fly-tipping) to be responsible for their actions.

The **Extended Producer Responsibility** requires the producer or another entity along the value chain of a product to be responsible for the product's end-of-life and includes also its package.

5.3 Social Sustainability

Another critical component in ensuring the sustainability of proper waste management is the cooperation of the local population. A long term environmental education campaign which focuses on the prevention principle as a fundamental notion will be expanded beyond recycling practices and reduction of waste as the main tool to achieve a new culture for sustainable waste management and recycling.