

CREATING MARKETS FOR RECYCLABLE MATERIALS: THE CASE OF MUNICIPAL SOLID WASTE IN HAITI

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ABSTRACT: *Municipal solid waste (MSW) generation and disposal has become a significant and growing global problem. Population growth, growing consumerism, lack of publically available disposal services, as well as the general absence of large and steady markets for recyclable materials, particularly for plastics, has exacerbated the waste generation and disposal problem, particularly in poor developing countries like Haiti where plastics have become an exponentially growing component of the waste stream. Generally, waste disposal options exist on a spectrum ranging from open-air dumps to sanitary landfills. In Haiti, the primary disposal site for the entire country is the 160-hectare Truitier open-air dump, located ten kilometers from downtown Port-au-Prince, and while estimated to receive 1,000 tons of waste per day, much of the waste is organic matter consistent with other Latin American and Caribbean (LAC) countries, putting the environment and health of the population at serious and increasing risk. However, analysis of new trends suggests that waste in Haiti, particularly in Port-au-Prince is increasingly some form of plastic. Numerous challenges exist for effectively addressing the MSW generation and disposal problems in Haiti. This paper outlines a number of these challenges, with a particular interest and focus on the sources, creation, and disposal of waste. The analysis highlights several encouraging recent small business developments, including PeaceCYCLE, Thread, and Plastic Bank that can serve as models for creating both employment opportunities, as well as markets for recyclable plastic materials—an important step toward helping to address the growing waste generation and disposal problems in Haiti.*

Keywords: *Municipal Solid Waste, Plastic, Haiti, Recycling*

INTRODUCTION

Municipal solid waste (MSW) management is a significant problem with global and local consequences for economies, the environment, and public health. With the exception of hazardous waste, MSW includes all waste (not a gas or liquid) that are thrown away by private citizens and businesses. According to Vergara and Tchobanoglou (2012), globally over one billion metric tons of MSW are produced and this is expected to reach 2.2 billion by 2025. While countries around the world are rapidly urbanizing, the majority of this growth is occurring in small and medium-sized cities in developing countries. Geographically speaking, MSW is particularly an urban matter; city occupants generate twice as much waste as their rural counterparts. Both the amount and make up of waste generated vary with socioeconomic, environmental, and cultural attributes (Espinoza et al. 2010; Hazra and Goel, 2009; Hoornweg and Bhada-Tata, 2012; Karak, Bahgat, and Bhattacharyya, 2012; Mmereki, Baldwin, and Li, 2016; Mohee et al. 2015; Shekdar, 2009; Troschinetz and Mihelcic, 2009; UNEP, 2015).

In Port-au-Prince, Haiti (see Figure 1) the current MSW problem is overwhelmingly complex and inextricably linked to the geographic context: political instability, weak governance, inadequate human and financial resources, and insufficient disposal procedures. In order to establish a successful policy framework that seeks to develop and improve waste collection practices, underscores the reuse of waste, and examines alternative strategies for minimizing waste, the stakeholders involved in the process must include members of government, the informal sector, and most importantly, Haitian citizens. Without the support of the locals, these efforts are destined to join the countless others that have failed to improve social, economic, and environmental conditions in Haiti.

Despite the growing list of Haiti's economic and environmental woes of which waste is merely one, solutions are both available and accessible in cities like Port-au-Prince that engage members of the Haitian population and create sustainable opportunities for both employment and environmental remediation (World Bank, 2015). Many of these initiatives are not backed by the Haitian government nor are widely publicized, but are instead efforts undertaken by small non-governmental organizations (NGOs) and non-profits and are among the only real efforts on the ground in Port-au-Prince to improve the mounting MSW problem.



Figure 1. Map of Haiti. Source: University of Texas at Austin, 2018.

The purpose of this paper is to examine the complex MSW problem in Port-au-Prince paying particular attention to the challenges associated with waste collection, composition, and disposal. A solution to this substantial environmental crisis is also proposed and discussed. The operations of PeaceCYCLE are an example of one such effort to make a difference at the local scale. PeaceCYCLE is a start-up business that aims to empower Haitian citizens by educating them about environmental issues and employing them in a dignified, socially responsible position that enables them to provide for their families. Thread is another model in operation at a much larger scale. Founded on the basis of a transparent “ground to good” supply chain, Thread incentivizes plastic waste picking in Haiti to create a fabric that is currently being used by several brands and consumer products.

BACKGROUND AND GEOGRAPHIC CONTEXT

Port-au-Prince, the capital of Haiti, is home to over 2.5 million people. Located on the western part of the island of Hispaniola, Port-au-Prince occupies the south central coast of the Gulf of Gonave (see Figure 1). With a GDP per capita of \$846 in 2014), Haiti remains the poorest country in the Caribbean; 59% of Haitians live under the national poverty line of \$2.41 per day and 24% live under the national extreme poverty line of \$1.23 per day (World Bank, 2017). Given its complicated physical geography, meteorological, seismic, and hydrological hazards like tropical storms, hurricanes, earthquakes, and floods frequently disrupt the lives of Haitians. On January 12, 2010, a 7.0 magnitude earthquake struck Haiti resulting in over 230,000 fatalities and more than a million displaced individuals. While approximately 1.3 million displaced individuals were living in tent cities in the capital, Hurricane Tomas swept over Haiti on November 6, 2010 causing widespread flooding and mudslides in some areas and killing 35 people. Given Haiti’s poor governance and lack of disaster preparedness and response plans, rising disaster losses are expected to occur in the future. Haiti’s vulnerability to natural hazards limits its ability to provide basic infrastructure and services like water, sanitation, and MSW management to its occupants. Waste disposal practices in

Haiti have clear implications for both public health and the environment. According to Bras et al. (2009), Most households regardless of socioeconomic status in Port-au-Prince use gullies to dispose of their waste (see Figure 2); further, nearly 90% of poor Haitians favor this method of waste removal to others. Linked with inadequate drainage and wastewater management systems, these procedures increase the likelihood of infectious disease as illustrated by the October 2016 cholera outbreak from Hurricane Matthew. According to the Pan America Health Organization (PAHO) (2017), there were 41,421 reported cases of cholera in Haiti and 447 deaths in 2016 alone. Runoff from Port-au-Prince contaminates both surface and groundwater supplies and harms species. Further, seasonal changes may worsen this problem; during the rainy season in Port-au-Prince, waste that is improperly eliminated often blocks drainage channels, exacerbates flooding, and introduces a toxic mix of pollutants to the bay (UNEP, 2015).



Figure 2. Gully in Port-au-Prince, Haiti. Source: Huffington Post,2017.

Problems associated with MSW management are widespread in Haiti and other developing nations, but particular geographic factors highlight the uniqueness of Port-au-Prince’s waste issues (see Table 1). According to Noel (2010), the existing MSW management systems is not unified; it is marked by a lack of government transparency, limited resources, and inappropriate waste disposal practices by urban residents (see Figures 3 and 4). Poor urban planning and inconsistent waste management approaches only intensify the problem. Despite the absence of any national waste management plan or policy, the Haitian government established the Metropolitan Solid Waste Collection Services (SMCRS) in 1981 to make municipalities responsible for waste management. Since its formation

Table 1. Waste Disposal Methods by Country in the Caribbean

	GDP (in millions)	Sanitary Landfills	Unsanitary Landfills	Open Air Dumps	Controlled Dumps
Bahamas	\$11.262	3	5	1	
Barbados	\$4.529	1			
Belize	\$1.741	1			
Guyana	\$3.502	1			
Haiti	\$8.023			1	
Jamaica	\$14.057			8	
St. Lucia	\$1.667	1			1
Suriname	\$3.278			1	
Trinidad and Tobago	\$21.895		6		

Sources: Hoomweg and Bhada-Tata, 2012; World Bank, 2018.

Municipal Solid Waste in Haiti

SMCRS has been the authority for the collection, transport, and disposal of MSW produced in Port-au-Prince (Riquelme, Méndez, and Smith, 2016). Since the 1990s, the SMCRS has suffered from budgetary limitations that have rendered their operations ineffective. What's more, according to the Solid Waste Management Association of North America (SWANA) (2010), due to shortages in personnel and equipment, SMCRS is only able to collect 20% of waste produced in Port-au-Prince; their efforts were further hampered by the January 2010 earthquake which generated an estimated 60 million tons of debris and construction waste that required final disposal (UNEP, 2015). For over a decade, MSW collection and removal in Port-au-Prince has been largely funded by a combination of international NGOs, the private sector, and the informal solid waste sector which include citizens who sort, collect, dispose of, and resell waste.



Figure 3. Plastic Waste in Port-au-Prince, Haiti. Source: Bodenman, 2017.



Figure 4. Extent of Plastic Waste in Port-au-Prince, Haiti. Source: Bodenman, 2017.

DATA AND ANALYSIS

With the exception of Haiti, the Latin America and the Caribbean (LAC) region have the most robust and consistent data on MSW generation compared to other world regions, experts concur that data on MSW generation in Port-au-Prince are unreliable; estimates of total MSW in the Port-au-Prince urban area span from 660 to over 1,600 tons per day. No data on MSW creation and collection in Port-au-Prince city exists, which makes it hard to evaluate trends in consumption over time. According to Espinoza et al. (2010), the January 2010 earthquake also prevented researchers from obtaining valuable information regarding the status of waste generation, coverage, and quality of services in Haiti to create a more holistic picture of waste management in Latin American and the Caribbean. Total MSW production varies among global cities with population size and economic development influencing the amount of waste generated, but they do not tell the whole story (see Table 2). Demographic and health data would allow for a more thorough understanding of these patterns. However, these data should be interpreted with caution due to discrepancies in definitions of MSW, data collection practices, and time period.

Table 2. Select LAC Cities and Associated Waste Generation Rates

City	Population	Total Waste (Tons/Day)
Port-au-Prince, Haiti	1,100,085	660
Nassau, Bahamas	200,000	534
Rio de Janeiro, Brazil	5,857,904	7,059
San José, Costa Rica	326,384	333
Greater Paramaribo, Suriname	287,131	287
Cap-Haitien, Haiti	141,061	85
Asunción, Paraguay	513,399	674
Mexico City, Mexico	8,615,955	11,890
Georgetown, Guyana	180,000	275
Panama City, Panama	708,438	666

Source: Hoorweg and Bhada-Tata. 2012.

Composition of solid waste is affected by multiple factors including location, cultural behaviors, and economic development and influences how often waste is picked up and how it is disposed. In Port-au-Prince, the bulk of MSW is organic matter and includes things like food waste and lawn trimmings. According to Hoorweg and Bhada-Tata (2012), this finding is consistent with trends in other LAC countries, but represents a much larger quantity compared to global composition rates. More specifically, in all small-island developing states (SIDS), organic matter accounts for between 41 and 48% of total MSW composition (Mohee et al., 2015). This is problematic for several reasons. MSW comprised of higher fractions of organic matter have much higher moisture content and increase the density in the total amount of waste generated in locations. In other words, organics can pose more difficulty for already burdened waste collection and transportation systems in cities like Port-au-Prince (Mmereki, Baldwin, and Li, 2016). More specifically, it is less likely that recovery mechanisms will be employed in lesser developed and developing countries given a combination of financial constraints and a lack of knowledge of available waste treatment technologies. Waste with a higher proportion of organic matter also poses a problem for final disposal in Caribbean SIDS because limited space exists for landfills, which make it an unsustainable option in the long-term (UN, 2011).

Similar to trends in other Caribbean SIDS (see Espinoza et al. 2010; Hoorweg and Bhada-Tata, 2012; Hoorweg and Giannelli, 2007; UNEP, 2015), plastic waste in Port-au-Prince has grown considerably since the late 1980s and in response to this, the Haitian government enacted a law banning the import of polyethylene bags and polystyrene styrofoam containers in 2012 (IPS, 2013). According to PeaceCYCLE (2018), an estimated 8 million plastic water bags (the Haitian equivalent of plastic water bottles) pollute Haiti each day. However, at the time of this writing, no information could be found on the success of this measure; news media reported on the initial implementation of the ban yet official reports from global NGOs detailing efforts to ban plastic and styrofoam products make no mention of Haiti among their case study countries. It is likely that the ban failed due to lax enforcement and monitoring. Even so, Haiti appears to have set the example for other Caribbean nations like Guyana, Antigua, and Barbuda who are currently putting in place frameworks to phase out plastic bags and styrofoam items in an effort to

clean up their oceans (Dyer, 2016). According to Morton (2015), bans and charging structures have shown to have the highest reduction in single-use plastic bags. Further Morton (2015, 44), states in the *Latin America and Caribbean - Review of Waste Minimisation Programmes* report that, “Strong political support, adequate legislative measures and strict enforcement are critical to the successful implementation of a ban or restriction on the usage of plastic bags and other single-use carrier bags.”ⁱ The multiple challenges facing the current administration in Haiti suggests that it is unlikely that a comprehensive strategy for MSW generation and disposal be enforced, let alone proposed and implemented.

Arguably, a more effective method to tackling the mounting plastic waste problem in Haiti is to create incentives for recycling or a secondary market for these items. Typically recycling participation is low in Caribbean SIDS due to a lack of awareness and education, the higher costs associated with the collection and transport of recoverable products to processing centers, low market value for recyclable products, and lack of land area to warehouse recyclables (Mohee et al 2015; Narayana, 2009). According to Hoornweg and Giannelli (2007), these initiatives would serve to focus on minimizing the amount of waste diverted to open dumps and landfills and thus encourage participation from both the public and private sectors in sorting and separating recyclables. Examples of such efforts in Haiti will be discussed further in the paper.

Disposal of MSW also varies geographically. Generally, final waste disposal options exist on a spectrum ranging from open-air dumps to sanitary landfills (Karak, Bahgat, and Bhattacharyya, 2012; Narayana 2009; Vergara, Sintana and Tchobanoglous, 2012). Open-air dumps, the most common method of waste disposal in developing countries, refer to those locations where waste is carelessly disposed of without any consideration for public health and the environment. A sanitary landfill employs safeguards to minimize risks of environmental contamination. Sanitary landfills, the most common form of waste disposal in developed countries like the United States, are locations where solid waste is spread out, compacted, and covered daily with clay, foam, or other material to minimize both the moisture content and risk of leakage of contaminated water or leachate. Unlike other methods where the waste is exposed, it lessens aesthetic concerns like odor and susceptibility to pests. A controlled dump is “a non-engineered disposal site where improvement is implemented on the operational and management aspects rather than on facility or structural requirements, which would otherwise require substantial investment” (UNEP, 2005, 7). Finally, unsanitary landfills, as the name suggests, are those sites where waste is not exposed however environmental defenses like liners are not implemented to reduce harm from leachate contaminants.

In Haiti, the primary disposal site is the 160-hectare Truitier open-air dump located ten kilometers from downtown Port-au-Prince that is estimated to receive 1,000 tons of waste per day. According to UNEP (2015), this is also one of the 50 largest active dumpsites in the world. This is a relatively common method of waste disposal in the LAC region with over half of the countries utilizing this as at least one option for final removal of solid waste (see Table 1).

SMALL BUSINESS DEVELOPMENTS

As discussed previously, most plastic bags and other plastic wastes, end up in “trash heaps” that are incinerated (open burning), while others clog open sewers and drainage areas posing threats to public health and the environment (UNEP, 2015). In the conventional sense, “recycling” of plastic bags and other plastic waste does not exist. Thus equally important, to better data collection, and enforcement of existing laws and regulations, is the need to create markets for recyclable materials, particularly for plastics. Encouraging the development of both private and public entities that utilize MSW, particularly plastic wastes, as an open loop production input or circular economy (CE), is one way to transform materials and waste into post-consumer products, while also creating much needed jobs in the process (Ghisellini, Cialani, and Ulgiati, 2016). According to Singh and Ordonez (2016), these initiatives are being undertaken across the globe resulting in innovative products like furniture and jewelry and the value of the up cycled or redesigned products are found to exceed the original material or item.

PeaceCYCLE is an excellent example of a small (14 employees), privately owned and operated company that up cycles used plastic water bags to create beautiful handcrafted products, including heavy duty carry bags, wine totes, and stylish handbags of various shapes and sizes (PeaceCYCLE, 2017). PeaceCYCLE employees begin by collecting the “trashed” plastic water bags from various neighborhoods in Port-au-Prince. The collected plastic bags, now a production input, are cut to a uniform size, washed and sanitized, layered (four bags on top of one another), hot ironed, and then cut again into particular patterns for specific products. Finally, the layered and ironed bags are sewn into final products. For example, 28 pieces of “trash,” formally 28 water bags, are utilized to produce a single bottle wine tote, creating a use (and market) for the plastic waste, as well as creating dignifying employment for 14 Haitians

(see Figures 5 and 6). All products are designed for sale in the United States and other more affluent markets. An online sales platform was still in development at the time of this report.

Another example at a much larger scale of production is Thread, which is known for a “ground to good” supply chain that utilizes the collection of plastic waste in Haiti by Haitians. Thread produces a fabric in Haiti and by Haitians that is used in numerous brands and consumer products, including Timberland boots and bags, Kenneth Cole shirts and jerseys, and Hamilton Perkins backpacks to name a few (see Figures 7 and 8), that are sold primarily in the United States and in other affluent markets. According to Thread’s 2016 Impact Report (Rosenberger and Halling, 2017), the manufacturing process utilized 378,127 lbs. of plastic waste and created 233 Haitian jobs in 2016. While the vast majority of the jobs created are unskilled and associated with waste collection, the stated goal is to also increase Haitian employment opportunities across the organizational chart. The report further states that Thread’s circular business (CB) model contributes directly toward four of the 18 United Nations Sustainable Development Goals, including: (Goal 1) End poverty in all its forms everywhere; (Goal 8) Promote sustained, inclusive, and sustainable economic growth, full and productive employment and decent work for all; (Goal 10) Reduce inequality within and among countries; and (Goal 12) Ensure sustainable consumption and production patterns. Overall, Thread’s “ground to good” supply chain helps to create a market for recyclable plastic in Haiti, and does so utilizing Haitian labor.

Finally, Plastic Bank is a company founded in 2013 that aims to reduce plastic waste in the oceans around the world. Plastic Bank’s (2017) strategy is simple: it “provides a consistent, above-market rate for plastic waste, thus incentivizing its collection. Individuals who gather our plastic can trade it for money, items or services.” Their operations in Haiti where poverty and unemployment are widespread have been incredibly successful with over 30 recycling centers in operation today, with the majority located in Port-au-Prince. Founder, David Katz, has managed to attract the attention of numerous companies and designer brands like IBM, Norton, Seventh Generation, and Shell, who all seek to use the recycled plastic in their own products (Messinger, 2015). To a certain degree, all three companies are working to create markets for recyclable materials, but as outlined, are working at different scales of operation, and are focused on different facets of the plastic waste stream.



Figure 5. Haitians Working at PeaceCYCLE in Port-au-Prince.
Source: Bodenman, 2018.



Figure 6. Single Bottle Wine Tote. Source: PeaceCYCLE, 2018.



Figure 7. Timberland Boots Made with Thread Fabric. Source: Thread International, 2016.



Figure 8. Kenneth Cole T-shirt Made with Thread Fabric. Source: Thread International, 2016.

SUMMARY AND CONCLUSIONS

An important first step to address the MSW problem in Haiti is the need for reliable data collection, for both MSW generation and disposal, particularly for the various forms of plastics that are increasingly evident from pictures and fieldwork experiences. As noted previously, data do not exist, and/or is unreliable across time and space.

Second, enforcement of existing laws and regulations regarding MSW generation and disposal is needed, as well as additional regulations implemented as data generation and research suggest. As noted previously, existing laws that ban the import of polyethylene bags and polystyrene styrofoam containers in 2012 appear to have failed. Support from the government, as well as local waste initiatives, is crucial for future efforts to be successful.

In sum, better and more reliable data must be collected, and more research and analysis conducted to more fully understand the multi-faceted and complex issue of MSW generation and disposal in Haiti. Encouraging the development of small business entities like PeaceCYCLE, Thread, and Plastic Bank, as well as supporting similar efforts that help create markets for recyclable materials, particularly plastics, are a good first step toward addressing the many problems associated with MSW generation and disposal in Haiti.

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¹ For a comprehensive overview of countries that have implemented successful plastic bans, please see Morton, 2015; UNEP, 2016a; and UNEP, 2016b.