



# LESSONS LEARNED FROM TWELVE YEARS OF URBAN SANITATION WORK IN HAITI

**A USAID Water and Sanitation Project Learning Note**

Project Title: USAID Water and Sanitation Project  
Sponsoring USAID Office: USAID/Haiti's Office of Infrastructure, Engineering and Energy (OIEE)  
Contract Number: AID-OAA-I-14-00049/720521-18F00001  
Contractor: DAI Global, LLC  
Date of Publication: 5 April 2022  
Revision:  
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Cover picture: Morne-à-Cabri Fecal Sludge Treatment Station. Credit: Marc Lee Steed

This publication was produced by the USAID Water and Sanitation project under Contract No. AID-OAA-I-14-00049/720521-18F00001 at the request of the United States Agency for International Development. This document is made possible by the support of the American people through the United States Agency for International Development. Its contents are the sole responsibility of the author or authors and do not necessarily reflect the views of USAID or the U.S. Government.

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## ACKNOWLEDGEMENTS

This document was made possible thanks to the contribution and close collaboration of the Sanitation Department of DINEPA made up of Ms. Edwige Petit and Ms. Vanessa Louis Charles as well as the USAID Water and Sanitation Project team: Daniel O'Neil, Marie Maud Jean, and Fenzie Jean.

An utmost appreciation is conveyed to the sector partners who enhanced and supplemented the document by sharing their experiences and/or work in urban sanitation, including Dr. Mary Clisbee, PhD of Zanmi Lasante, Estelle Grandidier from GRET, Sasha Kramer from the Sustainable Organic Integrated Livelihoods (SOIL), and many others.

Sharing the experiences of the last twelve years in urban sanitation helps highlight the challenges and opportunities in this sector and paves the way for new interventions in urban sanitation based on practical occurrences and the challenges faced in Haiti.

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## ACRONYMS

**AECID** Spanish Agency for International Development Cooperation

**BOD** Biochemical Oxygen Demand

**IDB** Inter-American Development Bank

**CERAAC** Think Tank and Action for the Sanitation of Les Cayes

**DINEPA** National Directorate for Water Supply and Sanitation

**HTG** Haitian gourde

**MICT** Ministry of the Interior and Territorial Communities

**OREPA** Regional Office of Water and Sanitation

**SME** Small and Medium Enterprises

**SIAAP** Ile-de-France Public Sanitation Service

**SOIL** Sustainable Organic Integrated Livelihoods

**STEB** Sewage and Fecal Sludge Treatment Plant

**USD** US dollar

**USAID** United States Agency for International Development

**WASH** Water, Sanitation and Hygiene



Figure 1 - Presentation of the study of the lessons learned. December 2020. Photo Credit: Nina Bernard

## Introduction

Improving urban sanitation is critical for the protection of public health. Haiti's poor urban sanitation results in contamination of surface and ground water and therefore to the spread of waterborne diseases. It is nearly impossible to provide safe drinking water in an area with poor sanitation.

To address these concerns, DINEPA was created in 2009 with the mandate for providing both safely managed water and safely managed sanitation in Haiti. DINEPA was the first Haitian governmental agency with this dual mandate.

Shortly after its creation, DINEPA developed a national strategy for improving sanitation and clear guidelines for how sanitation work was to be implemented in Haiti. It has worked with donors including the US Agency for International Development (USAID), the World Bank, the Inter-American Development Bank (IDB), and the Spanish Agency for International Development Cooperation (AECID) to implement this strategy with mixed results.

To review progress on this strategy, DINEPA held a national workshop in 2013 with funding from the IDB and in 2019, with funding from the greater Paris Sanitation Authority (SIAAP). Each of these workshops led to different improvements in how sanitation activities were implemented.

Along these same lines, the USAID Water and Sanitation Project engaged Zanmi Lasante to conduct a study on urban sanitation interventions implemented in Haiti to highlight the lessons learned for

The **USAID Water and Sanitation Project** aims to reduce the prevalence of cholera and other water-borne diseases, and improve the health and prosperity of the Haitian people. The Project supports the scaling up of water and sanitation services in Haiti, with the aim of helping 250,000 people gain better access to water services and 75,000 people gain better access to sanitation services, and to establish the foundations for the sustainable increase of access to water and sanitation in Haiti. This project contributes to the development objectives of the sanitation sector led by DINEPA, the regulatory body for the water and sanitation sector in Haiti.

the advancement of this sector. The results of this study were debated in a workshop on December 13, 2020.

Following this workshop, DINEPA and the USAID Water and Sanitation Project worked to improve and reorganize the main results of the study on lessons learned in urban sanitation by integrating the reflections from this workshop and the two previous workshops on urban sanitation carried out by DINEPA.

This report is the result of that effort. It compiles 12 years of urban sanitation experiences in Haiti, including lessons learned for future application of reforms within the water and sanitation sector.



Figure 2- Stagnant, polluted water clog the storm drains in Les Cayes and can seep into the ground water.

## Context

**T**hose who cannot remember the past are condemned to repeat it.  
(George Santayana)

It is with this perspective that the study on urban sanitation was commissioned. The study focused on four principal questions: to direct an evaluation on interventions and their effectiveness in the provision of sanitation services in urban areas since 2010.

The four questions were as follows:

1. What urban sanitation intervention models have been implemented in Haiti since 2010?
2. What limits or facilitates the success of these urban sanitation models?
3. What is the relationship between a successful urban sanitation intervention model and the application of specific technical sanitation solutions?
4. How are successful community sanitation awareness programs delivered in urban areas of Haiti?

The answers to these questions should make it possible to identify the experiences in urban sanitation that have been implemented, as well as measures and areas of improvements for future interventions.

The methodological approach used to answer these questions was qualitative and done using simple structured interview techniques with key players in the sector and a review of the data on urban sanitation. The answers to these questions, in addition to the brainstorming from the workshops with the stakeholders, served as a basis for this document.

From the outset, the literature review proved inconclusive concerning urban sanitation, specifically:

- Much of the literature primarily relates to the water sector or to the whole water, sanitation, and hygiene (WASH) sector. Very little focused on the sanitation component.
- Most literature on WASH focused on rural areas rather than urban ones. As a result, the focus was on decentralized sanitation solutions and behavior change in rural environments. There was little focus on the challenge of sanitation in more densely populated urban areas or on collective sanitation solutions.
- The one exception was for emergency sanitation in urban areas. Procedures for emergency sanitation in urban areas is well documented by DINEPA, with the support of its partners.

## General understanding of certain sanitation concepts related to the study

### SANITATION SYSTEMS

Broadly speaking, there are two types of sanitation systems: non-collective and collective sanitation systems:

#### Non-collective sanitation:

Any system carrying out the collection, pre-treatment, purification, infiltration, or discharge of domestic wastewater from buildings that are not connected to the public sanitation network are referred to as **non-collective sanitation**. This includes pit latrines and septic systems.

A non-collective sanitation system is considered to be **autonomous** when the treatment is done in-situ without the need for effluent transport. When the effluent needs to be transported for treatment, for example by vacuum truck, it is referred to as **semi-autonomous**.

When several buildings are connected to a shared pit or septic tank, then the sanitation is considered to be **grouped**. A grouped sanitation system can either be autonomous or semi-autonomous depending on whether the effluent and sludge is treated on site or transported elsewhere for final treatment.

#### Collective sanitation:

By contrast, all collection and treatment are done centrally in **collective sanitation**. Household plumbing is connected by sewer pipes directly to a central treatment facility. The wastewater and sludge are not stored locally but flushed directly away from the household.

A collective sanitation system is said to be **unitary** when wastewater and rainwater are discharged in the same network. The system is **separate** when two different networks are used for wastewater and for rainwater.

A collective sanitation system consists of both a sewage piping system and the wastewater treatment plant.

### THE SANITATION CHAIN

The sanitation chain is the chain of actions that ensures the safe containment, emptying, transportation, treatment, and reuse/final disposal of household sludge and wastewater. Sanitation can only be considered to be safely managed if all aspects of the sanitation chain are treated.

A sanitation chain, whether collective or non-collective, has three basic action segments:

#### Storage

**Storage** is the upstream set of actions aimed at safely storing wastewater and sludge produced by a user. In a non-collective system, the wastewater and sludge are stored at or near the household level, generally in a pit or septic tank. In a non-collective sanitation system, the wastewater and sludge are “stored” directly into a sewer network.

The objective of this segment is to ensure that the wastewater and sludge are stored in a sanitary fashion and not allowed to contaminate either the user or any water source.

This segment brings together the technologies with which the user is in direct contact. These technologies help to collect wastewater and excreta, to store them temporarily, and, possibly, to partially treat them: underground tanks, septic tanks, and sumps, etc.

#### Transport

The intermediate segment, transport, is the set of actions to remove the wastewater and excreta from its storage and to transport it to a wastewater and fecal sludge treatment station.

In a non-collective sanitation system, this includes safely collecting the sludge from the pit latrine or septic system. The goal is to ensure the cleanliness of the neighborhood by evacuating wastewater and excreta outside of the community. This segment

brings together technologies for transporting wastewater and excreta from production sites to disposal and treatment sites: Manual emptying (bucket, manual pump), mechanical emptying (vacuum trucks).

For a collective system, the transport is done through the sewage pipe network.

### **Treatment and Disposal**

The downstream segment, **treatment and disposal**, is the set of actions and operations aimed at the reduction of the biological contaminants, nutrients, and pathogenic organisms in the sludge to the point where the material is no longer a health or environmental threat.

Treatment normally consists of holding the sludge until the harmful microbes and virus are broken down through natural physicochemical and biological processes.

In Haiti, wastewater is generally treated in a lagoon-based system where the wastewater and excreta pass through a series of settling ponds that allow the sludge to settle at the bottom of the pond and the water to pass through to subsequent ponds until it is harmless enough that it can be released into the ground.

Purification is ensured thanks to a long retention time in a series of basins placed in series. Normally, there are three basins, however using four or even six basins provide even more thorough disinfection. The basic mechanism on which natural lagooning relies is photosynthesis. The upper water segment in the basins is exposed to light. This allows the development of algae which produce the oxygen that is required for the development and maintenance of aerobic bacteria. These bacteria then cause the decomposition of the organic matter. Carbon dioxide produced by the bacteria, as well as mineral salts contained in the wastewater, allows the planktonic algae to multiply. Therefore, there is a proliferation of two interdependent populations: bacteria and algae, also called "microphytes." This cycle is self-maintained as long as the system receives solar energy and organic matter.

At the bottom of the basin, where light does not penetrate, there are anaerobic bacteria which break down the sludge produced from the settling of organic matter. Carbon dioxide and methane are released from this level.

Solid sludge, such as from pit latrines, can also be placed into the lagoons for anaerobic processing. It can also be stored in temporary holding pits and composted until it is harmless.

If the sludge has been fully processed, the remaining material can be used as fertilizer. If it is only partially processed, it can be safely buried.

## **TECHNICAL SANITATION SOLUTIONS**

Technical sanitation solutions refer to the technologies and techniques used to meet the need for sanitation by segment. For example, for the storage segment, technical sanitation solutions include pit latrines, septic tanks, and portable toilets.

## **INTERVENTION MODEL**

An intervention model refers to anything that has certain characteristics that could lend itself to replication or imitation. The sanitation intervention model, therefore, refers to the coordinated set of actions taken, technologies chosen, social engineering both at the level of governance and in implementation. The model can be carried either by the state or by a non-public entity to achieve a sanitation objective. It can be applied either to one of the segments or the three segments of sanitation.

## THE CURRENT SITUATION OF URBAN SANITATION

The 2009 reform of the water and sanitation sector brought together all public sanitation operators under the control of a single regulatory body, DINEPA.

The disasters caused by the earthquake of January 2010 and the outbreak of cholera in October of that same year caused DINEPA to prioritize emergency response and the construction of the first fecal sludge management site in the country.

From 2011 to 2012, the sector was structured and organized under the leadership of a sanitation department, through a strategic orientation document.

The period between 2011-2016 was the take-off that allowed the implementation of the first actions in urban areas of 5 secondary cities of the country. Planning, operations, and control tools have been established and tested.

Following the 2016 sectoral dialogue, the 2016-2019 period saw the start of the definition and de-concentration of sanitation services, as well as that of the implementation of intersectionality for sustainable universal coverage. During this period, the transfer of operational tasks to the OREPAs was boosted and the working mechanisms with the health, urban planning, and environment sectors were adopted.

From 2019 to date, the sector has focused on operationalizing public services as well as decentralizing these services to the municipalities which is another requirement of the reform. In this sense, a search was launched in January 2019 for commitment of town halls to non-defecation in the open air.

### BASIC DATA OVERVIEW

The best source of nation-wide data on Segment I, storage, comes from the Mortality, Morbidity and

Service Use Survey (EMMUS VI, 2016-2017) conducted by UNICEF.

It found that about three in ten households (31%) had an improved, unshared toilet. This proportion is almost twice as high in urban areas (46.8%) than in rural areas (24.4%). By contrast, 69% of households used an unimproved sanitation: 24% used shared toilets, 20% had unimproved toilet, and 25% had no toilet.

In 2019, the IDB and OREPA-North produced a shit flow diagram for Cap-Haitian. In that analysis, they found the results shown in Table 1.

*Table 1. The use of different sanitation technologies in urban Cap Haitian (IDB, 2019)*

Sanitation technology	%
Latrine	51
Septic tank	37
Open defecation	11
Container-based sanitation	1

However, only 1% of the fecal material that was captured through container-based sanitation was safely treated. The rest was either not treated or dumped in an unsafe manner.

There is no other good documentation on practices for disposal and treatment of fecal sludge in Haiti.

Given that sanitation coverage is linked to that of water, it is important to note the rate of access to public water service for families. Currently, public water service covers 40% to 80% of urban families, but only in a clearly insufficient and irregular fashion--the targeted average rate of 80 l/person/day is very rarely reached. Additionally, urban slums that have the lowest toilet access rates are generally not served by a water network, but by public water kiosks.

There is also little documentation on storm water drains. With the poor sanitation coverage, these drains are the conduits for grey water and, frequently, fecal material.

## RECAPITULATION OF THE GUIDELINES OF THE NATIONAL SANITATION STRATEGY

DINEPA's National Sanitation Strategy is based on three pillars: education, service, and regulation. These three pillars are inextricably linked and must be implemented simultaneously to create a combination of incentives and penalties. This replaces the now forbidden practice of providing direct subsidies for toilet construction. This approach, once fully implemented, should guarantee an increase in sustainable coverage in sanitation for all parts of the urban population.

In urban settings, the emphasis is placed on holding homeowners accountable to have houses built in conformity with the required codes and regulations whether for personal use or as a rental property.

### SANITATION GOVERNANCE

Currently, the sector is regulated by outdated and scattered pieces of legislation. However, DINEPA has clearly defined strategies to direct the action of stakeholders to reach Haiti's goal of improved sanitation for all by 2030.

The main institutions who share responsibilities in the sanitation sector are the following:

- **DINEPA:** responsible for regulating all sanitation-related efforts in Haiti, including the collection, transportation, and treatment of sewage and drained fecal sludge. This includes the production and validation of norms and standards, regulations for the various related legal texts, the support offered to operators (OREPA and communities) and the supervision of all actors involved in the sector.
- The **OREPAs:** responsible for the development, control, and monitoring of the implementation of sanitation systems. They carry out this mandate through the rural

departmental units and the water and sanitation technicians for the municipalities. Eventually, the control of these systems could be transferred to the municipalities.

- **The Ministry of Health** and the **mayors** are responsible for the control and monitoring of the storage and transport segments for wastewater and fecal sludge.
- The **Ministry of the Environment** ensures compliance with discharge standards of the effluent.

### SANITATION SERVICES: MAISON D'ASSAINISSEMENT

Most municipalities in Haiti are unequipped to manage the sanitation chain because

- There are not enough trained professionals across the entire service chain.
- The established laws do not cover the entire chain of services that occur during the storage, transport, and treatment of fecal sludge and wastewater. In particular, the Public Hygiene Code is not adapted to the current conditions.
- Funding for sanitation is very limited.
- Water supply services are provided by structures that are not sanitation oriented.

In 2012, DINEPA implemented a program to improve the complete sanitation chain in Saint-Marc. This program included the study of the sanitation service chain; training of municipal staff and professional emptiers; detailed household surveys; and construction of a fecal sludge management site and an office dedicated to sanitation. This office was called a *maison d'assainissement* (Sanitation House).

The goal of the *maison d'assainissement* is to provide a home for sanitation consulting services and training. The *maison d'assainissement* provides:

- Consulting on sanitation solutions for specific houses as needed.

- Continuing training in sanitation and hygiene.
- Support for the management and inspection of sanitary facilities in public spaces.
- Continuous research, and adaptation of new technologies.
- The creation of a real sanitation market.

The establishment of this service chain in Saint-Marc created a model that can be replicated in the rest of the country.

## PLANNING, MONITORING, AND EVALUATION

### Planning

The sector planning depends largely on urban planning and suffers greatly if this planning is not done well. Haiti's weak urban infrastructure including a poorly planned road network and very high population density makes access for sanitation difficult. The rapid growth of these poorly planned areas only exacerbates the problem.

Additionally, many of the poorer neighborhoods are built on tidal flats that have high water tables and very limited drainage.

As a result, there is little sanitation planning and retrofitting appropriate sanitation solutions into these neighborhoods is very difficult.

To overcome these challenges, DINEPA is working on developing clear sanitation zoning for the different urban areas. The goal of the zoning is to clearly delineate the areas where different sanitation technologies are acceptable. The Mayor's office has the responsibility for enforcing this zoning through its issuance of building permits.

To develop the sanitation zoning, neighborhood-level maps are created showing the following key criteria:

1. Can the soil safely absorb the effluent from the waste?
2. What is the depth to the water table?
3. What are the subsoil conditions?

4. Is the area at risk of flooding?
5. Is the natural slope sufficient to allow for effluent flow?
6. What is the population density?
7. How is the population growing?
8. What are the socio-economic characteristics of the neighborhoods?

Based on these criteria, it is possible to determine the acceptable sanitation techniques. For example, in an area with appropriate soils, a low water table, good subsoil conditions, and low population density; pit latrines and septic tanks might be appropriate. Whereas in an area with a high-water table, only sealed systems would be accepted.

The USAID Water and Sanitation Project helped DINEPA to develop the sanitation zoning plan for Les Cayes. As shown in Figure 3, little of Les Cayes is appropriate for pit latrine or unsealed septic systems.

### Monitoring and evaluation

Currently, the best data on urban sanitation comes from the household surveys carried out by the health sector (EMMUS). However, these surveys are only conducted every five to six years. The frequency does not allow us to accurately judge the progress of the sector or to provide reliable and precise information to guide decision-making.

Therefore, DINEPA is developing its own household survey system as part of its internal data management system (<https://dinepa.gouv.ht/siepa/>). This will facilitate the monitoring of national indicators established for the sector.

## CAPACITY BUILDING AND TRAINING

Since its creation, DINEPA strengthened the sector by implementing different levels of training:

- Training of public service personnel:
  - The ongoing development of a master's program in hydraulic and sanitary engineering, in collaboration with the State University of Haiti

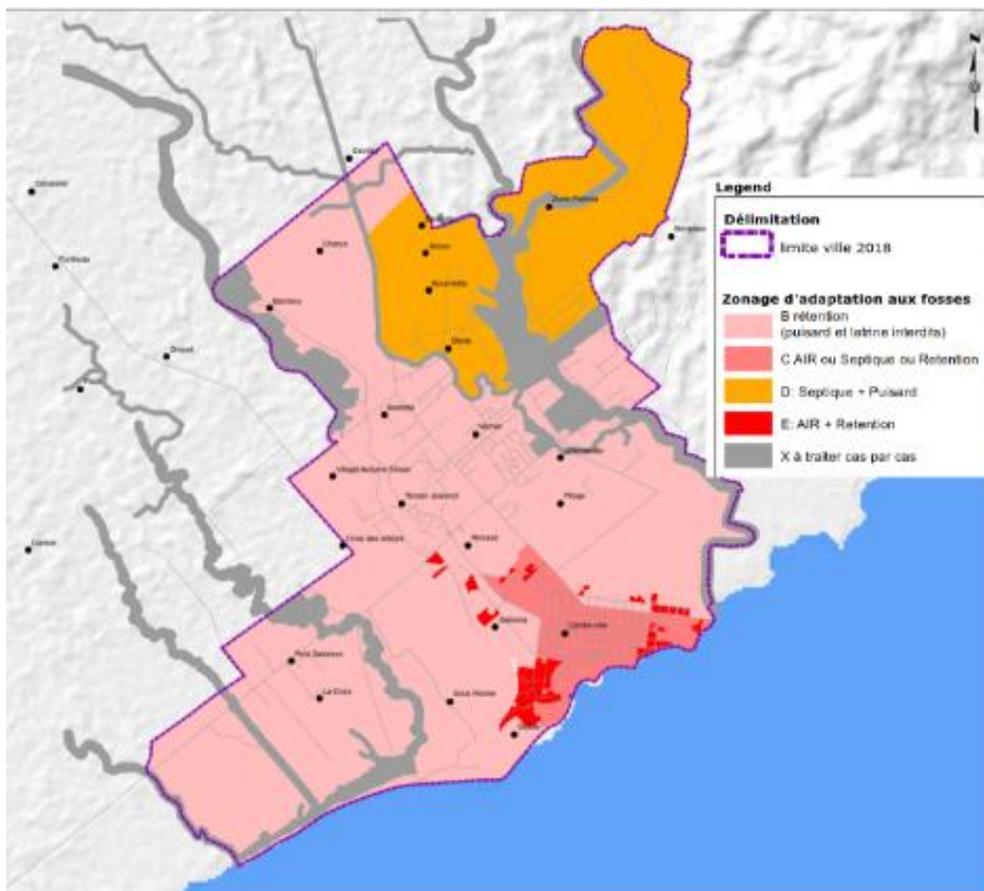


Figure 3- The sanitation zoning map for Les Cayes indicates what type of toilets can be built in each different part of the city.

Efforts have started alongside the MICT for the introduction of aspects of skills transfer in water and sanitation and in the process of modernization of the sector. These efforts should soon lead to:

- Municipalities with key water and sanitation staff able to control the service provided at the local level.
- Municipal administrations gradually being structured to take over the management of the potable water and sanitation services.

In addition, sensitization and commu-

- Setting up a potable water and sanitation technical trades framework
- The ongoing training of the staff of the various bodies of DINEPA both on-site or at international events
- The training of professionals in the sector
- Masons training in sanitation through a protocol signed with the National Institute for Professional Training (INFP)
- The training of manual pit emptiers of peripheral towns started since 2015
- The training of municipal staff
- The launch of training programs for municipalities peripheral cities between 2014 and 2016
- Participation in a training program for municipal jobs, led by the Ministry of the Interior and Territorial Communities (MICT).

nity mobilization are approaches used to strengthen behavioral changes in both urban and rural populations.

## FINANCE AND BUDGETING

Financing in this sector is borne largely by households. Both the construction and maintenance of the sanitation techniques as well as the costs associated with evacuation, treatment or final disposal fall on the individuals. Unfortunately, the sector is very poorly subsidized.



Figure 4- Manual drainers in Les Cayes. Credit: Marc Lee Steed

## Urban sanitation intervention models from 2010 to date

This chapter describes the urban sanitation intervention models implemented in Haiti from 2010 to date. First, it will present the technical solutions implemented by all the actors involved at the various points of the sanitation process. The paper will then present the sanitation intervention models implemented in Haiti based on the findings of the study conducted by Zanmi Lasanté.

### TECHNICAL SOLUTIONS USED In Each SEGMENT IN HAITI

To help homeowners and builders to avoid the risk of contaminating the water table, DINEPA's National Strategy calls for developing sanitation zoning in every city in the country. The National Strategy also suggests offering certification courses to plumbers and the craftsmen who construct the pits and septic tanks. Unfortunately, few sanitation zoning studies have been conducted and the certification process has not yet been done to scale.

DINEPA's technical guidelines for the construction of toilets, pits and septic tanks are in [Technical References](#) available through the DINEPA website.

The following sections outline the **technical solutions** favored in Haiti for each segment.

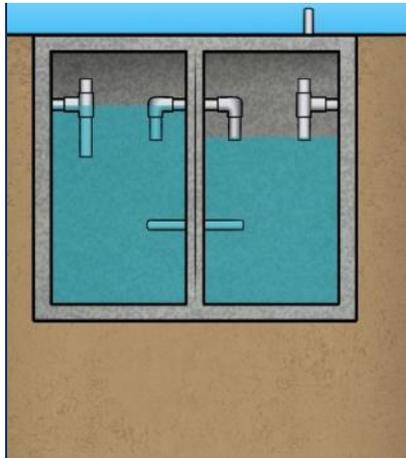
### COLLECTION SEGMENT

#### Pit Latrines

Most Haitian toilets are either directly over a pit or connected through pipes to a household septic tank. It is considered to be a “**dry toilet**” if the waste drops straight into the pit and a “**wet toilet**” or “**modern toilet**” if water is required to flush the waste downwards. Note that a wet or modern toilet can be built directly over a pit.

Pits can either have open sides and bottom or be completely sealed.

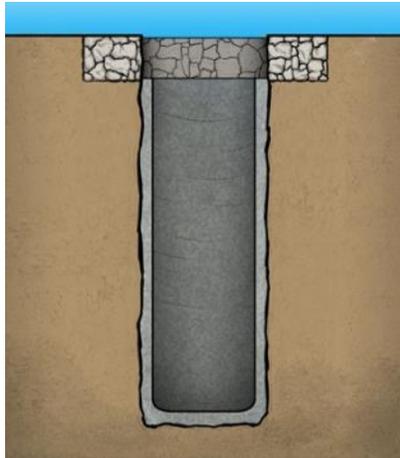
Dry toilets attached to a pit latrine are the most common type of toilet even in urban areas with a strong growth in the number of modern flush toilets being built over the pit. In areas where the bedrock layer is sufficiently deep to allow for excavation of the pit and the water table is sufficiently



**SEPTIC TANK**  
Professional,  
domestic or shared

**CONFINEMENT:**

Dug, lined, unlined or sealed  
pit, connected to a flush seat



**DRY PIT**  
Per household or shared

**CONFINEMENT:**

Dug, lined, unlined or  
sealed, domestic or shared  
pit, connected to a dry toilet



**CONTAINER SYSTEM**

Household

**CONFINEMENT:**

Container

deep so as not to be contaminated by the fecal material in the pit, and the soil. the liquid percolates away; making this the cheapest safe sanitation alternative. If the water table is too high, then the pit needs to be fully lined to prevent ground water contamination. However, a lined pit will quickly fill with sludge.

**Septic Tanks**

Septic tanks serve the same purpose as the pit latrines—they serve as a temporary holding tank for the effluent. Septic tanks create an anaerobic environment to promote decomposition of the sludge. Normally, the rate of accumulation of the sludge is faster than the rate of decomposition. Therefore, the fecal sludge must be periodically removed by a vacuum truck.

Septic tanks are normally designed to have two chambers. These chambers serve as settling basins. The extra liquid exits through a pipe into a drainage field. The remaining impurities are trapped in the soil and the liquid percolates into the soil or evaporates.

In Haiti, many septic tanks are built without a closed bottom. These are more properly called **cesspools**. Due to the high risk that these can cause groundwater contamination, DINEPA does not approve of the construction of cesspools.

In areas where it is not possible to build a drainage field, septic tanks can be built as a closed system. In this case, all the water is retained with the sludge. A **closed septic tank** is also a very safe sanitation solution. However, it will need to be emptied frequently.

**Biodigestors**

Biodigestors are similar to septic tanks, but generally have a single chamber and no ventilation. They can be designed to capture the methane that is generated by the decomposition of the sludge. Due to its larger size, they allow for a longer retention period to allow for a more complete decomposition of the biological contaminants. When properly designed and built, the effluent should be relatively safe for open disposal.

## **COMPOST AND URINE DIVERSION TOILETS (UDDT)**

Compost toilets and UDDT are viable solutions for densely populated urban areas without access to water (Cairns-Smith, 2014).

The implementation of this system by the non-profit organization SOIL is presented in detail in the next chapter.

## **GROUPED INDIVIDUAL SANITATION**

DINEPA's National Strategy recommends construction of a single collection system for a group of 5 to 25 houses as a cost-effective solution to improving sanitation in many neighborhoods. The users agree together to a management plan and provide monthly contributions to a fund to cover the cost of maintaining the system and regular emptying of the tank.

Grouped individual sanitation systems are a practical option in urban areas of Haiti where the following conditions are met:

- The neighborhood is densely populated so there is not adequate space for individual septic systems.
- The water table is deep enough to avoid the flooding and overflowing of tanks.
- There is sufficient space to install the system and road accessibility to allow trucks access to empty it.

The biggest obstacle for this solution is that the individual households have to have sufficient access to water. If the household does not have good access to water, then the fecal material will not flush to the common tank and sludge will accumulate in the pipes, eventually blocking the movement of the household sludge to the shared septic tank.

The experiment was attempted on two occasions by Solidarity International and by DINEPA, respectively.

The first system was built by Solidarity International in 2011, in the district of Christ-Roi in Port-

au-Prince. As they built the system, they helped the residents develop a long-term financial arrangement that specified how much each household would contribute to the maintenance of the system.

A year after this first system was completed, DINEPA also built a similar system in partnership Solidarity International. This time, it was built to serve a poor neighborhood of Saint Marc. DINEPA worked with the grassroots organizations in the area to establish the management structure for the system.

After three years of service, The Christ-Roi system was evaluated. The study revealed that the septic tank was full and the management committees no longer existed. No funds remained to empty the shared septic tank, and families no longer could use their toilets.

In Saint Marc, funding was cut before the complete training program was completed. As a result, the activities aimed towards raising awareness were also halted.

DINEPA intends to evaluate the two experiments and to make recommendations about viability of the system and how it might be adapted for public use.

The central septic tank can be setup as a biodigester from which the methane gas could be captured, and the sludge eventually used as compost.

Following the 2010 earthquake, three non-governmental organizations implemented biodigesters in urban areas of Haiti. Based on a study conducted in 2014 by Norwegian Church Aid, 99 biodigesters sites were listed, 74 of which were operational and the remaining 25 defective or awaiting repair.

Very few of the functioning toilets were able to meet the three goals aimed at providing safe sanitation, biogas, and compost. The few that were, typically were found in markets or other dense urban areas where users paid to use the toilets and the site operator diligently carried out manage-

ment duties. According to this same study, the major challenges associated with bio digesters are as follows:

- Water was frequently not available in sufficient quantities to properly flush away the fecal material in a toilet.
- Lack of financial forecast to repair components in the event of a breakdown or to periodically empty the pits.
- Low financial viability of systems whose management costs are based on pay-as-you-go toilets and gas production.

## EVACUATION SEGMENT

The National Sanitation Strategy recognizes the critical role of the private sector in its ability to provide services and the equally essential role of the public sector in creating a conducive environment for this to be safely performed. The National Strategy endorses a market-based approach and encourages an approach that does not rely on subsidies. As previously mentioned, the costs of services should be borne by the households.

### The formal septic pumping and transport services

This service only exists in the Port-au-Prince area because this is the only area currently served by a fecal sludge management site, the site at Morne-à-Cabri. There are around a dozen companies registered to transport the sludge to Morne-à-Cabri. These companies own a small fleet of vacuum trucks and focus on providing service to the hotels, public buildings, and private businesses that have existing septic tanks. Although some of the companies provide other services such as garbage collection or rodent control and all will also empty pit latrines; none of them provide septic tank construction services.

The cost of emptying a household's septic tank is on average 175 US dollars (USD) in Port-au-Prince and 250 USD in Cap-Haïtien.

DINEPA has established a framework to regulate this sector through the OREPAs. However, the OREPAs have not yet begun exerting control over the companies.

These companies currently transport around 20,000 m<sup>3</sup> of sludge from the septic tanks and pit latrines to the Morne-à-Cabri site each month. Given that the Port-au-Prince metropolitan area has a population of nearly three million, this represents only a very small percentage of sludge generated in this area.

### The informal sector

Manual pit emptying is done in the middle of the night by workers who generally have little training or protective equipment and work in very hazardous situations. Although they are sometimes referred to as *bayakous*, this is generally considered a derogatory term and is not used by the workers themselves. They work in a team with one person at a time entering the pit and excavating the sludge with a shovel. They fill a bucket with the sludge, which other workers haul out of the pit and empty into drums. Since few urban areas have designated sites for the disposal of sludge from latrines, the pit emptiers are left to their own devices to dispose of this sludge. As a result, the sludge is typically illegally dumped into ravines or open land.

Informal emptiers charge around 20,000 gourdes (200 USD) to empty a pit; this includes the cost of transporting the sludge away from the house.

## TRAINING OF OPERATORS

Between September 2015 and May 2016, DINEPA carried out an experiment to improve manual emptying operators in the commune of Liancourt near St. Marc. DINEPA provided training and equipment to the workers and even tested the use of manual pump mounted on a cart. This was part of the same program that developed the *maisons d'assainissement* mentioned earlier. As with that activity, the funding was cut for this work before the results could be fully appreciated.

The non-profit, ACTED, evaluated the performance of the pump and found it not to be appropriate. It was too expensive to operate and too difficult to maneuver to the sites where it was needed.

GRET's produced a report on excreta management in poor neighborhoods. It highlights three major challenges faced by emptiers:

1. The lack of an intermediate drop-off location and the distance from authorized fecal sludge management sites are seen as two major obstacles to the proper functioning of emptying in neighborhoods, as is the lack of price regulation. Please note that the Port-au-Prince Sewage and Fecal Sludge Treatment Plants (STEBs) were built very recently (2011) and one of them has not been operational since the end of 2013.
2. The pit emptiers do not have the technical and economic means to go to the fecal sludge management sites.
3. Neighborhood stakeholders are very reluctant to see the emergence of intermediate storage depots in neighborhoods, fearing a lack of long-term management (such as solid waste landfill sites) and the nuisance that this would cause.

DINEPA, wants to dignify the profession by way of improving the safety of the work and professionalizing the service. The USAID Water and Sanitation Project has had some initial success in improving the safety of their work and improving the reputation of the workers by helping them to organize into small businesses. This has been particularly successful in Les Cayes, as described in the next chapter.

## TREATMENT SEGMENT

As stated in its National Strategy, DINEPA would like to have twenty fecal sludge management facilities operating in Haiti. The Morne-à-Cabri facility

opened in 2011. Four others are currently under construction.

All five facilities are lagoon-based treatment systems, where the sludge is poured first through a grate to separate solids from the sludge. It then passes through a series of lagoons with the solids settling to the bottom. The solids undergo anaerobic digestion at the bottom of the lagoon. Periodically, the sludge is excavated and safely buried on site.

The status of these five sites is described in the following sections.

### Morne-à-Cabri

Following the 2010 cholera outbreak, there was an urgent need in Haiti for safe treatment of fecal material. The first proposed site was at Titanyen (described below). When work on that site stalled due to land tenure problems, DINEPA quickly pivoted and began construction of the Morne-à-Cabri facility in the northeastern corner of the Croix-des-Bouquets commune.

With funding from the IDB, ECHO, and UNICEF, the site was completed in 2011 and immediately put into operation. The site was designed to handle 15,000 m<sup>3</sup> of wastewater/month with 300 kg of volumetric loading of biochemical oxygen demand (BOD).

In the early days of operation, the site received from 5,000 m<sup>3</sup> to nearly 10,000 m<sup>3</sup> of wastewater and sludge from pit latrines each month. Although this was below the design volume, the BOD levels of the material were much higher than had been designed. Whereas the design had assumed BOD levels of 198 g/m<sup>3</sup>, the wastewater was tested at BOD levels of 252 to 3,228 g/m<sup>3</sup> and the sludge brought in drums had 5,160 to 40,000 g/m<sup>3</sup>. As a result, the facility was operating above its design capacity and required frequent maintenance.

Much of this surplus sludge was from the portable toilets in the temporary resettlement camps. As these camps emptied, the volume of sludge

brought to Morne-à-Cabri diminished. Currently, the site receives an average of 1,500 m<sup>3</sup>/month.

The tipping fees for Morne-à-Cabri were set in 2016 at 270 Haitian gourdes (HTG) per cubic meter, but this was subsequently reduced to 200 HTG per cubic meter. However, the OREPA has had trouble collecting even this amount. Due to poor collections, the site has been underfunded and has struggled to pay its staff salaries and done very little maintenance.

The USAID Water and Sanitation Project is currently providing support to the site. This includes cleaning out the lagoons, repairing the infrastructure and helping the OREPAs to put in place an effective, autonomous management structure.

### **Titanyen**

As mentioned previously, the Titanyen site was to have been the first fecal sludge management site. It is at the edge of Canaan on the northwestern side of the Croix-des-Bouquets municipality. Funded by the AECID, construction began on the facility in early 2011. Almost immediately, construction was halted due to a land tenure dispute. DINEPA pivoted to working on the Morne-à-Cabri facility. As the Morne-à-Cabri facility was completed, work restarted on the Titanyen site. It was opened at the end of 2012. After the site began receiving sludge, gas bubbles began appearing under the geomembrane liners in the lagoons. When no solution was found to mitigate this problem, the site was closed just 18 months after its inauguration.

AECID has committed to reconstructing the site. It is expected to reopen in late 2022.

### **FONFRED**

In 2012, the Haitian Government built a temporary fecal sludge treatment system in the Fonfred area for use while the national carnival was held in Les Cayes. The site is about 9 km from the Les Cayes city center. After the carnival ended, the site was closed. In 2016, the IDB financed a partial rehabilitation of the site. In 2020, the World Bank and the USAID Water and Sanitation Project worked with

the OREPA-South to complete the rehabilitation of the site and to develop a management plan for its operations. The site is being reopened as this document is being finalized.

The site is designed to process 1500 m<sup>3</sup> of sludge each month. The OREPA-South plans on charging 500 gourdes/m<sup>3</sup> as the tipping fee. It also plans on renting vacuum trucks to local contractors to enable them to empty septic tanks.

### **Mouchinette**

In 2013, the Haitian Government built a temporary fecal sludge treatment system in the Limonade municipality for use while the national carnival was held in Cap Haïtien.

The station was initially designed to hold 1500 m<sup>3</sup>/month of wastewater and fecal sludge. It was operational for a few months but was eventually closed. Since then, the service has not yet been restored and the station has been subject to theft and suffered substantial damages. OREPA-North, with the support of AECID and the USAID Water and Sanitation Project, will undertake the necessary steps to reopen the station in 2022.

### **Saint Marc**

As with the Fonfred facility, the IDB financed the partial construction of the Saint Marc facility in 2016. However, it was not fully operational. AECID is currently working with DINEPA to complete work on the site and to have it fully operational by the end of 2022.

## Interventions That Cover the Three segments

As described in the introduction section, safe sanitation only occurs if all three segments of the sanitation chain are safely managed. Providing a family with a safe toilet does not give that family safe sanitation unless there is also safely managed collection and transport of the sludge and that sludge is safely treated and disposed. For many years, organizations would subsidize toilet construction, but this did not seem to reduce open defecation. DINEPA found that absent safe transport and treatment, the toilets would quickly fill and be abandoned. For this reason, DINEPA has forbidden subsidizing toilet construction.

Of all the sanitation interventions in Haiti since the creation of DINEPA, only two have attempted to provide safe sanitation by treating all three segments. The first intervention is that of SOIL through their Ekolakay Sanitation Service. The second intervention is that of the USAID Water and Sanitation Project with their work in Les Cayes. The following sections describe these activities and analyze the factors hindering or promoting their success.

### CONTAINER-BASED SANITATION THROUGH EKOLAKAY

#### Overview



Figure 5- A SOIL client. Credit: SOIL website

SOIL manages a business called Ekolakay that provides container-based sanitation to around 1,100 households in the Cap Haitian area. They focus primarily on customers in marginal neighborhoods.

The Ekolakay service rents toilets for households in targeted neighborhoods. The toilet consists of a box-shaped seat containing a bucket with a urine diverter. Each week, Ekolakay collects the sealed container of feces and replaces it with a clean container. The household manages the urine, throwing it directly into the ground, a duct, or other designated area. Projects are underway to develop systems to dehydrate urine in low-resource countries.



Figure 6- Treatment and transformation of the waste of the NGO SOIL. Credit: SOIL's website

The service transports the filled containers to a temporary storage facility in Quartier Morin, while waiting to be transferred by truck to the composting site in Limonade for the treatment process.

In Limonade, the waste is fully composted. The **compost** is sold for agriculture. Due to the severe degradation of Haiti's agricultural lands over the last decades, SOIL considers the creation of the compost to be a critical part of their impact.

The Ekolakay toilets cost from 22 to 50 USD depending on the model. The cost is not charged directly to the customer but is factored into the monthly user fees.

Ekolakay charges 200 gourdes/month for its service. When this rate was set in 2013, it was equivalent to 5 USD. Today it is only 2 USD.

Many international partners have contributed to the funding of the SOIL initiative, including the innovative branches of USAID and IDB. Building the model has been a slow process that has gradually evolved over its 14 years of existence.

### **Factors limiting or intensifying the success of the intervention**

The Ekolakay system's greatest strength is its strong attention to customers' needs. It consistently monitors their needs through a robust system of data collection including an annual satisfaction survey, exit surveys, and compost testing. SOIL tracks metrics to guide and make data driven decisions.

SOIL used a strong system of community engagement in targeted neighborhoods from the inception of the project. Through their community engagement activities, they ensured that community voices were heard. They consider sanitation to be a basic human right.

While their approach is an environmentally viable solution, it is not financially sustainable. The 200 gourde/month service fee and revenues from the sale of compost covers only a small percentage of the Ekolakay operating costs. They make up the difference through private donations and grants.



Figure 7- A training session for manual pit emptiers

To reach a breakeven point, they would need to dramatically increase the number of customers and raise the monthly fee—both difficult propositions given Haiti's weak economy.

### **What should we remember?**

SOIL is the only organization in Haiti who has been able to consistently provide safe sanitation to lower income households. By focusing on customer needs and consistently looking for new innovations, they have been able to maintain their successful model despite the difficult operating environment in Haiti.

While they have not been able to scale up their operations as quickly as they had hoped, few businesses in Haiti have been able to prosper given the extremely challenging economic environment of the last few years.

The success of the Ekolakay service has shown that container-based systems are an acceptable solution in Haiti if the proper financial supports are available.

## **THE URBAN SANITATION INTERVENTION MODEL OF THE USAID WATER AND SANITATION PROJECT**

### **Overview**

One of the goals of the USAID Water and Sanitation Project is to provide improved sanitation to

75,000 people in Haiti. It targets five areas for this work: Cap Haïtien, Mirebalais, Canaan, Les Cayes, and Jérémie. The most successful of these was the intervention in Les Cayes. There, the project was able to combine work on all three segments and develop a sustainable model for safe sanitation. This work is described in the following sections.

### **The storage segment**

The focus of the work in the storage segment was on the people who construct the toilets and septic tanks.

As a first step, the project sought to identify the small businesses and artisans (masons, carpenters, plumbers) involved in toilet and septic tank construction.

It then helped them to formalize themselves into different businesses. This included going through the legal steps to be recognized by the State as a business. Six groups became registered businesses: ANCA, DENSCO, Top Vidange, ECLAT Total, and LOVABLECO.

In parallel, the project provided the small and medium enterprises (SMEs) with a mixture of technical training (how to choose what type of structure can be built, proper construction techniques, how to estimate construction costs, etc.) business management training based on the ILO's Start and Grow Your Business training program (what are fixed and variable costs, how to develop a budget, how to develop a business plan, how to monitor your finances), and marketing (how to identify clients, how to attract business, how to advertise your business).

Finally, the project had a small grant program that rewarded the SMEs for building toilets. They were offered a package of IT, office, and work site equipment. They received a part of the equipment upon completion of their business plan and additional equipment after contracting for their first 10 toilets and after reaching 40 toilets.

Of the six contractors who began the program, five were able to build at least 40 toilets. Six months

after completion of the small grant program three are still actively building toilets.

### **Emptying/Transport**

At the start of the project interventions in Les Cayes, there was already a loose association of the manual pit emptiers. This was a key ingredient in the project's initial success in Les Cayes. Because the pit emptiers' work is not respected, it is done in a clandestine manner late at night. The existing association gave the project a means of entry to begin identifying the pit emptiers.

Based on contacts from this first group of pit emptiers, the project was able to identify others involved in the business. It ultimately identified four distinct groups of pit emptiers. It then worked with these four different groups to form four different pit emptier companies.

Secondly, the project worked with the pit emptiers to train them on how to safely do their work. The training was based on the South African Water Research Commission's video on pit emptying (link to the [English version](#) and [Creole version](#)). The project also provided them with the required personal protective equipment and tools.

To overcome the challenge of transport, the OREPA-South has arranged to rent trucks and three-wheeled motorcycles with carts to pit emptiers. The fleet includes vacuum trucks (7.8 m<sup>3</sup> capacity), motorcycles with a tank trailer (1 m<sup>3</sup> capacity), flatbed trucks (capable of hauling 8 drums) and motorcycles with a flat trailer (capable of hauling 4 drums).

To be eligible to rent this equipment, the SME had to be registered with both the mayor's office and with the OREPA. The mayor's office also provides referrals to companies from clients seeking services. The role of each institution is shown in Figure 9.

The rental service began in March 2021 with a limited number of trucks. The World Bank and DINEPA have promised additional vehicles.

## Treatment segment

The fecal sludge is treated at the Fonfred site. This uses the lagoon-based treatment. The sludge is poured through the entry grate to separate out the solid waste. It then enters the first anaerobic basin. Most of the solids are expected to settle in this basin. The liquid then drains to a series of secondary basins. The final effluent is discharged into the soil. Periodically, the sludge from the anaerobic basin will need to be removed and placed in the drying beds for eventual safe disposal.

To reopen the site, the World Bank agreed to finance the infrastructure work and the USAID Water and Sanitation Project is providing the technical assistance.

The main focus of the technical assistance has been to put together a clear business plan with realistic

months of full operation to reach this breakeven point.

## Cross-cutting actions

To support these targeted interventions, the USAID Water and Sanitation Project has worked with the mayor's office to put in place an overall effort to raise awareness of the importance of improved sanitation. To lead this effort, the Mayor created a special task force on sanitation known by the French acronym CERAAC (Cellule de réflexion et d'action pour l'assainissement des Cayes -Think tank and Action for Sanitation in Les Cayes).

This group is composed of the representatives of the different ministries represented in Les Cayes and interested citizens. They organized public awareness events and played a key consultative role in developing the Sanitation Zoning for Les

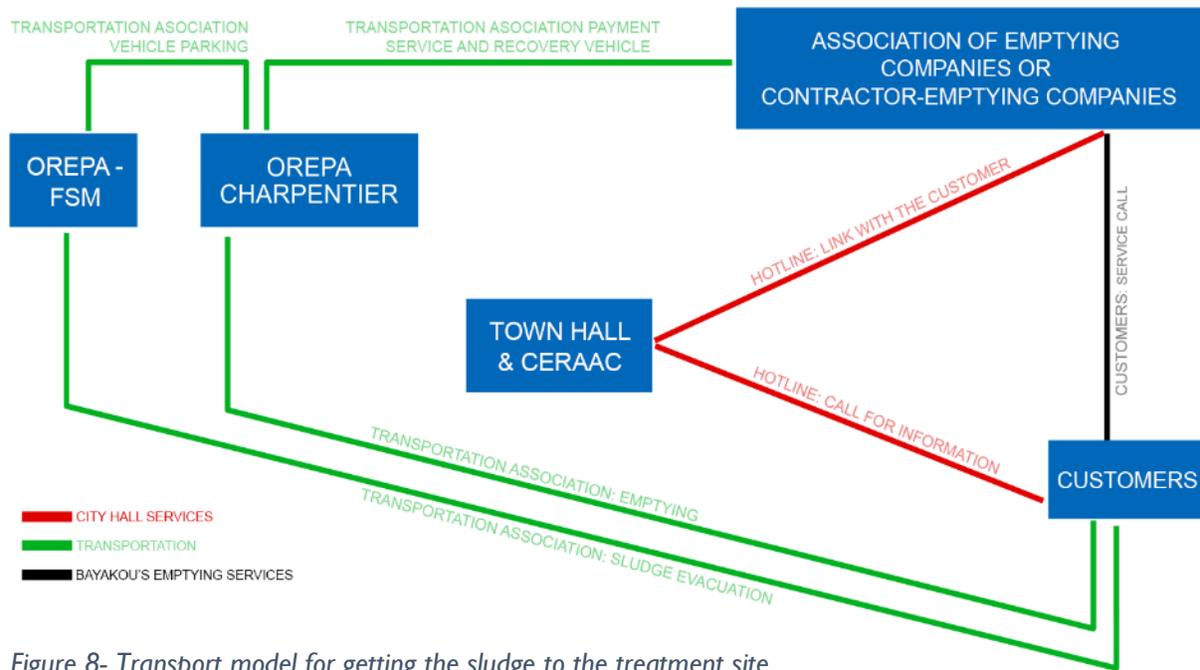


Figure 8- Transport model for getting the sludge to the treatment site

revenue targets. The current plans estimate the breakeven point at 300,000 gourdes/month. The main costs are salaries and benefits (218,000 gourdes). The main revenues are from the tipping fees (210,000 gourdes) with the rest coming from equipment rentals. It will take an estimated five

Cayes (described earlier). They have also played a key consultative role in developing a legal framework for the municipal administration for sanitation. This has resulted in a municipal decree that covers regulation of all three segments of the sanitation chain.



Figure 9- Aerial view of the Fonfred fecal sludge management site. The anaerobic ponds are the long rectangular structures in the lower left corner. The maturation ponds are the three square structures. The drying pads are the small squares in the upper right.

**What factors limit or promote the success of this model?**

The USAID Water and Sanitation Project has succeeded in putting in place a complete sanitation chain that should be able to operate without further subsidies. Its success comes from focusing on a market-based approach on all three segments. Other factors facilitating the implementation of the model include:

- A systemic approach that simultaneously allows intervention on several complementary fronts: training, equipment, coaching, evaluation, social recognition of prior learning.
- The leadership displayed by local leaders (town hall and OREPA).
- A flexible approach to financing the interventions that allowed the Project to continually tweak its implementation strategy.

The biggest challenges to putting this system in place were the following:

- Lack of knowledge of the sanitation sector by the local government and ministerial representatives.
- The vagueness concerning the roles and responsibilities for the OREPA and the municipalities in managing the sanitation chain.
- The continued expectation by the general population that toilet construction would be subsidized by donors.
- Lack of financial literacy of the SMEs.

The biggest challenge to the sustainability of the approach is that the system was put in place by a project with a limited duration. Once the project support ends, will the interventions continue?

**What should we remember?**

The SOIL model has been successful because SOIL has been able to consistently maintain a subsidy for its work. The USAID Water and Sanitation model strives to put in place a sanitation chain that can function without additional subsidies. It has done this by focusing on a market-based approach and worked closely with the actors at each level to understand their concerns and that of their clients.

If the sanitation chain in Les Cayes is able to continue to operate after the end of the USAID Water and Sanitation Project, then it is a good model for how a sanitation chain can be put in place in secondary cities.

However, the SOIL model reaches poorer customers that would not necessarily be served by this sanitation chain. Therefore, the two approaches are complementary.



Figure 10- Canaan. Credit: Marc Lee Steed

## The challenges of urban sanitation

The major urban sanitation challenges include:

- The weakness of urban planning and city management leading to disorganized urban areas.
- The high proportion of poor neighborhoods in most cities with poor inadequate housing and public services.
- Poor public water access in poor neighborhoods where few houses have direct household connections and are instead reliant on public or private kiosks.
- The cost of transporting sludge from the urban centers where it is collected to the treatment sites that are well outside of the urban areas.
- The lack of awareness of the potential value that can be created from the production of compost and methane gas, which could help offset some of the cost of waste treatment.
- The lack of funding for the sanitation sector threatens the sectors sustainability over the long term.

## Conclusions and recommendations

The main conclusions and recommendations based on the workshops as well as the wealth of experience that the Project has amassed and literature reviews related to urban sanitation are:

1. Haiti is not ready to support the establishment of central sewage systems. In the short term, the country will have to organize the existing system by setting up local CAN (*assainissement non collectif* - non collective sanitation) services for this:
  - a) The country must prioritize the **organization of its cities and urban neighborhoods**. The design of the sanitation system should be included at the earliest stages of development. Housing design and construction must be regulated to ensure that each house has sanitation.
  - b) There must be continued efforts to increase **access to the public water service**. The country must accelerate the process aimed at full urban coverage of water distribution networks and aim to gradually eliminate the reliance on public kiosks in urban areas.
  - c) Technical and financial assistance to **sanitation professionals** must be at the core of any new project that aims to improve the toilets and pits built and the evacuation and transport of sludge.
  - d) The State should support the efforts of **regional structures and municipalities** in their efforts to establish and operate sludge treatment systems around the city.
2. Haiti should, in the long term, continue to explore semi-collective sanitation as a step towards a centralized sewer system (collective sanitation). For this:
  - a. Efforts should be made to increase the coverage of **stormwater drainage** in the country's main and peripheral cities.

- b. **Solid waste** must be properly managed so that the storm drains and toilets are no longer used for garbage disposal.

The workshops and discussions also highlighted that:

- There is a pressing need to scale up urban sanitation solutions in Haiti. Although central sewerage is the preferred **solution for urban sanitation** around the world, this cannot be the only option in Haiti. Multiple types of sanitation systems should be considered based on sanitation zoning studies, the suitability of soils for sanitation, the socioeconomic context and the development trend of urban areas. The solutions must include government intervention in the management and regulation of sanitation. There must also be a plan to finance a large-scale sanitation program. In addition, studies should be conducted to measure the environmental and social benefits of standardizing the sanitation process.
- A **Public Sanitation Service** based on the learnings from the models previously developed must be established.
- The state must **prioritize sanitation** and must prioritize households located in the most vulnerable areas of the country. Prioritizing these areas is not only essential but it also requires the dedicated support of the Prime Minister's Office, the Ministry of the Environment and the Ministry of Health. This work must be well regulated to ensure that is properly implemented.
- To achieve total sanitation coverage in urban areas, the State must implement indirect **financing solutions** for the most vulnerable populations through programs that facilitate access to decent housing and initiatives that tackle poverty.
- The urban context in Haiti is complex - weak infrastructure, lack of funding, vio-

lence and mistrust hamper the implementation and development of a sanitation system that addresses all aspects of the sanitation value chain. The state must establish partnerships with private and public actors. It must also recognize the dominant presence of its private partners in the sanitation services sector in urban areas. Likewise, the OREPAs should build relationships with partners who have successful experience with a sanitation system or who are willing to prioritize interventions within urban areas of Haiti.