sustainable sanitation alliance

SuSanA Latinoamérica

Case Study – Sustainable Sanitation Projects
Integrated Wastewater Collection and Treatment Service
Alajuela Municipality, Costa Rica

Fig. 1: Project Location

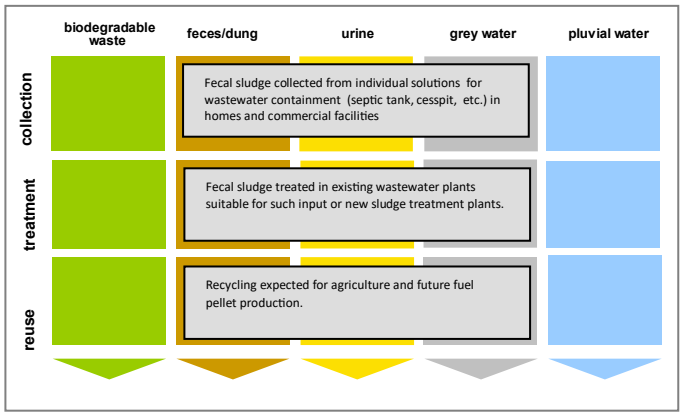

Fig. 2: Sanitation components applied to this project

1 Project Background

Type: Expansion of municipal sanitary sewage service to include septic tank cleaning in homes located outside coverage area, so that fecal sludge collection and treatment activities along with septic tank maintenance are improved, and resources are generated to expand sewage network in the future.

Period: Initially, project was established by a legal revision in 2017 that identified a potential expansion of the sewage service scope provided by the municipality involving fecal sludge collection and treatment.
Subsequently, a proposal for the new regulation regarding sanitation service provided by the municipality was prepared and began to me documented by the end of 2018. This process is currently in progress and it is expected to take effect in the last quarter of 2020.

Simultaneously, between 2017 and 2018 the wastewater treatment system in Alajuela City was remodeled. This action included a specific line for fecal sludge reception and treatment. The system has already been working, but the municipality does not provide a collection service home by home because the regulation has not been approved. For the time being, fecal sludge reception and treatment service is provided by private collection companies that operate in the region. Collection as a municipal public service is expected to be provided in year 2022.
This project was published for the first time in the official governmental journal in January 2019 and now is waiting for its second publishing which would formalize project implementation phase.

Scope/Category: The territorial aspect of the initiative involves the entire Alajuela Municipality in Costa Rica with a total population of approximately 300,000 inhabitants. The initial objective will be the central municipal area, which is the most populated, but in the medium term, covering other areas until reaching 88% of the municipal population equivalent to 264,000 inhabitants is intended.

Location: Alajuela Municipality, Costa Rica

2 Purpose and Cause of the Project

General Objective of the Project:

This initiative is intended to expand a traditional sanitary sewage service to an integrated concept of fecal sludge collection and treatment. For homes located in areas where sanitary sewage is present, recollection will continue through this system, while for homes located out of the coverage area, which have an individual system for wastewater treatment with soil absorption such as septic tanks or similar, the service consists of collecting fecal sludge and transporting it to a treatment plant for its final disposal.

Income generated by new fecal sludge collection and treatment services will be reinvested in projects to expand sanitary sewage networks and treatment plants so that in the medium term most of the population may access to this infrastructure.

Specific Objectives:

I. Legally complementing the scope of service provision and existing regulation, incorporating responsibilities, models and activities related to systems based in fecal sludge management;

II. Implementing proper systems for fecal sludge treatment and usage;

III. Implementing a scheduled fecal sludge collection model with strategically defined fees.

3 Location and Conditions

Alajuela Municipality in Costa Rica is divided into 14 districts, and Alajuela City, the municipal site, is located approximately 20 kilometers away from San José, the national capital. Approximately 88% of its population lives in urban areas whereas only 12% live in rural areas. Alajuela and San José are the most populated districts in the municipality and 100% urban. According to 2011 census, municipal population was 254,567 inhabitants, which is consistent with a demographic density of 655.4 inhabitants/km2. According to statistical projection, estimated municipal population for 2020 will be approximately 320,000 people. Alajuela is located in the intertropical zone of the planet, close to the Equator, but actually registers milder temperatures ranging between a minimum of 15ºC in winter and a maximum of 32ºC in summer, mainly due to its altitude of 960 m.

General Sanitary Conditions

Only 12% of the population in Alajuela City has services involving centralized wastewater collection and treatment networks. The rest of the inhabitants has individual sewage solutions, in this case, with prevalent inappropriate containment systems such as rudimentary cesspits and illegal septic tank cleaning services. These services are usually used to dispose sludge, which in many cases is done without an appropriate treatment into water bodies.

In the special case of Alajuela Municipality, being one of the most important urban centers in the country, the environmental and public health issue posed by wastewater disposal without or inappropriate treatment into water bodies has particularly serious consequences. Daily, a great volume of wastewater discharged in the municipality is responsible for impacting water quality in rivers and streams, local agricultural and fishing activities, and crop irrigation, and also affecting important river basins in the country such as Rio Grande de Tarcoles. In order to solve this issue, the local government has been performing important investments during the last years to reactivate and modernize wastewater treatment plants, especially Villa Bonita Plant involving the greatest treatment capacity among those operating in this municipality.

Sewage services through collection networks are responsibility of municipal management and only homes connected to network pay a fee. Because of low income generated by services and limitations of investment sources to expand centralized sewage system, this municipality began to study models to extend their service and generate additional earnings. Thus, using an integrated concept for wastewater colle ction to cover this activity including sewers or trucks was considered. This way, the whole population would be assisted instead of only 12%. This increasing number of users will rise income to enable expansion of existing sanitary sewage collection network. Therefore, in this case the system based on sludge management seems not only the most accessible service in the short term, but also a way to obtain resources to implement a centralized wastewater collection and treatment system in the long term.

Entity Agreement for Sanitation Service:

In Costa Rica, water services must be provided together with sewage services. Water and sewage services in Alajuela Municipality are distributed between two service providers: Costa Rican Water and Sewage Institute (AyA) and Alajuela Municipality government

AyA was created in 1960 to implement and operate water distribution and wastewater collection networks in the whole country. However, in locations whose services were already provided by municipalities, it was determined these would be rendered by municipal public management, as long as performance proved to be efficient. Regulation for services provided by AyA is performed by the Public Services Regulation Authority (ARESEP), which due to national legal framework, does not regulate activities directly provided by the municipality. Regardless this situation, municipal operation has intended to follow ARESEP technical criteria and guidelines.

In Alajuela, the municipality is in charge of providing sewage service in most of the municipal territory in districts such as Alajuela, San José, Río Segundo, Desamparados, Turrúcares and La Garita. Currently, approximately 15% of their population has access to sanitary sewage collection network, while 85% has an individual treatment system (mostly rudimentary pits). Pit cleaning services are regulated by the Costa Rican Health Ministry Law Nº7554/1995 (Organic Environmental Law) establishes duties for municipalities and other public entities to define and perform territorial planning intended to regulate and promote population wellbeing and economic and social activities of population in order to promote environment and natural resources protection. General Health Law N° 5395/1984 prohibits contamination of superficial and underground water channels with wastewater that impacts physical, chemical and biological characteristics of water making it dangerous for human health, terrestrial fauna or useless for domestic, agricultural, industrial or recreational use. Based on this framework and local context expressed, Alajuela Municipality issued a Regulation for Sanitation Service in Alajuela Municipality, in order to regulate sewage network service and also promote progress through fecal sludge management.

4 Project Background

Costa Rica has achieved important progress regarding drinking water supply and sanitation services in the last decades. However, wastewater collection, treatment and final disposal is still a great challenge for sanitation sector as described by the National Policy for Wastewater Sanitation (PNSAR) published in 2017. This policy is part of the National Development Plan (PND) that intends, among others, to fulfill objectives proposed by the United Nations (UN) in its agenda for Sustainable Development Goals for 2030. This document establishes that wastewater sanitation services in the country does not reach the amount and quality required and warns that a great part of these effluents end up discharged into rivers and seas without corresponding treatment, thus generating significant socio-environmental adverse impacts.

Aligned with national scene, Alajuela Municipality reveals many issues related to sanitation sector. Besides people without access to wastewater collection, an important part of homes, commercial installations and industries already connected to collection networks have their wastewater discharged to rivers and streams without corresponding treatment. Regarding population who have individual treatment solutions, particularly pits (mostly rudimentary, also including septic tanks), their effluents reach the environment without a proper treatment, either by seepage to soil due to inappropriate containment systems, this is, by sludge directly released to land or discharge to water bodies. In absence of regulation measures, both containment systems and sludge collection/transportation activities involve several contamination risks to public health and the environment because of inefficient systems and illegal collection services.

In order to solve previously mentioned situation, the municipality issued the Regulation for Sanitation Service Provision for Alajuela Municipality. This document established regulation and guidelines not only for collection network services, but also for septic tank cleaning and other similar individual systems, by introducing a public service without precedent on a national basis. Through this inclusion, Alajuela seeks to assure cleaning for individual treatment system as well as collection, transportation and proper treatment for generated sludge. This initiative enables collection for decentralized sewage service (based on fecal sludge management) even for population without access to wastewater collection network. This greater number of homes contributing by paying fees would make it possible to collect enough funds to expand collection network in the whole urban area of Alajuela in

the medium term. Thus, a service through schedule collection from pits is presented as a provisional measure to enable total coverage of wastewater collection networks.

Project Methodology & Design

Before identified unavailability of resources to assist population without wastewater collection network coverage, the project team thought about scheduled collection service and sludge treatment as a way of provisional assistance that would also generate income (fees) to invest in the construction of new sewage networks in the future.

Starting from an established strategy, different action fronts were identified. Some preliminary studies about local status (population, potential sludge generations and existing structures) and systems present in the whole world showed a way to configure a service chain through fecal sludge management. These studies drew up action fronts, potential configurations to service ordinance (structural and institutional aspect) and the beginning of a financial sustainability model. From that time, approval regulations and formalization of corresponding activities, including liabilities, procedures and conditions applicable to different actors involved in this initiative were consolidated.

A complete document was sent to be validated and processed by the regulation agency for sanitation services. Simultaneous to the approval service, adjustments and acquisitions were made to the wastewater treatment plant based on sludge intake estimations; capacity studies for an existing plant and different processes and technologies available for sludge processing. From a preliminary project, all required interventions to create a specific line for fecal sludge treatment were performed.

5 Applied Technologies

Configuring this implemented system involves from regulation, inspection and registration of individual systems to sludge collection treatment and final disposal performed by the municipality.

Regulation

Regulation for Sanitation Service in Alajuela Municipality is intended to provide wastewater treatment and final disposal for better organization and operation of municipal public collection service, establishing duties to the municipality and the users, as well as fee payment for these services. In order to prevent and avoid contamination to soil and natural water resources by human consumption, every natural or legal person that owns a house, commercial facility, or building must have wastewater disposal and treatment approved by the municipality and be responsible for its maintenance and good operational conditions.

Fee Model

Every owner of a real estate registered, located inside the municipality limits and using sanitation services provided by Alajuela Municipality, must pay fees previously established by the Municipal Council. If the user does not pay the bill before its deadline, a 2% fine and its payment in places authorized by the municipality is established. As a requirement for cleaning service, any real estate where the septic tank or individual treatment system is located, must have their taxes or any other duty with the municipality duly paid.

- Systems Registration and Inspection

- This initiative foresees scheduling technical inspections to assess conditions of individual systems in compliance with expected requirements, as well as registering monitoring and inspection activities.

- Implementing septic tanks in homes will only be authorized once it is verified that the system complies with every requirement. A calculation report must be submitted for every element comprising the system. A leak test must be performed in the area where it will be built, -indicating drainage area distance needed and the available area for this purpose. In some cases, a soil contamination test to demonstrate that this system does not impact underground waters or other water bodies will be required.

Preferably, individual systems must be built in the front part of the plot, facing the street, to enable a connection to the collection network to be built in the future. If this condition is not fulfilled, the user will connect home wastewater to the collection network, using pumps, if necessary. Additionally, in cases when access to the system requires going through private property, the presence of the legal owner is required. The system built must include a tap to allow an easy access without using tools or causing any kind of damage to the system or the property.

- Collection

- Including scheduled sludge collection by service provider. The municipality is responsible for organizing scheduled payment, receive and issue additional payment requests and charge fees for services rendered. Monthly payment for municipal sanitation service grants fecal sludge collection service for a septic tank or individual treatment system every two years to the user without access to a sewage system. Sludge or wastewater collection for volumes higher than those established as basic cleaning (around 1 m3 of sludge) will be charged per cubic meter collected.

- Treatment and Final Disposal/Recycling

Fecal sludge treatment is performed in a wastewater treatment plant present in the municipality, partly being treated in wastewater treatment line and partly in a specific processing line for fecal sludge collected. Current sewage system consisting of a biological process involving activated sludge, enables a provision of nearly 60 m3/day of sludge and when daily amount exceeds these volume, material is sent to a specific line for sludge, with an ordinary capacity of 80 m3/day with previous extension to 120 m3/day.

This exclusive system for sludge treatment consists of the following stages: pretreatment, stabilization, densification, drying, sludge disinfection and recycling. The process begins with a receptor tank providing sludge transported by tank cleaning trucks where from sludge is sent to a mixing tank, where calcium oxide is applied for disinfection (pH rises to 11-12 during 2 hours of retention).

Consequently, the material moves to a disinfection tank by gravity, where the supernatant liquid portion goes to wastewater treatment system and densified sludge is dehydrated in a screw press. Supernatant liquid from this process also goes to a wastewater treatment line. Then, dried sludge is composted along with urban pruning waste. The product from this process is used by Alajuela Park Department to plant seedlings. Currently, the capacity of dehydration stage is limiting general

process capacity; therefore, setting up drying beds to increase daily capacity for sludge entry per cubic meter is anticipated.

6 Project Setup

This initiative comprises a series of actions organized by Alajuela Municipality to assist on sanitation for its population through a proper fecal sludge management. Facing low availability of resources to expand sewage network coverage, scheduled sludge collection and treatment was determined as an strategy within the scope of municipal sanitation service. This complementation in the list of activities as a service provider includes instructions for a proper installation of containment systems and performance of sludge collection, transport, treatment and recycling activities for sludge originated by individual solutions.

For this purpose, the project seeks to regulate and establish a system through sludge collection, transport, treatment and final disposal or recycling. Structuring internal actions to register and monitor individual solutions is also considered.

A Regulation for Sanitation Service in Alajuela Municipality was approved for its first publication in the official governmental newspaper in 2019 and now, 2020, a second publication for the formalization and effective implementation of its guidelines. Besides regulation, this initiative involves organizing and managing present sludge collection and transportation services, as well as installing of specific treatment systems for sludge collection.

This project is intended to assist that population portion from Alajuela Municipality without access to wastewater collection network by providing sanitation service through decentralized solutions based on an appropriate fecal sludge management.

The strategy designed by the municipality presents this alternative way of assistance as a temporary measure that improves the service in the short term, and also provides enough resources in the medium term to expand collection network to the rest of urban areas. Thus, through scheduled sludge collection services, a fee to expand the collection network infrastructure (centralized sewage system) will be charged.

This expansion to the service scope involves different dynamics for each stage in the sewage service chain. Regarding containment stage, the municipality is responsible for registering existing monitoring systems (through polls), as well as guiding the installation of proper systems.

These technical inspections will assure systems will not cause any damage to the environment and also verify appropriate operation for cleaning services. Regarding collection and transport, the municipality is offering a scheduled fecal sludge collection service by organizing the septic tank cleaning sector and charging a monthly fee to users for collection per year or every two years in each home. Then, collected sludge is sent in tank cleaning trucks to municipal treatment plants, where it will go through a specific processing line for treatment and subsequent recycling in seedling crops used for landscaping or reforestation.

7 Recycling Type and Level

This system, already implemented, has foreseen recycling for treated sludge after disinfection, drying and composting stages. Obtained product is applied to seedling for forestry and ornamental species used in parks and reforestation projects under responsibility of Alajuela Park Department.

Besides these systems for future implementations, other potential recycling practices are included in the approval regulation. Complementary goods and services that the municipality may commercialize are: selling recycled treated water, selling dehydrated sludge or fertilizers obtained from fecal sludge; selling biogas; selling energy obtained from cogeneration process.

8 Other Project Components

This initiative includes a publicity campaign through municipal press department. This campaign is intended to explore new sanitation services provided by the municipality; involve and acknowledge people about appropriate rules and conditions to operate individual sewage systems. Initially, disclosure and awareness means will be social networks, websites, brochures and banners, all under municipal management.

9 Costs and Financial Aspects

Regarding fee charged by the municipality for fecal sludge collection services, this initiative is intended to provide a service in a more accessible cost for users regarding the price offered by private companies. Thus, the estimated price for sludge collection service, apart from water supply, is US$ 102 for 24-month coverage service (US$ 4.25/month), where users have the right to a standard cleaning including sludge collection of 1 m3. As a reference, the price charged by a private tank cleaning company for the same service, varies between $ 120 and $ 200. Also as reference, the service for conventional sewage including access to collection network, involves an integrated charge with drinking water supply, where the user is charged US$ 0.30 per cubic meter of water consumed on a monthly basis. The initiative has not formalized costs for planning, developing and implementing this project.

10 Operation & Maintenance

Operation and maintenance activities related to this initiative involve the following stages: registering and monitoring individual solutions, management and monitoring sludge collection and transportation services provided by different local companies: planning and managing implementation of fees and charges; treatment plant operation and directing and monitoring recycling practices for sludge byproducts. Thus, procedures involved in some stages are related to controlled activities by other parties (actors) and in others with real task performance.

For registering and monitoring individual solutions, tasks involve technical surveys to register (organizing local information and eventually guiding on containment system quality) and process data in management baselines of service providers. For managing and monitoring collection and transportation services, activities involve organizing the sector along with tank cleaning service providers; guiding on collection agendas and routes; organizing additional user demands or troubling events (unavailability to collect payment or other issues confronted) and financial management regarding charge and payment of subcontracted services. For treatment stage, operation involves daily truck routing, dosage, supervising

process quality and final product; materials and equipment replacement or adjustment, and finally, byproduct administration and control for recycling or final disposal. Recycling compost generated in seedling planting, managed by another municipal department, will involve material application (perform with duly care and personal protection equipment) to seedling forms, as well as cropping for their growth until they are resent for planting.

11 Experiences and Learned Lessons

Main lessons learned during initiative planning and development are related to long periods for approval and regulation of new activities and measures to start structuring systems while public policies are being developed.

In Alajuela, although scheduled service charge and fee charge must wait for service provision to be regulated, they have been progressively adapted to start an operation correctly, once they are released. In this sense, a treatment plant with a specific line for sludge, in order to account for the greatest amount of fecal sludge, has been prepared.

12 Sustainability Assessment and Long-Term Impacts

A basic assessment was performed (Table 1) to indicate which of all five sustainability criteria regarding sanitation, (according to Document 1 in SuSanA Vision) this project has its strengths in and what aspects were not outlined (weaknesses).

Table 1: Qualitative Reference about System Sustainability

	Collection & Transportation			Treatment			Transportation & Recycling		
Sustainability Criteria	+	0	-	+	0	-	+	0	-
Health & Hygiene		X			X			X	
Natural and Environmental Resources		X		X			X		
Technology & Operations		X		X			X		
Economics & Financing	X				X			X	
Institutional & Sociocultural	X				X		X		

Regarding assessed sustainability aspects, the initiative presents important progress in different stages of the sewage service chain

Accordingly, measures taken have an important impact to public health and hygiene, both considered a moderate force in the evaluation, given incipient stages for initiative progress to this moment. Regarding environment and natural resources, given that a trend to reduce incidence of irregular sludge disposal into land and water bodies, along with technology and operation, progress is considered strong for treatment and recycling stages, due to creation of specific processes for management and sludge recovery. Regarding financial and economic aspects, the initiative implies great progress for collection and transportation stage with the service model scheduled, enabling reduction and elimination of tank cleaning costs (before they were more expensive for being punctual and under demand). Regarding sociocultural and institutional aspects, it was considered that the initiative had a strong development in collection and recycling stages because it brought new ways and practices to service provision and user behavior.

13 Available Documentation

ALAJUELA (canton). Reglamento para la prestación de servicios de saneamiento de la municipalidad de Alajuela. Municipalidad de Alajuela - Subproceso de Acueducto y Saneamiento, 2018. Available at: <(https://www.munialajuela.go.cr/News/2029)>. Accessed on February 22, 2020

ALAJUELA (canton). Plan de Desarrollo Cantonal: Alajuela Cantón Inclusivo y Solidário 2013-2023. Municipalidad de Alajuela, 2012. Available at: <(https://www.munialajuela.go.cr/cms/api/File/DownloadFile/O therFiles/Plan_Desarrollo_Cantonal2013-2023_17-06-2019_14_47_19.pdf)>. Accessed on September 25, 2020

14 Entities – Organizations - People

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Case Study for SuSanA Projects

Sewage Service through Scheduled Pit Cleaning in Rio Grande do Sul

SuSanA 2020

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