

# FSMA SESSIONS 2021

## FECAL SLUDGE MANAGEMENT EXPERIENCES IN LATIN-AMERICAN REGION

1. Case of Alajuela - Costa Rica
2. Case of Santa Cruz City - Bolivia
3. Case of Rio Grande do Sul State - Brazil
4. Final considerations

June 2021



## 1. CASE OF ALAJUELA - COSTA RICA



Central América  
5 MM inhab.

# Costa Rica - Alejuela



# 1. CASE OF ALAJUELA - COSTA RICA



FSM as a strategy to extend service provision to the municipality and leverage resources for the future expansion of sewer networks

## General information



### Responsible organization:

- Local municipality (Municipalidad de Alajuela) - direct service provision
- Regulatory agency ARESEP (Autoridad Reguladora de los Servicios Públicos)
- The initiative ignited in 2017
- Case study was developed based on information supplied by the municipal service coordinator and documents supporting the new regulation

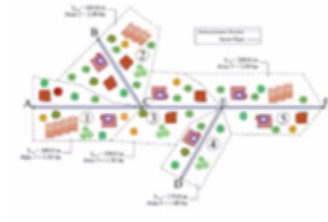


# 1. CASE OF ALAJUELA - COSTA RICA

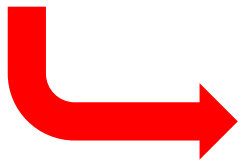
## Local sanitation services context



15%



85%



Impact over local water bodies (as the Rio Grande de Tarcoles)

Impact over productive activities (as fishing, aquaculture and irrigation)





# 1. CASE OF ALAJUELA - COSTA RICA

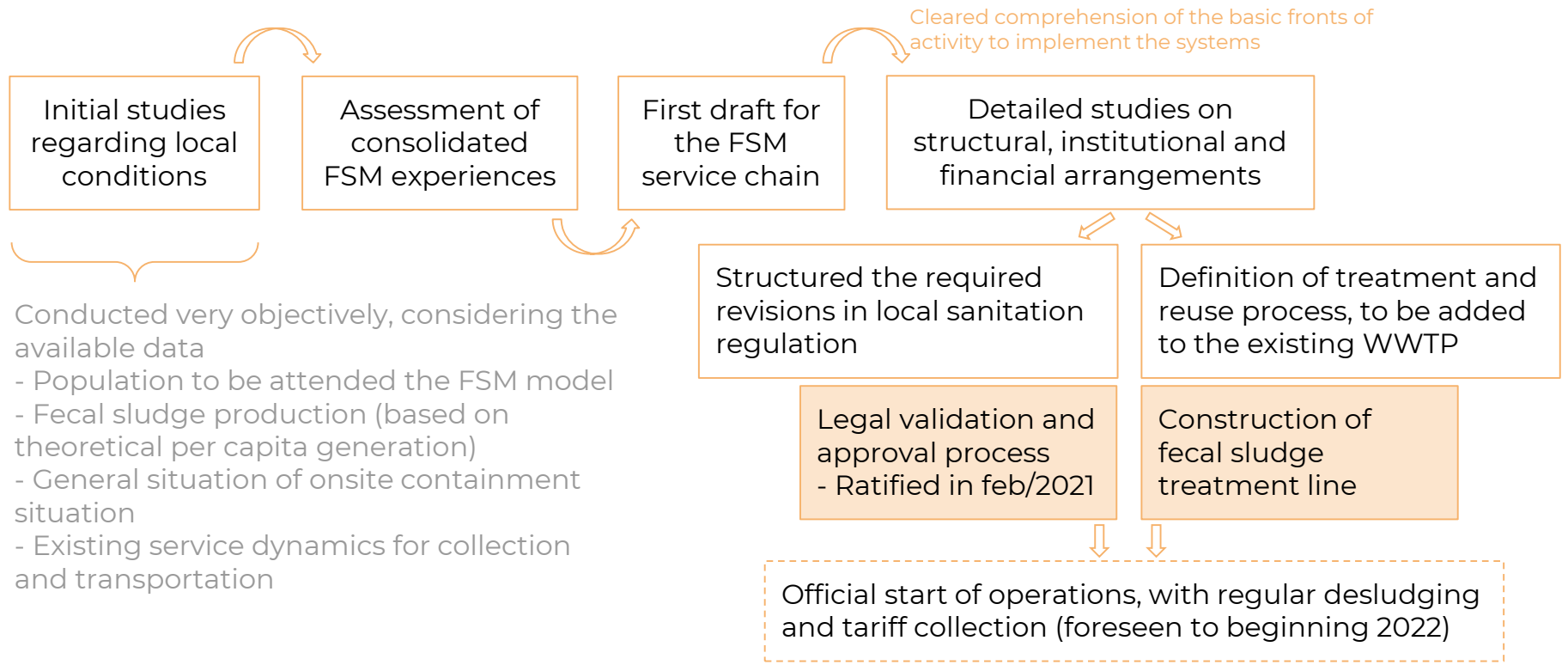
## Purpose and scope





# 1. CASE OF ALAJUELA - COSTA RICA

## Project steps

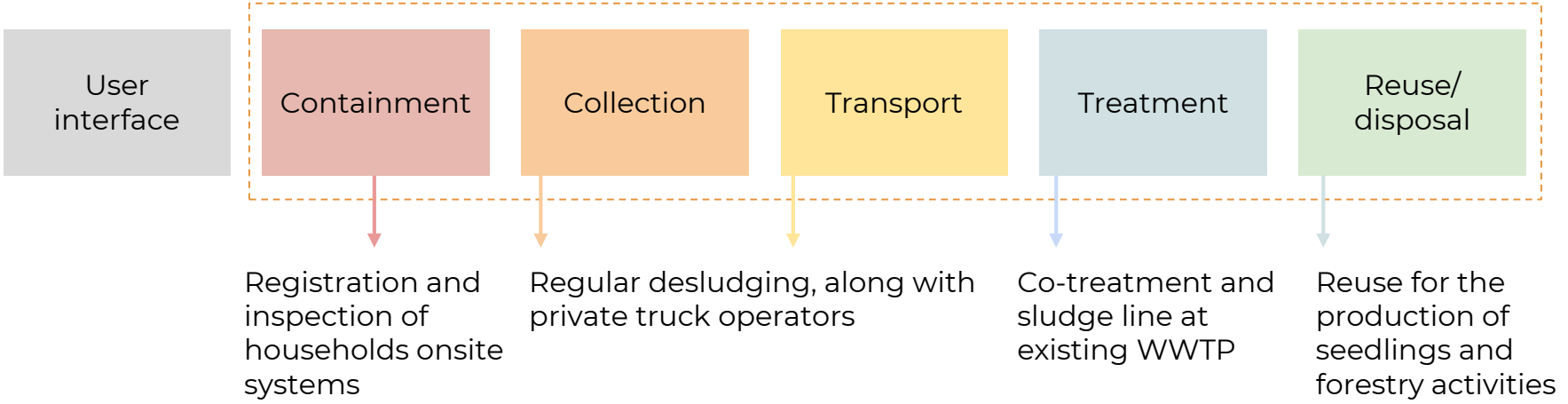




# 1. CASE OF ALAJUELA - COSTA RICA



## Description of the solution



# 1. CASE OF ALAJUELA - COSTA RICA



## Description of the solution

**Registration and inspection of onsite systems**

Registration of the households to be attended by the new service model

Upon registration the onsite containment solutions are inspected, advising customer if improvements are needed

Quality	Accessibility
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**Regular desludging**

The service scope assures the collection of 1 m<sup>3</sup> every two years per HH

70k HH	120 HH/d	120 m <sup>3</sup> /d
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Municipality responsible for organizing scheduled collection services, and additional desludging when necessary

Municipality organize services along with the private desludging companies

**Co-treatment and sludge line**

The existing WWTP is composed by activated sludge system, which can currently assimilate up to 60 m<sup>3</sup>/day of fecal sludge.

When this amount is exceeded the material is directed to as adapted sludge treatment line with capacity of 120 m<sup>3</sup>/day

**Reuse**

Treated sludge is used for the production of seedlings by the municipal greenspaces department

Future perspective of selling for agriculture and forestry activities

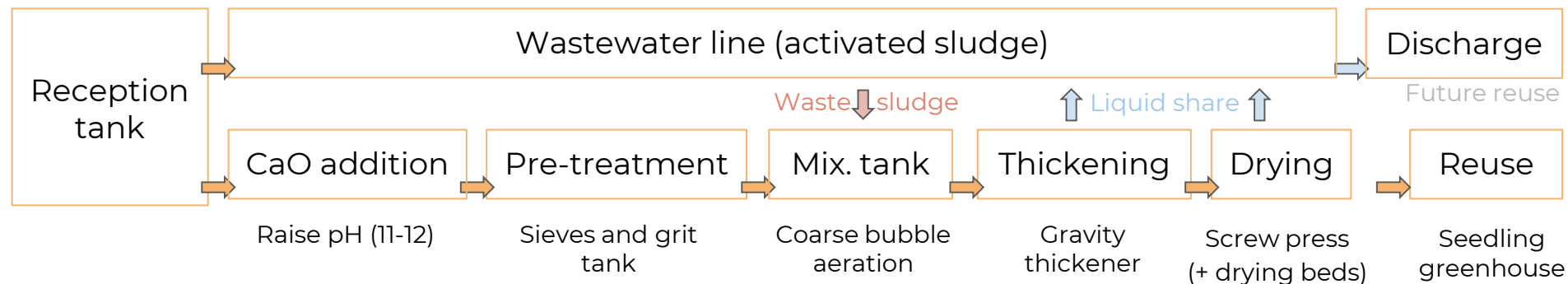
Liquid effluent currently discharged, but futurely to be reused in agriculture



# 1. CASE OF ALAJUELA - COSTA RICA

## Description of the solution

### Treatment and reuse at Villa Bonita WWTP



# 1. CASE OF ALAJUELA - COSTA RICA



## Responsibility distribution summary

### **Municipality of Alajuela**

- Organizing and monitoring FS collection and transportation by private companies
- WW and FS treatment
- Sludge reuse activities

### **ARESEP**

- Regulate service provision

### **Private desludging companies:**

- Attending desludging demands according to Municipality directives for procedures

### **Customers**

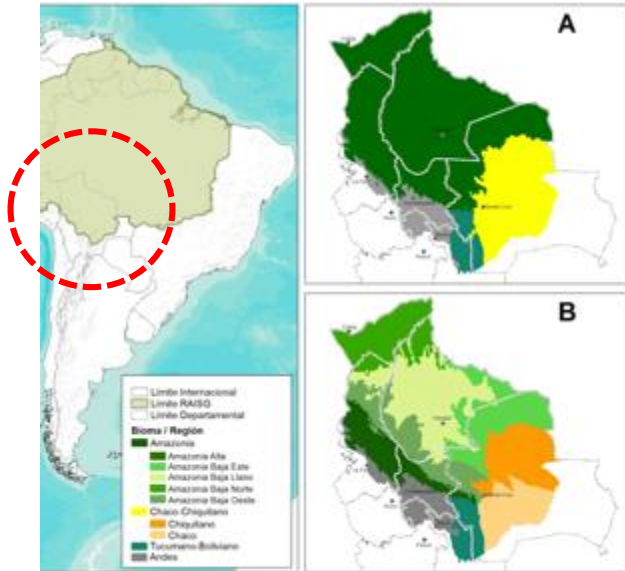
- Installation and maintenance of containment solutions
- Attending scheduled desludging
- Payment of tariff



## 2. CASE OF SANTA CRUZ CITY - BOLÍVIA

# Bolivia

Heart of South America  
11 MM inhab.



ra 1. Localización de la cuenca amazónica de Bolivia. A) Biomas; B) Regiones operativos.

# Bolivia – Santa Cruz





## 2. CASE OF SANTA CRUZ CITY - BOLÍVIA

Design of a pilot project for the improvement of the FSM service chain in the periurban areas of Santa Cruz

### General Information

#### City of Santa Cruz - Bolívia

- Metropolitan area hosts 1,9 million inhabitants
- Considered the financial center of the country (35% gross national product)



One of the cities with the greatest demographic growth rate in the world (2006-2020).

In Bolivia urban population might reach 72% in 2025

#### Responsible organizations:

- Promoted by MMAyA and AAPS
- Along with SAGUAPAC and COOPAGUAS, ADELTA, Municipal and State governments
- Financial and technical support from World Bank and GIZ

Project was implemented between years 2017 and 2019

The case study was developed based on the comprehensive materials developed under the pilot project initiative and contributions from the project consultant Luís Sivila





## 2. CASE OF SANTA CRUZ CITY - BOLÍVIA

### Purpose and Scope

The initiative aims to improve FSM conditions in Santa Cruz by promoting safe containment solutions, qualifying and organizing collection and transportation, creating adequate treatment facilities and develop proper reuse practices of fecal sludge.

Pilot design explores and orients actions towards:

- Awareness and capacity building
- Development and diffusion of guidelines and standards
- Complementing existing regulations
- Defining inspections and monitoring procedures
- Improving existing infrastructure (roads and treatment plants)
- Distributing responsibilities and supporting the appropriation by each actor
- Extend knowledge to enable safe and sustainable practices

Containment

Collection

Transport

Treatment

Reuse/  
disposal



## 2. CASE OF SANTA CRUZ CITY - BOLÍVIA

### Project steps

#### Diagnosys studies

In depth assessment of current situation of different steps of the FSM service chain:

- FS generation
- Containment structures situation
- Desludging dynamics
- Situation of existing collection and transportation services
- Conditions for FS treatment in existing plants
- Reuse/ disposal practices



Identification of focus points for improvement

#### Pilot initiative design

Description of the needed actions grouped on 5 components:

1. Containment structures and maintenance dynamics
2. Improvements on the collection and transportation activities
3. Structuring proper sludge offloading and treatment systems
4. Grounding for reuse practices
5. Communication and knowledge management strategies

Distribution of responsibilities amongst involved actors

#### Implementation plan

For each identified action, from the different components, it was addressed:

- Prioritization (timeline)
- Duration for the implementation
- Estimated budget

Plan considered a 2 year timeframe

## 2. CASE OF SANTA CRUZ CITY - BOLÍVIA



### Local Sanitation Services Context

Sanitation services have advanced expressively, but has not managed to keep up with the fast growth in urban population



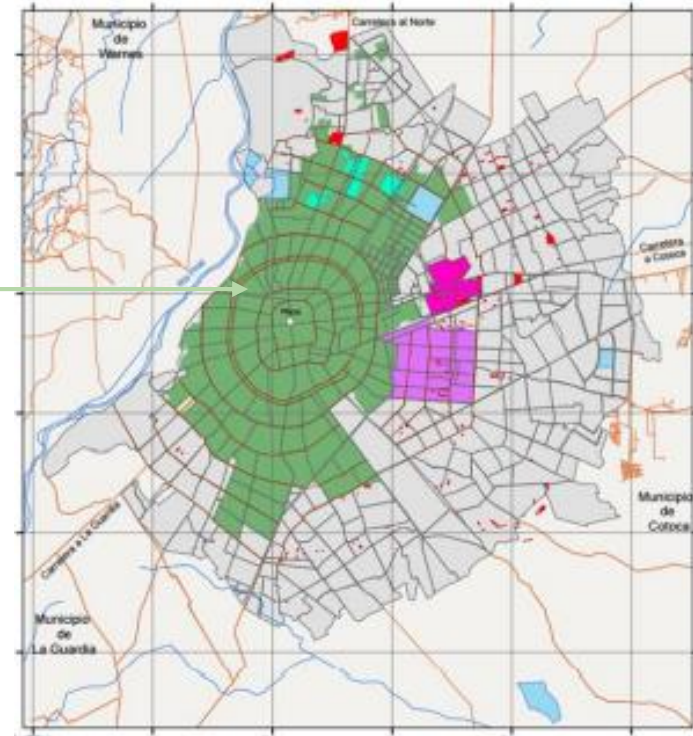
Slow implementation rhythm of sewerred systems is one of the challenges

1.4 million inhabitants and based on 2012 Census

- Only 51,6 % with access to sewer services (green area)
- 46% urban population with onsite solutions (151,428 households), most of which in the periurban area

Only a **small share** of generated sludge is properly treated.

- Only 30% of the households have declared desludging activities (28% hired and 2% manually), with an average frequency of 2 years
- Only one plant where desludging companies can properly destinate the material: PTAR PI, one of the WWTP of SAGUAPAC
- 21 small and medium private companies which operates without standard safety protocols



Source: SNV, 2017

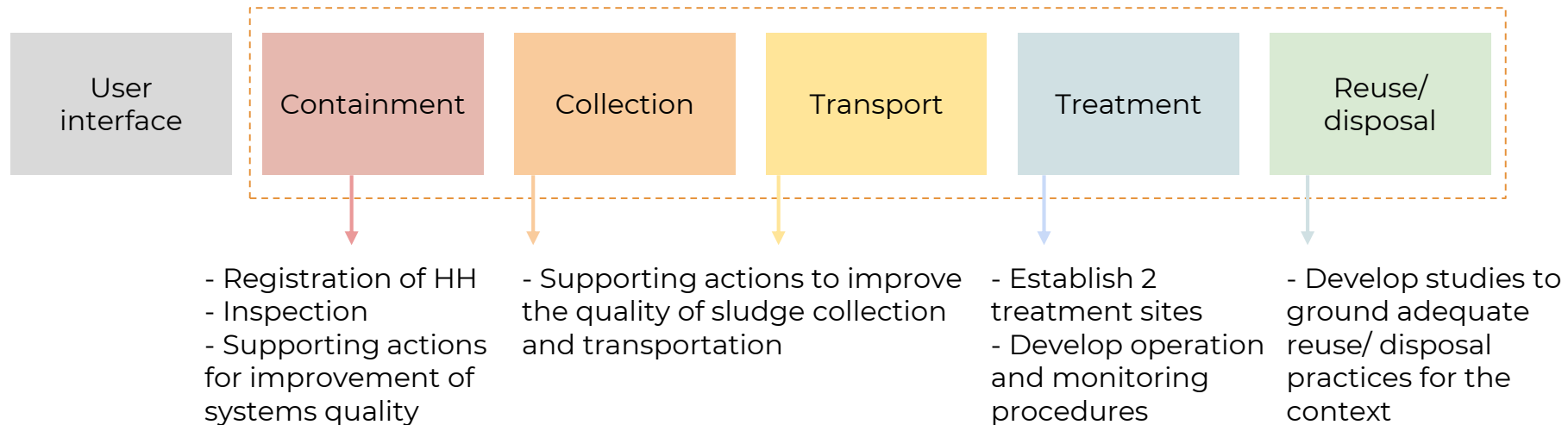
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## 2. CASE OF SANTA CRUZ CITY - BOLÍVIA

### Description of the proposed solutions

The solutions involved in this initiative are organized amongst: Primary activities (physical structures and service provision routines); and Supporting activities (institutional arrangement, communication strategies, capacity building, development of standard, guidelines and regulations)



## 2. CASE OF SANTA CRUZ CITY - BOLÍVIA



### Description of the proposed solutions

#### Improving containment solutions

- Registration of households
- System to monitor desludging from HH
- Standardized protocols for construction and maintenance
- Training and certifying professionals for construction
- Call center for users to request services and get more competitive budgets

#### Improving collection and transportation

- Protocols for equipment and operations control
- Rules for trucks operation:
  - i-) register number for each truck including technical information
  - ii-) identification plate on the truck tank
  - iii-) tank inspection
  - iv-) trucks monitored by satellite
- Training operators
- Certification of professionals

#### Improving offloading and treatment

- Implementing two independent systems for fecal sludge treatment (For SAGUAPAC and COOPAGUAS)
- Improve road access treatment plants
- Preparing and revising FS discharge, characterization and monitoring procedures
- Training the professionals
- Systematizing and analyzing sludge samples

#### Grounding for reuse practices

- Develop and test scalable business models for safe recovery (biofuel, fertilizer, animal feeding proteins, etc)
- Evaluate risks for human health and the environment and promoting mitigation measures
- Promote and enhance private initiatives for technological innovation on safe recycling of fecal sludge



# 1. CASE OF ALAJUELA - COSTA RICA

## Description of the solution

Two independent treatment sites

SAGUAPAC ETAR Sur or ETAR PI

COOPAGUAS New plant

Existing ww line or specific liquid line

Reception tank

Pre-treatment

Thickening

Drying

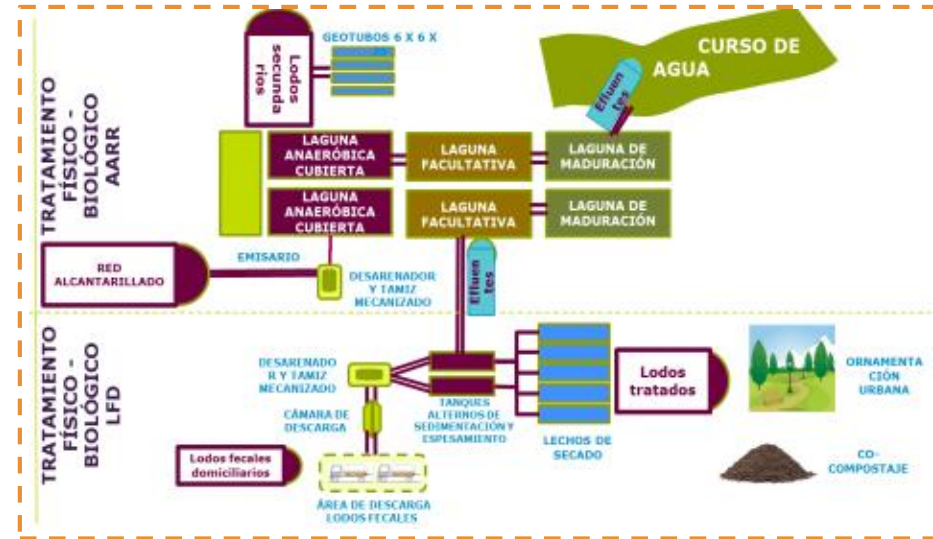
Co-compositing

Reuse

Sieves and grit tank

Gravity thickener

Drying beds





## 2. CASE OF SANTA CRUZ CITY - BOLÍVIA

### Description of the proposed solutions

Communication and knowledge management strategies

- Production of videos, banners, social media (facebook chanel) and events (such as EXPOCRUZ) - building awareness about FSM (success with “Fecalito”)
- Environmental awareness campaigns and diffusion of guidelines and standards for onsite containment systems



increasing engagement with the initiative

- Campaigns to engage targeted communities with the different steps of the FSM service chain
- Systematization and diffusion of the experiences of the project



+ experiences exchange with other cities and countries



## 2. CASE OF SANTA CRUZ CITY - BOLÍVIA



### Description of the proposed solutions

#### Management of the pilot initiative

In order to manage and assure effectiveness of the initiative, a group of strategic functions was established to follow the implementation continuously. Functions include:

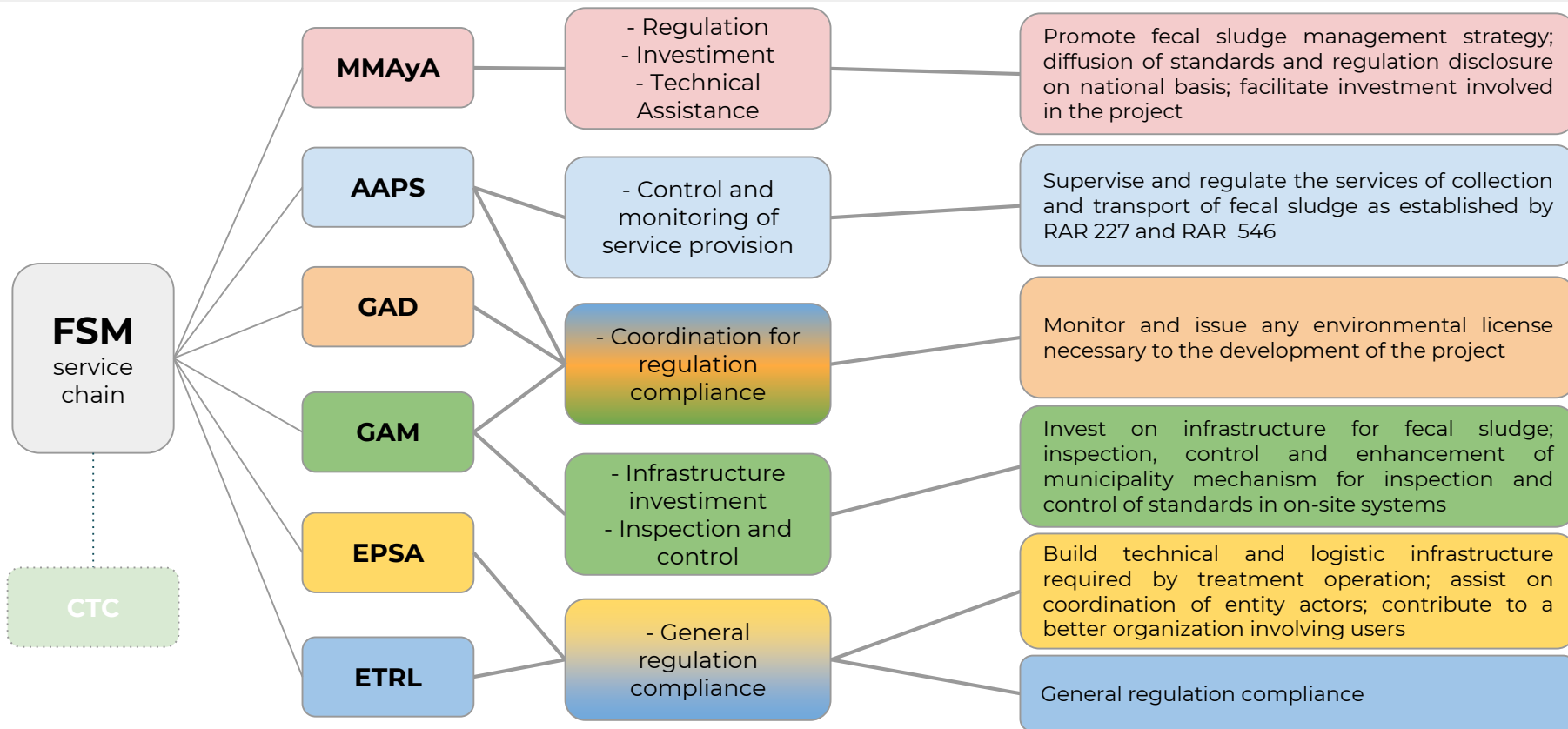
- Interinstitutional coordination
  - Technical and administrative support
  - Continuous monitoring
  - External evaluation
  - Financial and accounting auditory
- + Technical Coordination Committee (to supervise project goals)
  - WS utilities (SAGUAPAC and COOPAGUAS)
  - Desludging companies (ADELTAR)
  - Promoting organizations (AAPS and MMAyA)
  - Municipal and State governments





## 2. CASE OF SANTA CRUZ CITY - BOLÍVIA

### Responsibility distribution summary





## 2. CASE OF SANTA CRUZ CITY - BOLÍVIA

### Cost and Financial Aspects

The pilot initiative have a estimated total budget of 11.535.288 Bs (approximately US\$ 1.650.000)

COMPONENT	FS generation	Collection and transportation	Offloading/ treatment	Grounding for reuse practices	Communication and knowledge manag.	Pilot project management
INVESTMENT (Bs)	680.096	851.600	7.606.392	448.000	755.200	1.194.000
% FROM TOTAL	5,9%	7,4%	65,9%	3,9%	6,6%	10,4%

### Experiences and Lessons

After the design of the pilot project the framework was adapted in certain aspect. In practice, for instance, the call center was not implemented

Importance of the engagement strategy and adherence to the initiative

Participation of desludging service providers (importance of organized sector for that)

Challenges faced in the capacitation of the public management regarding new approaches, procedures and development of public policies



### 3. CASE OF RIO GRANDE DO SUL STATE - BRAZIL

# Brazil

- Largest country in South America
- 200 MM inhab.
- Rio Grande do Sul: 11 MM inhab.





### 3. CASE OF RIO GRANDE DO SUL STATE - BRAZIL



Sanitation service provision through regular desludging and FS treatment in Municipalities attended by CORSAN

#### General information

Rio Grande do Sul State - Brazil

- 459 municipalities, and over 11.4 million inhabitants (17% rural and 83% urban)
- 47% of the state municipalities have rural populations higher than urban

Responsible organizations:

- State Sanitation Company (CORSAN)
- State regulatory agency of Rio Grande do Sul (AGERGS)
- Federation of Rio Grande do Sul Municipal Associations (FAMURS)

The initiative ignited between 2015-2017, was designed in 2018 and approved in 2019

The case study was developed based on information supplied by the municipal service coordinator and documents supporting the local sanitation regulation submitted for approval.





### 3. CASE OF RIO GRANDE DO SUL STATE - BRAZIL

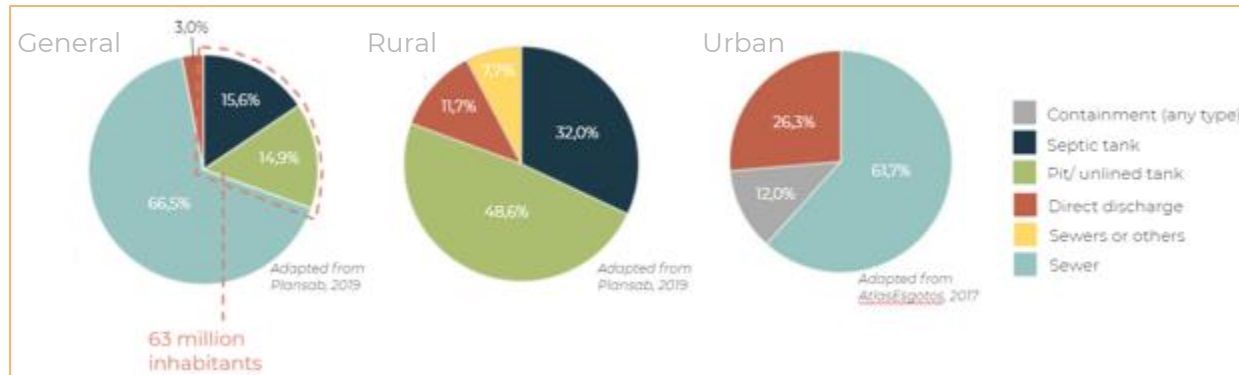
#### Local sanitation services context

Only 38.6% of the state population are officially covered by sanitation services (2019)

- 48% of urban population
- 8.8% of rural population

37% of the households in the state rely on individual containment solutions (2019)  
(7% of the households in the main urban areas also rely on individual containment)

CORSAN  
responsible for the  
sanitation in 275  
municipalities  
(60% of state total)



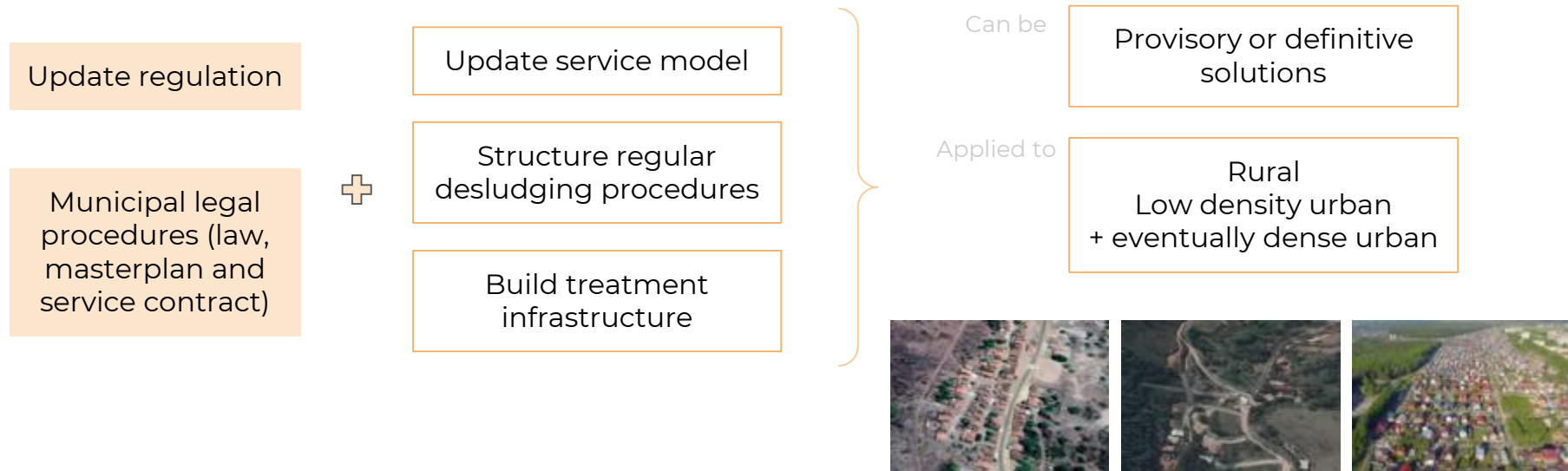
National picture



# 3. CASE OF RIO GRANDE DO SUL STATE - BRAZIL

## Purpose and scope

Make sanitation services more accessible to the regions where sewer networks are not technically or financially feasible, through the implementation of FSM

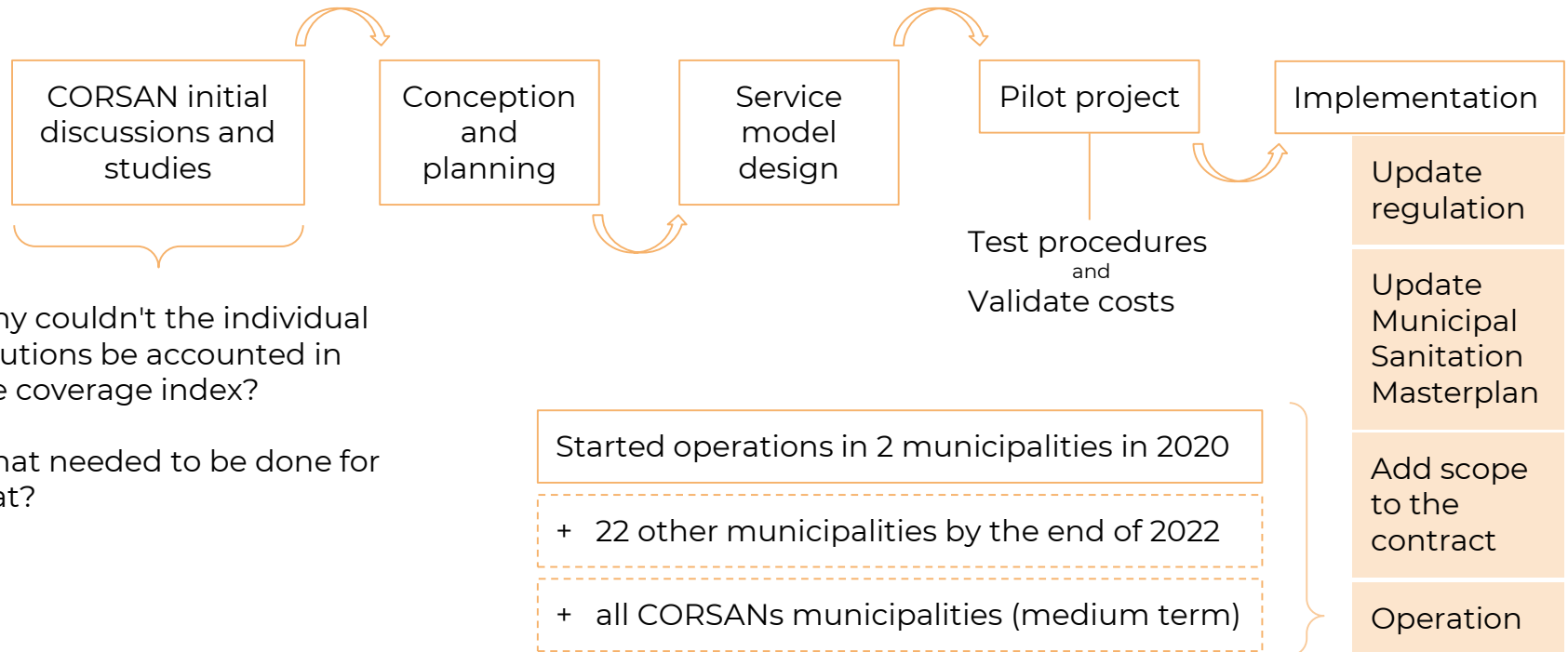






### 3. CASE OF RIO GRANDE DO SUL STATE - BRAZIL

#### Project steps



Why couldn't the individual solutions be accounted in the coverage index?

What needed to be done for that?

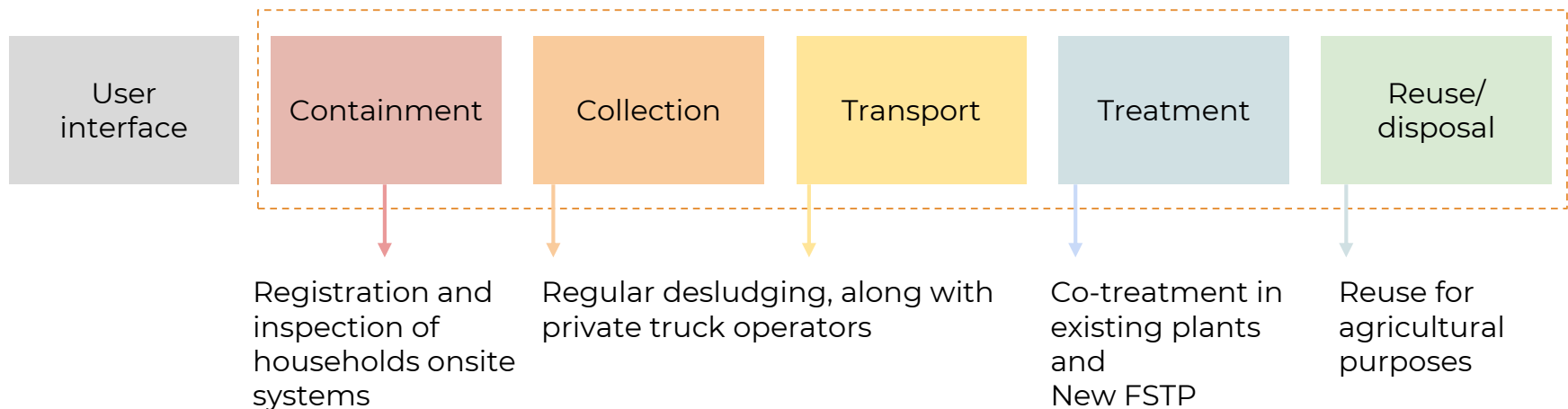


### 3. CASE OF RIO GRANDE DO SUL STATE - BRAZIL

#### Description of the solution

The solutions involved in this initiatives refer to: institutional arrangement; legal procedures; financial model; physical structures; and operational routines.

The assimilated responsibilities across the service chain varies between the different steps (from containment onwards), and involve different actors.





# 3. CASE OF RIO GRANDE DO SUL STATE - BRAZIL

## Description of the solution

Registration and inspection of onsite systems

Initial communication and program disclosure

Registration of the households to be attended

Inspection upon registration

Diffusion of existing standards



Regular desludging

Scheduled collection services, and booking additional desludging demands

Define collection routes

Collection and transportation by hired desludging company

Monitor services



Co-treatment and new FSTP

Solution will depend on municipality local conditions.

Depending on location, FS production and conditions of WWTP

A FSTP has been designed to attend 3 municipalities



Reuse

Futurely treated sludge directed to agricultural reuse (but still not planned)

# 3. CASE OF RIO GRANDE DO SUL STATE - BRAZIL



## Description of the solution

### Regulation

Approval process of new regulation, including the service provision via scheduled desludging and treatment of fecal sludge

“Reglamento para la prestación de los servicios de saneamiento de la municipalidad de Alajuela”

Updating regulatory procedures to properly follow the FSM service chain

### Financial aspects

Tariff uncoupled from water supply

Collection services at more accessible prices than private pit emptying services.

- USD 4,25 per month (USD 102 per desludging - every 2 years)

- While private services range from USD 120 to 200.

The charged value is close to what is charged for wastewater collection (USD 0,30 per m<sup>3</sup>)

Desludging is not performed as scheduled if there are payment debts

### Complementary actions

Communication campaign to engage population and bring awareness about the services and proper onsite maintenance

- Social media

- Website

- Brochures and banners



# 3. CASE OF RIO GRANDE DO SUL STATE - BRAZIL

## Responsibility distribution summary

### Municipalities

- Decide if FSM should be considered for services
- Update sanitation masterplan and approve it by law
- Update service provision contract



### AGERGS

- Regulate service provision

### CORSAN

- Communication with customers
- Booking and routing
- Registering and inspecting containment solutions
- Organizing and monitoring collection and transport
- Treatment and destination
- Charging tariff

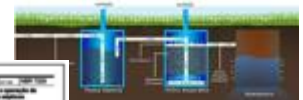
### Hired desludging company:

- Attend desludging demands according to CORSAN and AGERGS directives



### Customers

- Installation and maintenance of containment solutions according to standard
- Attending scheduled desludging
- Payment of tariff





### 3. CASE OF RIO GRANDE DO SUL STATE - BRAZIL

#### Cost and Financial Aspects

Costs for scheduled cleaning of individual systems

Estimates for monthly payment:

- Total monthly direct costs per home = \$ 4,45
- Total monthly indirect costs per home = \$ 1,97
- PIS/COFINS (taxes) = \$0,65 monthly per home
- Inspection = \$ 1,15
- Incentive for connection to system = \$ 0,45
- Final rate per home/month = \$ 0,45

Category	\$/month	\$/year
Social Residential (RS)	\$ 3,47	\$ 41,66
Basic Residential (RB)	\$ 8,77	\$ 105,23
Comercial (C1)	\$ 8,77	\$ 105,23

The amounts collected by CORSAN will be allocated to the Municipal Sanitary Sewage Fund\*:

- 5% of monthly income for sewage services regarding schedule cleaning of septic tanks
- 100% of monthly charges for cleaning service available for individual solutions (amount collected when cleaning was not possible in a home due to residential responsibility)

It was also established that 1% of the fee collected will be destined to create the Municipality Compensation Fund, a resource to be financed to municipalities where a Tank Central Plant is present (plants dedicated to fecal sludge) and/or a PTAR receiving effluents from other places

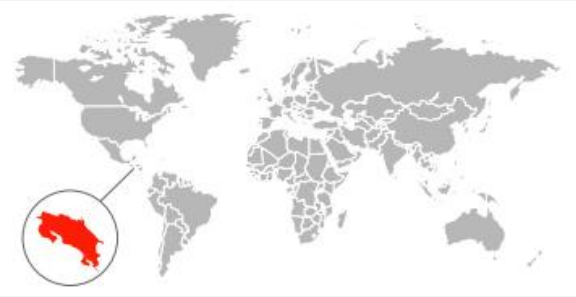
\*to be created by municipal law

# 3. CASE OF RIO GRANDE DO SUL STATE - BRAZIL



## Experiences and Learned Lessons

- Dialogue and alignment with parties involved:
  - CORSAN established a close relation with FAMURS and AGERGS regarding studies and discussions on service model and regulation, but only involved State Public Ministry in more advanced state of the project, which caused some delay in the validation and approval process.
  - For the next projects, the need to include the Public Defender Office, National Water Agency (ANA) and Federal Public Ministry, seeking to add complementary and even divergent perspectives in these discussions
- Relevance of having an efficient communication with all parties involved in order to generate understanding and support to the initiative
- Despite the conventional intention to establish a unique fee for different ways of wastewater treatment, the initiative decided to adopt its own model for scheduled collection service, considering sludge collection and transportation costs



## 4. FINAL CONSIDERATIONS



# Description of the solutions

	Regulation	Financial aspects	Complementary actions
<b>Alajuela</b>	<p>Approval process of new regulation</p> <p>Updating regulatory procedures to properly follow the FSM service chain</p>	<p>Tariff uncoupled from water supply</p> <p>Collection services at more accessible prices than private pit emptying services.</p> <p>Desludging is not performed as scheduled if there are payment debts.</p>	<p>Communication campaign</p>
<b>Santa Cruz</b>			
<b>Rio grande do sul</b>			

# Experiences and lessons learned

## Alajuela (Costa Rica)

FSM also seen by the Municipality as a strategy to raise increase financial capability for future investments (and for some cases as a temporary solution)

Approved in 2019 but only ratified in Feb/2021

Relevance of organic implementation and adaptation of the service procedures and structures

In 2018 the WWTP already started being adapted to support regular fecal sludge loads

## Santa Cruz (Bolivia)

After the design of the pilot project the framework was adapted in certain aspect.

Importance of the engagement strategy and adherence to the initiative

Participation of desludging service providers

Challenges faced in the capacitation of the public management

## Rios grande do sul (Brasil)

Dialogue and alignment with parties involved

Relevance of having an efficient communication

Despite the conventional intention to establish a unique fee for different ways of wastewater treatment

# 4. FINAL CONSIDERATIONS

## Paths and purpose for the FSM initiatives

The cases refer to very different initiatives, nevertheless in all contexts the relevance of FSM service models is explicit

- Alajuela had a very practical approach, focusing efforts directly into the development of new regulation, and adaptation to the existing treatment plant (still structuring the scheduled desludging dynamics)
- The initiative in Brazil had a more detailed study phase, focusing mainly on the financial and legal aspect of the service model, and had an extensive formulation and approval period with all involved actors, including public ministry
- The pilot project proposed for Santa Cruz constitutes an in-depth study about the local conditions of the sanitation service chain, proposing a comprehensive set of fronts of action to improve the FSM in the city, serving as an important action
- Even though at different levels, they all include communication and engagement strategies, recognising it as a crucial aspect for the initiatives to be effective
- Regulation is a key factor in all cases, and showed to be a challenging process (timeframe and dedication) - early engagement of different actors helped substantially in the case of Brazil

## 4. FINAL CONSIDERATIONS

### Service configurations

Services related to the containment step in all cases refer to inspection, offering guidelines and in the case of Bolivia creating standards and training construction professionals (financing and/or installing systems is not considered)

Scheduled desludging was a crucial strategy for the cases from Brazil and Costa Rica.

The creation of a call center for organizing service demand and supply was considered initially in Bolivia

All cases considered co-treatment strategies (organic adaptation to new service model?)

WS utility in the case from Brazil has initiated the designs for fecal sludge treatment plants but still in incipient stage

Main application of treated sludge is for nurturing city open spaces, with the perspectives of supplying to agricultural and forestry activities

### Engaged actors

WS utilities and regulatory agencies were engaged in all cases

Local municipalities were less present in the elaboration of the initiative in the case of Brazil

- It refers to the entire State of Rio Grande do Sul

- They are present, however during the implementation of the services

Desludging companies were only part of the initiative elaboration in the case of Bolivia (which highlighted the importance of such engagement from the start)