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ONSITE SANITATION GOVERNANCE TOOLS FOR SMALL MUNICIPALITIES – FIRST STEPS FROM SANTA CATARINA STATE, SOUTH BRAZIL

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Abstract

Promoting sanitation solutions are more than just choosing the right technology. The need for stakeholders' cooperation and engagement challenges small municipalities to consider fecal sludge management (FSM) and simplified sewerage approaches, not only conventional systems, promoting a flexible suite of services and emerging governance discussion in this complex scenario. In this paper, we conducted 10 semi-structured key informant interviews (KII) and show 15 implemented governance tools in 5 municipalities with less than 10,000 inhabitants, in Santa Catarina State, in the Brazilian southern region. None of the researched municipalities showed a systematized framework and the governance structure is composed of dispersed tools, mainly developed in response to a public attorney, who acts as a blind sponsor of onsite solutions, calling other stakeholders for action. Onsite sanitation performs a relevant role to achieve service universalization, this paradigm shift requires a new governance structuring model that considers FSM as a part of this ecosystem seems to be the trail first step especially where the conventional approach does not always reach financial sustainability.

Keywords: fecal sludge management, decentralized sanitation, safe sanitation for all, sanitation governance, sanitation for small cities.

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Introduction

Providing safely managed sanitation for all requires stakeholders to think beyond business as usual, switch paradigms and consider a range of solutions encompassing onsite facilities, fecal sludge management (FSM) and simplified sewerage approaches, not only conventional systems and wastewater treatment plants (WWTP), promoting a flexible suite of services and solutions.

However, the sector is underprepared for supporting and implementing such a mix of technical solutions and focuses on service provision rather than on building infrastructure. This requires a mindset change on the financial, institutional, policy, regulatory and social dimensions of the services, and harmonize sanitation solutions with related urban services. This shift toward a Citywide Inclusive Sanitation embracing a mix of onsite and reticulated solutions is further constrained by a lack of technical and management expertise in the sector (Gambrill, Gilsdorf and Kotwal, 2020).

In Brazil, especially in small cities, this reality is not different. Brazilian National Sanitation Plan – PLANSAB (Brazil, 2015) establishes two kinds of actions: structural and structuring. The first is related to the conventional approach in providing infrastructure and CAPEX for these works. The second is to provide conditions at the institutional level and organize stakeholders' relationships. The conservative mindset in the sanitation sector overwhelmed governance, management and other structuring actions and mainly consider structural actions a first step. But this is not only a Brazilian characteristic, where Bhagwan *et al* (2019) also reported a disjunction between infrastructure provision and management of the investment in Africa for instance.

Berendes *et al* (2017) exposed that both wastewater management and FSM represent the next challenge in sanitation service provision to ensure sustainable development goals (SDG) and estimated that, at least, 1.8 billion people will require FSM tools to achieve a safely managed sanitation condition.

FSM was largely neglected because onsite sanitation systems are usually thought of as a temporary solution until the implementation of conventional sewer systems. But even where there is a high coverage index, with sewer systems, onsite solutions will continue to be used. In the last two decades, FSM gained relevance to achieve Sustainable Development Goal (SDG), especially where centralized approaches proved to be financially prohibitive. Thus, many developing countries and international organizations have recognized a range of onsite technologies as an adequate sanitation solution for reducing backlogs. (Bhagwan, Pillay and Koné, 2019)

In Santa Catarina, a southern Brazilian state, the promotion of onsite systems as an improved sanitation solution was enforced by the Intermunicipal Sanitation Regulatory Agency (ARIS) and

some State Public Prosecutors (MP), especially in cities with less than 15,000 inhabitants. In this approach structuring actions and governance tools became naturally emerge. In this work are described some of these tools putting light on Santa Catarina FSM and sanitation governance's first steps. This paper's objective is to recognize onsite sanitation governance tools initiatives adopted at small municipalities in Santa Catarina state, south Brazil, based on a demographic approach and sanitation indexes analysis followed by field investigations through a semi-structured questionnaire.

Governance discussion has emerged in the public and corporative environments, mainly related to accountability, ethics, and institutional transparency. Several concepts and approaches to public governance were compiled, systematized, and discussed by Teixeira and Gomes (2019). The authors highlight that public governance cannot be confused with participatory governance. In public governance, citizens are stakeholders who interact to optimize public performance, with or without direct interaction. For the Brazilian public sector, federal ordinance 9203/2017 defined governance as a leadership, strategy, and control framework, put into practice to assess, orientate, and monitor management, looking for the conduction of public policies and service provisions that interests society as shown in Figure 1. (Brazil, 2017)

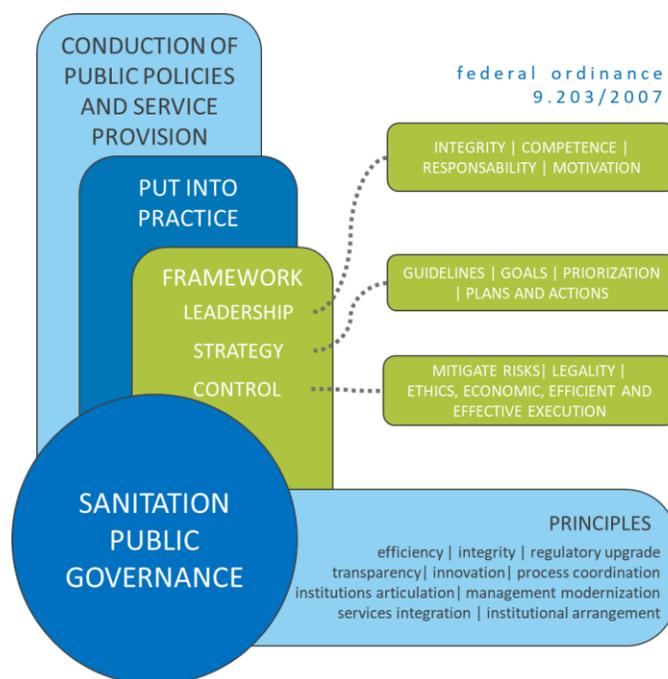


Figure 1. Sanitation public governance structure based on federal ordinance 9203/2017. *Authors.*

According to Brazilian regulations (Brazil, 2007), municipalities can develop innovative and decentralized strategies to deliver sanitation solutions in rural, remote, or informal areas. The same law proposes that municipalities with less than 20,000 inhabitants should express sanitation short- and long-term goals, followed by a systematic analysis of the planned actions in simplified sanitation plans. According to the Brazilian last census (IBGE, 2010), 70% of municipalities are in this group and 64% of these (45% of the total) had less than half of this number. The Southern region exhibits a major part of this group with 60% of municipalities framed on this criterion. Santa Catarina is the smaller state in this region with 6,219,867 inhabitants (IBGE, 2010), within 14% of the total population living in municipalities with less than 10,000 inhabitants (Figure 2).

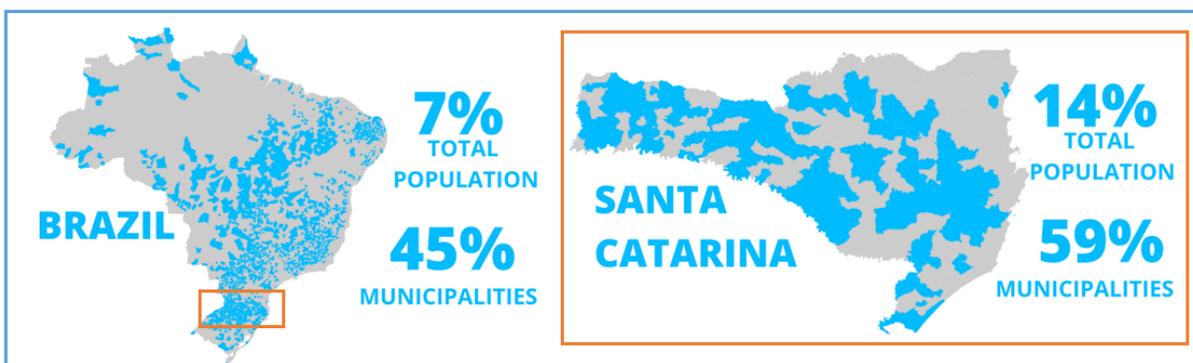


Figure 2. Brazilian (left) and Santa Catarina (right) distribution of municipalities with less than 10,000 inhabitants. Authors.

Methods

This research was developed in Santa Catarina, a Southern Brazilian state, with 293 municipalities and 59% of these with less than 10,000 inhabitants. An extensive demographic and sanitation indexes analysis on this group of municipalities was conducted to identify potential targets to apply a questionnaire. After this step, a first screening group, mainly regulators, academy, and operator associations, described as Primary Informants (PI), recognized some municipalities that reported any institutional arrangements related to fecal sludge management, non-sewered solutions or septic systems regulation. In this primary screening, the authors crossed the information with demographic and sanitation service delivery arrangements to identify possibly interviewed municipalities and defined an arbitrary sample with different service providers, regulators, and sanitation main indexes. After this screening 5 municipalities with less than 10,000 inhabitants in Santa Catarina state were selected and possible key informants (KI) were contacted with PI help.

All chosen KI were sanitation local government, utility, and service providers, following the World Bank (2016) Key Informant Interview (KII) methodology best practices. Before the interview begin, all participants were presented with the research objectives, and ethical concerns and signed the clearance/approval declaration indicated by the Federal University of Santa Catarina (UFSC) ethical bureau. Personal information was considered classified documents and, for this reason, KI and municipalities were not named in this paper. Municipalities were random called M1, M2, M3, M4 and M5. Also, 10 semi-structured Key Informants Interviews (KII) were conducted based on a short script related to institutional and technical aspects, as well as, on current sanitation development, short, and long-time expectations. All the KII were conducted by the 3 authors.

During the interviews, the authors took notes and orientated the speeches throught the script, looking for missing points in the answers, and taking care to not interrupt, or distort the interviewers' narratives construction. After each KII, the authors conducted a reserved discussion group to recognize and classify the instruments observed into groups' conception of sanitation governance and framed instruments over the sanitation service chain framework presented by Rao *et al* (2020). Instrument recognition was conceived based on the Discourse of the Collective Subject (DSC) technique used by Lisboa, Heller and Silveira (2013). The DSC is an interview processing data methodology that gathers information with a similar meaning into a unique speech. (Lefevre, Lefevre and Marques, 2009) As a DSC result the instruments were later catalogued (Figure 3).

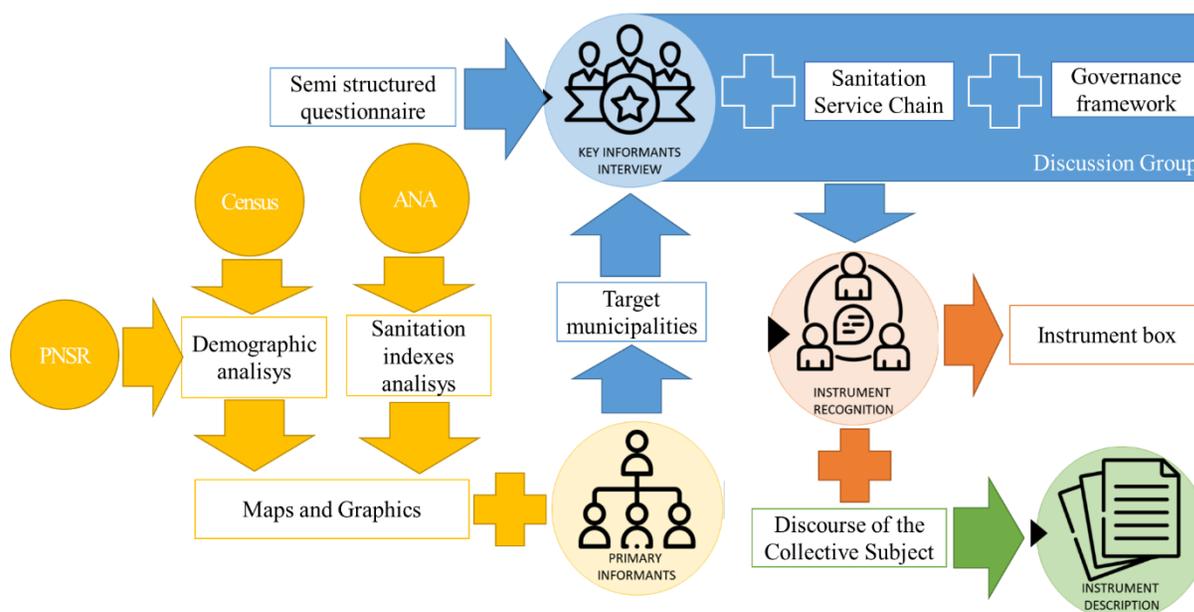


Figure 3. Instrument recognition methodological structure. Authors.

Results

Sample universe analysis was composed by 5 municipalities with less than 10,000 inhabitants in Brazilian last official census, performed in 2010. As noticed in Figure 4, these cities have different distributions between urban and rural populations and composition on improved sanitation solutions in urban areas. Also, M1, M4 and M5 has already a conventional sewerage system with a WWTP, with different charge politics over service provision and only M4 has a regulated sanitation tariff.

The instruments description was organized in the form of storytelling linking the instruments extracted at the interviews with the sanitation service chain (RAO, 2019) and governance framework (Brazil, 2017) in a linear narrative. During the description, the instruments were made explicit and written underlined with an instrument identification tag between parenthesis (i-xx).

During the interviews, it was observed over narratives construction that the current Municipal Sanitation Plans were not recognized as relevant, either a useful nor practical tool, even though sanitation conditions improvement were widely verbalized in total interviewed municipalities, by most of the key informants.

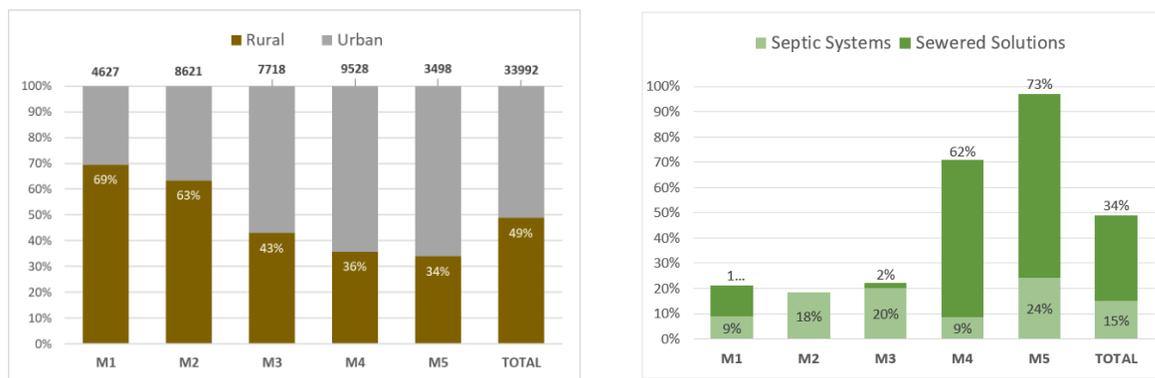


Figure 4. Population based on IBGE 2010 (left). % Labels indicate % of urban population and number label total population. Improved sanitation distribution based on MDR 2015 (right). *Authors.*

The onsite system census (i-01) conducted by a regulatory local agency, also called TRATASAN program, was described as an action that promoted the understanding of the role of onsite systems in small cities reality. This census was a response to public persecutors' demand over mayors on the achievement of sanitation goals established in the municipalities' sanitation plans. Most of Santa Catarina municipalities had already sanitation plans concerning exclusively sewerage solutions. Due to the high costs of sewerage systems the plans were not followed. In this scenario, regulators started to construct the census, with the municipality and prosecutors'

partnership, to understand the reality of onsite solutions adopted in cities with less than 15,000 inhabitants who joined TRATASAN program. The program was a step forward and moves in the direction to provide citywide inclusive sanitation from the World Bank's perspective (Gambrill *et al* 2020) mainly because helped municipal governments to understand challenges, putting light into a limited data scenario talking about aspects related to capital and operational costs of different technical solutions. Because of this, other instruments began to be proposed, in response to census results. Figure 5 shows the TRATASAN diagnostics results applied to M1, M2 and M3.

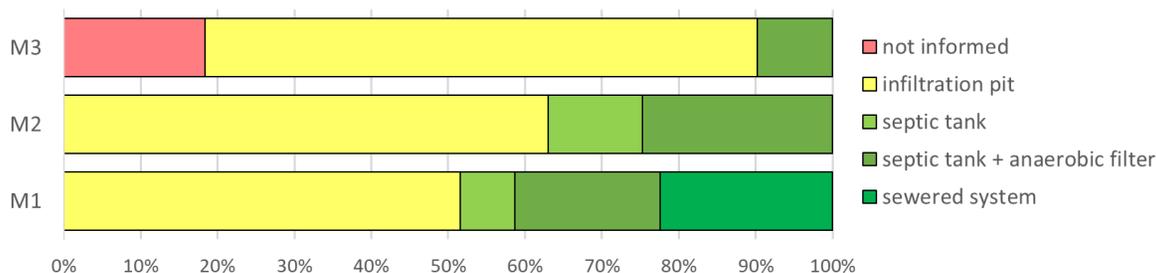


Figure 5. Onsite systems census results in M1, M2 and M3. *Authors.*

Real state registration with onsite systems status (i-02) establishes some control under containment structures and figures out the buildings with improved sanitation conditions, even in the absence of sewers. On the other side, houses with unimproved onsite systems can plan their structure's integrity with the enforcement promoted by a deadline law to fix and standardize onsite systems (i-03). Where standardization is not possible, because of area requirements a permission law for cluster systems where onsite systems is not technically possible (i-04) was used to promote extraordinary legal permission and allow a regulatory upgrade looking over these situations, expressing the role of cluster solutions even in non-sewered concept.

For sure, the regularization process can be outspread and requires prioritization, finance, and technical support. Surveillance task forces in sensitive areas (i-05) is a process coordination tool to focus energy on regularization first steps, based on environmental and urbanistic principles. Technical support such as onsite system design delivery without charge (i-06) can help municipalities to establish a strategy to standardize onsite systems considering local aspects, such as soil characteristics and improve construction principles for new and regularized structures. Also, these designs could be useful to promote a financial tool to reduce CAPEX through an interest subsidy law to fix and standardize the onsite system (i-07), where design and technical approval are necessary to request this benefit.

Another financial tool, focused on the emptying step, is the free emptying law (i-08) for a specific amount of fecal sludge for each building on a regular time basis. In the observed case (M1), 2 m³/year, by a schedule request to a municipality-contracted company. If the emptying service extrapolated this amount, extra volume is considered a household financial responsibility. A municipality own truck for the onsite systems emptying (i-09) is another way to promote regular and assisted fecal sludge emptying and transport.

When emptying service is directly provided by municipalities trucks, naturally involved stakeholders develop an onsite system emptying conditions diagnostics (i-10) and in parallel an emptied buildings control (i-11). These tools emerge as a primitive control on overuse and routine feedback to improve emptying conditions, especially where onsite systems are not standardized, and emptying service is not charged or regulated. In this scenario, major emptying services are made in a few buildings, in most cases after the frequent collapse of these systems. Also, these tools can be used to feedback containment real state situations, recognizing that buildings with recurrent emptying denote signs of non-compliance.

Emptying tools can be restricted by the absence of fecal sludge treatment units. Wastewater and Fecal Sludge co-processing (i-12) is often the first option in municipalities that already has a WWTP. A specific fecal sludge treatment facility (FSTF) (i-13) can be a step forward and promote a particular look at processes applied to this kind of effluent. For sure fecal sludge's high composition range can be a sizing challenge, especially when the treatment technology approach did not observe literature reported significant variations.

Fecal sludge treatment conducted by an FSTF or co-processing on a WWTP put light on fecal sludge management hole in sanitation service delivery solutions in the city. This materialization can establish the basis for system financing, since that the existence of a regular treatment site, implies a tacit, or explicit, non-diffuse responsible for fecal sludge. This strict liability gives service providers empowerment and responsibility over CAPEX and OPEX. Such as sewered systems this service has financial and economic needs that must be supplied, by taxes, tariffs or a specific Fecal Sludge Treatment invoice charged from each building (i-14).

CAPEX shortage to build specific or co-process units can be faced with municipalities' cooperation agreement for regionalized fecal sludge treatment (i-15). This instrument can promote the scaleup factor to share costs and responsibilities along the sanitation service chain and walks on service regionalization direction, one of the Brazilian legal framework goals.

Table 1 summarizes all governance instruments identified in the 5 municipalities researched linking those instruments with the sanitation chain and framework/principles established by Brazilian federal ordinance 9203/2017.

Table 1. Summary of governance instruments identified.

Tool	Municipality	Sanitation Chain	Framework	Principle
(i-01) Onsite systems census	M1 M2 M3	Containment emptying transport treatment	Strategy Control	Institution articulation
(i-02) Real state registration with onsite systems status	M2 M3	Containment	Control	Management modernization
(i-03) Deadline law to fix and standardize onsite systems	M2	Containment	Strategy Control	Integrity
(i-04) Permission law for cluster systems where onsite systems are not technically possible, especially small sites	M2	Containment	Strategy Control	Regulatory upgrade
(i-05) Surveillance task force in sensitive areas	M3	Containment	Leadership Strategy Control	Process coordination
(i-06) Onsite system design delivery (no charge)	M3	Containment	Strategy	Process coordination
(i-07) Interest subsidy law to fix and standardize onsite system	M1 M2	Containment	Strategy	Efficiency
(i-08) Free emptying law	M1	Emptying Transport	Strategy	Process coordination
(i-09) Own truck for onsite systems emptying	M4 M5	Emptying Transport	Strategy	Process coordination
(i-10) Onsite system emptying conditions diagnostics	M4 M5	Emptying Transport	Strategy	Process coordination
(i-11) Emptied buildings control	M4 M5	Emptying Transport	Strategy Control	Process coordination
(i-12) Wastewater and Fecal Sludge co-processing	M4 M5	Treatment	Strategy Control	Process coordination
(i-13) Fecal sludge treatment facility (only Fecal Sludge)	M2 M3	Treatment	Strategy Control	Services integration
(i-14) Fecal Sludge Treatment invoice charged from each building	M4	Treatment Disposal	Strategy Control	Institution articulation
(i-15) Municipalities cooperation agreement for regionalized fecal sludge treatment	M2	Treatment	Leadership Control	Institution articulation

Conclusions

In this paper, we typified 15 implemented tools in 5 municipalities with less than 10,000 inhabitants, in Santa Catarina State, in the Brazilian southern region. None of the researched municipalities showed a linked and structured framework that encompasses governance attributes of leadership, strategy and control systematized and organized according to federal ordinance 9203/2017 concepts. In this research universe, governance is constituted and constructed by dispersed tools, mainly developed in response to an external actor: Public Attorney. This specific stakeholder acts as a blind sponsor of onsite solutions, calling operators, public representatives and regulators for action in the recognition of this modal. This partnership between an important regulator and attorney can be recognized as Santa Catarina's first step in the understanding of the onsite system role in city-wide sanitation provision, especially in a small municipality's reality, in response to a financial inability to provide sewer solutions into this universe.

It was identified a partial absence of coordination and goals related to FSM tools and an explicated preference for sewer systems, especially where WWTP and centralized solutions already exist (M4 and M5). This can be explained by the historic structural approach to sanitation, leaving the financial and management responsibility directly to sewer operators, letting the governance structure be simplified and based on the operator. That should be the reason why sanitation stakeholders have difficulty to considering onsite solutions as a part of the regulatory sanitation system.

The recognition of onsite, decentralized and spread sanitation solutions require a more complex governance structuring, and it has more chances to happen where and when financing difficulties to implement sewer systems are identified, generally by external actors who develop the leadership over some sanitation practices. In this way, onsite-based solutions are considered a second plan or a transition step to sewer systems, waiting for the resolution of financing issues to construct conventional structures, mainly with public sponsoring programs. In the world, few municipalities have funds for a non-sewerage sanitation system and when it happened, resources were typically allocated for basic sanitation and hygiene promotion activities (WB and WSP, 2016) not specifically to develop the business environment needs for FSM.

The perception that onsite structures should be standardized solutions is evident, with all municipalities not recognizing infiltration pits as improved solutions, even in rural areas. The concerns are mainly related to liquid phase discharges on septic systems. The quality of onsite containment systems was also discussed by Peal *et al* (2020) in a way to ensure that supernatants effectively protect public health and the wider environment from risks that appear to be, in general, underestimated. (Peal *et al.*, 2020)

There is a long walk to promote safe-managed sanitation for all, especially in developing countries and small cities where the conventional approach does not always reach financial sustainability

to provide sewer systems. In this way, onsite solutions perform a relevant role to achieve service universalization. This paradigm shift requires a new governance structuring model that considers FSM as a part of this ecosystem seems to be the trail first step.

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