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Research Article

Does container-based sanitation align with sanitation sectoral planning in Lima?

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ABSTRACT

The paper explores the potential of Container-Based Sanitation (CBS) as an off-grid sanitation option in addressing extreme sanitation inequalities in informal urban settlements in Lima, Perú. It achieves this by evaluating the conflicting and political tensions within the formal and informal structures of state public service provision in Lima using qualitative data collected through semi-structured interviews with government officials, third-sector organizations, citizens of informal urban settlements, and academia. The paper argues that although the CBS provision has high social acceptability among its users within Lima's informal settlements, the state of Lima's fragmented sanitation sector regime hinders the possibility of scaling sanitation innovations. In Lima, scaling up CBS among informal settlements remains challenging as conventional sewerage is prioritised in WASH policy discourse and implementation. Even for CBS users, the technology was seen as a stopgap solution until they finally access sewered sanitation provided by the state, mainly because of the state's inability to fully address wastewater challenges and the assumption that conventional sewerage will eventually arrive.

Key words: CBS, governance, Lima, non-sewer, sanitation, scalability

HIGHLIGHTS

- The Pamplona Alta Case Study exemplifies the sanitation gaps in a city that experienced rapid economic growth but with inequitable access to urban sanitation.
- CBS systems emerged in the early 2000s as a potential solution for areas lacking traditional sewer infrastructure.
- Bureaucratic tensions and frequent changes in government officials hinder the adequate provision of alternative sanitation services.

INTRODUCTION

Peru is one of the fastest-growing economies in Latin America, with an average growth rate of 5.1% between 2002 and 2019 (World Bank 2023). Nevertheless, a gap exists between the economic growth rate and the delivery, access, and governance of urban sanitation, which is heavily characterized by inequality. In 2023, for instance, 29,3% of the total population in Peru lacked access to public sewerage networks (INEI 2023).

Within technocratic circles, the cause of the sanitation delivery gap has been attributed to the country's topography (i.e., towering mountain ranges and consequently dispersed settlements) (World Bank Group 2019) and fast-growing urban poor populations in cities like Lima (MVCS 2021). However, individuals living in wealthier neighbourhoods (i.e., the highest quintile) with similar geographical conditions are connected to sewered sanitation networks. Only 43% of the population in the lowest quintile has the same level of access in Lima (Mujica & Uriarte 2016). Pamplona Alta, one of Lima's large informal settlements, paints a vivid picture of the sanitation gaps in Peru. With a population of nearly 50,000 people distributed among 138 informal settlements (about 12,304 households), 92% of the population lack connection to the public sewer network (Techo 2020). Households often resort to using basic systems, such as silos or latrines, which essentially consist of simple pits in the ground for disposing of faecal waste, posing health and environmental risks to residents.

Container-based sanitation systems (CBS), a form of ecological non-sewered sanitation, have emerged in Lima over the past decade as an attempt to address sanitation access and disposal challenges in the city's informal settlements. Since 1999, more

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than two thousand CBS and dry toilet units have been installed in households in Lima's informal settlements as a way of bridging the widening sanitation access gap, filling in the state's incapacity to deliver and achieve various socio-ecological objectives such as water efficiency (Calizaya *et al.* 2009; X-Runner 2020). Current CBS systems, such as those provided by the NGO Sanima, collect and contain human excreta in sealable, removable cartridges. Containers are then collected and transported for disposal or processed to produce ecological products such as fertiliser and animal feed (e.g., black soldier flies) (Dewhurst *et al.* 2019; Montgomery *et al.* 2020). CBS proponents have claimed that this is a viable alternative to sewered sanitation, especially in lower-income and informal urban areas that do not have septic tanks or are not connected to formal sewered grids (Mikhael *et al.* 2017).

Yet, in terms of scalability and sustainability of CBS, additional questions remain around its economic, institutional, and operational viability (Mallory *et al.* 2022; Dube *et al.* 2023; Mdee *et al.* 2024). Particularly, in contexts like Lima, which is continually shaped by a complex combination of institutional inefficiencies, a failed neoliberal agenda, and a Westernised view of Peru's urban development, there is a need to interrogate where CBS fits within a city-wide inclusive sanitation (CWIS) strategy (Mdee *et al.* 2024). Arguments have also been made that CBS might be a form of low-cost sanitation. However, recent research suggests that no current safely managed urban sanitation system (including CBS) could be described as 'low cost' because when considering their full functionality and total cost liabilities, meaning the operations and scale considerations, all systems tend to fall within a similar cost range undermining the notion that some approaches are intrinsically cheaper (Igarashi *et al.* 2023).

This paper, therefore, contributes to the above discussion by asking the question: How do container-based sanitation (CBS) services offered across Lima's informal settlement align with formal sanitation delivery strategy in Peru? The rest of the paper is divided into four sections. Next, we present the political history of Peru's sanitation sector, the past and current policies. After that, we present the method that describes the study area, the sample, and the research tools used. Finally, we present the results and discussion, which cover the sectoral regimes, the current niche regime, and explore the possibility of subsidizing the CBS service in Lima.

The paper argues that despite the decentralization of sanitation delivery in Peru, the Peruvian state remains committed to pursuing the 'modern infrastructural ideal,' i.e., mirroring Westernized sanitation regimes through sewered systems (Durand 2012; Furlong 2014; Criqui 2020). Consequently, there is a lack of adequate recognition of non-conventional services in urban areas, despite many key actors in the sanitation sector acknowledging CBS's solution, its system, and its benefits.

THE POLITICAL HISTORY OF PERU'S SANITATION SECTOR

Peru's independence from Spain in 1821 gave rise to a ruling class comprising landowners, aristocratic intellectuals, and military figures, marking the beginning of a historical legacy characterized by profound inequalities and weak, fragile administrative and political institutions that permeated all sectors of the country's economy. Consequently, public policies and service delivery have become ineffective, corrupt, and discriminatory (Saco 1995). Particularly in cities like Lima, these discriminatory public policies, coupled with an increasing population, have resulted in a pronounced divide between the affluent urban elites and the less privileged residents on the outskirts of Lima. In the case of sanitation, statistics indicate that while individuals residing in wealthier neighborhoods have comprehensive access to sewered sanitation, only 43% of poorer neighborhoods are connected to a sewer network. This leaves approximately 800,000 people without proper sewage facilities. These marginalized populations, particularly those residing in informal settlements ('barriadas' or 'pueblos jóvenes'), are compelled to depend on septic tanks and unlined pits for their sanitation needs (Mujica & Uriarte 2016).

Peru's political history has been characterized by democratic transitions, authoritarian rule, and policy changes driven by economic and social factors. These dynamics have shaped the approach to public service provision, including sanitation, with a mix of state-led initiatives, market-oriented reforms, and the challenges of balancing social needs and political interests. In 1968, General Velasco came to power through a military coup, followed by another coup in 1975 led by General Francisco Morales-Bermúdez. It was not until 1980 that power was transferred to a democratically elected body, marking the beginning of a transition towards democracy. However, this period coincided with the rise of the Shining Path, a terrorist group that intensified migration to the capital city, Lima, due to its violent activities. Unfortunately, the democratic system faced setbacks when Alberto Fujimori successfully staged a coup d'état and assumed the presidency from 1992 to 2000, returning to authoritarian rule.

Under Fujimori's administration, Peru experienced the end of internal conflicts and subversive actions by the Shining Path. Structural adjustment programs were implemented to address economic instability and inflation, albeit at a social cost that undermined the legitimacy of Fujimori's government. As part of these reforms, ambitious social policies and the expansion of public services, including in slum areas, were initiated. Clientelist motivations influenced these policies. Fujimori's presidency was marred by corruption scandals, ultimately leading to the end of his authoritarian government in 2000. During his time in office, Peru adopted the principles of the Washington Consensus and implemented reforms guided by international financial institutions (IFIs) and structural adjustment measures. This included reducing subsidies and involving private companies in providing public services, such as sanitation. The introduction and implementation of neoliberal policies by various governments beginning in the 1980s supposedly addressed these historical structural and political challenges in Peru's public service delivery (Graham 1992). However, these so-called structural changes, inspired by international financial institutions like the IMF and under the regime of Belaunde, Garcia, and Fujimori, failed to materialize (Hudson 1992), and failed to address the deep-rooted inequality, political instability, and corruption that has plagued public service delivery in Peru. The shift from the populist policies of the 1960s and 1970s to a neoliberal economic agenda aimed to address challenges such as economic instability, excessive state intervention, and inefficient state-run businesses. The new agenda, therefore, targeted the privatization of state-run businesses and export-led growth (Hudson 1992).

Within the delivery of sanitation services, these adjustment policies encouraged the introduction of the private investment promotion law, the establishment of the National Office for Services of Sanitation (Superintendencia Nacional de Servicios de Saneamiento SUNASS), the creation and subsequently the dissolution of subsidiary water and sanitation companies and operative units (Torero & Pascó-Font 2003). Also, except in Lima, where SEDAPAL remained a state-led utility provider, the responsibility for providing water and sanitation was decentralized in the 1990s, granting municipalities autonomy and control over the sanitation provision (Flores *et al.* 2018). In reality, Crabtree & Durando (2017) argue that these structural changes, particularly during the Fujimori regime, were political decisions meant to establish political legitimacy within the international community and to appease organizations such as the IMF for financial assistance. Authoritarian rule from 1992 to 2000 saw the introduction of several SAP policies.

While these reforms aimed to improve efficiency and expand coverage, they often resulted in higher costs for consumers and uneven access, particularly in rural and low-income urban areas (Torres 2004). The restructuring laid the foundation for modern Peru's mixed public-private sanitation system, which remains a patchwork of public operators, private concessions, and community-managed systems, highlighting disparities in service affordability and accessibility (World Bank 2019). While post-reform policy adjustments will continue, a fragmented service delivery depends heavily on geography and income, making services unaffordable for low-income households or inaccessible.

METHODS

The study primarily draws on a case study of Lima's sanitation regime and CBS alignment. Qualitative data were collected using 26 semi-structured interviews conducted with government officials within SEDAPAL, SUNASS, and the Ministry of Housing, Construction, and Sanitation, key stakeholders within Lima's sanitation sector (i.e., individuals from academia, donor organizations, and local NGOs), the NGO SANIMA, local representatives of Pamplona Alta, CBS users, and non-users. The latter respondents were participants in the larger project and were purposefully selected for this part of the study.

The sample was used to conveniently represent all levels of government, private, and civil organizations. For the interviews with the residents of Pamplona Alta, snowball sampling was used until reaching saturation by finding the same information. From the secondary information, national policy, regulations, standards, and publications from international organizations, NGOs, and Peruvian research centers were prioritized.

This research focuses on Pamplona Alta, one of the pueblos jóvenes (shantytowns) in Lima that has a rugged topography. It is located within the San Juan de Miraflores district, with a population of nearly ninety thousand people, distributed among 138 informal settlements comprising 12,304 households; 92% of the population lacks connections to the public sewer network. Households resort to using rudimentary systems such as silos or latrines, which essentially consist of simple pits in the ground for waste disposal, posing health and environmental risks to residents (Techo 2020). The families with the highest rate of poverty live in Pamplona Alta (30% are in a situation of poverty) compared to the other six areas: Pamplona Baja, Zona Urbana, Pampas, Panamericana Sur, Zona María Auxiliadora, and Límites de Surco, which belongs to San Juan de Miraflores (INEI 2021).

Pamplona Alta has evolved since the 1960s as the prime spot for immigrant settlers, refugees of disasters, and free settlers looking for shelter within a housing-deficient Lima and weak housing policies (Cornelio 2019). State delivery of public services such as water and sanitation depends on dwellers holding legal title deeds or municipal certificates of possession (Cockburn *et al.* 2015). Self-managed local groups exist, organizing themselves to demand access to public goods and services through negotiations with the municipality, marches, and roadblocks.

RESULTS AND DISCUSSION

Lima's sanitation sectoral regime

Continuous bureaucratic tension, internal political conflicts, and the frequent changes of government officials at the national and local levels are standard features of Lima's sanitation sectoral regime (Oblitas de Ruiz 2014). Consequently, the average construction of water and drainage works in Peru is 14 years, and in Lima, 10.4 years. Particularly, cuts to subsidies, subcontracting public services, the relinquishing of state-owned enterprises, and the introduction of pro-market institutions during Peru's economic crisis in the 1990s have created and reinforced new avenues for capital accumulation, corruption, state incapability, and a struggling sanitation sector today.

Before 1992, Servicio de Agua Potable y Alcantarillado de Lima (SEDAPAL), the public water utility of Lima, was responsible for the delivery of water and sanitation and the coordination of the sector's policy (Oblitas de Ruiz 2014). In 1992, Superintendencia Nacional de Servicios de Saneamiento (SUNASS) was created to supervise the provision of sanitation services by private and public providers. Under a thriving neoliberal environment, the government attempted to reconfigure SEDAPAL as a private entity. The rationale was to promote higher technical and managerial efficiency rates of water and sanitation delivery in Peru to make SEDAPAL attractive for bidders (Ioris 2012). This period was when the public utility company had over USD45 million in external debts and could not raise enough money to cover its operating costs and failing infrastructure. Over 2 million individuals within Lima lacked access to a sewered connection, and less than 5% of the city's sewage was treated (Alcázar *et al.* 2000). Eventually, financing and ownership of SEDAPAL were relinquished to the Fondo Nacional de Financiación del Estado (FONAFE) – the only state-owned holding conglomerate (out of the 42) operating under commercial law (Crabtree & Durando 2017).

FONAFE-owned companies like SEDAPAL are expected to provide efficient service delivery with few staff and employees who may be highly remunerated compared to other public workers (Wise 2003). However, SEDAPAL and SUNASS's ability to deliver and coordinate water and sanitation services effectively remains limited, particularly for informal dwellers. For instance, the tenure of state-appointed ministerial officials overseeing the sector has been brief, with some barely remaining in office for more than a year. Their position and ability to stay in office are tied to the ephemeral nature of the Executive Branch of government. Since 2016, for instance, there have been five presidents of the republic and 10 presidents of the Council of Ministers (PCMs) (the latter being responsible for overseeing SUNASS) (OECD 2016). Our interviewees at SEDAPAL and SUNASS highlighted that this has resulted in delays in implementing and executing large sanitation projects because 'each new minister wants a revision of project guidelines' (Defensoría del Pueblo 2015). In addition to the fewer technical staff of both institutions, the majority lack the required technical skills, with less than 5% of SUNASS staff having professional qualifications and/or graduate certification (Alcázar *et al.* 2000). Actual delivery of services is thus characterized by 'circumstantial improvements' and a muddling-through approach (Ioris 2012) that favors certain forms of service technologies and delivery modes for a particular population (often rich and elite neighborhoods). This has created a large space for corruption and neopatrimonialism to thrive within the sector.

Additionally, our study highlighted the ongoing tension between the state government's aspirations, SEDAPAL, and municipal authorities, continuously intensified by a blame game and internal political struggle:

> *There is friction over the execution of projects between the regional and local governments. There are disputes between governors and mayors that subsequently affect the financing of sewerage projects. Sometimes the regional government belongs to a different political party than the local governments, and some jealousies and conflicts hinder the improvement of sewerage services in those areas* (Executive of Sunass, April, 2021).

The lack of coordination and distribution of roles and budget among state institutions and local authorities extends the duration of public works. Interviewers cited an example of when the Municipality of San Juan de Miraflores needed to build a retaining wall and road before implementing a sanitation project, Esquema 300, in Nueva Rinconada and Pamplona Alta:

There are 50 or 100 requests from residents for the construction of retention walls. As the local municipality, we would have to stop developing other projects to address them because the Ministry of Housing and Sanitation urgently requests them, but doesn't provide the money. If they (the Ministry) were to say the local municipality should do it, they should calculate the cost and the personnel needed, and then transfer the budget to us. They give you the responsibility, but they don't give you the money (Official, Local Municipality VMT, April, 2021).

In other cases, the local government blamed SEDAPAL for implementing local sanitation projects without their involvement and local knowledge of the area, which may prevent them from garnering direct political visibility, control, and legitimacy within the population:

If there were greater coordination with Sedapal, perhaps they could train our team of technicians and let us know their plan so we can contribute. As I said, they normally act on their own. In fact, if they need to break up roadblocks in a location, they don't have to ask our permission; they just send a letter saying, 'We're going to carry out this intervention,' and they proceed. They have a law for that (Official, Local Municipality SJM, June, 2021).

While these institutional tensions have historically constrained SEDAPAL's ability to provide sanitation in informal settlements, it is important to recognize that the urban landscape in Lima has shifted considerably in recent decades. Approximately 93% of urban growth in Peru over the last 20 years has occurred in informal settlements (Espinosa & Fort 2020), which has prompted a gradual adaptation in SEDAPAL's service strategies. Before this urban growth, SEDAPAL only provided water services in informal settlements during states of emergency, such as the cholera outbreak of 1980, or through projects funded by external sources such as the World Bank. However, SEDAPAL has since begun providing regular water distribution through tanker trucks to informal areas. This exemplifies how the state increasingly treats formality as a continuum rather than a strict binary, acknowledging service needs even in areas undergoing legalization processes. Furthermore, recent legal and policy changes, including Law No. 32065, enable the use of non-conventional technologies as part of national water service strategies, even in informal settlements. These shifts open new institutional and policy windows for the consideration of container-based sanitation (CBS) as a complementary solution, particularly in peri-urban and transitional areas that remain outside SEDAPAL's conventional network coverage. Nevertheless, operationalizing such flexibility will require adjustments in financing mechanisms, regulatory oversight, and coordination among SEDAPAL, municipal governments, and national authorities.

Though sanitation remains invisible for some actors at the National Government it has become a powerful political tool at the local level (see Supreme Decree No. 020-2006) (Defensoría del Pueblo 2015). Particularly during election periods, politicians wield it by promising poor informal dwellers in exchange for votes, often without a clear structure and intent to deliver the promised projects:

They always make promises about water and sanitation, but none of them keep them. They all promise that they'll help us because that's what we want most right now. Before, it was the title to the electricity, but now we have the title, we have the electricity, now we need water and sewage (Participant 4, Neighbor of Pamplona Alta, July 2021).

Service delivery remains uncoordinated, and large-scale, donor-inspired improvements consequently aim to consolidate power and wealth in the hands of a few corporations and pro-market technocrats (Hudson 1992).

Within local municipalities, the study observed a gap between the aspirations of the state and local municipalities in Lima. In the 1960s, new settlers in Lima emerged as influential political actors within the city, with their interests and individual forces becoming relevant to local and municipal politicians elected to address local demands. However, the relationship between these settlers and the municipality has become more complex. The local governments were often composed of elite groups with patrimonial interests, so their actions did not always prioritize the needs of the poorest communities (Olortegui 2001). Interviews with government officials suggested that mayors and officials, who may have little or no relevant expertise, are often hurriedly appointed into office:

A limitation of the low management capacity of municipalities and regional governments is the lack of qualified personnel, and this also means that the technical files they prepare are relatively weak. If the technical files they prepare for the

execution of the works are not well formulated, the great risk is that problems arise when they enter the execution phase (Participant 1, Coordinator of the Urban Sanitation National Program, March 2021).

These elite officials invest little time in comprehending the nature of sanitation challenges within the city, especially in informal settlements. These sectoral challenges directly impact sanitation access and governance within informal settlements. The lack of coordination and planning explained above interacts with the existing socio-spatial inequalities within Pamplona Alta to restrict safe and inclusive sanitation. Though the Municipality of San Juan de Miraflores accepts the responsibility for building retaining walls to qualify an area for sanitation works and sewer networks, the municipality does not have the financial capacity to provide these retaining walls. The responsibility thus is transferred to civil society organizations, NGOs, or citizens within community-based organizations (CBOs):

We set out to accompany the communities in the process of accessing water, […] we worked with Sedapal to be able to access water and sanitation, what Sedapal gives you as an observation, it tells you technical things, they (the families) do not understand it because they are very technical things, it is important that someone can accompany them in this process, someone who has technical knowledge, who can support them and can explain to them (Participant 6, Head of area in NGO Techo, July, 2021).

Peru has a long history of social movements in the form of Indigenous groups, neighborhood organizations, communal kitchens ('ollas comunes'), economic organizations, and NGOs (Crabtree 2000; Espinosa *et al.* 2022). Informal residents have gradually resorted to a mobilized effort to ensure the self-provisioning of basic services to gain the right to water and sanitation. Though their capability to scale these efforts up remains limited, residents mentioned in interviews and focus group discussions the importance of communal groups in bridging the provisioning gaps through everyday amenities such as latrines and drinking water.

Lima's new paradigm of sanitation

Since the launch of the 'new paradigm of sanitation' in the late 1990s, Lima has become the testing ground for various sanitation schemes (Fuertes *et al.* 2008). The service regime in Lima currently consists of domestic sewers, shared on-site regimes, public sanitation regimes, community-based organizations, coping sanitation regimes, and container-based sanitation and urine diversion systems (Calizaya *et al.* 2009; Román *et al.* 2011; World Bank Group 2019). This section traces the evolution of different sanitation regimes in Lima and Peru over the past two decades and how they have influenced the current governance and delivery of sanitation services.

In the early 2000s, the alternative pro-poor sanitation solutions (APSS) initiative was introduced to provide market-based, user-driven solutions to low access to inclusive sanitation in Lima. APSS, a public-private alliance inspired by the community-led total sanitation approach, was aimed at providing a wider range of sanitation options to meet the needs of low-income customers with different water access and requirements. By the late 2000s, the initiative had introduced two additional sanitation regimes into Lima's sanitation sector: (a) dry systems (ventilated improved pit latrines or ecological latrines) and (b) water systems (bathrooms with septic tanks and filter beds; bathroom with biodigester and filter bed; and bathrooms connected to sewers). However, sustaining a reconfigured sanitation service regime requires, on various scales and levels, highly committed stakeholders, a favorable regulatory framework, and a problem-driven iterative approach that allows for risks and learning (Andrews *et al.* 2017; Criqui 2020). However, these multiple services and infrastructure operated in Lima amid the fragmented sectoral regime and unfavourable political environment.

The large-scale rolling out of privatized, self-financed APSS also coincided with the introduction of ecological and off-grid sanitation solutions for informal settlements offered by NGOs and social enterprises in the late 1990s. NGOs, such as CENCA and Alternativa, implemented and installed various ecological sanitation models across Lima. For instance, the ECODESS toilet by CENCA was a urine diversion dry toilet composed of a toilet and a laundry along with a collector network of grey water that ends outside the house in a flotation tank that retains fats and suspended solids. Other systems had a double-vault urine-separating toilet with two chambers for collecting and drying excrement. Approximately 220 toilets were installed for US$165-200 per unit. In some cases, a total recycling unit costs US$603 per unit. Neither of the two organizations is known to operate these services within Lima. Mainly, as the state intensified its neoliberal WASH agenda to

drive market-based sanitation approaches such as the APSS, these NGOs' and social enterprises' social enterprise efforts were severely restricted by agencies such as SEDAPAL and SUNASS (Ioris 2012). This was compounded by a lack of user interest in ecological products from the sanitation technologies, the high cost of units for poorer households, and the system design failure (Oswald & Hoffmann 2007; Calizaya *et al.* 2009).

Current niche regimes

Sanitation social enterprises such as Sanima and Arrebol Perú, and international donor organizations (such as the German Embassy), are involved in providing sanitation solutions within Lima's informal settlements. This paper focuses on Sanima's CBS operation within Pamplona Alta.

Sanima has been operating CBS in Lima since 2012. Sanima reports indicate that as of 2022, it owns approximately 1,400 toilets and serves over 7,000 people within 127 settlements. Their services include the installation of dry Separett toilets for households, weekly emptying, and collecting and transporting fecal waste at landfills. Customers are provided new plastic bags and sawdust for subsequent collection at a monthly cost of US$10 and an initial installation cost of US$13.5 (training and toilet installation). The actual cost of a toilet is $130. Sanima collects waste from various collection points near homes. Families drop off full containers once a week in the morning, and the collection truck, staffed by Sanima personnel, picks them up, empties them, and returns the empty container with new plastic bags. Last year, Sanima introduced a new type of toilet with a built-in fan that helps prevent unpleasant odors, avoiding the need for sawdusts. Users have gradually transitioned to this new type of toilet. Sanima's staff keep records of who drops off their waste to monitor the service and be able to contact the user if they have not left their container. Sanima also has a customer service department that is responsible for answering questions and issues with the service, and for collecting monthly payments, which are usually made through digital wallets.

CBS appears to be the preferred option among the existing off-grid sanitation solutions within Lima's informal settlements. A former board director of a community-based organization highlights that:

> *The two dry toilet alternatives (Pebal and Sanima) are the best you have here in La Rinconada; in some ways, Sanima and Pebal are different. One offers you a service, while the other does not. Because Pebal only gives you the dry toilet, and where do they throw your waste? It is in the garbage dump, and others with space bury it. We had the opportunity to have that type of toilet, and like … yes, you can handle the situation when you have a space, but when you no longer have space to make a hole to bury, which is like compost, if not, you have spaces, you have to have Sanima. It is a practical, hygienic, adaptable, comfortable bathroom, and you can put it in any space you want*' (Participant 15, Ex-director board in Nueva Rinconada, May 2021).

Sanima's option is a relatively more hygienic solution for users than pit latrines because of its waste collection service. Families agree that with Sanima, they no longer have issues with flies, pit latrines filling up fast, and direct contact with their waste. Compared with pit latrines or silos, the CBS containers could be easily cleaned with bleach. Additionally, some were satisfied with the nature of the service provided by Sanima, precisely the regular pickup schedules and constant communication channels. According to a user:

> *In most informal settlements, they are using Sanima because we have many silos that have already collapsed, and housing no longer tends to make room. So, it is a good alternative where they have a dry toilet, and Sanima collects the materials. They collect every week … most settlements here use that because it is more hygienic* (Participant 13, Neighbor of Pamplona Alta, June 2021).

As can be seen, the CBS service is considered by the interviewees only as a temporary option to flush toilets, particularly in the absence of a regular water supply. Additionally, one CBS 'only solves the feces problem' and not the sewerage challenge within informal settlements:

> *The Sanima toilet is a help; there are no smells anymore. I think the Sanima one is the best until the water comes* (Participant 23, Neighbor of Pamplona Alta, September 2022).

Right now, Family's (Sanima solution) solves the feces issue for me, but it does not solve the sewage issue. I have to throw the water from the dishes and the kitchen into the street (Participant 15, Ex-director board in Nueva Rinconada, May 2021).

Some users agree that CBS is relatively expensive, particularly during the pandemic. In particular, several families had challenges paying for the service, but persisted in using it because pit latrines were no longer an option for them. Sanima has tried to reduce the fee, yet as an aid-dependent organization, this places an additional financial burden on the enterprise. Sanima officials, during interviews, admitted that its clientele could only afford the monthly service fee, which barely covers the full cost of operation:

The CBS business model is not self-sustaining; that is, it cannot finance itself solely by user fees and spends significant efforts to raise funds externally (Participant 10, Sanima director, May 2021).

Sanima attempts to raise subsidies for user fees through other operations and aid/donor resourcing (World Bank Group 2019). In 2022, 81.9% of Sanima's revenue was from grants, 17.4% from earned income, and 0.7% from philanthropic donations. However, this financing model is unstable as there is a continuous decrease in non-refundable donations from international organizations to Latin America (Interview with Sanima's director, 2023).

Will the state subsidise CBS delivery in Informal settlements?

Sanima aspires to foster collaborations with local authorities and SEDAPAL through investment and cross-subsidy. Whilst there are currently state provisions to facilitate this public-private partnership in the delivery of sanitation, there is no political and economic will and incentive to actualize this beyond sewered sanitation. Only for water provision, the government approved a Law of Universal Access in 2024 that encourages the use of non-conventional technologies. The regulations of the Framework Law (Supreme Decree N° 019-2017) encourage SUNASS to establish other sanitation services provided under special conditions in the Quality Regulations for the Provision of Sanitation Services. For example, removing excreta from septic tanks and disposing of it is considered a service in special conditions, but has to be temporary. Also, the current National Sanitation Policy (2022–2026), with its objective of achieving 100% of urban sewerage in socially vulnerable areas, promotes eco-efficient sanitation technologies that are adapted and resilient to climate change by making a budget available to provide eco-sanitation technologies for vulnerable, marginalized groups.

Yet, the Framework Law (Legislative Decree No. 1280) prohibits ecological sanitation organizations like Sanima from providing urban sewerage, wastewater treatment, or sanitary disposal of excreta services. SEDAPAL officials argue that it is necessary to continue promoting large-scale private sanitation investments, which are more viable through external donor financing (interview with SEDAPAL official, 2021) – particularly for CBS, a SEDAPAL official suggested that one of the challenges of accepting CBS as a permanent option will be designing standardized tariffs. Additionally, state involvement in CBS provisioning will mean making provisions to formalize informal settlements, including providing official planning cadastres and land tenure, which will involve large-scale state investments. Likewise, the state was concerned about the financial sustainability of sanitation social enterprises. As described earlier, Lima has been a pilot ground for several social sanitation enterprise initiatives that have failed to sustain their operations and services to informal residents. Whilst organizations like Sanima hope this challenge could be alleviated with state cross-subsidy, state officials mentioned that this would mean diverting resources and state capabilities away from sewered sanitation, which would, according to an official, '*not necessarily be effective for the state and the social enterprise*.'

For instance, some officials suggested that CBS social enterprises could explore localized partnerships that provide direct subsidies to CBS users, such as working with local municipalities rather than the federal government. However, in practice, this would require the active participation of local municipalities already constrained by human and financial capability. Municipal officials say funding for such private-public partnerships will be allocated from taxes. However, the tax base for areas such as San Juan de Miraflores is too limited to finance this type of service and thus could pose a further barrier to scaling up this initiative.

CONCLUSIONS

This paper has investigated whether Lima's informal settlement and sanitation sectoral regime provides a thriving and enabling environment for unconventional sanitation options like CBS. Using historical and contemporary analysis, we

have identified that the sanitation regime in Peru and Lima is best captured as characterized by institutions that are composed of a 'multifaceted combination of rhetorical constructions, disguised interests, technocratic rationality and, at best, circumstantial improvements' (Ioris 2012). Actual delivery of service in the urban landscape remains uncoordinated with non-routinized practices about providing sanitation in informal settlements. Whilst government institutional capability is fragmented by bureaucratic inefficiency, competing priorities, alleged corruption, and variable political will to address inequality, it does appear to have signaled an intention to address sanitation in informal settlements, and hence to also incorporate and formalize, even though the timeline to achieve this ambition remains uncertain.

Providing sanitation for the urban poor and marginalized remains a low priority, compounded by inadequate financing, a 'state capture' of sanitation provision, a sector plagued by corruption (e.g., the 2016 Odebrecht affair (OECD 2021), and a 'muddling through' management approach (Criqui 2020). Despite the decentralization of sanitation delivery in Peru, the Peruvian state remains committed to pursuing the 'modern infrastructural ideal,' i.e., mirroring Westernized sanitation regimes through sewered systems (Durand 2012; Furlong 2014; Criqui 2020). Consequently, there is a lack of recognition of non-conventional services in urban areas, although many actors in the sanitation sector know CBS's solution, its system, and its benefits.

For NGOs such as SANIMA, prooiding CBS solutions to individuals living in Lima's informal settlements, state regulations and lack of coordination continue to stifle what is claimed to be a solution to poor sanitation coverage. Extension of on-grid sewered sanitation is within SEDAPAL's plan for Lima. However, the geographical location, topography, and politics of land ownership of Lima's informal settlements make this challenging. Sedapal officials already share that it is technically and financially impossible to provide on-grid sewered sanitation to areas like Pamplona Alta. However, Law No. 32065, which recognizes both non-conventional technological options for water services as temporary solutions in urban areas affected by poverty or vulnerability, creates an opportunity for CBS and illustrates how SEDAPAL's role is evolving in response to changing urbanization dynamics and policy frameworks. Moreover, SEDAPAL's provision of water through tanker trucks to communities at different stages of legal recognition and infrastructural development introduces a new perspective on water and sanitation governance – one that moves beyond a rigid formal–informal binary and acknowledges more complex spatial configurations.

Residents of informal settlements have an already accepted user routine because they are expected to collectively organize and provide labor/resources for basic sanitation infrastructure in a way that is not required of residents in wealthier areas. To some extent, CBS, provided through market-based services, specifically Sanima, presents itself as the best option because of the high user experience satisfaction. However, it is still a 'temporary awaiting connection' option for families in Pamplona Alta.

SEDAPAL seeks to retain control over its network and client base and avoid the introduction of intermediary actors. However, in practice, different service regimes face misalignments and capability challenges with heavy expectations on poorer communities for collective action and contribution of labor (Durand 2012; Furlong 2014; Criqui 2020). NGOs that attempt to address the sanitation gap in cities often find themselves entangled in the webs and discourse of neoliberalism and technological fixes, inadvertently reinforcing infrastructural inequalities within the city (Oswald & Hoffmann 2007; Medem 2021). As long as there is no recognition by the State that it is a mandate to ensure the provision of safe sanitation urgently, there will be less space for intermediate solutions such as container-based sanitation. Consequently, organizations like Sanima will continue offering a solution to citizens who become clients of a constitutional right instead of being subjects of the law.

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ETHICS STATEMENT

Free and informed consent of the participants or their legal representatives was obtained, and the study protocol was approved by the appropriate Committee for the Protection of Human Participants, Executive Committee for Social Sciences, Humanities by the Pontificia Universidad Católica del Perú, Lima, Perú, Approval Number: 026-2021-CEI-CCSSHHyAA/PUCP.

DATA AVAILABILITY STATEMENT

Data cannot be made publicly available; readers should contact the corresponding author for details.;.

CONFLICT OF INTEREST

The authors declare there is no conflict.

REFERENCES

Alcázar, L., Xu, L. & Zuluaga, A. (2000) Institutions, politics, and contracts: the attempt to privatize the water and sanitation utility of Lima, Peru, *World Bank Policy Research Working Paper*, **2478**, 56.

Andrews, M., Pritchett, L. & Woolcock, M. (2017) *Building State Capability: Evidence, Analysis, Action, Building State Capability*. Oxford: Oxford University Press. https://doi.org/10.1017/CBO9781107415324.004.

Calizaya, J. C., García, S. & Miglio, R. (2009) *A Guide for an Integrated System of Ecological Sanitation in Suburban and Rural Areas ECODESS*. Lima: Water for People.

Cockburn, J. C., Quispe, J., Lucci, P. & Lenhardt, A. (2015) *On the Path to Progress: Improving Living Conditions in Peru's Slum Settlements*. London: Overseas Development Institute.

Cornelio, J. (2019) *Transando la posesión del suelo : análisis del caso de Pamplona Alta – San Juan de Miraflores en Lima*, Lima: Instituto de Estudios Urbanos, pp. 1–92.

Crabtree, J. (2000) Populisms old and new: the Peruvian case populisms old and new: the Peruvian case1, *PERGAMON Bulletin of Latin American Research*, **19** (2), 163–176.

Crabtree, J. & Durando, F. (2017) *Peru: Elite Power and Political Capture*. London: Bloomsbury Publishing.

Criqui, L. (2020) Sociotechnical alternatives and controversies in extending water and sanitation networks in Lima, Peru, *Water Alternatives*, **13** (1), 160–181.

Defensoría del Pueblo (2015) 'El derecho humano al agua y saneamiento. El control del gasto público en la ejecución de infraestructura de acceso.', *Informes Defensoriales*, p. 215. Available at: http://www.defensoria.gob.pe/modules/Downloads/informes/defensoriales/Informe-Defensorial-N–170-2015.pdf%0Afiles/3559/Informe-Defensorial-N–170-2015.pdf.

Dewhurst, R. N., Furlong, C., Tripathi, S. & Templeton, M. (2019) Evaluating the viability of establishing container-based sanitation in low-income settlements, *Waterlines*, **38** (3), 154–169. https://doi.org/10.3362/1756-3488.18-00027.

Dube, M., Anciano, F. & Mdee, A. (2023) The illusion of the container based sanitation solution: Lessons from Khayelitsha, *South Africa, Water Alternatives*, **16** (3), 849–868.

Durand, M. (2012) Waste management in a developing city: capitalising on current difficulties in Lima?, *Flux*, **1** (87), 18–28. https://doi.org/10.3917/flux.087.0018.

Espinosa, A. & Fort, R. (2020) *Mapeo y tipología de la expansión urbana en el Perú*. Lima: AdiPeru y Grade.

Espinosa, A., Janos, E., Pachecho, M., Juárez, J. & Chaparro, H. (2022) Populism in Peru: populist attitudes and perception of the populist offer and its relationship with political cynicism and attitudes toward democracy, *Frontiers in Psychology*, **13**, 1–13. https://doi.org/10.3389/FPSYG.2022.1070609/FULL.

Flores, U. B., Goksu, A. & Saltiel, G. (2018) *Incentives for Improving Water Supply and Sanitation Service Delivery: A South American Perspective, Incentives for Improving Water Supply and Sanitation Service Delivery: A South American Perspective*. Washington, DC: World Bank. https://doi.org/10.1596/29818.

Fuertes, P., Baskobich, M., Zevallos, M. & Brikke, F. (2008) The private sector and sanitation for the poor: a promising approach for inclusive markets in Peru, *Waterlines*, **27** (4), 307–322. https://doi.org/10.3362/1756-3488.2008.035.

Furlong, K. (2014) STS beyond the 'modern infrastructure ideal': extending theory by engaging with infrastructure challenges in the south, *Technology in Society*, **38**, 139–147. https://doi.org/10.1016/j.techsoc.2014.04.001.

Graham, C. (1992) *Peru's APRA: Parties, Politics, and the Elusive Quest for Democracy*. Boulder, CO: L. Rienner Publishers.

Hudson, R. (1992) *Peru. A Country Study*. Washington, DC: US Government Printing. https://doi.org/10.1016/0030-4387(94)90159-7.

Igarashi, J., Evans, B., Sleigh, A., Tarkash, D., Kennedy, R., Rosenberg, R. & Zakaria, F. (2023) Does 'Low cost' urban sanitation exist? lessons from a global data set, *Environmental Science and Technology*, **57** (45), 17237–17245. https://doi.org/10.1021/acs.est.3c05731.

INEI (2021) *Crecimiento económico, población, características sociales y seguridad en la provincia constitucional del Callao*. Lima: Instituto Nacional de Estadistica e Informatica.

INEI (2023) *Peru: formas de acceso al agua y saneamiento básico*. Lima: Instituto Nacional de Estadistica e Informatica.

Ioris, A. A. R. (2012) The neoliberalization of water in Lima, Peru, *Political Geography*, **31** (5), 266–278. https://doi.org/10.1016/j.polgeo.2012.03.001.

Mallory, A., Mdee, A., Agol, D., Hyde-Smith, L., Kiogora, D., Riungu, J. & Parker, A. (2022) The potential for scaling up container-based sanitation in informal settlements in Kenya, *Journal of International Development*, **34** (7), 1347–1361.

Mdee, A., Ofori, A., Barrington, D., Anciano, F., Dube, M., Hutchings, P., Kramer, S., López-Valladares, H., Parker, A., Riungu, J. & Ward, C. (2024) On a journey to citywide inclusive sanitation (CWIS)? A political economy analysis of container-based sanitation (CBS) in the fragmented in(formal) city, *Globalizations [Preprint]*, **22**, 875–895. https://doi.org/10.1080/14747731.2024.2434302.

Medem, I. (2021) *Mobile Toilets and the Urgent Need for Reflexivity in Social Entrepreneurship, Engenderings*. London: London School of Economics.

Mikhael, G., Shepard, J. & Stevens, C. (2017) *The World Can't Wait for Sewers: Advancing Container-Based Sanitation Businesses as A Viable Answer to the Global Sanitation Crisis*, London, WSUP, p. 14, Available at: http://www. wsup. com/wp-content/uploads/2017/02/Clean-Team-whitepaper. pdf.

Montgomery, I., Russel, K., Dave, R. & Harrof, L. (2020) *Supporting the Shift to Climate Positive Sanitation POLICY BRIEF Emissions Calculator Demonstrates Reduced Climate Impact with Container-Based Sanitation*. London: Alliance.

Mujica, A. & Uriarte, Z. S. (2016) *Fecal Sludge Management: Diagnostics for Service Delivery in Urban Areas Case Study in Lima, Peru*. Washington, DC: World Bank.

MVCS (2021) *Política Nacional de Vivienda y Urbanismo*, Lima: Ministerio de Vivienda, Construcción y Saneamiento, pp. 1–65. Available at: https://www.gob.pe/institucion/vivienda/informes-publicaciones/2027198-resumen-de-la-politica-nacional-de-vivienda-y-urbanismo.

Oblitas de Ruiz, L. (2014) *Servicios de agua potable y saneamiento en el Perú: beneficios potenciales y determinantes de éxito, CEPAL*. Santiago de Chile: Comisión Económica para América Latina y el Caribe, Available at: https://repositorio.cepal.org/items/d570cb84-ac01-4426-9a74-edf19a62164e.

OECD (2016) *Regulatory Policy in Peru: Assembling the Framework for Regulatory Quality, OECD Reviews of Regulatory Reform*. Paris: OECD.

OECD (2021) *Water Governance in Peru*, Paris, OECD, p. 195.

Olortegui, G. I. (2001) Informal settlers in Lima. In: *Coping with Informality and Illegality Human Settlementes in Developing Cities*, ESF/N-AERUS International Workshop Leuven-Brussels, Belgium, pp. 23–26.

Oswald, P. & Hoffmann, H. (2007). 'Results of an evaluation of ecological sanitation projects in the peri-urban settlements of lima/peru', *International Conference on Sustainable Sanitation: 'Food and Water Security for Latin America'*.

Román, A., Winker, M., Tettenborn, F. & Otterpohl, R. (2011) 'Informal Settlements and Wastewater Reuse : Improve of Urban Environment and Alleviate Poverty in Lima, Peru', (November 2007).

Saco, M. A. C. (1995) Disillusionment and hope: recent work on the political economy of Peru, *Latin American Research Review*, **30** (3), 188–197. https://doi.org/10.1017/s002387910001760x.

Techo (2020) *Relevamiento Asentamientos Populares – San Juan de Miraflores*. Lima: Techo.

Torero, M. & Pascó-Font, A. (2003) The social impact of privatization and the regulation of utilities in Peru. In: *Utility Privatization and Regulation: A Fair Deal for Consumers*?, Helsinki: The United Nations University World Institute for Development Economics Research, pp. 257–288. https://doi.org/10.4337/9781781951316.00021.

Torres, C. (2004) La reforma de los servicios de saneamiento en el Perú, *CEPAL Review*, **82**, 143–160.

Wise, C. (2003) *Reinventing the State: Economic Strategy and Institutional Change in Peru, Reinventing the State: Economic Strategy and Institutional Change in Peru*. Ann Arbor, MI: The University of Michigan Press.

World Bank (2023) *World Bank Open Data*, Washington, DC: World Bank. Available at: https://data.worldbank.org/country/peru.

World Bank Group (2019) *Evaluating the Potential of Container-Based Sanitation: x-runner in Lima, Peru*. Washington, DC: World Bank.

X-Runner (2020) *2020 X-Runner Impact Report*. Available at: https://www.x-runner.org/wp-content/themes/runner/2021-Impact-Report_x-runner_english.pdf.

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