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# Why it's time to get behind container-based sanitation

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# How can we unlock the full potential of container-based sanitation (CBS)?

The benefits of CBS are becoming recognized. Overcoming misconceptions that it's expensive can pave the way to greater scale.

**The COVID-19 pandemic has amplified concerns about the spread of disease, particularly in densely populated areas, and provides a stark reminder of the critical importance of safely managed sanitation, in or close to homes.**

This basic need is still denied to 4.2b people today[1], contributing to 432,000 diarrheal deaths annually[2], even before the pandemic struck. With sewerage not always feasible or cost-effective in urban slums, the need to scale CBS is more urgent now than ever.

CBS is a service-based business model built around standalone toilets that store waste in sealable, removable containers. These toilets may be provided in people's homes (household-level CBS) or as facilities used by multiple households (shared CBS). In both cases, CBS enterprises provide the toilets and maintain a managed service for collection of full containers, their replacement with empty ones and the transport of full containers to facilities for safe treatment, disposal or reuse of the collected waste. CBS is well suited to areas that are densely populated, suffer from flooding, have high water tables or rocky terrain. As a result, it has huge potential to increase access to safely managed sanitation for some of the world's least-served populations.

While CBS has gained high-level recognition as being essential to addressing the global sanitation crisis, it's often perceived as more expensive or less effective than other options, such as sewers, pit latrines and septic tanks. Many governments, funders and investors still think of sanitation in the same way as they think of traditional public infrastructure investments, and their investment structures are wired accordingly – i.e., based on high upfront capital outlay, with smaller ongoing costs for operation and maintenance, which are often not fully funded. With CBS models typically the exact opposite, and their cash flows very different from traditional sanitation infrastructure, this can lead to the perception that they are more expensive over the long term, hampering investment in the approach.

A lack of clear cost comparisons has inhibited investment, and the adoption of policy and regulatory environments conducive to fostering CBS. So, working with the Container-Based Sanitation Alliance (CBSA), an EY team set about answering a very simple question: how do the costs of CBS compare with other sanitation options?

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**Recognition of CBS effectiveness**

In 2019, the World Bank published Evaluating the potential of Container Based Sanitation. Emphasizing CBS' affordability, safety and resilience to climate variations, this report concluded that CBS should be considered as part of city-wide inclusive sanitation options, and laid out important lessons for governments and external funders.

In the same year, CBS was formally recognized as improved sanitation – and household-level CBS models as "safely managed" – by the Joint Monitoring Programme (JMP) for Water Supply and Sanitation, the official UN body for monitoring progress toward the Sustainable Development Goal (SDG) of adequate, equitable sanitation and hygiene for all.

These developments followed on from The world can't wait for sewers, a 2018 report published by EY and Water & Sanitation for the Urban Poor (WSUP). This report made the case for advancing CBS as a viable solution to the global sanitation crisis, and provided a clear blueprint for helping CBS enterprises achieve scale and sustainability.

[1]United Nations, 2020. Goal 6: Overview. [online] Available at https://sdgs.un.org/goals/goal6 [Accessed 27 October 2020].
[2]World Health Organization, 2019. Sanitation. [online] Available at https://www.who.int/news-room/fact-sheets/detail/sanitation [Accessed 27 October 2020].

# Plugging the cost comparison gap

Photo credit: Loowatt

New analysis provides the missing piece of the puzzle, clearly showing that CBS is less costly than other forms of improved sanitation.

**Using the Climate and Cost in Urban Sanitation (CACTUS)[3] methodology and field data as a baseline, the EY team gathered further standardized cost information through company financial data and in-depth interviews.**

They then used this to build an extensive, like-for-like cost comparison of different sanitation options in urban slums and other low income communities in Haiti, Ghana, Kenya, Peru and Madagascar. Key insights are that:

**1. CBS is the lowest cost form of safely managed sanitation**

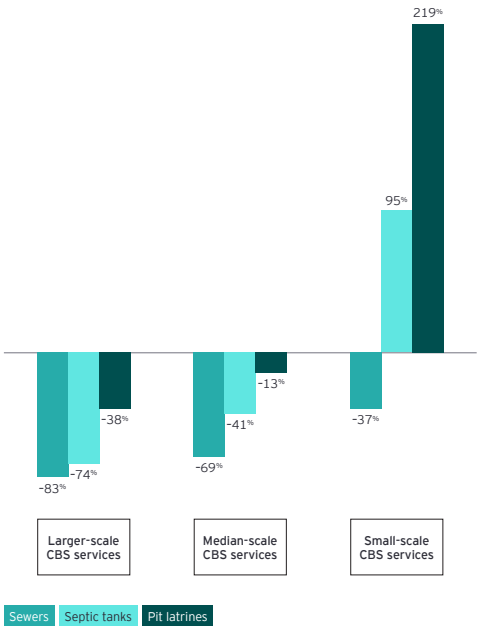
"Safely managed" sanitation is the gold standard for sanitation development outcomes. As currently classified by the Joint Monitoring Programme (JMP) for Water Supply and Sanitation, this involves people having access to an improved sanitation facility that:

- Hygienically separates excreta from human contact
- Isn't shared by other households
- Allows for excreta to be safely treated and disposed of in situ, or safely transported and treated off site

On this basis, the JMP classifies household-level CBS services as safely managed sanitation. These services are best compared to toilets that are connected to sewers or septic tanks, since they are most likely to be able to provide household-level sanitation with temporary storage, and safe transportation of waste for treatment or disposal.

On a like-for-like direct costs basis[4], the safely managed, household-level CBS models examined are considerably lower cost than sewers, costing between 37% and 83% less per household per year. The majority, specifically those operating at larger scale[5], are also less expensive than pit latrines and septic tanks, by up to 38% and 74% per household per year respectively (figure 1).

Figure 1: Percentage difference in annual cost per household of CBS services vs, other forms of sanitation[6]




**2. CBS arguably compares even more favorably vs. other traditional forms of sanitation**

It's worth noting that the benchmark sewer costs used for comparison are conservative. For example, analysis assumes new connections would be made to existing main sewers for transport of waste to a treatment plant. It doesn't factor in the huge costs that would be involved in constructing a main network where none currently exists, as would be the case in Haiti, for example.

Regarding comparisons between household-level CBS models and pit latrines, these treat both as being safely managed forms of sanitation. However, while pit latrines can meet safely managed criteria, the reality is that they rarely did in the locations studied. The vast majority would be classified as "basic."

This leads to a further point concerning JMP criteria, which currently dictate that no shared sanitation option can also be classed as safely managed, even if it hygienically separates excreta from human contact and provides for safe treatment or disposal. They also don't clearly account for other dimensions of safety that CBS services can provide beyond separation and treatment of waste – for example, resilience to climate variations, such as floods, which can render pit latrines, septic tanks and sewer lines unusable[7].

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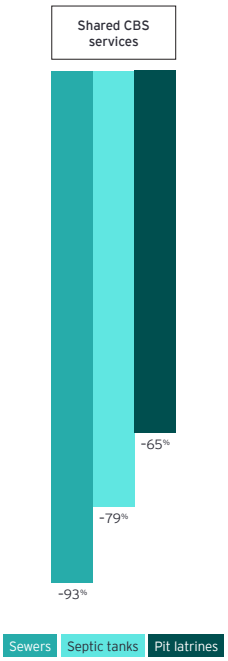
[3]CACTUS is a tool developed by the University of Leeds to collect real-world cost data for urban sanitation systems and aid decision making in citywide sanitation planning. See http://cactuscosting.com.
[4]CACTUS data do not include full indirect costs for CBS alternatives. For example, most do not include any management overhead costs. As a result, cost comparisons across sanitation types focus on direct CAPEX and OPEX costs in order to provide the best available like-for-like evaluation.
[5]For the purposes of this analysis, a larger-scale CBS service is one serving more than 1,000 households. While this does not necessarily constitute large scale in the context of the wider sanitation sector, it is a significant number for CBS providers, most of which are still in the early stages of development.
[6]A median value is used, since the mean can be overly influenced by outliers.
[7]Further cost benefit analysis is needed to fully explore and quantify differences across these broader dimensions of social and environmental value.

# CBS cost comparison case study

Given the dearth of data on shared sanitation provision, shared CBS models were also compared to household-level pit latrines, septic tanks and sewerage. Shared CBS models examined are respectively 65%, 79% and 93% less costly per household per year (figure 2).

Taken together, CBS services, both household-level and shared, compare very favorably with traditional forms of sanitation.

Figure 2: Percentage difference in annual cost per household of shared CBS vs. other forms of sanitation




### 3. Scale matters

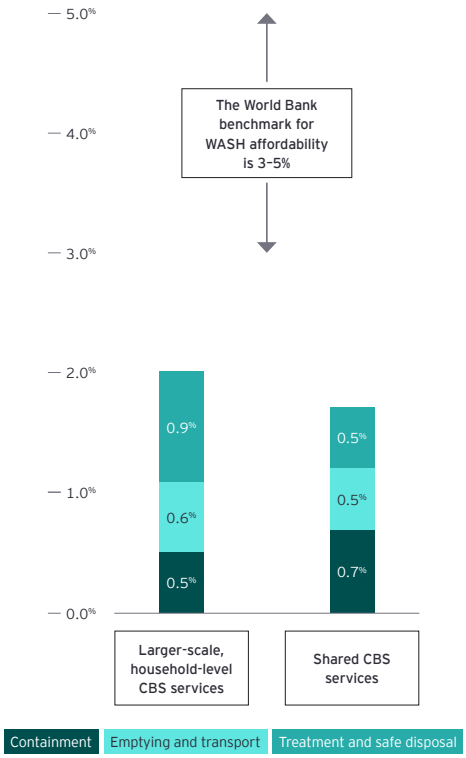
The CBS models included in this study were analyzed based on existing operational data and current operating scales, which are relatively small. While the favorable cost comparisons above are notable in and of themselves, they're even more significant when you consider that CBS is still a relatively new model of provision, compared with other more mature technologies. EY modeling suggests that CBS enterprises will gain further efficiencies as they mature and scale.

As the 2019 World Bank report on the potential of CBS noted, most CBS services are still in the relatively early stages of development. This is primarily attributable to the serious challenges of operating an innovative utility service focused on the urban poor. In many ways, CBS providers are currently both building and serving markets as they operate in very challenging environments, where adequate and appropriate financing, policy and regulation are not yet in place.

Analysis demonstrates that if these barriers are addressed, and enterprises are empowered to scale, this will unlock greater cost savings. As enterprises scale, capital and operating costs to service toilets remain unchanged on a per household basis. Assuming excess capacity means that absolute management and sales can be held constant as installations increase, every additional 100 toilets reduces the annual cost of CBS per household by 3%-12% of total yearly household costs, depending on an organization's current footprint.

Further emphasizing how scale impacts affordability, analysis shows that both shared CBS services and household-level services delivered at scale can be provided at well below the World Bank's definition of water, sanitation and hygiene (WASH) affordability (see figure 3). Benchmarked at 3%-5% of gross national income (GNI) per household, this is a critical measure, as it assesses affordability relative to household incomes in a particular country[8].

Figure 3: Percentage of annual household income spent on CBS services, by sanitation value chain segment




True sustainability and scalability depend on improving gross margin, which in turn, depends on increasing revenues or reducing costs.

[8]Affordability is a function of the cost of a CBS service relative to the GNI per household for the country in which the service is provided. As such, it should be noted that affordability can vary significantly, based on a country's logistical, regulatory and economic conditions.

Scale matters to job creation, too. Staffing accounts for between 34% and 59% of the annual cost per household of providing CBS services (see figure 4), which suggests that investment in scaling CBS is also an investment in scaling jobs in low income communities.

Figure 4: CBS costs by category as a percentage annual cost per household

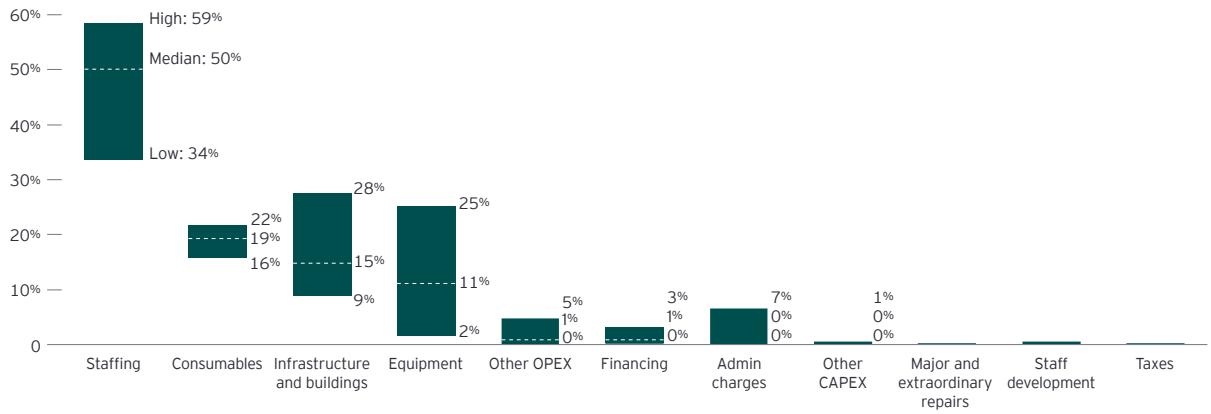



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Photo credit: x-runner

# Creating the necessary conditions for CBS to thrive

Photo credit: Sanivation

Knowing CBS is the most cost-effective form of safely managed sanitation, governments and investors should do more to help it thrive.

Achieving the UN Sustainable Development Goal (SDG) target of equitable sanitation for all by 2030 depends on scaling new models that reach the people and places that conventional sewerage can't.

It's already well-established that CBS is more technically feasible than sewers for rapidly bringing safely managed sanitation to hard-to-reach locations, such as urban slums.

Thanks to this comparative cost analysis, it's now also clear that CBS is more cost-effective than traditional methods of provision. Our research dispels the myth that comparable CBS models are more expensive to implement and maintain than safely managed sewers, septic tanks and pit latrines. Demonstrating this is seen by many in the sector as critical to encouraging:

**1. Governments and municipal authorities to create the conditions for CBS models to thrive and close the urban sanitation gap**

This requires policy and regulatory frameworks that support the proliferation of CBS as an essential component of city-wide, blended approaches to sanitation provision. This includes regulatory frameworks that enforce provision of safely managed sanitation for poor and marginalized communities, as well as the creation and support of markets for the reuse of waste. Authorities should also consider entering into public-private partnerships with CBS providers. By helping to provide more reliable revenue streams, and reduce costs of capital and customer acquisition, such partnerships can greatly improve CBS providers' capacity to scale and achieve further economies. This will require governments to adapt their investment structures to align with CBS cash flow requirements.

**2. Governments and investors to increase investment in CBS and develop innovative forms of finance to support it**

Between novel idea and proven concept lies the "dragon pit" of testing, iterating and validating the business model – a process that can take considerable time and requires access to appropriate investment. Helping existing CBS enterprises to scale, and encouraging more to spring up, requires more blended financing and innovative financial instruments that are specifically designed to address these challenges. This means outcomes-based instruments that incentivize cross-sector collaboration, emphasize social impact over financial returns and focus specifically on accelerating progress toward the Sustainable Development Goal (SDG6) of access to equitable sanitation for all by 2030.

**3. The JMP to disaggregate its criteria for safely managed sanitation to further incentivize investment in shared CBS models**

As described earlier, the highest-level JMP designation of sanitation – safely managed – currently requires hygienic separation of excreta from human contact, safe treatment or disposal of waste, and that the sanitation facility is not shared by more than one household. As it stands, the requirement to meet all three of these criteria means shared CBS models can only ever be classed as limited, despite their high hygiene and waste management standards.

Separation of these criteria by the JMP would support clear recognition that shared CBS models are, in fact, safely managed across multiple dimensions. This would support further investment in these models, as well as household-level CBS services already classed as safely managed. This is important since shared CBS models are frequently deployed in the lowest income communities, and may be the only viable means to significantly improve the safety and quality of sanitation services in those locations.

**4. Utilities and other sanitation providers to develop more robust, comparable and transparent data on system costs and climate impacts of sanitation**

Particularly in relation to different waste treatment processes and reuse options, access to ongoing data is needed to inform smart sanitation investments, as well as to foster public-private partnerships. The contribution of system costs and climate impact data should be made to the CACTUS project to support sanitation investment decisions and further analysis.

As was said at the outset, the COVID-19 pandemic provides a stark reminder of the critical importance of access to safely managed sanitation. This basic need is still denied to 4.2b people today and its absence is a major contributor to hundreds of thousands of avoidable deaths each year. Scaling CBS is essential to meeting this need at an affordable price and to making safe sanitation accessible to everyone, everywhere.

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**About the Container-Based Sanitation Alliance**
The Container-Based Sanitation Alliance (CBSA) brings together leading practitioners in the development and provision of container-based sanitation (CBS) — a hygienic, affordable and sustainable sanitation service ideally suited to densely populated urban areas and other hard-to-reach locations. Formed in November 2016, the CBSA envisions a world where safe sanitation is no longer out of reach for low-income families in these communities. Working together, we aim to support the delivery of safe sanitation for everyone, everywhere, by enabling CBS to achieve scale and sustainable impact. To this end, we promote CBS as an essential component of blended, city-wide approaches to sanitation, and encourage its widespread acceptance and endorsement by governments and regulators as a safely managed form of sanitation. For more information, please visit cbsa.global.

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