Global assessment of grant-funded, market-based sanitation development projects

Rishi Agarwal, Akshay Kohli, Subhash Chennuri, and Marion W. Jenkins

Evidence on the performance of market-based sanitation (MBS) interventions is needed to support renewed focus on using them to deliver sanitation services at scale. We conducted a comprehensive review of WASH grant-funding since 1980 to identify household sanitation supply projects using an MBS approach, assessed project characteristics and outcomes (population impacted), and reviewed project strategies against three key factors for scaling MBS (customer and business finance; availability and viability of local entrepreneurs; appropriate toilet product and business models). For a subset with higher outcomes, we assessed project strategies more fully against nine MBS strategies considered good practice, and the programme's ability to leverage household investment. Of 103 sanitation supply projects in eight global databases, 49 qualified as MBS and occurred in 22 countries across sub-Saharan Africa, South/Southeast Asia, and Latin America. Cumulatively, 27.6 million people, nearly all rural, gained access to basic sanitation via markets across these projects. 'Large-scale' MBS projects exceeding 50,000 people gaining basic sanitation (n = 27) compared with those that did not (n = 22) were longer and significantly more likely to address all three key factors (74 per cent vs. 41 per cent; p = 0.019), but on average applied only six of nine good practice strategies. Outcomes and programme leverage were higher in South/Southeast Asia than in sub-Saharan Africa. However, African projects tended to have shorter duration, fewer reached 'large-scale', and rarely employed a sales and marketing strategy. We discuss implications for improving the design and performance of MBS interventions globally and particularly in sub-Saharan Africa.

Keywords: sanitation marketing, project design, implementation strategies, basic sanitation access, household investment, cost-effectiveness

ACCESS TO BASIC SANITATION REMAINS a critical challenge in the global south (UNICEF-WHO, 2015). The United Nations Sustainable Development Goals (SDGs) have set a target of achieving adequate and equitable sanitation and hygiene for all and ending open defecation by 2030. Reaching this ambitious target will require significant contributions from the domestic private sector to ensure supply of sanitation infrastructure and services to all households.

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Market-based approaches to sanitation (i.e. *sanitation marketing*, *sanitation as a business*), which unlock household investment and develop private sector supply of household toilets and related services, have gained in popularity and are included in the sanitation strategies of global development agencies (USAID, 2014; UNICEF, 2016; World Bank, 2018; WHO, 2018). Renewed interest in market-based sanitation (MBS) is driven in large part by the SDG imperative, acknowledged limits of demand-oriented programmes alone, such as Community-Led Total Sanitation (USAID, 2018a; Venkataramanan *et al.*, 2018), and awareness of successful MBS applications, ranging from a 1980s programme in Mozambique that developed low-cost dry pit latrine slab designs purchased by over 4 million households globally (Cairncross, 1992; Black *et al.*, 2008) to a current programme in Bihar, India, in which over 220,000 household toilets have been sold since 2012 (PSI India, 2017).

However, the extent to which MBS projects have been succesful and delivered results at scale is unknown; no global inventory of MBS interventions and their impact on sanitation access exists. Calls for MBS first emerged from the 1980s International Decade of Water and Sanitation (Cairncross, 1992), yet we still lack systematic evidence across projects and geographies on leveraging markets to deliver sanitation sustainably and at large scale. A recent systematic review found insufficient documentation on MBS approaches to adequately assess their value for promoting sanitation (De Buck et al., 2017).

The United States Agency for International Development Water, Sanitation and Hygiene Partnerships and Learning for Sustainability (USAID WASHPaLS) project seeks to generate evidence to improve MBS programming and its scale up. An initial literature review for the project identified three important factors for successful MBS programming. The first concerns appropriate toilet product and sanitation business model choices. 'Toilet product' refers to the interface (e.g. slab, pan, water closet) and integrated substructure (e.g. pit) of a sanitation facility and may or may not also include the superstructure. A key sector goal for investing in development of sanitation markets is to ensure they offer customers, especially poorer customers, toilet products and services that match their preferences and budgets (Cairncross, 2004; Heierli et al., 2004; Schaub-Jones and Valfrey-Visser, 2009; Dumpert and Perez, 2015). Toilet products need to be geographically and culturally suitable, and offer choice in designs and price points (Cairncross, 1992, 2004; Salter, 2008; WSP-IFC, 2013). At the same time, entrepreneurs who supply these toilet products need context-appropriate and profitable business models for their production, sales and marketing, and demand fulfilment (Kappauf, 2011; WSP-IFC, 2013; Dumpert and Perez, 2015).

Availability and viability of local sanitation entrepreneurs is another key factor. Market supply of toilet products and services to households is a local affair and depends on the existence of nearby sanitation entrepreneurs (Schaub-Jones and Valfrey-Visser, 2009; WSP-IFC, 2013). In many areas, local entrepreneurs may not exist or be hesitant to commit more fully to their sanitation enterprise activities, while potential new entrants may not believe sanitation is a sufficiently attractive business opportunity (WSP-IFC, 2013; Gero et al., 2014; Dumpert and Perez, 2015; CS WASH

Fund and Aguaconsult, 2018). How MBS interventions expand the pool of local sanitation entrepreneurs and enable their sustained profitability remains unclear (Schaub-Jones, 2010; Gero et al., 2014).

The third factor concerns financing requirements of consumers and entrepreneurs. The poorest households often require a financial subsidy to purchase a toilet from the market, while others can afford to purchase but face cash liquidity constraints which could be addressed by microfinance (Cairncross, 1992; Mehta, 2008; Trémolet, 2012; Jenkins and Pedi, 2013a). However, consumer microfinance for sanitation is often not available or too costly. Entrepreneurs also may require financing to start up or expand their sanitation-oriented businesses, but are often small, informal, and lack collateral required for business loans (Trémolet, 2012; Dumpert and Perez, 2015; Murta et al., 2018). Evidence on how best to design, leverage, direct, and use public and private sources of financing for consumers and businesses in the development and scale-up of MBS approaches is lacking (Trémolet, 2012).

To address the dearth of documentation on MBS interventions and better understand the role of these three factors in programming, we screened a global data set of 1,253 WASH (water, sanitation and hygiene) project grants dating back to 1980 for household sanitation supply projects using an MBS approach (USAID, 2018b). We then systematically examined characteristics, implementation strategies, and outcomes for each identified MBS project. Below we describe the data, screening process, and analyses, and present results on the global distribution of MBS projects, project attributes such as duration and setting, project outcomes (i.e. population gaining access to a toilet), and programming factors addressed by the project's implementation strategies. For a subset with larger outcomes, we examined strategies in greater depth and household investment leveraged by programme expenditures.

Methods

We started with a global list of 1,253 WASH development grants compiled by USAID WASHPaLS (USAID, 2018b). Here we describe the data, definitions, information sources, screening criteria, and process of identifying MBS projects and assessing their characteristics, outcomes, and programme leverage. We followed a three-step screening process (see Figure 1) to identify country-level MBS projects (Figure 1, Group D) from the original list of WASH grants (Figure 1, Group A).

WASH project grants data set

WASH project grants were compiled between January and March 2017 from the online project databases of four international development funders (World Bank, USAID, Bill & Melinda Gates Foundation, UK Department for International Development [DFID]) and four WASH Aggregator websites (see Supplemental Table S1). They include grants funded from 1980 through 2015 (latest end year 2020).
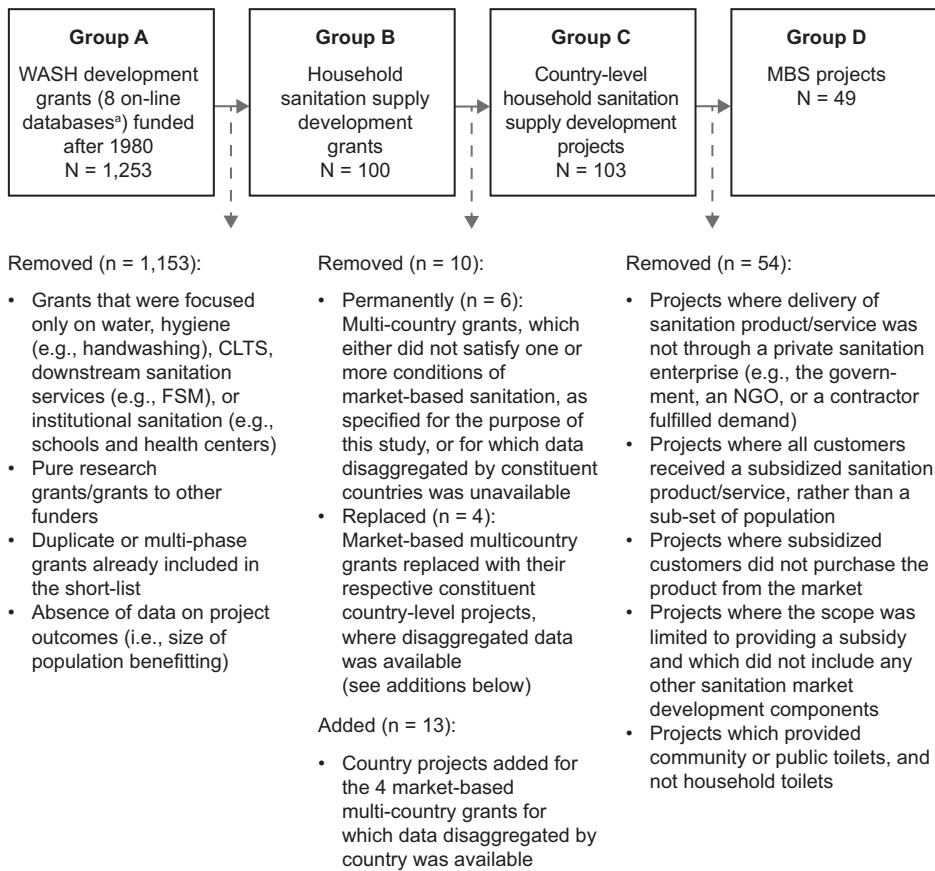
Group A	Group B	Group C	Group D
WASH development grants (8 on-line databases[a]) funded after 1980 N = 1,253	Household sanitation supply development grants N = 100	Country-level household sanitation supply development projects N = 103	MBS projects N = 49

Removed (n = 1,153):

- Grants that were focused only on water, hygiene (e.g., handwashing), CLTS, downstream sanitation services (e.g., FSM), or institutional sanitation (e.g., schools and health centers)
- Pure research grants/grants to other funders
- Duplicate or multi-phase grants already included in the short-list
- Absence of data on project outcomes (i.e., size of population benefitting)

Removed (n = 10):

- Permanently (n = 6): Multi-country grants, which either did not satisfy one or more conditions of market-based sanitation, as specified for the purpose of this study, or for which data disaggregated by constituent countries was unavailable
- Replaced (n = 4): Market-based multicountry grants replaced with their respective constituent country-level projects, where disaggregated data was available (see additions below)

Added (n = 13):

- Country projects added for the 4 market-based multi-country grants for which data disaggregated by country was available

Removed (n = 54):

- Projects where delivery of sanitation product/service was not through a private sanitation enterprise (e.g., the government, an NGO, or a contractor fulfilled demand)
- Projects where all customers received a subsidized sanitation product/service, rather than a sub-set of population
- Projects where subsidized customers did not purchase the product from the market
- Projects where the scope was limited to providing a subsidy and which did not include any other sanitation market development components
- Projects which provided community or public toilets, and not household toilets

Figure 1 Flow-chart of grant search and screening steps

[a] Online databases: Bill & Melinda Gates Foundation (BMGF) Grants database; Department for International Development (DFID) Development Tracker; German Corporation for International Cooperation GmBH (GIZ) project data; USAID Foreign Aid Explorer; World Bank projects; Sanitation Marketing Community of Practice (www.sanitationmarketing.org); Sustainable Sanitation Alliance: Sanitation Library (www.susana.org); WASHFunders Funding Map (except for BMGF) (www.washfunders.org)

Definitions

We defined MBS projects as those that promoted private sector supply of household toilets in which customers made a full or partial monetary contribution towards its purchase or upgrade directly from a private enterprise. Monetary payment could have come from savings and/or cash equivalents, including credit, subsidy vouchers, and pass through price discounts. Where customers received a subsidized sanitation product and/or service, we applied the following screening conditions to qualify as MBS:

- The subsidy was restricted to a specified sub-population (e.g. vulnerable households, located in challenging geography) and not available to all customers.

- Subsidized customers purchased from the market.
- The project's scope went beyond providing the subsidy and included market development components (e.g. new toilet product, new business model).

We excluded projects where the government, an NGO, or a contractor delivered the product or service to households as not market-based, and those involving community or public toilets as out of scope. We considered the original project design in assessing whether the approach and strategies qualified as MBS.

Screening (step 1)

We screened the title and description of each project in Group A (Figure 1), looked through other project materials if needed (see Supplemental Table S2), and applied the following actions to identify grants for household sanitation supply development (Figure 1, Group B):

- Consolidated duplicate listings or phases/extensions into one entry.
- Removed projects without provision of household toilets, research grants, funder-to-funder grants, and grants without information on number of people gaining toilet access over the project's life (i.e. ongoing or recently completed grants without progress/evaluation report). At this stage, we retained grants providing community/public toilets for household use.

Identifying country-level MBS projects (steps 2 and 3)

Group B included multi-country grants, some of which did not meet our MBS definition (i.e. delivery not via the private sector, subsidy not restricted, project only supplies community or public toilets). We removed non-MBS multi-country grants and those lacking data on outcomes disaggregated by country. Multi-country MBS grants with disaggregated country-level outcomes were replaced by their constituent country-level projects. These changes resulted in Group C (Figure 1), the set of grant-funded country-level household sanitation supply development projects.

Next, we examined documentation in detail for each Group C project against our MBS operational definition and criteria, resulting in Group D (Figure 1), the final set of grant-funded country-level MBS projects since 1980.

Country-level project characteristics

For each Group C project, we compiled data on the parameters and characteristics below using the project completion report and/or most recent progress report. When unavailable, data was taken from the project proposal, project website, or a project-related published study.

- time period and duration;
- rural/urban setting;
- funding institution(s);
- implementing organization;

- country and region;
- whether or not strategies/activities addressed one or more of the three key MBS programming factors:
  - Appropriate toilet product and business model choices. To be counted as addressing this factor, the project had to introduce a more desirable and/or affordable toilet product, or a new or adapted sanitation business model.
  - Availability and viability of local entrepreneurs. To be counted for this factor, the project had to bring new private sector entrants into the sanitation market, expand the role played by existing sanitation entrepreneurs (e.g. training, increasing product portfolio), or improve their profitability.
  - Financing for consumers and businesses. By design, the project had to introduce or improve access to a financing mechanism for customers and/or entrepreneurs to be counted for this factor.

Project outcomes: population benefiting

We searched project completion and evaluation reports, or the most recent report, for metrics related to number of people gaining access to basic sanitation (i.e. an improved household toilet facility that was not shared) for all projects in Group C. Where there was no information in the grants database, we searched a project website or published articles or studies related to the grant. The number of people gaining basic sanitation was estimated from reported number of *toilets sold* attributable to the project over its lifetime multiplied by a household size of 5. Where *toilets sold* was unavailable, we used the reported *population gaining access to toilets*. If neither *toilets sold* nor *population gaining access* was reported, *number of households gaining access to toilets* was used and multiplied by 5. For projects that supplied community or public toilets, the reported population benefiting was used directly.

   We applied a threshold outcome of at least 50,000 people (equivalent to 10,000 toilets sold or households gaining access) to classify country-level MBS projects (Group D) as 'large-scale' projects that could offer lessons on scaling MBS approaches for more in-depth study. The 50,000 value, while low compared with sanitation deficits, reflects a mid-point across the MBS projects.

Analysis of large-scale MBS projects

We analysed 'large-scale' MBS projects in more depth to assess strategies employed to develop the local sanitation market and household investment leverage ratio, as described next.

   We reviewed project documents and publications for nine sanitation market development strategies (defined in Table 1) distilled from a recent desk review and case studies of good implementation practice (USAID, 2018b). Several of the large-scale Group D country-level projects were part of one multi-country MBS grant for which strategies were available only for the multi-country grant. In this case, we assessed the strategies described in the overall multi-country grant project. Where no clear mention was made of a particular strategy, we did not count it as employed by the project.

Table 1 MBS good-practice strategies and definitions applied in this study

No.	MBS strategy	Definition
1	Target market selection: formative research	Conducting preliminary research to understand consumer segments and preferences (e.g. willingness to pay, buying process, barriers to purchase), and value chain (e.g. roles of actors, price points, barriers to servicing consumers) for sanitation products and services
2	Product system: product design	Identifying or improving upon sanitation products which are desirable and affordable for consumers
3	Sales and marketing	Incentivizing actors to increase the outreach of sanitation products and services, and developing collateral and messaging to target customers, with the aim of converting potential customers into paying customers
4	Delivery model	Introducing a new model, or improving upon an existing model, through which customers receive sanitation products and services (e.g. network, one-stop-shop), in place of the traditional mason/do-it-yourself (DIY) model
5	Customer finance	Providing or increasing access to credit for purchasing sanitation products and/or services, or providing market-compatible subsidies (i.e. the subsidy should be targeted towards a specific subset of the population, inaccessible to all potential customers, and customers should purchase sanitation products and/or services from the market, i.e. the private sector)
6	Enterprise finance	Providing or increasing access to credit for capital or operational expenditure to sanitation businesses, or providing start-up grant, seed capital, or equivalent support in cash or kind during initial years of the enterprise (e.g. free moulds for making SanPlats)
7	Entrepreneur training	Training local entrepreneurs in technical and business aspects such as toilet construction techniques, bookkeeping, and marketing of sanitation products and services
8	Business environment: associated supply chain/upstream	Developing the associated service or product ecosystem (e.g. distributors and retailers of input materials and components used in construction of toilets) for sanitation products and services
9	Business environment: market rules	Shaping market rules (includes taxes and tariffs, laws, regulations, and policies) to enable the sanitation market, support increasing demand, and/or improve enterprises' viability

Source: Adapted from USAID, 2018b

A simplified analysis of the leverage ratio of household investment to programme costs, as defined in value for money analyses of sanitation grant funding (Trémolet et al., 2015; White and Burr, 2016), was conducted for large-scale MBS projects for which programme cost efficiency was previously available (USAID, 2018b), and for which investment made to construct toilets by households was reported in project-related literature. We computed leverage ratios by dividing the reported average

amount households invested in their improved toilet by the total programme expenditure per household gaining basic sanitation access.

Results

We identified 103 country-level household sanitation supply projects (see Figure 1, Group C) out of 1,253 WASH development grants funded after 1980. Of these, 49 qualified as MBS (Figure 1, Group D); that is, they unlocked household investment, strengthened the private sector, and met our MBS definitional criteria. The remaining 54 non-MBS projects provided a subsidy to all potential customers, relied on an NGO or contractor for toilet delivery, had no market development components, or provided household access using communal or public toilets. Nearly 90 per cent of MBS projects ($n = 43$) were fully or partially funded by four agencies: the World Bank, Bill & Melinda Gates Foundation, DFID, and USAID. MBS projects were implemented in 22 countries across sub-Saharan Africa, South Asia, Southeast Asia, and Latin America primarily by a local or international NGO or non-profit organization ($n = 31$), or a local or national government ($n = 11$). See Supplemental Table S3 for details of the 49 MBS projects.

Project characteristics

Over half of the household sanitation supply projects (henceforth 'supply projects') have been funded since 2010, while the proportion in each decade that qualified as market-based increased from 13 per cent in the 1990s to 56 per cent in the 2010s (see Table 2). Duration of MBS projects compared with non-MBS projects appears

Table 2 MBS and non-MBS household sanitation supply project duration by decade

Decade[1]	MBS projects		Non-MBS projects	
	Number	Average duration (years)	Number	Average duration (years)
1980s	1	22	2	13.5
1990s	3	6.3	20	6.8
2000s	15	6.2[2]	8	8.6[4]
2010s	30	3.8[3]	24	3.9[5]
Total	49	5.1[¶]	54	6.0

Notes: [1] Decade when project began.
[2] Two ongoing projects based on planned completion date; two ongoing projects missing completion date and omitted.
[3] Ten ongoing projects based on planned completion date; two ongoing projects missing completion date and omitted.
[4] One ongoing project based on planned completion date.
[5] Nine ongoing projects based on planned completion date.
[°] T-test of difference in mean duration between MBS and non-MBS projects: 2-sided $p = 0.20$, 1-sided $p = 0.10$

to be somewhat shorter (mean 5.1 years vs. 6 years; std. dev. 2.8 vs. 3.0 years; t-test 2-sided $p = 0.20$, 1-sided $p = 0.10$, for unequal variances). Project duration may be declining for both types, however; average duration through actual or projected completion for projects started in or after 2010 was 3.8 years and 3.9 years, respectively, for MBS and non-MBS (Table 2). Supply projects and the subset using MBS approaches have been implemented largely in rural areas; 74 per cent of supply projects and 80 per cent of MBS projects served rural areas.

MBS programming factors

We examined reported approaches used by each of the 103 supply projects to see if they addressed any of the three key factors for MBS programming (i.e. appropriate toilet product and business model choices, availability and viability of local entrepreneurs, and consumer and business financing) (see Table 3). Non-MBS projects mostly included strategies to address just one factor (67 per cent), typically the financing factor for consumers (93 per cent), while a majority of MBS projects (59 per cent) reported a strategy for each factor. While few non-MBS projects addressed the lack of availability and viability of local entrepreneurs or the lack of appropriate sanitation products and/or business models, at least 80 per cent of MBS project designs included a strategy for these factors.

Project outcomes

Since 1980, supply projects have cumulatively resulted in an estimated 52 million people gaining access to basic sanitation (see Figure 2). Slightly over half (27.6 million) acquired their toilet through the market under one of the 49 MBS

Table 3 Extent to which key programming factors were addressed by MBS project strategies

Programming factor[1]	MBS (n = 49)	Large-scale MBS (n = 27)	MBS not at large-scale (n = 22)
Appropriate toilet product and business model choices	80% (39)	93% (25)[2]	64% (14)
Availability and viability of local entrepreneurs	92% (45)	96% (26)	86% (19)
Financing for sanitation customers and businesses	80% (39)	81% (22)	77% (17)
Number of factors addressed			
1	8% (4)	4% (1)	14% (3)
2	33% (16)	22% (6)	45% (10)
3	59% (29)	74% (20)[3]	41% (9)

Notes: [1] See 'Methods' for definitions
[2] Proportion of large-scale MBS projects significantly different from the proportion of 'not at large-scale' MBS projects for this factor (z-score = 2.50, 2-tailed $p = 0.012$)
[3] Proportion of large-scale MBS projects significantly different from the proportion of 'not at large-scale' MBS projects for this characteristic (z-score = 2.35, 2-tailed $p = 0.019$)
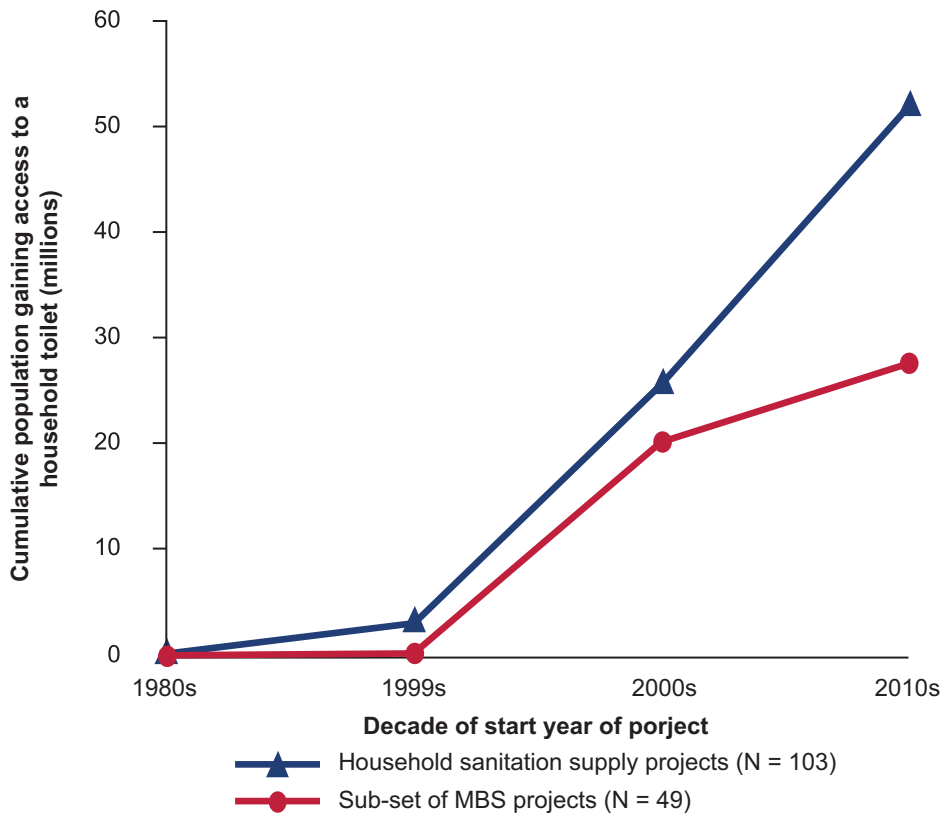
Figure 2 Cumulative population gaining access to basic sanitation since 1980 from household sanitation supply projects, and share of population from MBS projects

projects. Rural MBS projects have accounted for nearly all of the MBS outcomes (27.4 of 27.6 million). The five largest country-level MBS projects accounted for 77 per cent (21.4 million) of MBS outcomes, of which the largest accounted for 58 per cent (16 million). This trend of a few very large projects dominating outcomes is also seen among the set of non-MBS supply projects; the four largest accounted for 81 per cent (19.8 million) of total outcomes, with the single largest contributing 63 per cent (15.4 million). The population gaining access per MBS project averaged 563,000 people (median 81,000; 400–16,000,000 range), slightly higher but not significantly different from the mean of 452,000 for non-MBS projects (median 51,000; 400–15,400,000 range). Twenty-seven MBS projects (55 per cent) reported an outcome for basic sanitation access exceeding 50,000 people (i.e. output exceeding 10,000 household toilet sales).

Regional examination

Overall, 49 per cent of all the supply projects were implemented in sub-Saharan Africa, 25 per cent in South Asia, 13 per cent in Southeast Asia, and 12 per cent

in Latin America. Among MBS projects, relatively more were implemented in sub-Saharan Africa (59 per cent vs. 39 per cent of non-MBS) (see Supplemental Table S4 for geographic distributions). However, MBS project outcomes have occurred disproportionately in South Asia (69 per cent) with only 18 per cent of cumulative outcomes occurring in sub-Saharan Africa.

Comparing average outcome per MBS project further illustrates regional differences. The average MBS project in South and Southeast Asia benefited 1.3 million people (median 185,000; 1,000–16,000,000 range) compared with 170,000 people (median 33,000; 400–1,900,000 range) in sub-Saharan Africa. Even after excluding the Asian outlier (16 million), average outcomes of MBS projects in South and Southeast Asia were higher than those in sub-Saharan Africa (389,000 vs. 170,000 people). Duration of MBS projects in sub-Saharan Africa also appears to be shorter than in South and Southeast Asia, with a mean of 4.2 years vs. 5.5 years (std. dev. of 1.72 vs. 3.89 years; t-test of difference: 2-sided $p = 0.19$, 1-sided $p = 0.09$, for unequal variances), excluding the 22-year outlier in sub-Saharan Africa.

Large-scale MBS projects

We compared characteristics of the 27 MBS projects that achieved 'large-scale' ($\geq$ 50,000 people gaining basic sanitation access) against the 22 that had not. While 45 per cent of MBS projects in sub-Saharan Africa were large-scale (13 of 29); 78 per cent (14 of 18) in South and Southeast Asia were large-scale. Projects achieving large-scale outcomes were significantly more likely to include strategies for all three programming factors (74 per cent vs. 41 per cent; z-score = 2.35, 2-tailed $p = 0.019$) and in particular, to address appropriate toilet product and/or business model choices (93 per cent vs. 64 per cent; z-score = 2.50, 2-tailed $p = 0.012$) (Table 3).

Projects reaching large-scale also appear to have longer durations (mean 5.8 years) compared with those that did not (mean 4 years) (t-test of difference: 2-sided $p = 0.078$, 1-sided $p = 0.039$, for unequal variance), and twice as many large-scale MBS projects had durations of 7 years or more, compared with those that were not. We observed this tendency separately in sub-Saharan Africa (5.7 vs. 4 years) and in South and Southeast Asia (6 years vs. 4 years).

MBS strategies of large-scale projects

Table 4 shows the frequency with which large-scale MBS projects employed each of the nine strategies (defined in Table 1) considered good practice for MBS design. Of the 20 large-scale MBS interventions with available documentation (19 country-level projects, 1 multi-country grant with 8 large-scale country-level projects), all included entrepreneur training. Five other practices were included in at least 60 per cent ($n = 12$) of large-scale project designs: providing customer finance; conducting formative research for target market selection; making improvements to product design; introducing or improving upon a toilet delivery model; and promoting sales and marketing. However, only 40 per cent ($n = 8$) included the package of four core market development strategies (i.e. target market selection, product system design,

Table 4 MBS development strategies employed by large-scale MBS interventions

No.	MBS good-practice strategy[1]	Number of interventions (n = 20)[2]
1	Entrepreneur training	20
2	Customer finance	16
3	Target market selection: formative research	16
4	Product system: product design	15
5	Delivery model	14
6	Sales and marketing	12
7	Business environment: associated supply chain/ upstream	8
8	Business environment: market rules	8
9	Enterprise finance	4

Notes: [1] See Table 1 for descriptions and definitions
[2] Includes 19 country-level large-scale MBS projects and 1 multi-country MBS grant which is at a large-scale in each of its 8 country-level projects

delivery model, and sales and marketing), and only 40 per cent ($n = 8$) sought to address the business environment through shaping market rules and/or developing the associated service or product ecosystem. Just 20 per cent ($n = 4$) had a strategy for enterprise finance. On average, large-scale interventions employed six of the nine MBS good practice strategies in Table 1. Among those in sub-Saharan Africa, only one of six employed strategies for promoting sales and marketing, compared with 10 of 13 in South and Southeast Asia. As a result, sub-Saharan African projects employed on average five MBS good practice strategies, compared with six in South and Southeast Asian projects. We excluded the multi-country grant from this analysis because it spanned both regions.

Household investment leverage

Programme leverage was estimated for five of the large-scale MBS projects (see Supplemental Table S5 for data, calculations, and sources). For each US$1 of programme expenditure, MBS projects we examined leveraged household investment of approximately $5 to $13.5 in South and Southeast Asia ($n = 3$), but only $0.1 to $0.9 in sub-Saharan Africa ($n = 2$).

Discussion

To our knowledge, this is the first systematic assessment of grants across the global South for household sanitation supply development that used a market-based approach. Our analysis of grants for MBS from 1980 through 2015 revealed important patterns, overall and regionally, in the characteristics and outcomes of MBS projects. These have implications for improving the design and performance of MBS development investments generally and particularly in sub-Saharan Africa.

Prevalence and contribution of MBS projects

There were very few MBS projects among the 1,253 WASH development grants we screened. Among household sanitation supply projects since 1980 (~8 per cent of WASH grants), less than half used an MBS approach. Non-MBS supply projects typically provided a subsidized toilet to all households and/or relied on an NGO or contractor to deliver it. However, the proportion of grant-funded supply projects using a market-based approach has been increasing, with the majority since 2010 adopting the approach.

Of the estimated 52 million people who gained basic access since the 1980s through sanitation supply projects we identified, slightly over half (27.6 million) acquired their toilet through the market developed by an MBS project. While these numbers are substantial, they pale compared with the total number of people who gained access to sanitation over the 1990–2015 period according to JMP data (UNICEF-WHO, 2015), indicating most people adopting sanitation are doing it themselves, without grant aid.

The average MBS country-level project had an outcome of 563,000 people, not significantly different from the average outcome of non-MBS supply projects in our data set (452,000 people), and surprisingly similar to average outcomes, in terms of numbers of people benefiting, under other sanitation development approaches we examined. For example, UNICEF Community Approaches to Total Sanitation (CATS) across 53 countries had an average outcome of 453,000 people living in an open defecation-free (ODF) community, per country project (UNICEF, 2014).

When comparing approaches for accelerating sanitation access and changing behaviour, one must also consider sustainability of investment outcomes and impacts after interventions have ended. There is some evidence that market changes created by MBS interventions continue to deliver accelerated gains in access years after project funding has ended, as sanitation entrepreneurs, who were strengthened, continue to grow and expand their engagement in the sanitation market (Devine and Sijbesma, 2011; Dwan and Bond, 2016; Revell, 2017). Local government, however, has played a critical leadership role in continuing to drive sanitation uptake in these cases. On the other hand, evidence of replication of subsidy-driven hardware delivery without further project funding has been hard to find (Rodgers et al., 2007). Elsewhere, MBS-strengthened local sanitation markets have been identified as a key factor in sustained ODF (Ahmed et al., 2011). Households who self-financed purchase of their own toilets via local markets in a study in India had higher rates of satisfaction with their facility and its location than those with contractor-delivered subsidized toilets (Jenkins et al., 2014). Evidence from Cambodia also shows that owners who purchased from local markets were more satisfied than owners who self-built in response to community ODF triggering (Pedi and Touch, 2010; Pedi et al., 2012). And in diverse settings across the globe, higher satisfaction with one's toilet facility is associated with higher levels of facility functionality and consistent usage by family members (Pedi and Touch, 2010; Kema et al., 2012; Tumwebaze et al., 2013; Pedi et al., 2014; Jenkins et al., 2014).

Project outcomes

While we found cases of highly successful application, many country-level MBS projects failed to impact a large number of people. The five largest accounted for a disproportionate share (nearly 80 per cent) of the total outcome of MBS projects we identified, and nearly half benefited less than 50,000 people (i.e. ≤10,000 toilet sales). In fact, this pattern also applies to non-MBS supply projects (the four largest accounted for 81 per cent of total outcomes), and to the 53 UNICEF CATS country projects mentioned above, wherein the five largest accounted for 60 per cent of total outcomes (UNICEF, 2014). Thus, the highly skewed distribution of MBS project outcomes may partly reflect unobserved or intrinsic characteristics of development investment.

Length of intervention

'Large-scale' MBS projects were longer in duration than those that were not, with a higher proportion receiving funding for 7 years or more. Earlier work examining longer duration rural MBS projects shows a pattern of toilet sales beginning to accelerate 4 to 5 years after project initiation, with as much as 90 per cent of sales occurring after this point (USAID, 2018b). Together, these findings lend support for funding commitments for new MBS development grants of a minimum of 5 years, and plans for extension beyond that, to see large-scale market expansion outcomes from investments. This necessitates patience on the part of donors and implementers during the initial market design and testing phase, which routinely takes up to 2 years before getting the product, delivery, and sales marketing model sorted and ready for roll-out. Sales are likely to remain low throughout this testing and adaptation phase, followed by an initially gradual upward curve once roll-out begins.

These lessons are not new; Cairncross (1992) identified the need for longer grant funding cycles for MBS, beyond typical 2 to 3-year cycles, as an important lesson from the International Decade of Water and Sanitation. They appear to have been forgotten or overlooked, as evidenced in notably shorter recent grant funding cycles, declining to 3.8 years on average for MBS projects initiated in or after 2010 (see Table 2). Funders appear to consider MBS projects no differently from general WASH grants in terms of grant duration; there was no significant difference in average duration of MBS and non-MBS supply projects in our data set (5.1 years vs. 6 years overall; 3.8 years vs. 3.9 years since 2010). While MBS projects show accelerated growth in outcomes over time, a typical subsidy-reliant or NGO contract supply project is likely to produce outcomes at a more uniform rate.

Design and approach

Addressing all three factors in programming and in particular lack of appropriate toilet products and business models, were attributes of more successful MBS development (Table 3). However, although most large-scale MBS projects addressed

the financing factor (81 per cent), their strategies were focused almost exclusively on consumer needs; very few (20 per cent) tackled the limited financing options available to enterprises (Table 4) which can constrain sanitation markets from serving more low-income households.

Looking more closely for nine good practice strategies across large-scale MBS projects, we found only 5–6 being used, pointing to potential for improvement and better performance. For example, at a minimum MBS interventions should include the four core sanitation market development strategies at the heart of MBS practice (i.e. formative research for target market selection, product design improvements, delivery model design, and sales and marketing; see Table 1). Only 8 of the 20 large-scale MBS interventions did so, and none was in sub-Saharan Africa. Beyond these, few large-scale MBS projects worked to address the broader business environment (i.e. shaping market rules, developing the associated service or product ecosystem) and, as noted above, even fewer addressed enterprise finance.

Cost efficiency and leverage of MBS investments

MBS projects that have achieved large-scale outcomes have done so at comparable or lower programme cost, per person gaining access to basic sanitation, to CLTS-only and to other types of sanitation promotion interventions in South and Southeast Asia (see Supplemental Table S5 for cost efficiencies compiled from literature). There is, however, no discernible trend across sanitation project approaches in sub-Saharan Africa. For instance, several MBS projects with high outcomes in South and Southeast Asia have cost between $2.8 and $9 per person gaining basic access (USAID, 2018b). This compares with a range of $4.5 to $9.7 per person in South Asia across a large-scale DFID-funded sanitation promotion project and six Global Sanitation Fund (GSF) CLTS projects (Trémolet et al., 2015; White and Burr, 2016).

In sub-Saharan Africa, costs for two much lower outcome MBS projects ranged from $31.5 to $33.5 per person (USAID, 2018b). Wider ranges and higher costs per person gaining basic access in sub-Saharan Africa have also been observed among CLTS and other sanitation promotion projects (GSF CLTS: $4 to $37; DFID: $10.6 to $14). CLTS costs in Africa in another study ranged from $14.7 to $15.1 (Ethiopia) and $104.6 to $139.2 (Ghana) per person gaining basic access (Crocker et al., 2017). Subsidy-based supply interventions, of which some included MBS components or leveraged local markets, also show a small range of lower costs in South Asia ($1.7–$4.5) and South east Asia ($1.5–$10.8), and a wider range of higher costs in sub-Saharan Africa ($10.8–$43.4) (Cairncross, 1992; Kolsky et al., 2010; Trémolet et al., 2015; White and Burr, 2016).

When comparing investments across sanitation promotion approaches, ability to leverage household investment is an important consideration (Kolsky et al., 2010). MBS approaches do this by design, often at relatively high levels as we found in South Asia and South east Asia but at considerably lower levels in sub-Saharan Africa. Household investment leverage ratios for CLTS-only projects are even lower, ranging from 0.005 to 0.21 across 10 projects we found in sub-Saharan Africa (Trémolet et al., 2015; Crocker

et al., 2017). We were unable to find data for leverage ratios for CLTS-only projects in Asia. Leverage ratios for 10 subsidy-based projects in the literature ranged from 2.3 to 10.3 in South Asia; 1.2 to 19.9 in Southeast Asia; and 0.13 to 1.7 in sub-Saharan Africa (Cairncross, 1992; Kolsky et al., 2010; Murta et al., 2017). These estimates suggest large-scale MBS projects are more effective at unlocking investment from households than CLTS-only projects (based on evidence for sub-Saharan Africa), and equally effective as subsidy-based projects (based on evidence across all three regions).

Geographic differences in MBS outcomes

Average outcomes of MBS projects in Asia were 7–8 times higher than in sub-Saharan Africa. Programme costs per person gaining basic sanitation access in sub-Saharan Africa also appear to be 5–6 times higher (USAID, 2018b). Even after removing one outlier outcome, average outcomes in South and Southeast Asia were 2.3 times higher than in sub-Saharan Africa. Interestingly, project outcomes were significantly lower in Africa than in Asia among our set of non-MBS supply projects (by a similar ratio of 1 to 7–8) and among the 53 UNICEF CATS country projects (seven times higher outcome of people living in ODF communities in South Asia than in Africa) (UNICEF, 2014).

One contributing factor for underwhelming MBS project outcomes in sub-Saharan Africa as well as higher costs could be their shorter average duration. As noted above, MBS projects must develop locally relevant strategies and enterprise designs through an iterative trial and error process before sales can begin to accelerate, typically in and after year 4 (USAID, 2018b). Shorter project durations may be insufficient or non-conducive for iterative approaches, leading to less successful outcomes, or may be too short to see toilet sales accelerate. Another factor may be the general absence of sales and marketing strategies needed to convert potential customers into paying customers in sub-Saharan African MBS projects.

Lower performance and higher costs of implementation in sub-Saharan Africa, which not only affect MBS interventions (see above), may also reflect broader contextual differences from Asia, such as population density, cost of doing business (e.g. labour, capital), infrastructure (e.g. transport, electricity), and a less competitive business environment. These differences have been identified for higher costs in Africa than in Asia in studies comparing firm-level costs broadly across geographies (Iarossi, 2009), and specifically for sanitation businesses (WSP-IFC, 2013). The success or failure of MBS projects, particularly when implemented for the first time, will be influenced by such broader contextual factors (Jenkins and Pedi, 2013b; USAID, 2018b). Careful attention to contextual factors and far more operational research on MBS in Africa are warranted, as is better tracking of toilet sales growth and programme costs to understand reasons for these differences.

Limitations of the study

We limited our research to a list of WASH development project grants previously compiled by USAID WASHPaLS. Bilateral WASH funders (e.g. Danish International Development Agency, Agence Française de Développement, Swedish International

Development Cooperation Agency, Australian Department of Foreign Affairs and Trade, Japan International Cooperation Agency) were not explicitly searched, nor were other foundations or development banks. Thus, the number of MBS and household sanitation supply country projects and their cumulative outcomes are lower bounds on true numbers.

Our results on strategies, activities, and outcomes reflect the quality of publicly available information self-reported by grantees to funders. Availability and quality of public documentation on grant-funded sanitation projects was problematic. Tracking down project information and data to estimate outcomes was challenging and time-consuming, and sometimes impossible. Data were particularly difficult to access for projects other than those funded by the World Bank or DFID. Metrics and definitions used to measure and report outputs and outcomes across funders lacked consistency. Funders may have reported number of household toilets built, number of households reached, or number of individuals reached. Projects that integrated CLTS with MBS often only reported outcomes in terms of total number of toilets constructed without distinguishing between improved and unimproved facilities. Monitoring and tracking inconsistencies and data problems for comparing cost efficiency and effectiveness of sanitation grant-funding have been noted repeatedly (Trémolet et al., 2015; White and Burr, 2016; Venkataramanan et al., 2018).

Where no clear mention was made of a particular strategy, we did not count it as employed by the project. Conversely, sometimes project strategies and activities were described only in proposal materials, and may not reflect actual strategies used during implementation. We applied a uniform average household size of five members to convert household toilets sold or households gaining access, to a standard population level outcome, resulting in a small over- or under-estimation of the population benefiting for any specific project, but this is unbiased overall and does not affect our assessment of trends, patterns, and characteristics across projects.

The term 'large-scale' should be interpreted with caution; it simply reflects an arbitrary threshold applied to identify a set of positive deviants among identified MBS projects. Success or degree of scale achieved in a project with an output greater than 10,000 toilets or outcome exceeding 50,000 people depends on project context and country, and requires additional information to assess. For example, penetration, or the ratio of toilets purchased to households with a need, may be more appropriate to define success, and geographic spread, which takes into account coverage across more target communities and markets, may be better for evaluating scale. Few projects, however, report these metrics and attempting to assess either was beyond our resources.

Key findings and implications for policy and practice

1. MBS and non-MBS sanitation supply projects have reached similar levels of reported end-of-project outputs and outcomes; however, stakeholders must also consider sustainability and longer-term outcomes and impacts when comparing MBS and subsidy-driven supply approaches.

2. Few MBS projects achieved outcomes of significant scale, and most had underwhelming outcomes. While this was a pattern also observed among subsidy-driven supply and CLTS projects, we believe there is substantial room for improving MBS performance across regions through ensuring more good practice strategies are included in MBS intervention designs.

3. MBS interventions should be designed from the onset to address lack of appropriate toilet products and sanitation business models and ensure availability and viability of local entrepreneurs, in addition to consumer financing strategies for liquidity and affordability constraints. Project designs that addressed all three key factors for MBS programming in their proposal strategies and activities were significantly more likely to achieve scale than those that did not.

4. Financing for businesses, a critical factor identified in recent literature on sanitation market development, has rarely been included in MBS project strategies to-date. Developing and testing successful approaches for enterprise finance provision may be a missed opportunity for MBS development and could be the focus of operational research to inform programming.

5. While this study offers preliminary high-level guidance for stakeholders in the sector, more in-depth analyses of larger-scale MBS projects and longer-term evaluations of their impacts are needed to develop a comprehensive evidence base of implementation experience and outcomes to improve MBS project design, implementation, and performance. The desk review of MBS by the USAID WASHPaLS project (2018b) includes implementation research needs that could serve as a starting point towards this goal.

6. When funding and designing MBS projects in sub-Saharan Africa stakeholders should be cognizant that per capita implementation costs for rural projects in the region have been significantly higher than in Asia, and household investment leverage ratios considerably lower. Possible reasons range from insufficient project duration and absence of direct sales and marketing strategies to broader contextual factors such as lower population density and challenging business environment. There is a need to study drivers of lower outcomes and associated higher costs, and to identify strategies to reduce MBS unit costs in this region.

7. Further research of this nature would be aided by public release of more detailed project documentation and consistency in reporting metrics for outputs and outcomes, needed to measure, track, and compare effectiveness and cost efficiency across programmes, geographies, and approaches.

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Supplemental information

Table S1. Sources for the starting list of 1,253 WASH development project grants

Table S2. Information searched on various project categories

Table S3. List of MBS development projects

Table S4. Geographic distribution of projects and outcomes

Table S5. Cost efficiencies and leverage ratios of select MBS and non-MBS projects from the literature

Global assessment of grant-funded market-based sanitation development projects

Supplemental Material

Table S1. Sources for the starting data set of 1, 253 WASH development project grants

No.	Source	Type of database	Grants
1.	Bill & Melinda Gates Foundation (BMGF) Grants Database	Grant funder	374
2.	UK Department for International Development (DFID) Development Tracker	Grant funder	120
3.	United States Agency for International Development (USAID) Foreign Aid Explorer	Grant funder	170
4.	World Bank projects	Grant funder	271
5.	German Corporation for International Cooperation GmbH (GIZ) Project Data	Implementer	34
6.	Sanitation Marketing Community of Practice (www.sanitationmarketing.org)	Aggregator website	40
7.	Sustainable Sanitation Alliance: Sanitation Library (www.susana.org)	Aggregator website	188
8.	WASHFunders Funding Map (ex-BMGF) (www.washfunders.org)	Aggregator website	56
	Total		1,253

Table S2. Information sources for various project categories

No.	Project Category	Information parameters	Information sources reviewed	Dates when information was recorded
1.	Household sanitation supply development projects (N=103)	• Classification as MBS development project • Time period and duration of project • Population setting (i.e., rural and/or urban focus) • Funders • Implementer • Geographic area • MBS programming factor(s) addressed (i.e., entrepreneurship, finance, and business model and products) • Project outcomes (measured in terms of the number of people gaining access to toilets, attributable to the project over its lifetime)	For 'Classification as MBS development project': • First preference: Grant project descriptions on funder database, and grant project proposals • Second preference (where the above sources were unavailable): Grant project completion report, or most recent grant project progress report For all other parameters: • First preference: Grant project completion report, or most recent grant project progress report • Second preference (where the above sources were unavailable): Grant project proposal, project website material, or published article	On or before 1st October 2018
2.	Large scale MBS projects (N=27)	• MBS strategies used as part of the project	• Grant project proposal • Grant project completion report • Most recent grant project progress report • Project website material • Academic papers • Implementer's project advertising material	On or before 1st November 2018

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Table S3. List of MBS development projects

No.	Projects	Funder	Implementer	Country	Start year	End year	Source Database
1	Bangladesh – iDE	SDC, WSP, Humanitarian Foundation	iDE	Bangladesh	2011	2013	Sanitation Marketing CoP
2	BD Rural Water Supply and Sanitation Project	World Bank	Ministry of Local Government Rural Development and Cooperation	Bangladesh	2012	2016	World Bank
3	BRAC WASH	DGIS Netherlands, BMGF, DFID	BRAC	Bangladesh	2007	2020	DFID
4	Improving Water, Sanitation, and Hygiene	USAID	WASHPlus	Bangladesh	2012	2016	USAID
5	PHA (Programme d'Hygiene et Assainissement) Benin	DANIDA, Dutch Aid, GIZ	Directorate for Hygiene and Basic Sanitation	Benin	2005	2009	Sanitation Marketing CoP
6	Hands-Off Sanitation Marketing Program	USAID, World Bank, Global Sanitation Fund, AusAID, Ministry of Rural Development, ADB, The Stone Family Foundation	WaterSHED	Cambodia	2009	Ongoing	Sanitation Marketing CoP

No.	Projects	Funder	Implementer	Country	Start year	End year	Source Database
7	SaniShop, Cambodia	USAID, Lien Aid	World Toilet Organization	Cambodia	2009	2016	Washfunders
8	The Cambodia Sanitation Marketing Scale Up Project (SMSU)	BMGF, The Stone Family Foundation, World Bank, USAID, MSME Project	iDE	Cambodia	2009	2015	SuSanA
9	CM-Sanitation Project	World Bank	N/A	Cameroon	2011	2016	World Bank
10	Increasing Sustainable Access to Water Sanitation and Hygiene in the Democratic Republic of Congo	DFID	United Nations Children's Fund	Congo	2013	2016	DFID
11	Ethiopia – CRS	UNICEF, World Bank	iDE	Ethiopia	2012	2017	Sanitation Marketing CoP
12	Sustainable Sanitation and Hygiene for All (SSH4A), Ethiopia	DFID	SNV	Ethiopia	2014	2020	SuSanA
13	Market-based Sanitation solutions for compound housing	BMGF	WSUP	Ghana	2014	2016	SuSanA
14	OBA Urban Sanitation Facility for the Greater Accra Metropolitan Area (GAMA)	World Bank	PCU	Ghana	2015	2016	World Bank
15	Results Based Financing for Sanitation and Hygiene	World Bank	Ministry of Agriculture and Rural Development	Ghana	2013	2016	World Bank
16	Sustainable Sanitation and Hygiene for All (SSH4A), Ghana	DFID	SNV	Ghana	2014	2017	SuSanA

No.	Projects	Funder	Implementer	Country	Start year	End year	Source Database
17	Urban Sanitation Project in Peri-Urban areas of Kumansi, Ghana	BMGF, The Stone Family Foundation, Silicon Valley Foundation	Clean Team	Ghana	2010	2015	Sanitation Marketing CoP
18	Water Access, Sanitation & Hygiene for Urban Poor (WASH-UP)	USAID	CHF International	Ghana	2009	2012	USAID
19	EkoLakay (EcoSan model)	The Schmidt Family Foundation, BMGF	Sustainable Organic Integrated Livelihoods (SOIL)	Haiti	2011	2016	Washfunders
20	Delivery of Sustainable Sanitation Solutions to the Poor in India	Michael & Susan Dell Foundation	Movement for Alternatives and Youth Awareness	India	2012	2013	Washfunders
21	India – WaterAid	WaterAid	WaterAid	India	1995	1999	Sanitation Marketing CoP
22	Sanitation and Hygiene Initiative through Community Institutions of the Poor in Uttar Pradesh, India	BMGF	Rajiv Gandhi Charitable Trust	India	2012	2015	SuSanA
23	SHG Revolving Facility for Home Improvement (including toilets)	The Oak Foundation	Nav Bharat Jagriti Kendra	India	2005	2015	Washfunders
24	Supporting Sustainable Sanitation Improvements in Bihar through Supply-Side Strengthening (3SI)	BMGF	PSI	India	2012	2017	BMGF

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No.	Projects	Funder	Implementer	Country	Start year	End year	Source Database
25	Indonesia Water, Sanitation and Hygiene (IUWASH)	USAID	Development Alternatives Incorporated (DAI)	Indonesia	2011	2016	USAID
26	Total Sanitation and Sanitation Marketing (TSSM), Indonesia	BMGF, WSP	Government of Indonesia	Indonesia	2007	2010	Sanitation Marketing CoP
27	Selling sanitation: A Market Development Project for Household Sanitation in East Africa	BMGF	IFC, WSP	Kenya	2012	2014	SuSanA
28	Sustainable Sanitation and Hygiene for All (SSH4A), Kenya	DFID	SNV	Kenya	2014	2020	SuSanA
29	Up-Scaling Basic Sanitation for the Urban Poor in Kenya (UBSUP)	BMGF	Water Services Trust Fund	Kenya	2011	2016	BMGF
30	Lesotho - Urban Sanitation Improvement Team (USIT)	UNDP, World Bank, DFID, KfW	ACCESSanitation	Lesotho	1980	2002	Sanitation Marketing CoP
31	Loowatt	BMGF	Loowatt	Madagascar	2012	Ongoing	SuSanA
32	Rural Water Supply and Sanitation Pilot Project	World Bank	Ministry of Energy and Mines	Madagascar	1997	2005	World Bank
33	The USAID / Madagascar Water Supply, Sanitation and Hygiene Bilateral Projects: Rano Hp et Ranon'ala	USAID	Catholic Relief Services	Madagascar	2009	2013	USAID
34	Water For People (Everyone Forever)- Malawi or Sanitation as a Business (SAAB)- Malawi	Autodesk, Coca-Cola, The Stone Family Foundation, BMGF	Water for People	Malawi	2010	Ongoing	Sanitation Marketing CoP

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No.	Projects	Funder	Implementer	Country	Start year	End year	Source Database
35	CLTS + Sanitation Marketing	USAID	WASHPlus	Mali	2012	2016	USAID
36	Sustainable Sanitation and Hygiene for All (SSH4A), Mozambique	DFID	SNV	Mozambique	2014	2017	SuSanA
37	Nepal – IDE	UNICEF	iDE	Nepal	2011	2013	Sanitation Marketing CoP
38	Rural Water Supply and Sanitation Project	World Bank	Rural Water Supply and Sanitation Fund	Nepal	1996	2003	World Bank
39	Sustainable Sanitation and Hygiene for All (SSH4A), Nepal	DFID	SNV	Nepal	2014	2017	SuSanA
40	Creating Sanitation Markets Initiative	USAID	WSP	Peru	2007	2010	Sanitation Marketing CoP
41	Mtumba Sanitation and Hygiene Participatory Approach	The Stone Family Foundation	WaterAid	Tanzania	2008	2011	Washfunders
42	Rural Water Supply and Sanitation Project	World Bank	Ministry of Water and Livestock	Tanzania	2002	2008	World Bank
43	Rural Water Supply Programme in Tanzania	DFID	Ministry of Health and Social Welfare, Government of Tanzania	Tanzania	2012	2016	DFID
44	Sustainable Sanitation and Hygiene for All (SSH4A), Tanzania	DFID	SNV	Tanzania	2014	2020	SuSanA
45	Total Sanitation and Sanitation Marketing (TSSM) Tanzania	BMGF, WSP	Government of Tanzania	Tanzania	2008	2011	Sanitation Marketing CoP

No.	Projects	Funder	Implementer	Country	Start year	End year	Source Database
46	Sustainable Sanitation and Hygiene for All (SSH4A), Uganda	DFID	SNV	Uganda	2014	2020	SuSanA
47	Water for People- Uganda or Sanitation as a Business (SAAB)- Uganda	BMGF	Water for People	Uganda	2008	Ongoing	BMGF
48	Vietnam – iDE	World Bank	iDE	Vietnam	2003	2018	Sanitation Marketing CoP
49	Sustainable Sanitation and Hygiene for All (SSH4A), Zambia	DFID	SNV	Zambia	2014	2020	SuSanA

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Table S4. Geographic distribution of projects and outcomes for population gaining access to basic sanitation

Region	MBS projects		Non-MBS projects		All projects	
	Number of projects	Total outcome	Number of projects	Total outcome	Number of projects	Project outcome
Sub-Saharan Africa	29 (59%)	4.9 million (17.9%)	21 (39%)	3.1 million (13%)	50 (49%)	8.0 million (15%)
South Asia	12 (24%)	19 million (68.9%)	14 (26%)	19.6 million (80%)	26 (25%)	38.6 million (74%)
Southeast Asia	6 (12%)	3.6 million (13%)	7 (13%)	0.74 million (3%)	13 (13%)	4.3 million (8%)
Latin America	2 (4%)	0.05 million (0.2%)	10 (19%)	0.65 million (3%)	12 (12%)	0.7 million (1%)
Other	-	-	2 (4%)	0.37 million (2%)	2 (2%)	0.37 million (1%)
Total	49	27.6 million (100%)	54	24.4 million (100%)	103	52 million (100%)

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Table S5. Cost efficiencies and leverage ratios for household contributions of select MBS and non-MBS projects from the literature.

Project	Approach	Program cost per person gaining access to basic sanitation facility (USD)	Program cost per household constructing / purchasing a basic toilet (USD)	Household contribution / Cost per toilet (USD)	Leverage Ratio	Data Sources for Program costs, Household contribution
Supporting Sustainable Sanitation Improvement (3Si), India	MBS	9.0	45.0[1]	225	5	(PSI India, 2017) (USAID, 2018)
Sanitation Marketing Scale Up (SMSU) Project, Cambodia	MBS	8.5	42.3[1]	321	7.64	(Wei, et al., 2014) (USAID, 2018)
Hands-off Sanitation Marketing Program, Cambodia	MBS	4.3	21.5[1]	283	13.48	(Pedi, et al., 2014) (USAID, 2018)
Total Sanitation and Sanitation Marketing (TSSM), Indonesia	MBS	2.8	13.8[1]	–	–	(USAID, 2018)
Rural Water Supply and Sanitation Project, Nepal	MBS	4.4	22.1[1]	–	–	(USAID, 2018)
Total Sanitation and Sanitation Marketing (TSSM), Tanzania	MBS	–	167.6[1]	7.51	0.04	(Peletz, et al., 2017) (USAID, 2018)
Results Based Financing for Sanitation and Hygiene, Ghana	MBS	–	157.7[1]	150	0.95	(SNV, 2011) (USAID, 2018)
SHEWA-B, Bangladesh	BCC[2], Subsidy	4.50	–	10.90 per person	2.4	(OPM, 2015)
PRONASAR, Mozambique	CLTS	14.00	–	0.07 per person	0.01	(OPM, 2015)
ZSHP, Zambia	CLTS, MBS	3.40	–	5 – 13 per person	1.5 – 3.8	(OPM, 2015)
DISHARI, Bangladesh	CLTS, Subsidy	–	–	–	2.27	(WSP, 2010)
PRAGUAS, Ecuador	Subsidy	–	–	–	0.18	(WSP, 2010)
Total Sanitation Campaign (TSC), India	CLTS, Subsidy	–	–	–	10.3	(WSP, 2010)
PAQPUD, Senegal	CLTS, Subsidy	–	–	–	0.87	(WSP, 2010)
Improved Latrines Program (PLM), Mozambique	CLTS, Subsidy	–	–	–	0.13	(WSP, 2010)
Sanitation Revolving Funds, Vietnam	Subsidy	–	–	–	19.92	(WSP, 2010)

Unnamed project, Zimbabwe	BCC[2], Subsidy	–	37.20 (1988 USD)	63.20 (1988 USD)	1.7	(Cairncross, 1992)
Unnamed project, Philippines	BCC[2], Subsidy	–	26 (1988 USD)	30 (1988 USD)	1.15	(Cairncross, 1992)
Testing CLTS Approaches for Scalability[3] – Health Extension Worker-led, Ethiopia	CLTS	–	91.48[3a]	3.14[3b]	0.03	(Crocker, et al., 2017)
Testing CLTS Approaches for Scalability[3] – Teacher-led, Ethiopia	CLTS	–	83.24[3a]	1.53[3b]	0.02	(Crocker, et al., 2017)
Testing CLTS Approaches for Scalability[3] – NGO-led, Ghana	CLTS	–	433.43[3a]	84.00[3b]	0.19	(Crocker, et al., 2017)
Testing CLTS Approaches for Scalability[3] – NGO with Natural Leader training, Ghana	CLTS	–	543.73[3a]	115.40[3b]	0.21	(Crocker, et al., 2017)

Notes:

1. Program costs sourced from USAID 2018
2. BCC: Behavior Change Communication
3. Testing CLTS Approaches for Scalability in Ethiopia and Ghana
   a. Program cost per household constructing a basic (assumed) toilet = Program cost per household targeted / % Share of households targeted constructing a basic (assumed) latrine (see source document for program-level data, definitions, and descriptions for these parameters)
   b. Household contribution = [Cost of hired labor per household targeted + Cost of purchased hardware per household targeted] / Share of households targeted constructing a basic (assumed) latrine (see source document for program-level data, definitions, and descriptions for these parameters)

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