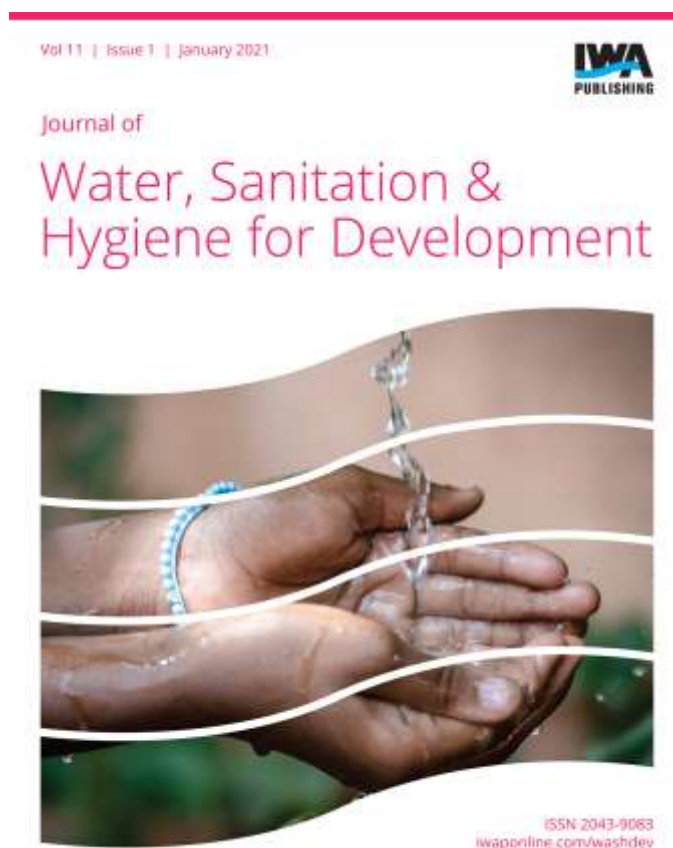


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Research Paper

Modelling behavioural change from sea-based 'helicopter latrines' to land-based shared improved latrines in the Demaan, Jepara, Indonesia

S. Sunarti, Muhammad Helmi, Retno Widjajanti and Annisa Amellia Purwanto

ABSTRACT

The government of Indonesia pursued a slum-upgrading programme from 2011 to 2018 which included replacing 'helicopter latrines' with shared improved latrines. However, these latrines have not been fully utilised by slum dwellers yet. This study aimed to construct a model of behaviour change to urge people to switch from using helicopter latrines to using shared improved latrines through the process of community empowerment. A qualitative research method was conducted. Purposive and snowball sampling techniques were deployed to select study participants. Data were collected through interviews and focus group discussions. The results showed that the challenge in improving communities' sanitation behaviour can be answered with a bottom-up approach that integrates tangible and intangible elements. These elements have the dimensions of form, meaning and activity. Form is a tangible element namely shared improved latrine building that is physically acceptable to the community. Meaning and activity are intangible elements. Meaning involves the cognitive aspects to create a sense of ownership and action from affective aspects involves the activity of using the latrines. To improve the sanitation conditions, governments should involve the community in every activity, empower the community through education campaigns, and conduct supervision until the community can be independent.

Key words | behaviour setting, community empowerment, sanitation, slums, sustainable behaviour

HIGHLIGHTS

- This study contributes to knowledge about implementing community empowerment by changing the sanitation behaviour of each individual.
- A bottom-up approach that integrates form, meaning, and activity can be used to address the challenges of changing sanitation behaviour.
- Sanitation in slums must be addressed by considering the character of the community as users and the character of the environment.

INTRODUCTION

The large numbers of people living in and moving to urban areas in developing countries contribute to the establishment of large and rapidly developing informal urban

settlements often referred to as slums (Fink *et al.* 2014). UN Habitat (2006) defined a slum household as a group of individuals living under the same roof in urban areas with

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certain deficits including uninhabitable houses, lack of living space, no security of tenure and restricted access to safe water and adequate sanitation. The problem of slums is a crucial one that becomes a challenge for governments in those developing countries (Sunarti *et al.* 2018). The characteristic that is most often mentioned in the definitions of a slum is the lack of basic services, including access to sanitation facilities and safe water (UN Habitat 2010). The sanitation aspect is a major challenge in handling slums (Isunju *et al.* 2011). An inadequate water supply and poor sanitation, drainage and garbage collection in dense settlements can increase the prevalence of various diseases, such as diarrhoea, typhoid, hookworm infection, and cholera (Ezeh *et al.* 2017; Katukiza *et al.* 2012).

Research on sanitation in slum areas has mostly examined the social, economic, psychological, environmental, and technological aspects of public health (Wegelin-Schuringa & Kodo 1997; Burra *et al.* 2003; Avannavar & Mani 2007; Isunju *et al.* 2011; Katukiza *et al.* 2012; Ezeh *et al.* 2017). Other research has considered handling sanitation in the planning, development, and post-implementation stages in a way that includes community participation and empowerment, cooperation, and partnerships between government, the private sector and the community, and a consideration of gender roles in sanitation use (McFarlane 2008; Roma *et al.* 2010). Previous studies have shown that sanitation is a particularly crucial aspect of slums that must be addressed for a sustainable healthy environment to be achieved. At the global stage, sanitation and safe water are one of the concerns in the UN's Sustainable Development Goals which embedded in Goal number 6: 'Ensure access to water and sanitation for all' (United Nations 2015, p. 18), and target number 6.2: 'By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations' (United Nations 2015, p. 22).

Among the many challenges to handling sanitation in slum areas is the issue of changing the behaviour of the community about using improved sanitation facilities. There has been a great deal of research about changing community behaviour, such as switching from open defecating to using improved sanitation services. These behaviour changes are related to motivation, attitude, norms, abilities, regulations, economic value, accessible locations, institutions in society,

and the role of government (Devine 2009; Roma *et al.* 2010; Schouten & Mathenge 2010; Mosler & Contzen 2016). Meanwhile, other researchers have examined the factors that can change people's behaviour using the EAST approach (Easy, Attractive, Social, Timely) to persuade the community to adopt such changes (Service *et al.* 2014).

The challenges related to handling the sanitation in slums also occur in Indonesia. The Indonesian Government's efforts in handling slum areas are contained in the 100-0-100 programme, which states that by 2019, 100% access to sanitation should be reached, with 0% slum areas and 100% access to drinking water. The Demaan Urban-Village of Jepara Regency, at the northern tip of the Central Java Province, is a coastal area that has received a slum-upgrading programme from the government. It comprises RT 01-03 RW 04 and RT 03 RW 04 RT. (RT is the division of territory equal to a neighbourhood unit, and RW is the division equal to a hamlet.) Various slum-upgrading programmes have been provided between 2011 and 2018, including the provision of improved sanitation facilities to replace the 'helicopter latrines' which many residents use. Helicopter latrine is the Indonesian term for unimproved hanging latrines, which are built above the sea or other bodies of water and do not have toilet bowls. Thus, urine and excreta are not separated from human contact. Many people build and use helicopter latrines because of their limited financial capacity and the limited land available. This condition damages marine biota and fosters an unhealthy and unfeasible environment.

The World Health Organization and United Nations Children's Joint Monitoring Programme (JMP) have defined improved sanitation facilities shared with other households as limited sanitation service (World Health Organization & UNICEF 2017). They are also called shared improved sanitation (Shiras *et al.* 2018). To avert problems with sanitation, the Indonesian Government-built shared improved sanitation facilities and dismantled the helicopter latrines. This meant that the community had to change its behaviour from defecating above the sea to using the shared improved latrines or individual household toilets provided. However, it is not easy for people to change their behaviour quickly. The many challenges include adjusting their character. There are still people who are reluctant to use the shared improved latrines.

Previous research about changing behaviour from using unimproved latrines to using shared or non-shared improved latrines has focused on social, economic, and psychological health (Wegelin-Schuringa & Kodo 1997; McFarlane 2008; Devine 2009; Roma *et al.* 2010; Schouten & Mathenge 2010; Service *et al.* 2014). Unlike those studies, however, this study examines behaviour changes that focus on the user (the humans) and their environment. The user has a certain character that is abstract (intangible), and the environment, in this case, is the toilet building which is a physical object. Techniques to change individual behaviour are influenced by the interaction between the tangible toilet building and the intangible internal character of the individual. In using shared improved latrines, there are several obstacles related to the interaction of the two elements. One of them is that users often have limited knowledge and experience. This requires empowerment and intervention that involve various stakeholders. Based on the gaps in previous research and problems in the field, the purpose of this study was to construct a model of behaviour change to urge people to switch from using helicopter latrines to using shared improved latrines through the process of community empowerment.

METHODS

Study design

This study used a qualitative method to explore data from the field. Literature has a function as a research proposition, and it is only borrowed for guidance in the field, which can be further explored. The research strategy used is a case study with a single-case design type because it is a case that can be generalised to other situations that have almost the same character (Yin 2009). The analysis technique is a thematic analysis of data from interviews, observations, and documents that produce units of information (Lapadat 2010; Guest *et al.* 2012). The information unit in this study produces certain aspects according to the interpretations and insights that have been obtained. In the next stage, the units of information are then classified into certain themes contextually according to the substance of the research. Then, because of the single-case design of

this research, the identified themes are matched with research propositions or other literature to meet the research objectives.

Study site

This study was conducted in Demaan which is in the Jepara District of the Jepara Regency, precisely within the urban areas of the coastal region. Demaan is divided into 7 RWs and 22 RTs. These areas vary from slum conditions to neat settlements. Four RTs were the research locations for this study. They were RT 01 RW 04 (referred to as area #1), RT 02 RW 04 (referred to as area #2), RT 03 RW 04 (referred to as area #3) and RT 03 RW 03 (referred to as area #4). The research locations had a total area of 10.11 hectares, and they included slum settlement conditions, high building density, a high population density of 166 people/ha, uninhabitable houses, and limited economic conditions.

Prior to the government's slum-upgrading programmes, the research locations had various problems, including unimproved sanitation facilities. Most of the inhabitants defecated and urinated in the sea. The communities built emergency latrines, commonly called 'helicopter latrines', which do not require specific skills. The community collected 50,000 Indonesian Rupiah (IDR) per household from 20 households because building one helicopter latrine usually required funds of 1 million Rupiah. During the upgrading programme, the government improved sanitary conditions in the study area by building shared improved latrines – individual household toilets – and dismantled the helicopter latrines. With those conditions, people's behaviour in terms of sanitation has also changed from using sea-based helicopter latrines to using the land-based shared improved latrines/individual household toilets.

Data collection and sampling

This study used primary and secondary data. The primary data were obtained through field observations, one focus group discussion (FGD) with other stakeholders and in-depth interviews. Field observations were carried out to determine the physical condition of the sanitation facilities including both the shared improved latrines and the helicopter latrines, along with details such as the shape of the

building, materials, the sizes and type(s) of toilet used, and sources of water. Field observation was conducted in two stages, namely in 2018 and 2019. In 2019, observations and FGD were conducted to confirm the results of observations in 2018. The FGD was held on 17 June 2019. The determination of FGD participants was done by using purposive sampling. The FGD participants were the person who accompanied the community and became the intermediary for the government in carrying out the programme and the person from an agency that carried out the upgrading programme at the research location. Based on these criteria, there were 17 participants, consisting of people from government agencies and facilitators. The FGD was conducted by inquiring about and discussing the types of upgrading programmes, programme implementation, and the conditions before and after the upgrading programme in Demaan regarding sanitation. Moreover, an in-depth interview of community members was conducted using a snowball sampling method and a semi-structured format. The purpose of the interviews was to collect information on changes in community behaviour after the switch from the helicopter latrines to the shared improved latrines, along with the community's constraints and preferences for sanitation, also the maintenance of shared improved latrines at the research location. The 14 interview participants were people living near shared improved latrines and people living around the shore line. Thus, there were a total of 31 participants in the FGD and community interview.

Secondary data were obtained from the district office and facilitators, a community self-reliance agency, the Health Department, and the Housing and Settlement Department. These secondary data were used to verify data from the interviews with the resource person. In examining the validity of the data, data from community interviews were crosschecked with FGD data with facilitators and government agencies, along with data from field observations and secondary data.

The results of the interviews and FGD were grouped using the following code:

a.../b.../c.../d...

where:

a: data collection technique (I = interview, F = FGD)

- b: informants' classification (R = resident; FC = facilitator; CL = community leader; GA = government agency)
- c: institution (N = no institution; HS = Housing and Settlement Department of Jepara; DO = Demaan Urban-Village Office; PW = Public Works and Spatial Planning Agency of Jepara; JO = Jepara Sub-District Office; DH = Department of Health; DS = Department of Social and Community and Village Empowerment; SA = self-reliance agency)
- d: number of the informant.

For instance, F/GA/HS/2 means that this information was obtained through the FGD, the person was from a government agency, namely the Housing and Settlement Department of Jepara, and he is the second informant from that institution.

Data analysis

The analytical technique used was a thematic analysis. It involved grouping the data according to the research theme, to find the phenomena that occurred in the field. The thematic analysis was done by grouping words that often appeared from the interview and FGD results to become units of information which were then classified into contextual themes. In addition, a qualitative descriptive analysis was carried out to better explain the data that was grouped thematically. The next step was to match the research themes with research propositions and literature on people's behaviour and community empowerment to produce models of the changes of behaviour from using helicopter latrines to shared improved latrines. Figure 1 presents the framework and the process to produce the themes in this study.

RESULTS AND DISCUSSION

Sanitary condition in Demaan before and after the slum-upgrading programme

Before upgrading the programme, there were 10 helicopter latrines in areas #1, #2, and #3, which ran along the shoreline. A helicopter latrine is commonly made from wood/bamboo. It is located over the water, which is about 2–5 m

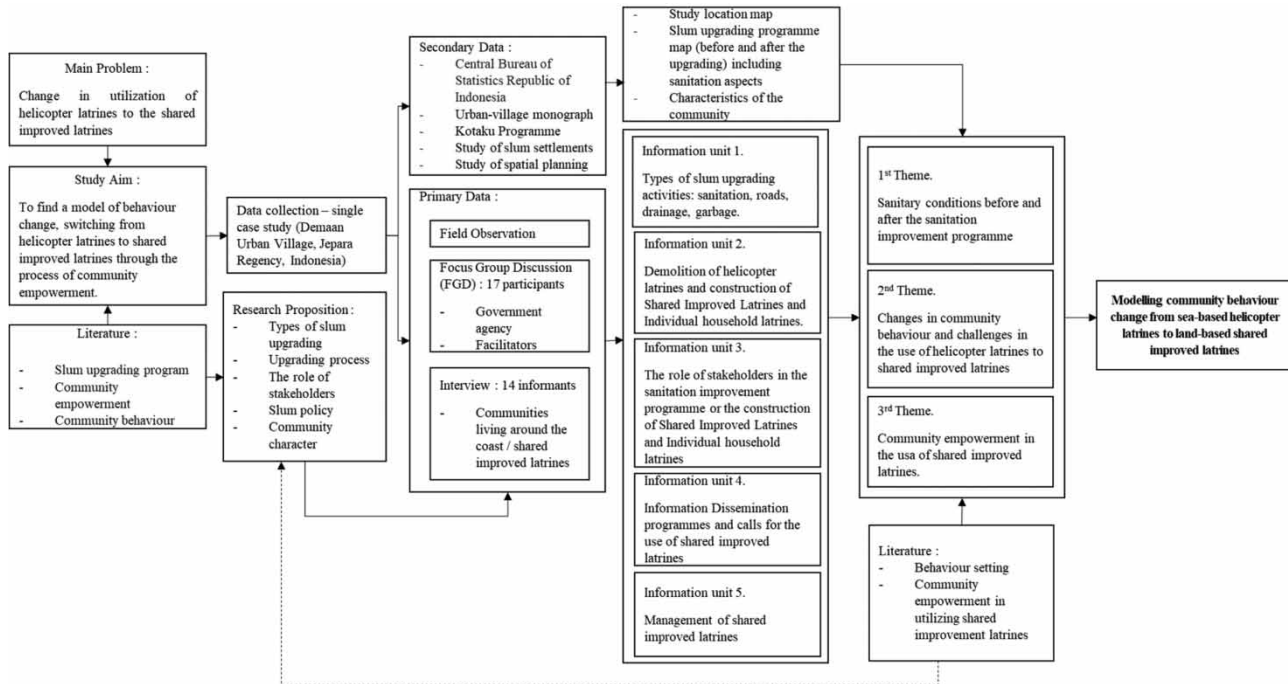


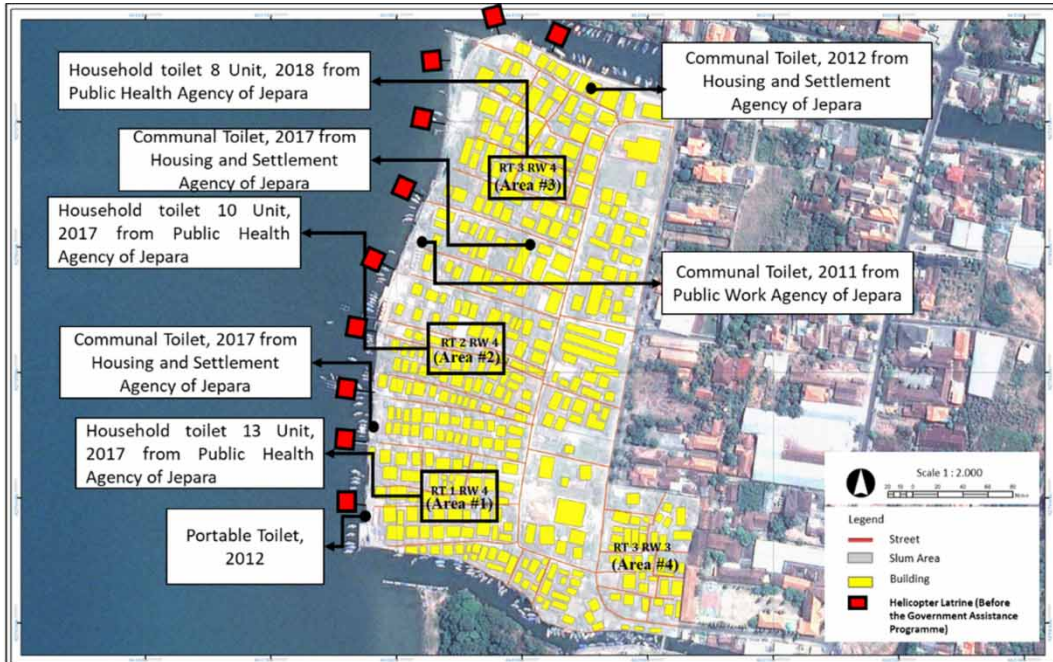
Figure 1 | Research framework.

from the shoreline. Therefore, the community builds a bridge made of bamboo/wood to connect the shoreline and the helicopter latrine. The helicopter latrine usually has one or two toilet cubicles with an area of 1 m² for each cubicle. It also has no roof, no toilet bowl, and no safe water source inside. As a substitute for the toilet bowl, in the middle of latrine cubicle, a hole leads to the sea as a place for defecation.

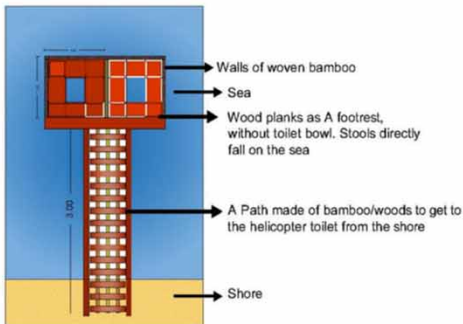
Started in 2011, the government helped with the construction of a shared improved latrine with eight toilet cubicles in area #3. In 2012, two shared improved latrines were built: a portable toilet in area #1 and a shared improved latrine of the floating market in area #3, each of them had three toilet cubicles. Then, in 2017, two more shared improved latrines were built: one in area #1 with six toilet cubicles, and the other one in area #3 with eight cubicles. Beside the shared improved latrines, in 2017–2018, the government provided building materials for the construction of individual household toilets in as many as 13 households in area #1, 10 households in area #2, and 8 households in area #3. Along with the construction and availability of improved sanitation facilities, the government

dismantled the helicopter latrines. The last one in area #3 was collapsed by a wave in 2019. The distribution of helicopter latrines, shared improved latrines, and household toilets before and after the government assistance programme can be seen in Figure 2.

Improving the quality of latrines in Demaan was started by a self-help agency that identified community needs, one of which was the need for improved sanitation facilities. The improved sanitation facilities from the government programme were in the form of improved shared latrines. The construction was done in two ways: (1) independently by the community which was supervised by supervisors and consultants from the government and (2) construction by third parties appointed by the regional government. The sanitation assistance programme in Demaan used a semi-top-down process in which the programme is based on community needs, but the implementation does not involve the community very much. In the implementation and maintenance of the shared improved latrines, a community empowerment approach was adopted where the community had the role of maintaining the cleanliness and sustainability of the shared improved latrines. To provide this



Helicopter Latrines (Before the Government Assistance Programme)

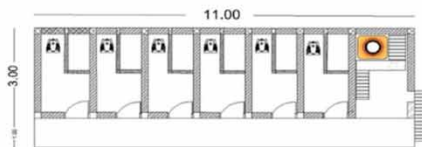


Blueprint



Real-Life Photo

Communal Toilets (After the Government Assistance Programme)



Blueprint



Real-Life Photo

Figure 2 | Spatial distribution of helicopter latrines, shared improved latrines, and household toilets before and after the government assistance programme.

maintenance, the communities formed a community institution, which is usually managed by residents who live close to the shared improved latrine.

Besides providing physical programmes in the form of building shared improved latrines and individual household toilets, the government also provided programmes to encourage changes in community sanitation behaviour. These programmes included disseminating information to the community and providing visual invitations in the form of a banner and written regulations. To change people's behaviour, the government collaborated with Babinsa (Bintara Pembina Desa – a non-commissioned law enforcement officer posted in villages and wards and affiliated with the civilian administration) and Bhabinkamtibmas (Bhayangkara Pembina Keamanan dan Ketertiban Masyarakat – members of the Indonesian National Police who fostered public security and orderliness) to supervise the public, so they did not return to using unimproved latrines. If there were violations, the people were given a verbal warning from the supervisor and/or a written report was given to the regional government.

Changes in community behaviour and challenges from using 'helicopter latrines' to using land-based shared improved latrines

Prior to the government programme, the limited availability of improved sanitation facilities naturally shaped people's behaviour to meet their needs based on their capabilities. With their economic limitations, the community could build only helicopter latrines. Because helicopter latrines were the only option available to meet their needs, the habit of defecating above the sea became the norm. After the local government implemented a sanitation improvement programme, there were physical changes in the locations, conditions, and building construction of the sanitation facilities in Demaan. *Katukiza et al. (2012)* stated that the lack of legal ownership of the land is one obstacle to increasing the sanitation level in a slum. This statement was true for the research location; in choosing the locations for the shared improved latrines, the government considered the land availability and legality in Demaan as stated by the following informant:

In implementing the construction of sanitation facilities, there are still constraints on the available land for sanitation facility development – F/GA/HS/1

Thus, the upgrading of the sanitation facilities took the form of relocation from illegal helicopter latrines above the sea to legal shared improved latrines on the land in the residential area. When compared with the sanitation ladder from the JMP (*World Health Organization & UNICEF 2017*), the level above shared improved latrines (limited sanitation service) is basic sanitation service. Basic sanitation service is defined as improved sanitation facilities that are not shared with other households. According to the community, they prefer sanitation facilities in the form of individual household toilets, as revealed by the following informants:

Residents want the government to provide assistance for the construction of private toilets where residents will seek additional money if assistance is not met in building private toilets – I/R/N/2

However, because of limited land and legality in the study area, the government could not increase the sanitation level to the basic sanitation level for the entire area. Not only was the form of sanitation facilities not in accordance with the community's needs, but the limited availability of land meant that the locations of the new latrines were often not in accordance with the community's needs either. Changes that are not in accordance with the needs of the community force them as users to take actions that they have not yet become used to. Some aspects of that experience changed and their impacts can be seen in *Table 1*.

Table 1 shows that physical change such as creating new spaces (shared improved latrines) has an impact on the environment, safety, and even the behaviour of the community. Changes in community behaviour show that the community adapted to improvements in sanitation facilities. To achieve the goal of creating healthy living behaviours in Demaan, community commitment to behaviour change is needed. However, changes in community behaviour are not easy to achieve, and there are still many challenges to solve. As stated by *Young (1993)*, techniques for changing people's behaviour are influenced by environmental factors that are often tangible and internal factors from individuals

Table 1 | Differences between helicopter latrines and shared improved latrines

No.	Aspect	Difference Helicopter latrines	Shared improved latrines	Impact
1.	Location	Located above the sea, 2–5 m from the shoreline and parallel to the alleyway of settlement	On land, around residential areas	<ul style="list-style-type: none"> • Reduce the pollution to the marine biota (stools are stored in the septic tank). • Reduce the risk of falling into the sea. • Reduce the risk of collapse from wave damage.
2.	Building condition	<ul style="list-style-type: none"> • Not permanent • Without toilet bowl and roof • Made from wood/bamboo • Comprise one or two toilet cubicles (1 m² per cubicle) 	<ul style="list-style-type: none"> • Permanent • Brick walls • Closet bowl • Roof of tile or asbestos • Galvalume doors • Ceramic floors 	<ul style="list-style-type: none"> • The closed room makes defecation more private and convenient.
3.	Water source	No water source	Water from water supply company or wells	<ul style="list-style-type: none"> • People can immediately clean themselves at the location without having to carry water from home or clean themselves at home. • Previously, stools fell directly into the sea, but in the shared improved latrines, the community requires action to flush the toilet.
4.	Sources of construction financing	Community self-help, redevelopment when buildings were hit by waves, each family contributing IDR 50 000	Government programme	<ul style="list-style-type: none"> • Communities no longer collect money to build helicopter latrines. • Carried out by third parties, communities do not participate directly in the construction.
5.	Maintenance	There is no specific treatment	Self-managed by the community. Residents' contributions are used for cleanliness, maintenance, and meeting water needs.	<ul style="list-style-type: none"> • Requires active community involvement to achieve sustainable use of shared improved latrines. • Problems often arise among residents regarding responsibilities for maintenance. • Improperly managed shared improved latrine could lead to environmental pollution.

or communities themselves that are intangible. Moreover, Wynveen (2017) observed that pro-environment behaviour results from a chain of cause and effect from values, attitudes, beliefs, and norms.

In the case of the Demaan, sanitation improvement in the form of providing improved sanitation latrines, socialisation, and supervision of the community were the government's ways to change people's behaviour from using unimproved latrines. However, there were problems

from factors related to both individuals and groups in the community. Most of these factors were intangible, so they could create bottlenecks in realising consistent changes in people's sanitation behaviour to create healthy living behaviours. Some residents still refused to use shared improved latrines for various reasons. One reason was people's habit of using helicopter latrines, where they could look at the sky and chat with neighbours, as stated by the following informants:

Many complaints from residents who used to use helicopter latrines then moved to use communal toilets included feeling that only a limited view could be seen. In the previous behaviour, users felt they could freely see the scenery around the beach. However, when using closed communal toilets, users feel limited in seeing the scenery – F/GA/HS/2

This can no longer be done in shared improved latrines. The room is closed and quieter; this makes defecation difficult for the community. In terms of dignity, the closed space is a positive attribute of shared improved latrines. Apparently, for a community that is accustomed to using open structure helicopter latrines, this attribute becomes a negative attribute for shared improved latrines. This finding is in accordance with the statement from Devine (2009) that defecating in the open offers an opportunity for socialisation. Under these conditions, any intervention must consider the perceived trade-offs for individuals when adopting more hygienic practices.

People's reluctance to use shared improved latrines was also caused by the problem of water availability, as revealed by the following informants:

There are several obstacles in the use of public toilets, one of which is the availability of water. Like public toilets in RT 01 RW 04, the water is salt water – F/FC/SA/1

This finding is consistent with the statement by Alam *et al.* (2016) that water limitations are a significant barrier in maintaining toilet hygiene, and they make the community unable to flush toilets adequately. Although technically there is a source of water in each shared improved latrine, in practice, water was not always available because of water shortages. These shortages were caused either by damage to the well's pump or from limited flow from the water supply company. The lack of water availability means that the community must exert almost the same effort as using helicopter latrines namely need to bring water from home. Even when they used helicopter latrines, people did not have to bring water to flush the toilets and they could clean themselves at home. This finding supports the statement of Hulland *et al.* (2015) that the burden of collecting

and carrying water to the place of defecating or urinating is very problematic, especially for women. On the other hand, this condition is in contrast to findings by Sinha *et al.* (2017) that easy access to water may not be a predictor of individual latrine use. In the case of Demaan, water may not be the major determinant of shared improved latrines use, but it did affect the community's willingness to use shared improved latrines.

The shortage of water was also connected to the maintenance of the shared improved latrines. Because of the scarcity of water, residents were reluctant to contribute funds for maintaining the latrines. There were also maintenance problems from people's low awareness. Shared improved latrines are not guarded by officers every day; hence, many people use them without paying dues. This has resulted in a lack of funds for maintenance, which affects the ability of the agencies that manage the shared improved latrines to function, and consequently, the conditions at the shared improved latrines become worrisome. When the shared toilets are unclean and poorly maintained, the facilities can be underused or abandoned, which encourage open defecation (Alam *et al.* 2017). In this regard, Sonego & Mosler (2014) observed that interventions that focus on commitment, self-efficacy, and satisfaction with clean latrines are recommended to encourage keeping them clean. Therefore, one challenge that arose in changing people's behaviour in the study location was how to foster the community's self-management commitment.

According to Katukiza *et al.* (2012), community-based sanitation facilities have three general attributes: the willingness of the community to pay for them, a high level of community involvement, and whether the facilities are in accordance with the local situation of slums. From that description, it can be seen that in the case of Demaan, the sanitation facilities did not meet those three attributes. The local government did not explore the capacity and willingness of the community to help finance the new latrines. The level of community involvement continued to be low, as the design was prepared by the government and the construction was done by a third party. Last, the programme to improve sanitation through shared improved latrines was not yet in accordance with what the community needed. Since the three general attributes of community-based sanitation facilities were not fulfilled, the community eventually

found the sanitation improvement programme difficult to accept. As a result, some in the community did not use the shared improved latrines, which undermines the economic and social benefits of the programme.

Slightly different from *Katukiza et al. (2012)*, *Dickin et al. (2017)* stated that besides the willingness to pay as one factor driving individual sanitation use, there were other factors, such as convenience, status, privacy, and dignity. Observed from the factors of privacy and convenience, the actual form of shared improved latrine building protected the privacy of its users better than helicopter latrines. Considering convenience, shared improved latrine buildings were stronger and more protected from the weather than helicopter latrines, so that residents could be more comfortable using them. However, in the study area, as stated above, the people were accustomed to using helicopter latrines; therefore, they had not yet grown comfortable using the shared improved latrines and they need time to adapt. The privacy factor is an option for people who have not used helicopter latrines because some residents already know the ethics and benefits of using land-based closed toilets. Considering the factor of status afforded by the new latrines, as stated above, the community preferred to use individual household toilets than shared improved latrines. However, because of limited land and funds, that desire could not be accommodated. The status factor is related to rights and obligations. With shared improved latrines, the rights and obligations of joint property are limited and require high maintenance, whereas if privately owned toilets are used, the community can freely use and maintain them. Furthermore, concerning the use of shared improved latrines, the dignity factor was related to the position, self-esteem, and emotions of people as they interacted with those from other communities. The people in the studied area had suppressed their shame in using open sanitary facilities due to the limitations of the improved sanitation facilities. Therefore, they feel accustomed and were not embarrassed anymore. This is in accordance with the findings by *Surya et al. (2017)* that a decrease in the consistency of toilet use does not occur only because of problems of function and maintenance, but also because of the prevalence and acceptance of open defecation as a norm. As not all five factors mentioned by *Dickin et al. (2017)* were fulfilled in the study location, increased individual sanitation use continued to be difficult.

To encourage sanitation, a process was needed for the community to recognise the advantages of comfort and privacy in using the shared improved latrines and to promote the sense of dignity in using them, despite their status of being publicly owned.

In addition, the programmes to improve the sanitation quality in Demaan were mostly handled by the government, both in terms of decisions and development, so that community engagement was not be generated. This is in accordance with the statement by *Meredith & Macdonald (2017)* that a top-down approach that is typically led by an institution or the government cannot generate local engagement. Since the shared improved latrines were built, the other challenges in achieving community-based sanitation were to improve community engagement in the use and maintenance of the toilets. Solving the challenge of the low level of community involvement in the use and maintenance of the toilets required a community empowerment approach. In addition, increasing public awareness of healthy living behaviour and improving individual sanitation required fostering a sense of ownership and a sense of place. These can be achieved through cognitive and affective aspects, as noted by *Popov & Chompalov (2012)* in their statement that affective behaviour is one element of behaviour setting.

Model of community behaviour change from sea-based helicopter latrines to land-based shared improved latrines

Changing people's behaviour from using helicopter latrines to using shared improved latrines requires the community's commitment, which has both cognitive and affective aspects. Behaviour change is not easy; it requires involving various stakeholders. *Simiyu et al. (2020)* stated that intervention strategies on shared sanitation management should focus more on social dynamics including the role played by social cohesion, better communication, and improved social relations. Therefore, solving the challenge faced by the public response to the use of land-based shared improved latrines requires community empowerment using a bottom-up approach and a behaviour-setting technique. According to *Laurens (2004)*, human behaviour can result in a behaviour setting in a place/space that is in accordance with the human activities; behaviour setting

could be an activity space that describes a unit of the relationship between human behaviour and the environment. Thus, for this study, shared improved latrines were new government-given spaces/places that were related to the behaviour of the community with regard to their environment. So, they should be designed in accordance with the activities carried out by the community. This is consistent with the opinion of [Sample *et al.* \(2016\)](#) who stated that interventions to change human behaviour and the environment, especially sanitation, must pay attention to physical, cultural/social, and economic factors if they are to be run effectively.

To achieve sustainable behaviour change, [Young \(1993\)](#) classified the behaviour change techniques into three categories of intervention: information, positive motivation, and coercion. In addition, he said that sources of change from environment/others were tangible and internal sources were intangible. Along the same lines, [Wynveen \(2017\)](#) described intervention in the form of an educational programme to encourage pro-environment behaviour. She identified four elements, and two of them are the promotion of awareness and persuasion of benefit. A public awareness campaign can be used as a tool to cause a sanitation

behavioural change ([Katukiza *et al.* 2012](#); [Sara & Graham 2014](#)). Beside awareness intervention, [Dickin *et al.* \(2017\)](#) found that community leaders played an important role in supporting an intervention, disseminating information, and ensuring that the collective management from sanitation systems can be sustained. [Alam *et al.* \(2016\)](#) also argued that behaviour change strategies that target the central role of community managers can be very effective in improving the quality and hygiene of sanitation facilities. Those above studies were combined to develop a behaviour change technique in Demaan with a community empowerment approach. The techniques used to realise changes in people's behaviour regarding the use of shared improved latrines are illustrated in [Table 2](#).

The process of community empowerment using behaviour-setting techniques has the following three stages: (a) Disseminating information to the public. [Simiyu *et al.* \(2020\)](#) stated that the need to educate and create awareness is often emphasised because it is perceived that the public needs to understand the importance of keeping toilets clean. [Tsinda *et al.* \(2013\)](#) also argued that if a large proportion of the population depended on shared sanitation facilities, more emphasis could be placed on hygiene education

Table 2 | Behaviour change techniques to promote the use of shared improved latrines

Aspect	Source of change	Information	Positive motivation	Coercion	Change
Cognitive	Environment/ others (tangible)	<ul style="list-style-type: none"> Information dissemination about healthy and proper sanitation facilities Economic and social benefits in using shared improved latrines 	<ul style="list-style-type: none"> Incentives for those who use shared improved latrines Social support from community leaders Promotion of the use of shared improved latrines 	<ul style="list-style-type: none"> Sanctions if the community uses the helicopter latrine Social pressure from community leaders 	Changes in thinking to increase the sense of ownership of shared improved latrines as a dimension of form
Affective	Internal from each individual (intangible)	<ul style="list-style-type: none"> Direct experience in using shared improved latrines Community insights regarding shared improved latrines Benefits received by individuals using shared improved latrines 	<ul style="list-style-type: none"> Commitment to the use of shared improved latrines Legalisation of organisations formed to maintain shared improved latrines 	<ul style="list-style-type: none"> A sense of responsibility in using shared improved latrines Feeling guilty for damaging the marine environment through the use of helicopter latrines 	Changes in feelings, interests, emotions and attitudes that cause dimensions of meaning and activity

practices, with a focus on proper use and cleanliness of facilities. This opinion is consistent with the practice in the study area where the community still depends on shared sanitation facilities. Therefore, transferring knowledge becomes the main stage in inviting people to change behaviour. This means providing information to the community, using campaigns regarding the use of shared improved latrines either through the chief of RT, community organisations, community leaders or electronic media. This information would include knowledge about health, the environmental impact of helicopter latrines, and recommendations regarding the use of land-based shared improved latrines and their management. (b) Approaching the cognitive aspect. This is carried out by the government by providing assistance to the community through socialisation and discussions about the benefits of shared improved latrines on land, health standards, and the impact of helicopter latrines on health and the environment. A change in mindset about the healthy and proper use of shared improved latrines could be **meaningful** for users after they know the benefits and direct impact on their lives, which get better and healthier. (c) Approaching the affective aspect. Affective aspects involve changes in feelings, interests, attitudes, emotions, and values, so that finally there is behaviour in the form of **activity** in using shared improved latrines. Stakeholders empower the community by inviting them to maintain the toilet. In any future implementation of the programme, the community should be involved in the planning and development, which can lead to a sense of ownership towards the government-built toilets, and the hard work of the community itself eventually fosters the use of the shared improved latrines.

In this approach, support from all stakeholders would be needed to ensure that the community use the shared improved latrines, allowing the environment to become healthy and improved from its slum conditions. The government must not withdraw after the shared improved latrines are constructed. Rather, it must continue to assist the community in their management. Other stakeholders, such as community self-reliance institutions, religious leaders, and community leaders have a role in inviting the community to change their behaviour towards the use of shared improved latrines because a clean and healthy environment would be part of the practice of one's faith.

Based on such a community empowerment approach, with its cognitive and affective aspects, changing people's behaviour in using shared improved latrines is a challenge. Cognitive aspects could change the individuals' mindset to develop a sense of ownership, and they could affect behaviour change, while affective aspects support those impulses to take action. Many scholars have noted that a sense of place can be influenced by human behaviour, social milieu, and culture (Canter 1977; Hashemnezhad *et al.* 2013; Ghoomi *et al.* 2015). A place has three dimensions: (1) form, (2) meaning, and (3) activity (Canter 1977; Punter 1991; Montgomery 1998). In accordance with this scholarly opinion, in this case, shared improved latrines are new places or spaces as dimensions of form, which could be acceptable by individuals in society if they already had a sense of ownership. This form dimension is included in the tangible elements. After the existence of new buildings, namely shared improved latrines that are feasible as dimensions of 'form', the next stage is the dimension of meaning. This involves individuals knowing the importance and benefits of using the toilet for health and propriety. The third step is the dimension of activity, in which the individuals could take steps to use the toilets without coercion. The dimensions of meaning and activity are among the intangible elements. Overall, the flow and form of community behaviour that changes from using helicopter latrines to using and caring for/maintaining land-based shared improved latrines in Demaan can be seen in Figure 3.

Thus, the government policy for physical development programmes, especially in sanitation, could be accepted and followed by the community if the development process used a bottom-up approach that integrates tangible and intangible elements. The tangible element is the physical form. Here, it is a shared improved latrine that can accommodate users' needs and is accepted by the community. Therefore, a sense of place could emerge in the community. The intangible element, which is presented in the form of meaning and activity formed from the results of community empowerment from cognitive and affective aspects, has an important role to form an attachment to the place, especially the physical form of new buildings that the community has never known before.

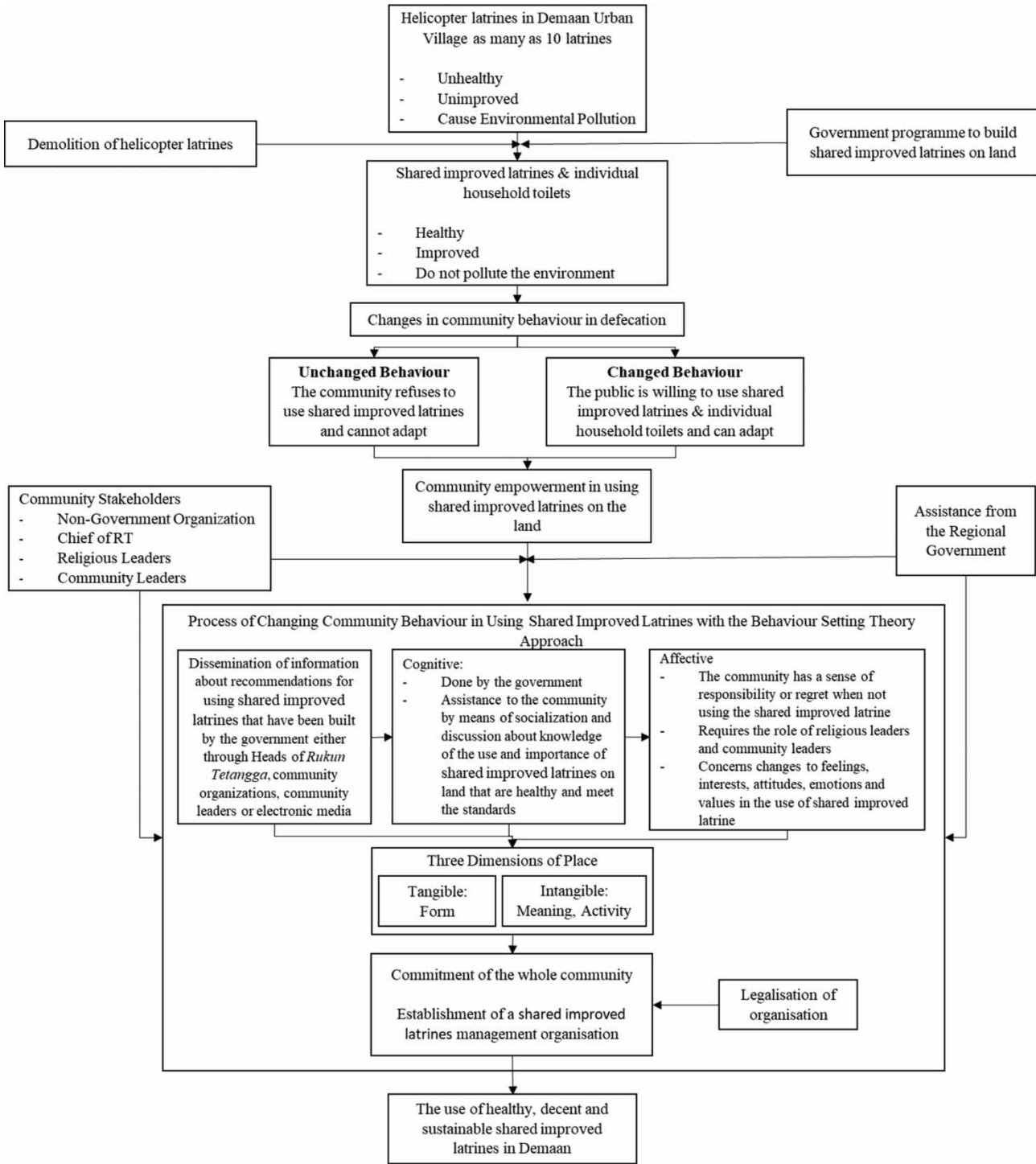


Figure 3 | The model of community behaviour change in the use of shared improved latrines.

CONCLUSION

The empowerment approach through behaviour change techniques can be used to solve the challenges that occur regarding people's behaviour of using unimproved sanitation facilities by developing cognitive and affective aspects of actions. The cognitive aspects of actions are the lead responsibility of the government. They involve the dissemination of information and education about the use of shared improved latrines, so that people can live healthy, safe lives, and the environment can become clean, healthy, and comfortable. In addition, in this aspect, the community should be invited to identify their problems and needs in using shared improved latrines. Next is the affective aspect. It requires involvement by figures trusted by the community to invite the community to commit and take responsibility for using public/shared improved latrines. Affective aspects can run by themselves if the cognitive aspects have been embedded in society. Based on the cognitive and affective aspects, the challenges in using shared improved latrines can be answered in real terms with a bottom-up approach that integrates tangible and intangible elements: form, meaning, and activity.

Form, the tangible element appears as the shared improved latrine buildings, which must be physically acceptable to the community and in accordance with their needs. To create sanitation facilities that are acceptable to the community, future effort to improve the conditions in slum areas, local governments should empower and increase community involvement. Involvement is carried out by identifying and exploring their capabilities, needs, and desires from the planning stage (design, location, and completeness of facilities), to the construction and maintenance stages. Providing sanitation facilities that are acceptable to the community also encourages the sustainability of its maintenance because of the sense of ownership. However, it is also necessary to provide financial support to maintain the facilities, considering that slum communities are low-income people. Apart from that, having human resources to maintain these facilities also must be considered.

The first intangible element is meaning. Regarding behaviour change, it is necessary to empower the community through education campaigns to embed the importance of using shared improved latrines. When people know the

value of using those latrines, their commitment, responsibility, and sense of ownership are enhanced. For its part, the government should provide continuity supervision (monitoring, reporting, giving warning, and giving incentives or disincentives) during the transition period and after the programme to create community awareness. By achieving the form and meaning dimensions, the community would take the necessary steps (activity) to use shared improved latrines and maintain them without coercion. Dimensions of form, meaning, and activity can change the individuals' behaviour in using the shared improved latrines.

Empowerment through the behavioural setting technique requires collaboration between community leaders, local government, and the community as actors, both as individuals and as members of the society. Community empowerment in a slum-upgrading programme leads to physical and social aspects where the action or implementation is in a collective form; however, the novelty in this study was that the community empowerment was carried out by each individual to yield behavioural change in their daily activities. Finally, future research should explore the notion of social learning. According to this research, we can draw the conclusion that social learning has a major important role in the community behaviour. Thus, we need to ensure the process of cognitive and affective aspect.

DATA AVAILABILITY STATEMENT

All relevant data are included in the paper or its Supplementary Information.

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