



# Self-help group participation towards sustainable solid waste management in peri-urban villages: evidence from Mumbai Metropolitan Region, India

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## Abstract

The growth of secondary and tertiary sectors in the peri-urban villages results in development strain and causes demographic, socio-economic, and spatial transformations. Deficiency in provisioning of basic services is one of the prime concerns for these villages. This study aims to examine the present conditions and the community's attitude towards waste management, and whether the self-help groups (SHGs) can aid in developing a sense of collective responsibility. Five villages from the Bhiwandi Surrounding Notified Area in Mumbai Metropolitan Region, India, were selected for a case study investigation of the current situation of service provisioning by the rural local bodies. Questionnaire surveys were conducted for 122 households and the heads of all SHGs in the villages simultaneously. Due to the limited household surveys, the data were triangulated with documents and interviews with officials. The results were qualitatively and quantitatively analysed to understand people's perception of the SHGs and the major factors through which the groups contribute in improving livelihoods and living conditions. The SHGs also play a significant role in developing awareness of issues and social integration in the rapidly evolving structure of these peri-urban communities, as is highlighted in the case studies. The relations between SHG participation and literacy levels on the attitude towards local involvement in solid waste management for the villages were analysed. The resulting significant correlations point towards the consideration of these factors while planning for a development model for peri-urban villages. Policy-level support to the SHGs can help in fostering local partnerships and community initiatives towards better service delivery in the villages. This kind of social empowerment forms the basis for social sustainability, which in turn promotes economic and environmental sustainability.

**Keywords** Awareness · Community participation · Self-help groups · Socio-economic impact · Solid waste

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# 1 Introduction

Peri-urban growth is a challenge for most countries in the developing world (Geneletti et al., 2017; Torres, 2007). Managing the environment of peri-urban areas has significant implications for the sustainable development of the entire region (Allen, 2003). The framing of urban areas as vital engines of economic development (Dixon & McMichael, 2015; Sadowsky, 2014) results in an urban bias in planning (Kandpal & Saizen, 2019a; Tacoli, 1998). The peri-urban areas fall outside the urban jurisdiction and are under rural administration. They undergo the stresses that are associated with rapid growth (Saxena, 2015) in the absence of an efficient institutional mechanism. The planning concerns for peri-urban areas, especially in the developing countries, are recently becoming an imperative research agenda (Lin et al., 2016; Simon, 2008). In India, there is a lack of institutional instruments for directing peripheral development in a controlled manner (APN, 2011). Residential complexes, industries, and commercial establishments come up in the peri-urban villages due to cheaper land and an absence of taxes levied by urban local bodies. Population increase and intensification of the secondary and tertiary sectors lead to an increase in different types of wastes (Shaw, 2005). There is no adequate provision of sanitation and solid waste management (SWM) services in these areas as the rural local bodies are not responsible for these services, as per the decentralised powers and activities delegated by the Government of India (NIRD, 1995).

The per-capita waste generation is increasing by 1.3% per annum in India (Ghatak, 2016). Moreover, with the changing demography and lifestyles in the peri-urban villages, waste management is becoming an issue of huge proportions. This is the case in the peri-urban areas of many big cities in India like Chennai, Patna, Guwahati, etc. (Narain et al., 2014). In the absence of an SWM system, waste is dumped along the roadside waterbodies or is burnt. Even if it is collected, the waste is dumped in waste lands away from the residential area in the village (Dodke, 2018, personal communication). A lack of financial, technical and human resources, and a lower order governance framework suggest a potential for participatory approaches in provisioning of basic services (Kalwani, 2017; Shabani, 2015; Subhash, 2002). The collective action theory by Ostrom (2010) led to the conceptualisation of the term ‘service co-production’, which implies a contribution of the service users in the process of provision of services (Realpe & Wallace, 2010). Citizens, with their cooperation and active involvement, can play a major role in the success of an SWM system. Several studies have validated the need for community participation (JICA, 2015; Mlozi, 2011; Muller et al., 2002; Zahra et al., 2012). This focus on social aspects is based on the recognition that ‘social capital’ (Bhandari & Yasunobu, 2009; Nayak, 2015) can be an important resource in bridging the gap between government provisions and the local needs.

Self-help groups (SHGs) in India are ‘village-based voluntary organisations of people’ (mostly women) from similar socio-economic backgrounds, with a purpose of solving their problems through self-help and mutual help (Desai & Joshi, 2013; Narasimha et al., 2016; Saravanan, 2016). They differ slightly from micro finance institutions, as their sole focus is not on credit and savings, but also on working towards social empowerment, outreach, and capacity building under ideal conditions (Deininger & Liu, 2009). There exists a substantial body of research on the socio-economic impacts of SHGs (Saravanan, 2016; Sundaram, 2012) in terms of poverty reduction, improvement in livelihoods, and the overall well-being and resultant empowerment of women in villages (Gaiha & Nandhi, 2007; Swain & Wallentin, 2009). Unlike the SHGs in other countries which have a singular focus, the

SHGs in India follow a multi-directional approach, touching upon all aspects of life of its members from basic necessities to socio-cultural needs (Nayak, 2015). However, there is a research gap in terms of understanding the actual impacts of SHGs in creating awareness and changing attitudes of the people towards a decentralised approach of service provisioning. In the peri-urban interface, they can act as effective agents for encouraging adoption of new techniques and approaches to natural resource management and income generation. The guidelines for *Swachh Bharat Mission*<sup>1</sup> by the Government of India (GoI, 2017) also propose the involvement of SHGs as actors in rural solid and liquid waste management. This also makes it necessary to understand the ways in which SHGs can directly contribute towards a waste management service provisioning mechanism.

This research focuses on the experiences of peri-urban villages within Mumbai Metropolitan Region (MMR) in India. It is the most populated urban agglomeration in the country, according to Census of India 2011. The Bhiwandi Surrounding Notified Area (BSNA) comprises of 60 villages within MMR, with the Mumbai Metropolitan Region Development Authority (MMRDA) as its special planning authority. There are similarities between villages in terms of non-agricultural development and a resultant formation of a peri-urban landscape. The proposals for SWM in the regional plan are broad-based, with a focus on solid waste generation and disposal methods for the urban bodies, and do not consider the case of peri-urban villages (MMRDA, 2016). A critical appraisal of the conditions in BSNA villages in terms of SWM services is required considering their rapid urbanisation and changing socio-economic situation (Kandpal & Saizen, 2019b). The objectives of this study are to examine the present conditions of SWM and the community's attitude towards SWM in the peri-urban villages and to analyse whether the SHGs can aid in developing a sense of collective responsibility. It puts forth quantitative and qualitative evidence of how SHGs can be an effective tool for influencing the attitudes of citizens towards participation for waste management in peri-urban villages. The conclusions of this study highlight the importance of policy support to SHGs in fostering community initiatives towards better service delivery in the peri-urban villages.

## 2 Literature review

A review of the research on the peri-urban areas suggests that local bodies require increased administrative abilities to deal with the complex problems of managing waste associated with the increasing urbanisation (Méndez-Lemus et al., 2017; Shaw, 2005). The studies build upon the idea of solving complex problems through local involvement instead of a complete dependence on local bodies. In particular, Shaw (2005) examined the potential of local initiatives for managing solid waste in the peri-urban areas of India through case studies. The findings highlight that participation of locals is not a straightforward process. Factors that include support from local bodies, the nature of participation, and functioning of the involved community groups, influence the outcomes of participation. At the core of this idea, public participation is about creating links between citizens and decision-makers (Berry et al., 2019). This ensures that policymakers and planners consider the viewpoints of the local community while performing their tasks. The Sustainable Development Goal

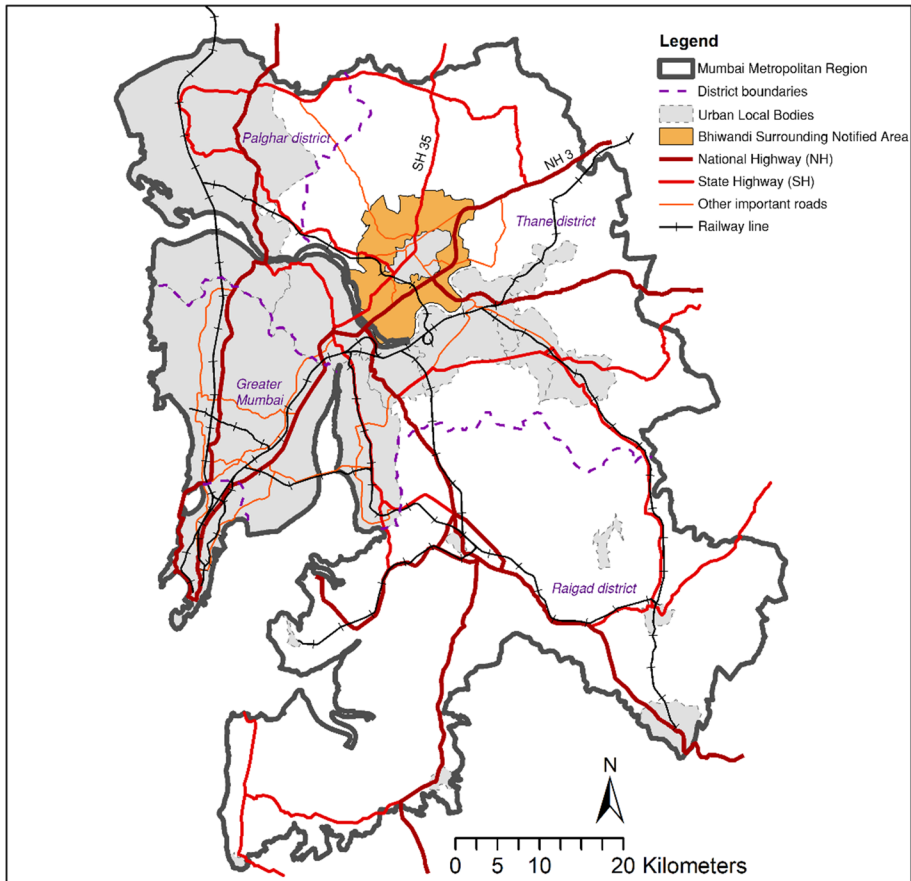
<sup>1</sup> *Swachh*=Clean, and *Bharat*=India. *Swachh Bharat Mission* was launched in 2014 to promote sanitation coverage in rural areas and develop Solid & Liquid Waste Management systems for urban and rural areas.

11 also advocates a place-based approach to development through partnerships between different groups of stakeholders.

An important part of local participation is the concept of ‘social capital’, which is defined as ‘networks together with shared norms, values, and understanding that facilitate co-operation within or among groups’ (OECD, 2001). From the perspective of development planning, the most pertinent definition of social capital is that of Putnam (1995) that considers the interrelation between social capital and governance. Harrison (2003) and Hans (2014) put forth social capital as a resource in the relationship between an effective governance system and an engaging community and described it as ‘the features of social organisation, such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated action’. It comprises three aspects: bonding, bridging, and linking (Chen & Meng, 2015). Bonding focuses on the connections between people in a similar context, whereas bridging focuses on relations across groups or sections. Linking consists of networks outside the community concerned with the other actors. It is essential to consider the existing community groups in any area, and their contribution to social capital, as participation in community groups or civic associations can bring about a feeling of trust. This is because different people engaging in a social network implies their willingness to institutionalise their relationships and follow the norms, which also predisposes them to cooperate (Méndez-Lemus et al., 2017). Education is also considered an important parameter of social capital, especially when it comes to participation in any beneficial activity, as it helps to increase individual awareness of their vulnerabilities and opportunities. The networks comprising social capital also act as channels of information in the community (Hans, 2014).

Participation in community groups brings to focus the SHGs and their widespread presence across India. A typical SHG is a homogenous group of 10 to 20 individuals who come together and save a predetermined amount of money, ranging from 10 to 200 Indian Rupee, on a monthly basis. The pooled amount is deposited in a group bank account and is used to provide credit to the members as and when required. Nayak (2015) develops a discussion on how SHG involvement by women aids in enhancing social capital. The evidence from his case study highlighted the involvement of SHG members in community mobilisation activities. In particular, a higher level of participation can lead to more networking among the members and also with external institutions, such as government bodies, banks, and other community groups. Hans (2014) also pointed out the recent efforts by the Indian government to ‘enhance social capital in the country’ and promote participatory efforts. The *Swachh Bharat* Mission guidelines (GoI, 2017) make suggestions for exploring waste management systems based on SHGs and similar groups.

These studies and government recommendations indicate the need to explore the potential of SHGs in contributing to service provision in peri-urban villages through participation. Waste management is a critical concern in the villages and involves multiple steps with a possible involvement of locals. Thus, it is necessary to analyse the role that can be played by SHGs in it, be it in a direct manner, or indirectly through influencing others.



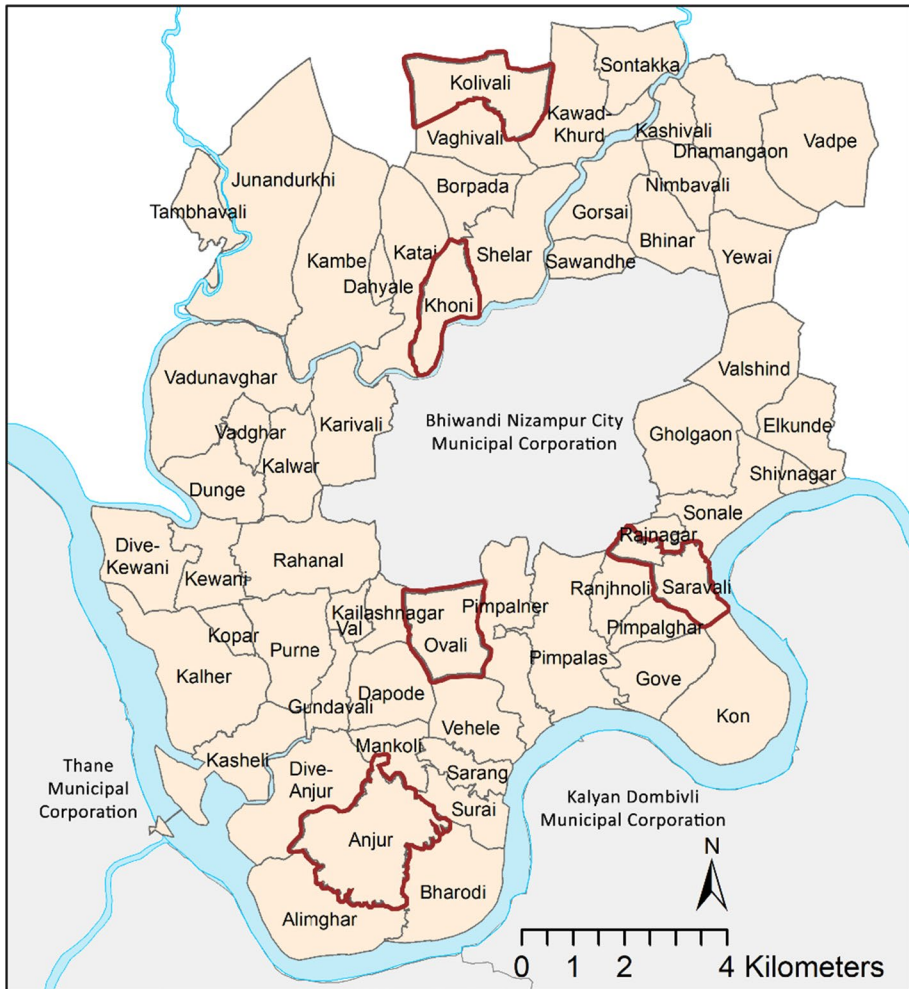
**Fig. 1** Mumbai Metropolitan Region and Bhiwandi Surrounding Notified Area

### 3 Materials and methods

This section provides a background of the study areas, and the details of data collection and analysis used for this research. A case study approach has been adopted, and a combination of quantitative and qualitative analyses has been used for interpreting the data and making inferences.

#### 3.1 Study area

Located to the northeast of Mumbai city, Bhiwandi is historically famous for its textile industries (MMRDA, 2012). The BSNA, comprising of 60 villages, is around Bhiwandi Nizampur City Municipal Corporation (BNCMC) and is also adjacent to Thane Municipal Corporation and Kalyan Dombivli Municipal Corporation. Figure 1 shows the urban areas within MMR and the location of BSNA. The main factor behind urbanisation in these



**Fig. 2** Villages of Bhiwandi Surrounding Notified Area and locations of the five case studies

villages is the development of industries, particularly warehouses (MMRDA, 2012). The second regional plan for MMR (1996–2011 period) focused on industrial relocation outside of Mumbai city in MMR, and the improvement in transport network. This resulted in the sprouting of industries in BSNA. Good road connectivity with Mumbai city, and the rest of the state and the country, provided an impetus to the development of warehousing activities (Singh & Singh, 2013). The upcoming secondary sector further resulted in the burgeoning of the service sector including transportation, construction, and other allied activities.

The five villages of Khoni, Saravali, Ovali, Anjur and Kolivali have been selected to carry out the household surveys and meetings with women from SHGs. Figure 2 shows their locations in BSNA, and Table 1 shows their population and density.

Khoni has the highest population density in the entire BSNA. The development here can be attributed to its adjacency to BNCMC. Similarly, Saravali has undergone development



**Table 1** Demographic details of villages based on 2011 Census of India

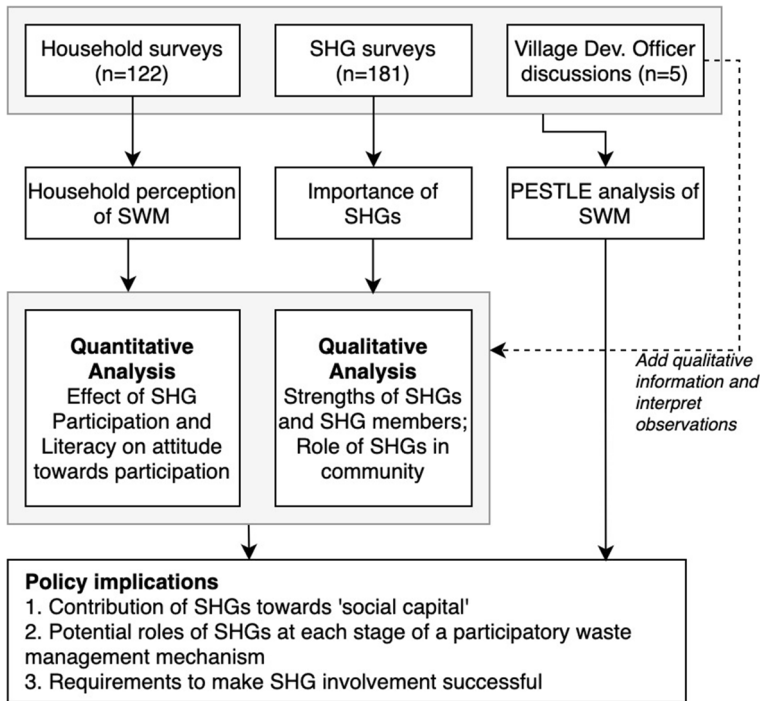
	Khoni	Saravali	Ovali	Anjur	Kolivali
Population	26,016	3532	1566	3807	2854
Pop. density (persons/km <sup>2</sup> )	14,453	2559	775	945	1146

due to its proximity to Kalyan Dombivli and also its adjacency to the national highway. An entire industrial estate is situated within the village boundaries. Ovali, which abuts the national highway, has witnessed the construction of warehouses in nearly one-third of the total village area. Agricultural lands have been converted to industrial land use, with shared ownership of the construction on it. Anjur is not adjoining the highway and is near the river towards the southern end of BSNA. There have been no major industrial or commercial developments within the village. It is, however, currently witnessing land speculation activities due to a proposal of direct connectivity across the river through a bridge. Kolivali is located towards the northern limit of BSNA. Due to its relative remoteness from the urban centres, it has not witnessed any development in the secondary or tertiary sectors. The village is also highly underserved when it comes to the provisioning of basic services. These five cases together will provide a holistic overview of the situation and the necessary community interventions for better provision of SWM, in the context of the influence of SHGs.

### 3.2 Data collection and methodology

This study is an exploratory research focusing on the well-being of the population from their own perspective. It uses data collected through semi-structured interviews during February–March, 2018, typically between 10:00 a.m. and 5 p.m. The overall research process is detailed in Fig. 3. It is a part of a broader study on institutional strengthening for the planning and management of peri-urban villages. Permission was sought from the district-level and block-level authority before conducting the household surveys and meetings with the heads of the SHGs in the villages. All the interviews and discussions were conducted by the first author.

The first part of data collection involved using a random sampling method to interview a total of 122 households in the five villages (Khoni—35, Saravali—26, Ovali—21, Anjur—20, Kolivali—20). Due to the limited sample size, the data related to service provision were cross verified with the rural local bodies. Spatial distribution of samples was kept in mind, and all the neighbourhoods in the villages were visited. The questionnaires used for household surveys consisted of a wide variety of questions related to livelihood, education, basic services, existing social infrastructure in village, SHG membership, and attitudes towards participation in community activities. In addition to these household surveys, separate interviews were conducted with the heads of each SHG, during the same period. There are a total of 181 SHGs in the five villages. Questions related to the loans provided in the previous year were asked, and also about any other activities taken up for improving the living conditions in the village. Open ended questions on the working of SHGs, and their strengths, were also included. Furthermore, discussions were also conducted with the village development officer (VDO) of each of the five villages to understand the existing situation of service provision in the villages. A narrative approach is used for qualitative discussion on the interviews. Simultaneously, a review of the ‘Draft Regional Plan of MMR 2016–36’ and the ‘Development Plan



**Fig. 3** Process of research

2008–28 for BSNA’ was done to assess the current SWM provisions for the peri-urban villages. A combination of all the observations has been used to analyse the SWM challenges and the policy implications under the PESTLE (Political, Environmental, Social, Technological, Legal, Economic) framework.

This analysis hypothesises that the households willing to participate in community SWM activities have (1) a higher level of participation in an SHG and (2) higher literacy ratio. The variables used are summarised in Table 2 (WILL indicates ‘willingness to participate in community activities for SWM’; SHG.HH indicates ‘ratio of SHG membership in household’; LIT.HH indicates ‘ratio of literate persons in household’). A cross-tabulation was also conducted to examine the relationship between the two variables—willingness to participate in community activities for SWM, and the preferred method of solid waste disposal.

The 122 household surveys were used as observations in analysis. Statistical data analysis was performed in IBM SPSS Statistics 19 software package. A Mann–Whitney  $U$  test was used to compare the two categories of responses (Yes and No) for WILL. The variables considered for comparison were SHG.HH and LIT.HH.

## 4 Results

A total of 75.4% of the household survey primary respondents were women as they are the ones who are at home during daytime being homemakers. The views of women provide important insights into village development planning and community needs because they



**Table 2** Variables used in the study

Variable	Type	Description
Willingness to participate in community activities for SWM in villages (WILL)	Categorical	2 categories—yes = 0; no = 1
Ratio of SHG membership in household (SHG.HH)	Continuous	No. of household members in an SHG divided by the total no. of household members
Ratio of literate persons in household (LIT.HH)	Continuous	No. of literate members in the family (completion of, or higher than primary education level) divided by the total no. of household members
Preferred method of solid waste disposal	Categorical	4 categories—collection vehicle; community bin; roadside dumping; incineration

are directly related to the activities towards maintaining living conditions at the household level. However, once the interviews started, other members of the households would also join the discussion. Especially for the opinion-based questions, care was taken to ensure that the view of the household as a whole was considered while filling the questionnaire. For the discussions with the SHGs, the focus was on the overall working details of the respective SHG. All the interviewed heads of the SHGs were women.

#### 4.1 Prevailing status of SWM

A general lack of SWM mechanisms was observed in all the villages. There are no accurate village-level data records pertaining to the provisioning of basic services. In addition to this, the entire solid waste of BNMC urban body is dumped within the boundaries of Katai village, which is neighbouring to Khoni village in BSNA. The area of 5 ha which is used as a dumping ground is falling short of the current requirements reportedly, and the process to acquire a new site within BSNA is ongoing to dump the waste from the urban body. The discussion with VDOs also brought forth the concern of residential and commercial development due to purchase of land by private developers (Dhondge, 2018, personal communication). The people's lifestyles are also urbanising, resulting in increasing waste generation. Table 3 summarises the existing status of the main parameters associated with SWM in the villages, based on the responses received in the household surveys and the discussions with the VDOs.

Figure 4 shows a visual documentation of the existing situation observed in the five villages during the filed visit.

#### 4.2 Importance of self-help groups

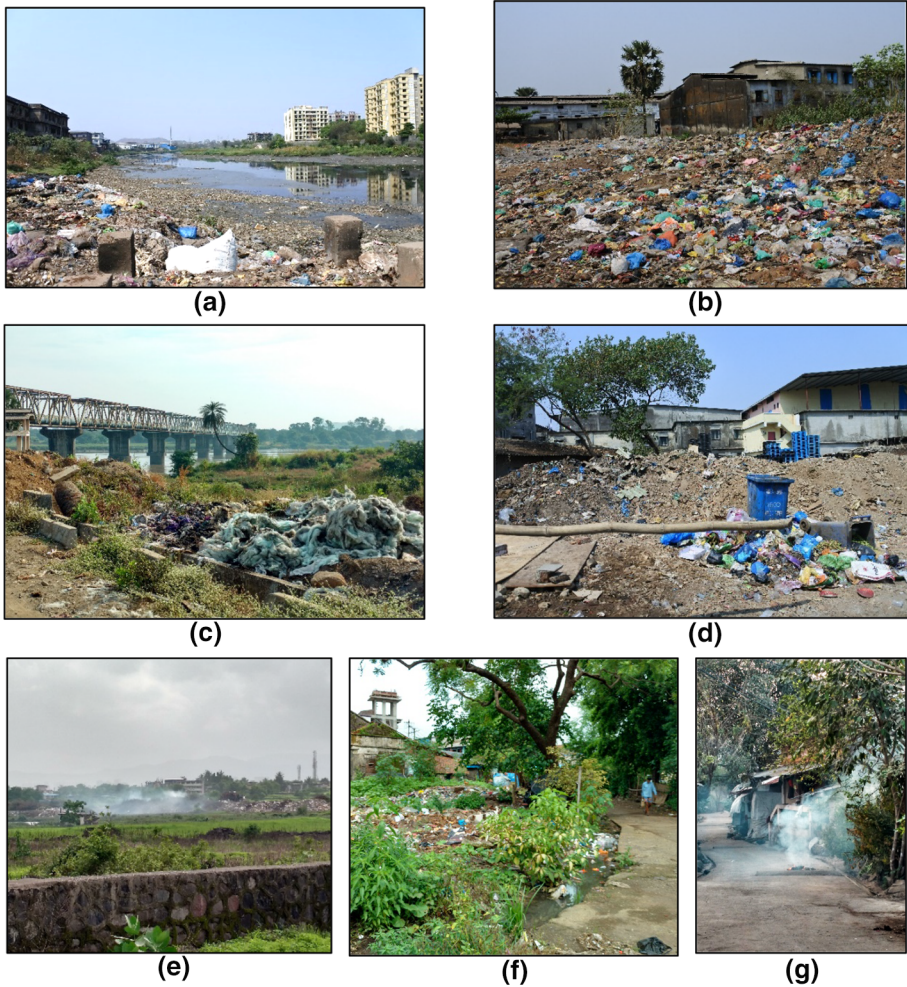
*Household level findings:* The interviewed households were asked about the perceived benefits of SHG membership on various aspects of their living. All the households that had at least one member enrolled in an SHG generally felt that they were benefitted by the SHG. Table 4 summarises the responses on the perceived benefits of SHG membership on the household, and the sector with the highest perceived benefit is highlighted for each village.

The responses highlight the profound impact of SHGs on the education expenses of children and the general household expenses. The household expenses typically included investment in material assets and items of daily need for the household members, religious ceremonies, and repayment of loans. The next important impact was on livelihoods or the income generating activity. This included investments for household businesses (shops for grocery, tailoring, and canteen service), or agriculture and allied activities. The other two factors where SHG had an impact included housing (purchase or construction of new house and repairs to an existing house) and medical expenses for the household members.

Questions related to the perception of SWM were also asked. The respondents were aware that SWM is an issue due to the prevailing unhygienic conditions of solid waste lying around. However, all of them responded that the collection of solid waste is the primary responsibility of the local authorities. They were further asked about their opinion on what constitutes SWM. The answers were grouped into two categories—(A) segregation, collection, recycling, and proper disposal, and (B) collection of waste and disposal away from the residential areas. They were also asked whether members from their households would be willing to participate in community activities for SWM in the village. The total responses for each village are summarised in Table 5.

**Table 3** SWM status in the villages

	Khoni	Saravali	Ovali	Anjur	Kolivali
Collection	Infrequent and partial; limited to few areas (2 collection vehicles only)	Partial; 1 collection vehicle; Only community bins in few areas	Regular (1 collection vehicle); 5 sanitation workers	1 collection vehicle at a fixed place and time; 1 sanitation worker	No collection vehicle; 1 community bin; No sanitation worker
Incineration	Village and household levels	Household level	Household level	Village and household levels	Household level
Dumping area	Riverside	Riverside	Outside the settlement	Outside the settlement; riverside	Households dump waste in open land individually
Segregation and composting	–	Pilot trial done; no future plan	–	Pilot trial done; discussion to introduce it on a larger scale	–



**Fig. 4** Existing situation of solid waste disposal: **a** riverside dumping in Khoni, **b** roadside dumping in Khoni, **c** riverside dumping in Saravali, **d** community bin in Ovali, **e** village-level incineration in Anjur, **f** roadside dumping in Anjur, **g** household-level incineration in Kolivali

**Table 4** Perceived benefits of SHG membership (relative frequency %)

Sector of positive impact	Khoni	Saravali	Ovali	Anjur	Kolivali
1. Education expenses	<b>91.4</b>	65.4	81	<b>65</b>	60
2. Household expenses	82.9	<b>69.2</b>	<b>90.5</b>	60	<b>65</b>
3. Income generating activity	31.4	61.5	42.9	45	40
4. Housing	42.9	34.6	42.9	55	55
5. Health	22.9	19.2	14.3	10	10

**Table 5** Survey responses for perception of solid waste management

Village	What constitutes SWM?		Willingness to participate in community activities for SWM	
	Category A (%)	Category B (%)	Yes (%)	No (%)
Khoni	40.00	60.00	68.6	31.4
Saravali	50.00	50.00	80.8	19.2
Ovali	42.86	57.14	71.5	28.5
Anjur	45.00	55.00	75	25
Kolivali	30.00	70.00	65	35

The respondents in category A stated that their knowledge about SWM came through the SHG member in the family or through the school curriculum of the children. This response was found to have a direct relation to their willingness to take part in community activities, since each household under category A had responded positively for the willingness question. However, there were households with a positive response for willingness who fell in category B. While this shows a lack of knowledge about the stages in an SWM system, it also shows the presence of motivation to engage in waste management. Thus, there is a general awareness about issues of solid waste but a lack of concrete knowledge specific to SWM.

Self-help group-level findings: The interviews with the SHG leaders proved beneficial in comprehending their contribution to the socio-economic conditions in the village from their own perspective. Details pertaining to the ways in which SHGs play a role in improving the living conditions within the village were also revealed.

Table 6 shows details of the credit taken through SHGs in 2016–2017, and the highlighted figures point that the highest number of bank loans was taken for business-related activities. These include setting up of household business, investing in an existing business or any other income generating activity. Educational expenses for children were the second most important reason. These findings reinforce the findings from household surveys regarding the positive impact of SHGs on access to credit for rural women, household expenses, and promotion of income generating activities for women or their families.

Groups of women working together with cooperation and mutuality are indicative of bonding in social capital. Additionally, it is vital to draw attention to the role of SHGs in the social networks within villages. The relationship of SHGs with the citizens of the village is mainly based on reciprocity and trust. They act as important nodes in many horizontal and vertical networks at the local level. Horizontal connections include the intra-group and inter-group relationships between members. Instances of the SHG members aiding their friends, who were later motivated to themselves join the SHG, were reported (Kene, 2018, personal communication). This is indicative of bridging social capital. The vertical linkages of SHGs include the banks, regional-level federation of SHGs, NGOs (Non-Governmental Organisation), and the government. Participation in the SHG activities brings its members in close contact with government officials, bank officers, and NGO workers. This points towards linking in social capital. As reported by many participants during the group discussions, they are no longer dependent on the male family members to pay the bills

**Table 6** Total credit availed (in Indian Rupees) through SHGs in 2016–2017

Village	No. of SHGs	Total members in SHGs	Total no. of members availed loan	Total credit from banks	Total credit from internal savings	Purpose of bank loans* (in %)				
						E	G	B	H	A
Khoni	77	912	615	1,16,87,000	10,60,000	26	21	38	11	4
Saravali	36	605	368	28,14,000	29,25,000	22	18	43	10	6
Ovali	17	237	110	23,57,000	7,30,000	23	21	29	15	10
Anjur	28	335	152	5,41,800	6,42,840	19	17	27	19	8
Kolivali	23	263	191	3,28,920	6,39,000	15	16	22	20	8

\*E, education; G, household expenses; B, household business; H, house construction/repair; M, medical; A, agriculture

**Table 7** Values of SHG.HH and LIT.HH (village-wise)

Village	SHG.HH		LIT.HH	
	Mean	SD	Mean	SD
Khoni	0.25	0.11	0.54	0.17
Saravali	0.27	0.11	0.59	0.15
Ovali	0.23	0.07	0.51	0.12
Anjur	0.26	0.08	0.58	0.15
Kolivali	0.28	0.10	0.54	0.15

and taxes. They visit the *gram panchayat*<sup>2</sup> office and do the necessary documentation and the payment process. This form of self-reliance helps them to assert their requests to local authorities. A majority of the SHG members reported a definite increase in their self-confidence, and awareness of banking processes as a result of joining the group (Shingole, 2018, personal communication; Chauhan, 2018, personal communication). The interaction with NGOs has also increased their awareness about environmental issues in the villages. The SHG leaders actively organise a yearly tree-plantation drive along with the *gram panchayat* officials in Anjur village. *Dr. Shri Nanasaheb Dharmadhikari Pratisthan*<sup>3</sup> organises cleanliness drives once a year in many villages across the state. *Pandurang Shastri Swadhyay Parivar*<sup>4</sup> conducts cleaning drives for soak pits and drains in many villages. The villages Ovali and Anjur have benefitted by this in 2016–2017, as reported in the interviews; 23 out of 26 SHGs (88.5%) in Anjur and 13 out of 17 SHGs (76.5%) in Ovali participated in these activities along with the NGO workers and also disseminated information to village households in order to encourage their participation. Proactive leadership on the part of SHGs in working with the organisation workers points towards the possible role of SHGs at various stages of implementing SWM system across the villages.

The officials in Anjur indicated a plan to start vermicomposting at the village level in future. The plan is still at a preliminary stage, and the SHG leaders have been involved in discussions on how the idea can be propagated to gain acceptance from the citizens. The officials had also distributed cloth bags in 2016 with the support of SHG women, as an effort to reduce plastic waste. Another noteworthy example is the cleanliness drives carried out by eight of the SHGs within Saravali (under a separate cluster organisation, *Sankalp Gram Sanstha*). The heads of the SHGs together approached NGOs for cleaning equipment. Now the women clean all drains and the solid waste dumped on roadside in their neighbourhood, once in every three months (Thakre, 2018, personal communication). The SHGs in all villages also take the lead in organising community celebrations on International Women's Day and important religious festivals. These observations highlight the outreach and the ground-level connect of the SHGs in the social setup of the peri-urban villages.

<sup>2</sup> *Gram* = village, *Panchayat* = council. Gram Panchayat is the rural local body consisting of representative elected by the village residents.

<sup>3</sup> 'Dr. Shri Nanasaheb Dharmadhikari Pratisthan' is an institution for social service conducting activities across the state of Maharashtra.

<sup>4</sup> 'Pandurang Shastri Swadhyay Parivar' is an organisation engaged in social reformation, and has centres across India and some other countries.



**Table 8** Descriptive statistics (total)

	WILL	SHG.HH	LIT.HH
0 (Yes)			
Mean		.2851	.6034
<i>N</i>		88	88
SD		.09337	.14307
Median		.2900	.6000
1 (No)			
Mean		.1868	.4194
<i>N</i>		34	34
SD		.06054	.08384
Median		.2000	.4000

**Table 9** Rank statistics of Mann–Whitney *U* test

WILL	Number	Mean rank	Sum of ranks
SHG.HH			
0 (Yes)	88	72.66	6394.00
1 (No)	34	32.62	1109.00
Total	122		
LIT.HH			
0 (Yes)	88	74.40	6547.00
1 (No)	34	28.12	956.00
Total	122		

**Table 10** Test statistics for the Mann–Whitney *U* test

	SHG.HH	LIT.HH
Mann–Whitney <i>U</i>	514.000	361.000
Asymp. Sig. (2-tailed)	.000	.000

### 4.3 Assessing the household attitudes towards local participation in waste management service provision

This section presents the results from the statistical analyses. Table 7 shows the mean and standard deviation values of SHG.HH and LIT.HH for each village.

The median values of SHG.HH and LIT.HH for the Yes and No groups in WILL, for the five villages combined, are presented in Table 8.

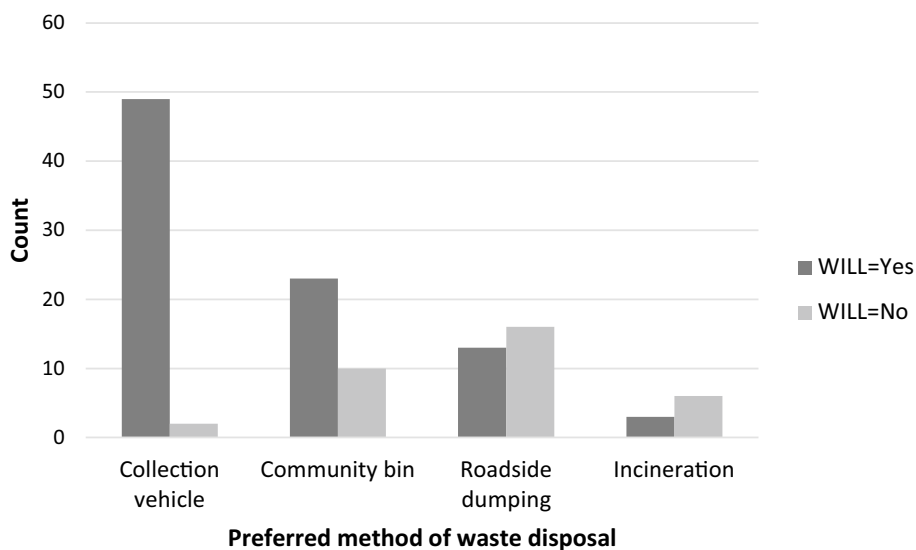
The results indicate that the ratio of SHG membership in households was greater for WILL = Yes (median = 0.29) than for WILL = No (median = 0.20). The ratio of literacy in households was also greater for WILL = Yes (median = 0.60) than for WILL = No (median = 0.40). Tables 9 and 10 summarise the results for the Mann–Whitney *U* test.

It can be concluded that SHG.HH and LIT.HH are significantly higher for the ‘Yes’ group than the ‘No’ group of WILL ( $U = 514$ ,  $p < 0.05$  for SHG.HH; and  $U = 361$ ,  $p < 0.05$  for LIT.HH).

The results of preferred method of waste disposal are shown in Table 11.

**Table 11** Preferred method of waste disposal for interviewed households (%)

Village	Collection vehicle	Community bin	Roadside dumping	Incineration
Khoni	28.6	42.9	28.6	0
Saravali	42.3	50	7.7	0
Ovali	71.4	4.8	14.3	9.5
Anjur	75.0	10	5	10
Kolivali	0	10	65	25

**Fig. 5** Cross-tabulation of WILL and SWD.PREF

For each category of waste disposal method, the total number of responses was tabulated alongside the Yes and No categories of willingness to participate in community activities. These cross-tabulation results in Fig. 5 indicate a relatively higher number of households responding negatively to the willingness question in the solid waste disposal categories of roadside dumping and incineration. Roadside dumping and incineration indicate a lack of responsibility towards the community, or ‘social apathy’, which can be a major issue associated with community participation. This result could signify a relation between the adopted practice of solid waste disposal and the willingness. Except for the case of Kolivali, where there is no provision for a collection vehicle and households have limited options for waste disposal.

## 5 Discussion

The responses from the surveys, discussions with village officials and SHG leaders, and the documentary review were assessed to analyse the SWM system in peri-urban villages under the PESTLE categories. The main points can be summarised as follows:

Factor	Inferences
Political	Lack of accountability of government officials Drawn out administrative procedures for approval of plans Need for evaluation surveys for effectiveness of government policies
Environmental	Proliferation in the illegal sites for dumping solid waste- roadside and riverside Incineration of waste in the open
Social	Increasing population Intensification of secondary and tertiary activities in the villages Lack of behavioural accountability Lack of awareness about the steps in SWM Involvement of SHGs in cleanliness activities in Saravali, Anjur and Ovali
Technological	Lack of infrastructure Lack of skilled manpower in the rural local bodies
Legal	Lack of specific guidelines for SWM in the decentralised activities at the rural local body level Inadequate strategies for SWM in the development plan of BSNA No directives to develop local SWM plans
Economic	Lack of financial resources

As a part of decentralisation policy of the national government, the activities assigned to the *gram panchayat* include maintenance of sanitary conditions. It is a very generic listing and only mentions removal of rubbish heaps, jungle growth, filling of insanitary ponds, prevention of water logging, and other improvement in sanitary conditions (NIRD, 1995). For peri-urban villages, with a high population density and growth rate, it becomes imperative for the local administration to come up with SWM plans to maintain hygienic living conditions within the villages. The high population density in Khoni and Saravali results in greater need for SWM services, which the *gram panchayat* is unable to provide. This results in partial collection of waste by the collection vehicle and majority of the households resorting to community bins. The coverage of collection vehicle is higher in Ovali and Anjur and can be attributed to lesser population and population density. Kolivali *gram panchayat* does not provide any collection or safe disposal service and the households dump the waste in any open space nearby or burn it.

The analysis shows that a higher ratio of participation in SHGs was found in the households willing to get involved in community activities for SWM. Thus, it can be inferred that SHGs play a considerable role in influencing the attitude of the people towards issues. The ratio of literates in the household was also found to be higher in the respondents willing to participate in community SWM activities. This suggests that in addition to encouraging general forms of awareness, formal education will also directly benefit in developing a positive attitude towards local participation. Apart from general household expenses, education expenses and livelihood were the two prime reasons for taking assistance from the SHGs. It can thus be safely concluded that SHGs indirectly impact literacy. The villages of Saravali and Anjur are examples of proactive SHG involvement in cleanliness and environmental improvement as described in the SHG-level findings. They also have the highest mean literacy ratio among the interviewed households (0.59 and 0.58, respectively). It was observed that these two villages had the least proportion of negative responses for the willingness question. As inferred from the interviews with the SHG leaders, the social exposure gained by the SHG members has a direct impact on their level of general awareness, which in turn motivates them to bring about positive changes in the village. Since a large part of the women in the surveyed households were found to be literate in these villages (81.2% in Khoni, 87% in Saravali, 73.4% in Ovali, 90.2% in Anjur, and 72.5% in

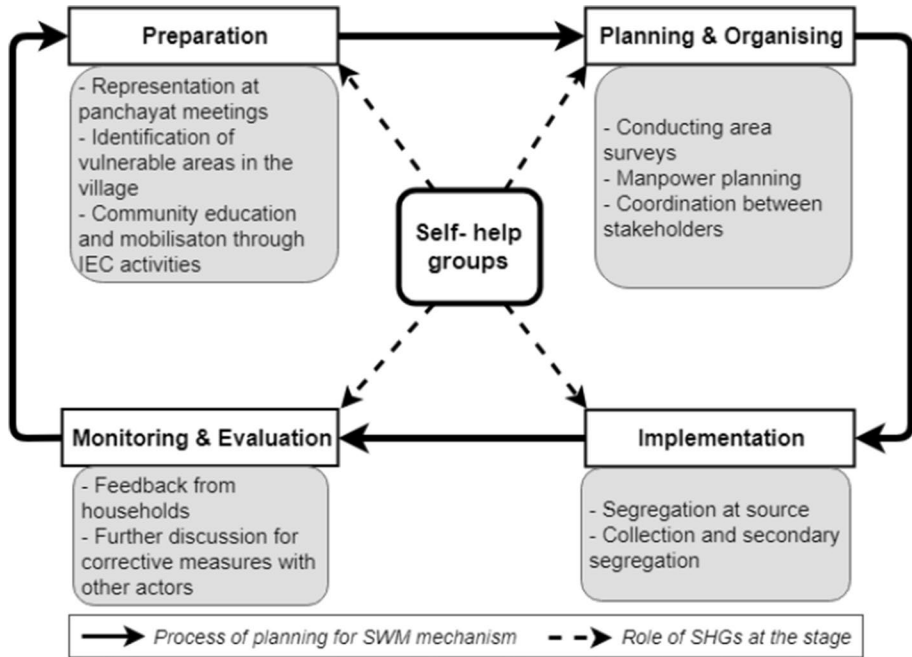
Kolivali), they can be effectively trained under capacity building programmes to engage them in awareness generation and information dissemination at the village or cluster level. Experience sharing between villages, along with information dissemination, can stimulate good practices for community based SWM systems in the villages. This is also applicable to a village like Kolivali, where financial and manpower constraints of the administrative setup have resulted in the complete absence of any SWM provision.

Studies have indicated that relying solely on community action for improving the critical SWM infrastructure is not sufficient and the government has a pivotal role to play in it (JICA, 2015; Mappasere & Idris, 2016; Shaw, 2005). This is reinforced by the survey findings as a majority of the respondents informally mentioned their awareness on the negative effects of uncollected solid waste, and yet they practiced roadside dumping or incineration. Along with the cross-tabulation results, this could indicate unaccountability of behaviour in some cases, or a result of direct dependence upon the services provided by the local body for disposing household waste. Upon questioning the households with a negative response towards participation in community activities, they typically responded as not wanting to invest time in working for the village unless the government officials show some motivation to improve the cleanliness. All the interviewed SHG leaders in the villages also acknowledged the lack of initiative on the part of *gram panchayats* to assist SHGs in their functioning. The assistance could be in the form of a formal meeting space or regular involvement of SHG leaders in the decision-making processes of planning in the village. The SHGs in Saravali emphasised on how the officials could play a role by providing them with tools and gears for cleaning, and then, they could plan towards increasing the frequency and scale of their cleanliness drives. It could also motivate the SHGs from other areas in the village to take up such activities. This indicates that an impetus from a government body will go a long way in creating an enabling environment and motivating the members to get involved in local efforts towards betterment of the village.

One of the limitations of this study was a restricted sample size due to practical constraints in carrying out the surveys. This study does not dwell much on the financial aspects within SHGs. Aspects related to income of households also could not be included in the study as the responses towards the questions related to income were not answered satisfactorily by everyone. Since many of the households have sold their agricultural land to private developers, or have a shared ownership of the warehouse constructed on their land, they were reluctant to divulge any details about the income.

## 6 Policy and managerial implications

The major challenges in setting up a SWM mechanism include awareness about segregation, organising people, acquiring detailed data, and adequate institutional and financial support corresponding to the strain of urbanisation in peri-urban villages. As revealed in the discussions with the government officials, lack of responsibility towards the community, or 'social apathy', is a major issue associated with public participation in SWM. In such a scenario, the social networks and experience built by the SHGs can be successfully capitalised to cultivate awareness and bring about a change in people's attitudes. SHGs are grass-root-level organisations, and by formalising the savings and credit, they gain the trust of households. Policy support to SHGs can help in fostering local partnerships and community initiatives. The discussion on qualitative findings from the SHG interviews helps infer the key strengths of SHG members as—increased self-confidence and



**Fig. 6** Potential role and contribution of SHGs towards each planning stage for SWM mechanism

self-reliance; proactive leadership and self-organisation skills; awareness of environmental issues through interactions with NGOs; and social outreach and ground-level connect with citizens. These observations are suggestive of their contribution towards social capital by enhancing bonding, bridging, and linking. SHGs can act as entry points for implementing agencies because of their direct relations to the social structure within the village. As a connecting platform, they can help in developing a sense of collective responsibility. They can act as effective agents for Information, Education and Communication (IEC) activities related to SWM in villages. Providing a social platform to SHGs will help them to form networks for issues on a larger scale. Doing so will be a step towards integrating social, economic, and environmental priorities of the peri-urban areas. This will help in incorporating the contextual needs and enhancing the relevance of SWM projects for the local actors. Based on this construct, Fig. 6 presents the potential roles that can be played by SHGs at each stage of the cyclical planning process for an SWM mechanism in the village.

Currently there are no formal structures for direct organisational links between the rural administration and the SHGs. An area development society constituted from selected members of the SHGs can act as a support organisation to the *gram panchayat* in implementing an SWM programme and providing the necessary assistance. By institutionalising partnerships in this manner, the SHGs could act as a link between the citizens and the government. It will add to the conventional IEC approach as a participatory approach that involves learning from the people and allows flexibility depending upon the context of the village. It will be a mutually beneficial model of collaborative action between the SHGs and the rural local bodies. External assistance can be taken from organisations (as can be seen successfully in the small-scale effort of SHGs in Saravali), or subject experts and local area experts.

Local governance is deficient in case of peri-urban villages and requires to be strengthened. A nodal technical support group can be created at the metropolitan regional level to assist the peri-urban villages in planning for and implementing SWM plans. Mobilisation will be a key step for the entire model to be successful on a long-term scale, as continuous efforts and progress in this stage will lead to the creation of a community consciousness. Behavioural changes in the community cannot be brought about instantly and require persistent motivation. Involving the SHG members and reaching out to the other citizens through them will work like a catalyst to promote mobilisation throughout the local community in the villages. Advertisements, meetings, door-to-door talks, sessions in school, and processions can be used by the SHGs to get information to the public. Developing coalitions with neighbouring villages will also help in a scenario of joint efforts towards SWM initiatives.

For SHG involvement to be successful, it will also be necessary to execute capacity building of the local officials. It will provide them with knowledge for facilitating the participation process and clarify the benefits of public participation. This will aid in strategically steering the community towards a stable waste management system. Efforts like special incentives to promote waste segregation and composting, and penalties to defaulters will catalyse the community for source segregation and community activities. Government policies to increase the expenditure autonomy and the tax-collection capacities will also enable the rural-level governance to effectively plan for an SWM system. Thus, institutionalisation and incentives will be important strategies for the success of this partnership model.

## 7 Conclusion

The management of solid waste in peri-urban villages is challenging and requires urgent attention in MMR. Local participation can augment the efforts taken by the government towards waste management. It can also encourage better accountability of the officials at the village level due to increased community awareness and collaborative functioning. This study attempts to highlight the social dimension and potential of SHGs in overcoming the lack of SWM provisioning by the rural local bodies. The novelty of the study lies in ascertaining evidence of social networks in the form of SHGs' involvement in community activities in the village. Analysis of social aspects is a complex field and statistics on their own fail to capture the intricacies. Hence, the adopted methodology also focused on qualitative observations to account for interactions between locals, groups, and the government. Socio-economic empowerment of women as a result of SHG membership forges them into key channels of communication which can be used for advocating SWM. The emergence of leadership through the interactions within and outside SHGs can help in translating awareness into concrete actions. The bottom-up nature of SHGs nurtures social support which in turn can help in overcoming the challenges faced by citizen participation at the rural level. Since the peri-urban villages are a constantly dynamic system, the type of participation required for effective SWM in the villages can also vary with time. The suggested linking of SHGs and the rural local bodies will be a model that adapts and evolves according to the needs of the specific peri-urban villages.

The United Nations' guidelines for sustainable development cite 'social mobilisation' and 'community engagement' as two approaches towards social sustainability, which in turn will catalyse economic and environmental sustainability. Ensuring the involvement of

SHGs in SWM mechanisms in the peri-urban villages will greatly contribute in helping the rural citizens to make informed choices for waste management and is beneficial for all the stakeholders. The social consciousness created by SHG involvement is also essential to overcome the problem due to periodical changes in administration. The VDOs keep on changing at regular time intervals; village leaders and other village assembly members also keep on changing. Participation of SHGs will provide the necessary continuity in involving the local perspective in planning. Public policies stressing on increasing women's participation in SHGs will thus have a positive impact not only on the household welfare, but also on the overall waste management conditions in the village. If SHGs are engaged in developing and implementing an SWM mechanism, it will increase the probability of an efficient and inclusive local participation model, which is a stepping stone towards sustainable SWM in villages. The SHG participatory approach is also a major step towards the localisation strategies deemed necessary for achieving the Sustainable Development Goals, as any efforts should be locally designed for complete effectiveness.

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#### Declarations

**Conflict of interest** The authors declare that they have no conflict of interest.

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