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Revitalising Ponds for Climate Adaptation

Community-led Strategies: Managing Loktak Wetlands

Resilient Neighbourhoods through Water-Sensitive Urban Design: Bengaluru

Coastal Confluence Zone Planning: South Goa

SHGs in MSW Management: Udupi

Leveraging ICCC for Monitoring and Action

Empowering Urban Poor through Digital Learning: Odisha

Strengthening Municipal Finance: Peri-Urban Development

Unlocking Self-Sustainability: Hubballi-Dharwad

Beyond Growth: Sustainability and Climate Adaptation



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Issue I (Supplementary)

Nurturing Resilience: Revitalising Ponds as Localised Solutions for Climate Adaptation	1
<i>Jamsheed Hamid Rather, Bushra Dilshad and Abi Sri Rama</i>	
Enhancing Climate Resilience through Community-led Localised Strategies for Loktak Wetland	28
<i>Surabhi Mehrotra, Lal Bihari Singha, Yogesh K. Garg and Purnima Borikar</i>	
Water Secure Cities: Climate Resilient Neighbourhood Modules through Water Sensitive Urban Design	44
<i>Monika Valase</i>	
Planning and Management of Coastal Confluence Zones: A Case of Rivers of South Goa	63
<i>Saishree Prasad Naik and Rajeev R</i>	
Role of SHGs in MSW Management – A Case Study from Udupi	96
<i>Divya Tiwari, Shruthi Sreenivasan and Meghna Vodapalli</i>	
Environmental Surveillance and Management: Leveraging ICCC for Monitoring and Action	111
<i>Nilanjana Dasgupta Sur and Saoni Sanyal</i>	
Digital Learning Platform for Empowering Urban Poor through Slum Dwellers Association (SDA) Capacity Building Programme in Odisha	141
<i>Banisweta Patro, Sivaram Kandaswamy Pazhanivelan and Kushal MP</i>	
Unveiling Disparities and Strengthening Municipal Finance for Sustainable Peri-Urban Development	157
<i>Swati Sharma and Sheuli Mitra</i>	
Unlocking Self-Sustainability: A Strategic Analysis of Hubballi-Dharwad’s Municipal Finance and Proposals for Future Growth	180
<i>Manvi Gubreley and Ritwik Shwetaketu</i>	
Beyond Growth: Developing Cities for Sustainability and Climate Adaptation	200
<i>Moumita Shaw, Raman Kumar Singh, Ruchi Gupta and Yogita Lokhande</i>	

Editorial

Urban transformation is becoming more common in recent years. Cities, often regarded as "engines of growth", are growing in an unplanned manner. To ensure sustainable urban development, we must protect our cities and fringe areas around the cities from various climatic risks and hazards. Around the world, rising temperatures, desertification, unexpected natural disasters, and overall shifts in climatic trends are directly affecting the quality of life. This situation demands urgent action to enhance the resilience of our cities against these climatic threats, emphasising the need to build the capacity of institutions and policy makers, as well as residents and other stakeholders to secure a sustainable future.

In this direction, the Ministry of Housing and Urban Affairs (MoHUA), Government of India, and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH are jointly implementing the 'Sustainable Urban Development - Smart Cities II' (SUDSC II) project on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). As part of a strategic partnership with GIZ for the SUDSC-II project, NIUA is providing an end-to-end ecosystem support mainstream risk-informed, integrated, resilient and sustainable urban development in cities.

In the current edition of Urban India, authors with diverse expertise in urban domain endeavour to address these challenges and provide perspectives and solutions to a number of concerns that the urban sector is currently facing. This edition focuses on the critical aspects pertaining to the three thematic areas of the project- climate resilient infrastructure, digital innovation and municipal finance.

In the first article, Jamsheed Hamid Rather et al. have evaluated and explained how ponds can act as localised solutions for climate adaptation in nurturing resilience in villages in a peri-urban setting. Authors have analysed the publicly available meteorological data like precipitation and temperature to answer a few key questions like changes in temperature, precipitation, biodiversity, their socio-economic impacts, and the importance of community participation. The study emphasises on the importance of integrating traditional knowledge with modern conservation efforts, advocating for localised solutions as a viable path towards sustainable development and climate adaptation.

In the next paper, Surbhi Mehrotra et al. have explored the community-led localised strategies to address the climate resilience in the settlements of Loktak Wetland in Manipur. The authors have developed a methodology abbreviated as CORE (Conduct participatory assessments, Optimise local resources and capacities, Respond to climate-related challenges, Empower communities) which supports the concept of community development based on available assets in the

community. The findings support community-centric, localised initiatives based on indigenous knowledge in creating long-term climate resilience in vulnerable wetland settlements such as the Loktak Wetland.

In her contribution to this issue of the Urban India journal, Monika Valase has explored the concept of 'water secure cities' through the application of Climate Resilient Neighbourhood Modules (CRNM), within the framework of Water Sensitive Urban Design. The paper delves into the relationship between climate resilience and urban design, and emphasizes on the significance of networked and locally based solutions. It includes a detailed research as well as a set of context-based strategies for enabling planned urban expansions, boosting a neighbourhood's carrying capacity for better water management, and making it more resilient to the wrath of climate change and haphazard urbanisation.

Through their research paper, Saishree Prasad Naik and Rajeev R, have addressed the importance of planning and managing Coastal Confluence Zones (CCZs), providing specific examples from four rivers of South Goa. The paper presents a framework for the planning of the CCZ areas and the preparation of a Land Use and Development Control Plan for the pilot project area of the Talpona River CCZ. In addition, the paper puts forward localised management guidelines for the CCZs, that are linked to the applicable Coastal Regulation Zone rules.

Authors Divya Tiwari et al. have demonstrated how Self-Help Groups (SHGs) significantly contribute to the progress and development of India, particularly highlighting their role in managing solid waste in Udupi city. The research examines the evolution and impact of a programme for waste management in Udupi involving SHGs and documents the role of Saahas, an NGO in the same. The findings demonstrate that empowering local groups fosters accountability at the ground level. The paper also shares some crucial success elements that were found to maximize the model's potential and assure its long-term survival.

In the next paper, Saoni Sanyal and Nilanjana Dasgupta Sur, have analysed the functioning of Integrated Command and Control Centres (ICCCs) in addressing environmental challenges within rapidly urbanising Indian cities. The study underlines the importance of a comprehensive approach to urban management that takes into account environmental concerns in light of the pressure on the natural resources and ecosystems as cities grow. To attain the comprehensive ICCC services in environmental monitoring and surveillance, the study recommends better implementation of their functionality in India by drawing lessons from global practices in environmental surveillance.

In their contribution to this issue, Banisweta Patro et. al emphasise on the relevance of a digital learning platform in empowering urban poor through the Slum Dwellers Association (SDA) Capacity Building Programme in Odisha. Their study demonstrates how the SDA training application and capacity building web dashboard developed under the Jaga Mission in Odisha are the two significant monitoring tools for delivering training programmes across the state within a short time span. The paper also emphasises on the sustainability of the application as a user-friendly, scalable digital model through participatory urban digital transformation practices under the Jaga Mission for sustainable urban development.

Swati Sharma and Sheuli Mitra investigate the impacts of urban growth on peri-urban regions in the cities of Bhopal and Jaipur. They also explore the ways to strengthen municipal finance for sustainable peri-urban development. Major findings indicate that majority of the problems arise out of the dichotomy of jurisdictions between municipal corporations and village panchayats in peri-urban areas. Based on the findings of the study, the paper attempts to find alternative sources of municipal revenue to address the gaps with timely expansion of municipal boundaries, collaboration with local farmers, and need for preparation of broad land use plans to implement mechanisms of land value capture.

In the next paper, Manvi Gubreyey and Ritwik Shwetaketu explore the concept of self-sustainability by analysing the status of municipal finance in Hubballi-Dharwad. The paper presents a comprehensive analysis of the municipal financial dynamics in Hubballi-Dharwad, shedding light on its current advantageous position and the strategic initiatives needed to ensure long-term self-sustainability. The paper emphasizes on the need and approaches for creation and capture of 'value', be it in terms of betterment charges, land value capture, or other value capture finance methods.

In the last paper, Moumita Shaw et.al, emphasise on the issues and challenges that arise from urbanization, particularly in context of the extreme climate vulnerability and intensified challenges from rising temperatures, extreme weather conditions, etc. The paper establishes the need for holistic and coordinated actions towards building climate resilience, adopting digital innovations and solutions, and strengthening the sources of funding. It further attempts to collate several initiatives taken by the Government of India for encouraging the states and the cities to undertake development that is sustainable and resilient.

This supplementary issue of Urban India aims to showcase distinctive case studies from settlements presenting evidence-based policy recommendations and proposing innovative solutions to address urban challenges. I strongly believe that this compilation of research papers will act as a good reference for all relevant stakeholders who aim to build sustainable cities.

I would like to express a heartfelt gratitude to all those who have contributed to this edition of Urban India. My deepest thanks go to our editorial team for their dedication, to our esteemed authors for their insightful papers, and to our reviewers for their meticulous critiques and invaluable feedback. I am also profoundly grateful to our readers for their continuous support and engagement, which motivate us to strive for excellence. Lastly, I extend my appreciation to all those behind the scenes, whose efforts often go unnoticed but are crucial to the success of our publication.

Dr. Debolina Kundu
Editor

Role of SHGs in MSW Management – A Case Study from Udupi

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Abstract

Urban local bodies outsourcing solid waste management operations to private entities leads to high costs, low accountability, and poor service. Udupi city, located in the south Indian state of Karnataka, began incorporating Self-Help Groups (SHG) for this purpose in 2006. This paper traces the programme's evolution and impact through a case study of Udupi's waste management programme involving 14 operational SHGs in 27 out of 35 wards under the city municipal corporation, and documenting the role of Saahas, an NGO in the space of solid waste management. By analysing the challenges faced during the initial phase and how they were overcome, the findings reveal that empowering local groups fosters accountability at the ground level. However to unlock the model's full potential and ensure its long-term viability, several critical success factors were identified. The aim of this study is to contribute to a broader understanding of how SHGs can be successfully integrated into sustainable solid waste management practices.

Keywords: Municipal solid waste (MSW) management, Self-Help Groups (SHG), Resource recovery, Sustainability, Urban governance, Saahas, Udupi

Background

Waste management is one of the primary responsibilities of all local governing bodies. Over the past few years, population growth and a growing economy have led to a rapid rise in the per capita waste generation in cities as well as the quantum of waste generated (Biswas et al., 2021). Moreover, the composition of the waste has also changed due to the increasing use of packaged goods and single-use items (Datta et al., 2022).

Solid Waste Management Rules, 2016, accord the responsibility of waste collection to municipal bodies, who appear to be guided by two related policy imperatives i.e. privatisation and universal service provision (Luthra, 2019). Without a holistic development plan, waste management is getting increasingly challenging and expensive for the municipalities (Kumar, 2020). There

have been media reports referring to the strength of garbage mafia superseding the power of administration (DHNS, 2019). This is especially true when private players are onboarded, as their main objective, by virtue of definition is to maximise profits, which leads to conflict of interest between local bodies and the private partners (Parhi, 2019).

Waste management as practised in most parts of the country is just collection and dumping of waste material, which requires no specific skill set, hence cost is the only criteria for allocating the contract. Contractors are able to bid low because they are not concerned with resource recovery and scientific disposal methods. Moreover, corruption on account of fuel consumption etc. have also been reported (Devanathan, 2021). There is another problem with the contractor system, the staff deployed by them are often not paid the official minimum wages. A large part of the informal workforce suffers exploitation from contractors as their payments and work benefits do not come under the direct pay scheme (Gowda et al, 2021). In order to address the issue of worker exploitation specifically, certain municipalities in India and cities the world over, such as Quezon in the Phillipines, and Yogyakarta in Indonesia, have awarded waste management contracts to women-led Self Help Groups (SHGs) (Vincetian Missionaries, 1998; Fajarwati et al., 2020). Many of these were initiated by the women workers themselves who came together to demand that the contract be awarded to them directly instead of the contractors. They get these contracts, not just on humanitarian grounds, but also because they are economical as a middle contractual layer is removed from the waste ecosystem.

In India, an SHG is defined as an informal, self-governing group of men/women from similar socio-economic backgrounds (Sundaram, 2012). This SHG was initiated in the early 1970s to empower women to create self-employment and/or microfinance opportunities, thereby enabling the financial inclusion of marginalised sections of society. The income generated through the operations of an SHG is split between the members of the group and/or invested back into the business (Ahmad, 2020).

SHGs can also be registered under any state's Society Act or a State Cooperative Act. SHGs have leaders/representatives who act as the point of contact between the SHG members and the government while serving as spokespersons for the group. These representatives also maintain the financial accounts of revenue and expenditure, profit and loss, among other responsibilities. According to the Economic Survey of India, 2022 -2023, of the 12 million SHGs present in India, 88 per cent of them comprise all-women member groups (Mahapatra, 2012).

Over the past few years, SHGs have begun to take up waste management operations in some urban and rural pockets of India. Udupi, a city in the south Indian state of Karnataka, has been a pioneer in the inclusion of SHGs in the management of the city's waste since 2010. However, they struggled to run their operations, the service levels were poor as well as the earnings of the SHG members. Participation of SHGs in peri-urban villages near the Mumbai metropolitan region has led to increased general awareness and better community involvement for solid waste management (Kandpal, K aizen, 2021). According to Swachh Bharat Mission, in urban India, currently there are more than 3500 SHGs operating in sanitation and solid waste management (SWM) operations alone (DAY-NULM, MoHUA, 2024).

Saahas, an NGO implementing end-to-end waste management programmes, started working with the Udupi Municipal Corporation in 2018. Saahas looked into the entire working of the SHGs and the SWM system and identified the gaps. For three years it worked to streamline the process, providing technical support in waste collection and processing, improving infrastructure, and building the capacity of the various actors. This brought in significant improvement of the overall SWM operations and also the earnings of the SHGs. Currently, waste in 27 wards (out of the 35 wards) is collected and managed by SHGs, accounting for 71 per cent of the city's waste. Overall, 14 SHGs are involved in solid waste management across these 27 wards in urban Udupi.

The subsequent sections of this case study will detail the evolution of the SHG model of waste management in Udupi, the challenges they faced, and how Saahas was able to address some of these. This case study will elaborate on the critical factors required for the effective inclusion of SHGs in the solid waste management systems of India, and most importantly, provide insights on what is necessary to scale and sustain their operations. This would help other cities to evaluate if they can adopt this model and the overall pros and cons of the SHG based SWM model.

Evolution of SHGs for SWM in Udupi

Chanda always wanted to have her own small business. She had tried her hands at various occupations such as tailoring, selling snacks, soft toys etc., but nothing had given her a steady income. In 2006, she came to know about the Nirmal Nagar Yojana and how the Udupi City Municipal Council (CMC) was earnestly looking for self-help groups to take up SWM activities. Chanda was part of an SHG and decided to take this up. Inspired by her group, five more SHGs joined the Udupi CMC's initiative on solid waste management. Chanda and Vanaja were two of the five women leaders who pioneered the SHG involvement in waste collection in Udupi. Chanda's inspiring journey grabbed the attention of the national media as well (The Times of India, 2021).

The model functioned in a way that a certain geographic area was allocated to each SHG who would collect waste and a service fee from waste generators of those specific wards. The waste collected by the SHGs was stored in secondary storage points from where it was taken to the city landfill by the municipality. The collection was either carried out by the SHG themselves or they hired some staff and managed the overall operations. Most of the waste went to a landfill, and some high value items were pulled out by the collector and sold to the local scrap dealer. Interestingly, Udupi city had brought in the user fee concept for SWM in 2003, which many cities have begun to introduce in recent years but are facing a lot of resistance (Singh, 2020). While initially, the fee collection was challenging in Udupi as well, eventually people were happy to pay for a better waste collection service. Thus, it was relatively easier for SHG women, who belonged to local communities, to establish a level of trust and service quality assurance. Slowly more people were agreeable to paying a fee which assured them of a satisfactory standard of the service. The model thrived and over the years, more and more SHGs took up SWM operations in Udupi. In 2009, for instance, Asha, who had learnt about the potential of income generation from the SWM project, began her own SHG to implement waste collection. The municipality was also happy with this system as they did not have to spend anything on primary waste collection, services and complaints, if any, were also addressed by the SHG itself.

By 2009, the total number of SHGs involved in waste collection had gone up to 14. They were

collecting waste from 27 of the 35 wards of Udupi. All the women who had taken the leap of faith into joining this initiative had done so to earn a steady income and become financially independent.

Initial Years

Operations and Infrastructure

In the initial years, the SWM operations by the SHGs in Udupi were quite rudimentary. There was no one to guide them and door-to-door waste collection was neither systematic nor effective. They used hand-driven push carts, donated by the government and other benefactors for door-to-door waste collection. This was a slow procedure and it was not possible to collect from all houses in the ward on a daily basis. Hence, the waste collection was irregular. No one had heard of waste segregation and the SHGs collected mixed waste from which they would pull out some of the recoverable/recyclable items that were sold to the local scrap dealers. This sorting activity was often done at their homes as no storing place/shed had been allocated to them by the municipality. The remaining mixed waste was taken to the government designated dumping sites from where it was periodically transferred to the city's landfill by the municipality.

SHG Structure in the Early Stages

The groups had a flat hierarchy, and SHG leaders/representatives were actively involved in on-site operations along with the rest of the members of the SHG. The revenue and profits generated by them from the operations would then be divided equally between all members. This shared ownership structure helps drive accountability and motivation to all team members. This is a must for operations like SWM as it is a highly dispersed, low skill activity which is difficult to measure and monitor. Self-driven, accountable staff can deliver great service levels with very low monitoring effort.

Change in Infrastructure and the SHG Structure

As the operations matured, some members took more initiative to expand and invest private funds and a leadership structure emerged. Funds were invested to purchase vehicles to improve collection and expand operations. Most were purchased second hand and repaired, modified for waste collection, for example by raising the trailer height. Increased coverage helped improve revenue through sale of recyclables and also the user fee.

However, they were still sending out a lot of waste to the landfill as only a small fraction of waste was sellable. Additionally, the SHGs were struggling with manpower shortage. People were not ready to become part of the SWM SHGs as the work was not very hygienic; pulling out items from mixed waste was not something many wanted to do.

The year 2016 was a turning point for the SHGs, and most of the leaders underwent a 15-day training in Solid & Liquid Resource Management (SLRM) that was arranged by the District Collector. The District Collector at that time, Priyanka Mary Francis, was keen on driving sustainable SWM in Udupi, in addition to increasing the income of the SHGs. The training was conducted by Vellore Srinivasan, an SLRM expert working with the Ministry of Housing & Urban Affairs. Apart from many other aspects, the training provided them an understanding of how

source segregation helped improve resource recovery and subsequently their incomes. They also learnt that it was mandatory for all citizens to segregate their waste into three categories: wet, dry, and domestic hazardous.

However, when they tried to bring these changes on the ground, they faced stiff resistance from the citizens. Due to this, material recovery from mixed waste continued to be a challenge. Additionally, secondary sorting was conducted manually as they lacked the infrastructure.

Formalising the Partnership with the City Municipal Council

Udupi Municipality decided to formalise the engagement in 2017 with a Memorandum of Understanding (MoU). They also decided to support the SWM workers by providing vehicles for waste collection. The MoU defined their roles and responsibilities clearly, and the key points were:

SHGs were to appoint drivers and collection workers to carry out the waste collection operations in their allotted wards.

SHGs were to pay a monthly rent of Rs. 5000 to the CMC to use the waste collection vehicles provided by the council.

- Regular servicing and maintenance of the vehicles was to be carried out by the SHG.
- All expenses related to operations and maintenance of vehicles were to be borne by the SHG.
- SHGs were to ensure that no mixed waste collection was done in their respective wards.
- Rejected waste in the sorting units was to comprise less than 10 per cent of the total waste.
- All workers were required to wear proper personal protective equipment (PPE) while on duty.

The formalisation of operations through an MoU brought in a level of professionalism and seriousness about the operations. In 2019, the CMC provided the SHGs with Tata Ace vehicles. Typically, one vehicle per ward that consisted of about 1500 waste generating houses/shops was provided, though a few wards in the city-centre even had up to 4000 houses. The municipality also provided them with dry waste sorting and storage sheds; typically one shed was shared between two SHG groups with each group managing two wards each.

Implementation of the MOU

Despite the clause of monthly payment of rent by the SHGs as per the MoU, the implementation of the same was not done until a year later. Even afterwards, most SHGs did not comply with this requirement, stating that their earnings were quite meagre, and they could not pay the monthly vehicle rental. Additionally, the vehicles were required to be parked at secondary transfer stations or in the CMC godown. However, this required the drivers to travel an extra distance to pick up their vehicles in the morning, which in turn delayed the start of their operations and increased their fuel costs.

Maturing of the Model: Intervention by Saahas

In 2018, the NGO- Saahas signed a contract with the City Municipal Council for an SWM project in Udupi. The project was initiated through the CSR funding received by HDB Financial Services. The scope of the project entailed the following:

- Implementing segregation of waste at source in all 35 wards of Udupi district, Karnataka;
- Building awareness levels and capacities of the City Municipal Corporation (CMC) staff, SHG members, and citizens on sustainable SWM practices;
- Providing technical inputs to CMC, Udupi, for setting up of processing facilities of adequate capacities for all waste streams;
- Promoting home and community composting.

Under this project, Saahas deployed a team of 14 people consisting of a Project Manager, two Coordinators, and 11 Field Supervisors. The focus in the first year of the project was on creating awareness of a three-way source segregation and consequent behavioural change. In the next two years of the project, the Saahas team also worked closely with the SHGs and the CMC to streamline SWM operations and ensure maximum recovery of resources from all waste streams— including construction and demolition and e-waste-generated in Udupi. The Saahas team worked to build capacities of various stakeholders and also provided technical inputs for building the city's waste collection and processing infrastructure. The project ended in June 2022. The key interventions of Saahas that specifically helped improve the SHG operations are given below:

- Awareness and behavioural change generation
- Providing technical training and establishing Standard Operating Procedures (SOPs)
- Monitoring of segregated waste collection and the Monitoring & Evaluation system
- Provision of technical support to the CMC
- Infrastructure support
- Safety and hygiene

Awareness and Behavioural Change Generation

- The Saahas team conducted multiple training workshops on source segregation, home composting, safe menstrual practices etc., for various stakeholders to bring them on board with the ideas and practices of sustainable waste management. They also covered waste worker safety, hygiene, dignity of labour, and professional fire safety training for SWM unit workers.
- Sensitisation sessions were conducted for the ward councillors to sensitise them on segregation of waste and importance of its implementation to bring about long-term positive change and its sustenance.
- Well trained and dedicated teams from Saahas carried out door-to-door awareness and other Information, Education & Communication (IEC) and Behavioural Change Communication (BCC) activities to encourage source segregation by all waste generators.

- SHG members and CMC staff were also involved in these activities to build their capacities. Over the course of three years, a total of 166 awareness events and workshops, clean-up and blackspot removal drives were organised for households, schools, colleges, and hostels, markets, apartments etc. Through these events about 13,500 citizens were reached directly.
- To improve source segregation, Saahas also introduced a standard operating procedure of once-a-week collection of dry waste, rather than daily collection.

Providing Technical Training and Establishing Standard Operating Procedures (SOPs)

- Saahas worked with the SHGs and the CMC to develop SOPs for waste collection, transportation and transfer of waste, as well as guidelines for the safety and health of the staff.
- These SOPs helped standardise the SWM operations, creating a uniform system across all wards in Udupi which helped establish monitoring processes and data collection formats.
- Saahas also helped the SHGs in recording the necessary data by developing data formats and training the staff. The data captured included daily waste collection, waste sorting, storage and sales, employment details, monthly income and expenditures, and other details.

Figure 1: Segregated Collection of Waste in Udupi City Source: Saahas, 13 December, 2021



Monitoring and Evaluation System

- Saahas distributed custom logbooks for recording data and trained the staff on measurement and data recording. The specifics of the segregated waste collected across various streams would be entered in the logbook, and a picture would be shared in a WhatsApp group with all the SHG members, CMC, and Saahas team members. This information would be used by the Saahas team to prepare a daily waste collection report for the city.
- The waste collection team also recorded at the waste generator level the details of people not giving segregated waste. This helped in identifying defaulters of source segregation, and using this information focused IEC activities were carried out for the defaulters.
- Additionally, the data recording process allowed the CMC to spot discrepancies in the stream-wise quantities of waste collected by the SHGs. This could be easily cross-checked with the number of houses in the ward and the SHG would be questioned why there was a lower amount of waste collection.

Figure 2: Logbook Records of Dry Waste Streams in Subhramanya Nagara Ward

Shed Name: *Bannanje sthd* SHG/Incharge Name: *Santhya* June 2022
 Month/Year
 Wards covered: *Subhramanya*

SL NO	Dry waste categories	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	TOTAL
Recyclables																																
1	Pet bottles	25	10	21	27	5	12	16	12	15	5	11	20	27	30	28	22	10	20	23	20	23	20	18	20	18	20	23	15			
2	Plastic/Items (Mixed)	52	30	48	56	12	33	22	30	28	13	23	42	54	48	51	48	31	42	51	54	58	55	47	50	52	51					
3	Natural/ white Plastic covers	10	12	25	38	7	10	7	15	13	10	25	30	19	27	25	26	28	18	20	33	27	25	30	21	25	20					
4	Plastic Covers (Colour)	11	5	10	17	2	5	2	4	10	3	2	10	13	10	13	10	3	5	6	12	15	18	15	20	19	8					
5	Milk covers	15	7	15	19	2	8	4	5	4	5	4	8	10	15	13	16	4	7	10	11	10	13	15	10	15	13	10				
6	Boro bags	22	6	12	15	1	5	3	5	3	6	3	5	7	20	19	17	5	10	11	10	17	13	17	24	15	10					
7	Papers	38	20	33	35	4	10	13	16	17	7	8	20	32	35	34	32	10	25	27	25	30	28	20	30	20	21					
8	Carton boxes	40	35	40	23	8	25	20	32	35	11	20	58	40	48	34	30	22	27	20	31	28	20	20	25	18	12					
9	Core/ Brown boards	74	48	66	70	15	41	27	40	48	21	38	51	68	72	65	60	37	40	53	55	68	65	70	68	54	80					
10	Tetrapacks	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
11	Metals	10	12	10	25	—	3	5	4	6	2	10	10	13	10	8	10	—	4	15	20	10	4	10	7	8	5					
12	Aluminium Cans	3	4	7	4	1	2	1	2	1	4	3	5	4	5	38	3	1	5	4	5	3	4	4	3	4						
13	Aluminium foils	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—					
14	Cocunut shells	50	30	60	40	10	25	18	20	21	10	23	30	45	51	48	40	23	20	30	32	40	32	25	30	25	30					
15	Glass bottles	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Non recyclables																																
16	E-Waste	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
17	Multi layered plastics	12	7	12	10	3	6	4	7	5	3	12	10	15	10	11	10	3	5	6	7	5	6	5	6	5	6	5				
18	Plastic rejects	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
19	Cloth & footwears	30	20	40	30	5	17	13	20	7	2	10	25	32	40	20	22	10	20	25	20	30	27	15	20	23	40					
	TOTAL	341	246	399	409	75	261	190	211	227	149	193	302	380	420	374	365	189	245	302	334	354	311	306	343	333						
	<i>Diverted</i>	80	60	80	70	20	40	30	50	40	20	60	40	80	40	40	40	80	70	80	60	80	60	80	70	80	70	80				
	No of staffs	4	3	4	4	1	2	1	2	2	2	3	4	4	4	4	4	2	3	3	3	3	3	3	3	3	3	4				
	Timings (no of hours)	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8				
	<i>Interval</i>	300	150	150	100	300	550	100	150	150	350	550	200	450	900	1150	900	1150	900	1150	900	1150	900	1150	900	1150	900	1150				

Source: Saahas, 20 July, 2022

Technical Support to the CMC

- Saahas provided technical inputs to the Udupi CMC to set up processing centres of adequate capacity for all streams of waste.
- For wet waste, the technical consultant Dr. Joshy Cherian provided a detailed plan for processing of the wet waste. A pulverizer machine was made available for shredding of some difficult waste streams like tender coconut, meat waste etc.
- For dry waste processing infrastructure, the technical consultant, Saahas Zero Waste developed a blueprint of a 10 TPD (tons per day) Material Recovery Facility and made detailed technical specs for all machineries, along with the business model and SOP for the operations.
- Apart from this, the Saahas team on-ground also helped improve the SOPs at the dry waste centres. The staff was trained to improve sorting efficiency and destinations were established for additional waste categories. This helped improve the revenue (as more categories could now be sorted) while reducing the cost of sorting.
- Saahas also helped with segregated wet waste going to the biogas plant that had become non-operational.
- Saahas helped the CMC establish a Windrow system of composting.
- A system was established for collection of e-waste and construction and demolition (C&D) waste.

Infrastructure Provided by Saahas

With the help of CSR funding from HDB Financial Services Saahas installed some critical infrastructure in the CMC owned SWM shed, which improved efficiency and earnings of the SHGs.

- Infrastructure was in the form of five waste sorting and storage units and three conveyor belts for waste sorting.
- In August 2019, Saahas procured three conveyor belts to be placed across three Dry Waste Collection Centres. With the help of the conveyor belts, the sorting efficiency of the SWM staff went up from 40 kg to 100 kg per day per person.
- Saahas also installed a compost turner machine in August 2021 for thorough mixing of compost and a pulverizer cum shredding machine to shred the tender coconut shells and make coco peat out of them. This was added to the composting set-up.

Figure 3: Conveyor Belts Donated by Saahas through HDBFS

Source: Saahas, 3 March, 2022

To encourage staff to start wearing PPE and adopt good safety and hygiene practices, Saahas provided gloves and masks to all of them, and bags to sort and store dry waste free of cost. The Saahas team also brought about behavioural change in the staff regarding how PPE was very important for their overall health and hygiene and it became a habit over a period of time. After one year, PPE and bags were given to SHGs at 50 per cent subsidy by Saahas in order to help them develop the habit of procuring these items and budgeting for them in their operations plan. One-time distribution of uniforms was also done by Saahas for the collection and unit workers.

Impact of Saahas Interventions

At the start of the Saahas operations in Udupi, less than 10 per cent of the waste generated there was segregated at source. The IEC and BCC campaigns carried out between 2019 and 2022 by Saahas in collaboration with the SHG and CMC, increased it to over 80 per cent by the end of June 2022.

The sorting and storage sheds installed improved the entire process of segregation for the SHGs, which in turn helped improve the overall quality and revenue earnings from dry waste. The conveyor belts helped improve the sorting speed from 30-40 kg per person per day to 100-120 kg per person per day, and the staff was able to sort waste into 14-17 categories. As waste storage could now be done, it was sold in larger volumes to bigger traders instead of scrap dealers, commanding better rates.

These critical improvements in source segregation levels, tighter monitoring, and efficient sorting operations increased the revenue generated through the sale of dry waste for all SHGs. The overall revenue from sale of dry waste went up for SHGs by Rs. 20,000 to 100,000 a month. About Rs 100,000 was being earned by the SHGs working in the city centre where higher quality dry waste was being generated by commercial entities.

Financial Model of the SHG Operations

For the wards that are being managed by the municipality directly, the service fee for SWM is being collected via property tax. However, the key source of earnings is the service fee; user fee varies based on type of generator (broadly based on the quantum of waste generated). The monthly rate has increased over the years for everyone; it is now Rs. 50 per household (in 2010 it was Rs. 20), Rs. 200 for small shops, Rs. 500 for larger stores, and so on.

Figure 4: Standard Financial Model Break-up of the SHG-Model, Surabhi Navodaya Group

Moodu sagri					
Income					
Particulars		Subtotal	Total		
User fee collection	Households	1,00,000	1,44,000		
	Commercials	44,000			
Sale of dry waste					
Grand Total			1,44,000		
Expenditures					
Particulars	Staffs	Units	Amount	Sub total	Total Amount
Workers Salary	Driver	2	17,000	34,000	1,09,000
	Collection staff	5	15,000	75,000	
Vehicle	Fuel	2	13,000	26,000	28,000
	Maintenance			2,000	
Grand Total					1,37,000
Profit					
Income	1,44,000				
Expenditure	1,37,000				
Difference	7,000				

Source: Saahas, 12 December 2, 2021

The revenue heads of the SHG financial model comprise user fee collected from waste generators and the sale of dry waste to recyclers. The expenses, on the other hand, comprise salaries given to the workers employed by the SHG representatives for the SWM operations, in addition to the maintenance and fuel costs of the transport vehicles.

In 2020, the number of wards being handled by SHGs in Udupi was 25 out of the 27 wards. However, as the city grew, in 2022, four SHGs gave up or downsized collection operations in their respective wards located in the outskirts of the city. This was because, in the outskirts, household and commercial establishments are dispersed, which increases the cost of collection for the SHGs. In the densely populated city centre more houses can be covered in less time and at a lower fuel expense, thus the earnings are higher. Hence the municipality took over operations in the wards

on the outskirts and hired additional drivers. However, no sorting infrastructure was sanctioned in the outskirts. It is worth noting that the SHGs handling waste collection in the wards in and around the city centre are able to sustain their operations financially with municipal support.

Changing Structure of the SHGs

At the initial stage of SWM operations by SHGs, they had a flat hierarchy wherein all the members of an SHG had equal say and also equal share in the profits. However, over the past 15 years, the SHG model has evolved into more of a private ownership structure where the leader takes all decisions, invests and manages the overall operations, and hence takes the lion share of the profit as well. There is now an employer-employee relationship between the representative/leader of the SHGs and the rest of the members. Most of the SHGs have also hired staff, both permanent and temporary female and/or male, for all on-ground operations. The standard structure of an SHG involved in SWM operations is represented in Table 1.

Table 1: Example of SHG Structure for SWM Operations

S. No.	Self-Help Group Name	Total Number of Employees	Female to Male Ratio of Employees
1	Karunya	6	3:3
2	Sri Siddhi Sannidhi	28	15:13
3	Spandana Nagara Shri Shakthi	17	8:9
4	Shree Anjaneya Navodhya	9	3:6

Source: Primary data from Saahas field team

SHG leaders who were actively involved in the field work earlier, primarily focus on managing the overall operations and finances and the relationship with the municipality. The other SHG members and hired staff do waste collection and sorting operations. Some SHGs even have bill collectors for user fee collection and dry waste management unit supervisors for monitoring waste sorting.

Limitations in the SHG Model of SWM

While this model encourages entrepreneurship, and in Udupi the leaders took risks during the initial phases and were rewarded for the same, it eventually led to some serious concerns.

Inequality among equals: What started as a rather flat hierarchical structure, eventually turned into a typical employer-employee relationship as SHG leaders took over the managerial and financial activities and entrusted the job of collection and sorting to other members, leading to a skewed balance of power amongst members.

- **Cost of operations:** Ownership and accountability, the two main pillars of the SHG model, are compromised when hierarchy is introduced in the system. This also leads to increased cost of operations as staff monitoring becomes important.
- **Reduced efficiency and service levels:** As employees, the SHG women are not motivated to give their best as they don't have a share in the profit, hence overall efficiency and service levels are compromised.

- High rate of attrition: Due to the employer-employee relationship, SHG women are not motivated to continue in the same jobs for long, which also increases the cost of hiring and training.
- Non-compliance of labour laws: High attrition rate disincentivises the SHG leader to comply with labour laws. Less than half of the SHG staff in Udupi are registered for provision of PF & ESI benefits.

Tax evasion: Another critical non compliance is not using bank transfers for salary disbursement or other financial transactions. SHG leaders don't want to reveal the profit and earnings with other SHG members and also the municipality as this would attract a tax burden. This is because there is general reluctance from their end to declare their income or profit as they would be questioned on keeping a bigger share. Currently they make sure that their books show as if they barely break even or run in negative.

Learnings and Critical Success Factors

Based on the summary of activities under Saahas's intervention in Udupi and the learnings from the ground, critical factors for the success of the SHG model for SWM are as follows:

Supportive policy framework: The Nirmal Nagar Yogna that tied the municipality funds with inclusion of the SHG ensured that the entire machinery worked to make this successful. There was tremendous support to get the citizens to pay for waste management.

Training and support: As SHGs are typically a group of underprivileged men or women, they need significant training and support in managing the operations and also business acumen. Municipalities can outsource the leadership training and support to an external agency, which would empower SHGs in creating a collective leadership team, which remains a big challenge, as seen in Udupi. Barring the key SHG members, others are reluctant to take up leadership positions. Training and business support is also imperative from an operations standpoint. In Udupi it was seen that while the SHGs were doing a good job of waste collection, they were not doing much resource recovery. Even after being provided with the infrastructure, many were not comfortable with taking up the operations of waste sorting and selling, as it required them to establish connects with buyers for each material. Experienced NGOs or even private players can be enrolled to provide hand-holding and training on data management, bookkeeping, and other regulatory compliances.

Service fee collection by the SHG: If the SHG system is run like a sub-contractual activity where the SHG is paid a lump-sum amount for services, it would not be successful and it would operate like a contractor system. To bring in accountability from both waste generators and primary waste collectors, direct service fee collection by the primary collector is a must.

Hiring locals to form SHG: The SHG must comprise local men/women. This helps in establishing a better connect with the community, as a level of familiarity ensures that both parties (generators and collectors) accountability is better in the SHG set-up, regular monitoring by the municipality is a must. Monthly meetings must be organised, and they must be asked to submit data in standard

format that must be analysed using dashboards to compare and track the performance of key parameters.

Use of simple mobile-based IT tools: Most men and women in India, whether literate or otherwise, are comfortable using smart phone Apps. If a data collection system is designed using some of these formats, the acceptance and usage would be easier. A common data management support unit by the municipality who can help all SHGs would also be of great help.

Ensure SHG format is not diluted: Ideally in the SHG driven SWM system, the primary collectors come together to form the SHG and run the operations. However, often this does not happen and the SHG hires collection staff, thus introducing a management layer under which the rights of the waste workers are not guaranteed. There is also lack of accountability and ownership, hence the key synergy between the SHG and the SWM system is lost in this format. This can also get compromised if the SHG leader/ representative leader runs the SHG like an employee-employer set-up where, instead of profit sharing, the other members are paid a salary or a fixed amount and are not involved in decision making and running the operations. The municipality must ensure that a proper collective leadership develops in the SHGs engaged by them through training and capacity development. They also must ensure that the collectors are also members of the SHG and are not just employees and there is some transparency in the profit distributions amongst the members.

Conclusion

While the SHG system comes with some challenges, it is still better than the contract system where the municipality pays a fixed fee to the contractor while it collects the service fee from the generators through property or any other tax. There is an obvious conflict of interest in the motivations of an urban local body who works for public interest, and its private partner who is focused on profit maximisation. The key problem in this set-up is that the user (waste generator) does not pay directly to the service provider (contractor) hence the provider feels no obligation to maintain a service standard and user complaints are directed to the municipality, hence the resolution mechanism, if any, is delayed at best. In the SHG model where the waste collector earns the income primarily from the service fee and some amount from the sale of dry waste it encourages users to segregate waste at source as that improves the dry waste earnings for the collector. Similarly, as the waste generators are paying the collector, they will also keep a watch on the service levels and question the collectors if they fail to collect and handle waste properly. Thus, the city gets a monitor in each waste generator and collector. To conclude, the SHG model can bring in accountability at the lowest level while improving the service levels. However, to maximise and sustain the benefits of this model, it is critical that policies are conducive, municipal support is available, and monitoring is consistent.

Conflict of Interest

Authors declare no conflict of interest.

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