



Toxics Link
for a toxics-free world

Upscaling people's participation in urban solid waste management Constraints and prospects



As urban waste in India rises at staggering proportions, community interventions hold the promise of dealing with the waste effectively and converting it into a resource



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About Toxics Link

Toxics Link is an environmental NGO, dedicated to bringing toxics related information into the public domain, both relating to struggles and problems at the grassroots as well as global information to the local levels. We work with other groups around the country as well as internationally in an understanding that this will help bring the experience of the ground to the fore, and lead to a more meaningful articulation of issues. Toxics Link also engages in on-the ground work especially in areas of municipal, hazardous and medical waste management and food safety among others. We are also involved in a wider range of environmental issues in Delhi and outside as part of a coalition of non-governmental organizations.

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Acknowledgements

This project required a collaborative effort and made us incumbent on seeking the cooperation of many organisations and individuals working with issues of solid waste management across the country. We are grateful for their assistance and hope to continue the relationship beyond this customary practice of thanks giving.

It has taken us 18 months to complete this work, though our involvement with the issues of waste management, recycling and the informal sector is nearly a decade old. Though, the essence of the project involved the documentation of community based organisations working with waste issues across the country, and understanding the constraints to upscale them, it had several other key interventions like building a collaborative platform (named Alliance for Waste Management) of expert organisations and individuals working in South Asia and organising training workshops for field practitioners. At the grassroot level we initiated the model of a Zero Waste colony in Delhi to show that such a system is ossibile.

An intervention of this magnitude necessitated a joint venture. To begin with, we thank Dr. Virender Sharma, Dr. Neena Gulabani and Dr. Anjali Widge, members of the Advisory Committee, and former Programme Officer Mr. Narayan Belbase of Ford Foundation, who helped

in conceiving and formulating the main ideas.

During the documentation process, we had the opportunity to see the work of more than 70 organisations and about 40 municipalities. But, paucity of space does not permit us to mention the names of all individuals, organisations, municipal staff, the numerous waste collectors and other field workers who have all contributed in some way in the research.

Our special thanks to the participating members particularly Dr. Vivek Agrawal, Ms. Jyoti Mhapsekar, Mr. C. Srinivas and Mr. Suresh Bhandari who spared their precious time to interact with us. We also take this opportunity to express our gratitude to the Resident Welfare Associations of Sarita Vihar, Area Councilor, Mr. Hemchand Goyal, Deputy Commissioner of Central Zone, MCD, and other field staff of government agencies working in Sarita Vihar.

Special thanks to Swedish International Development Agency (SIDA), which has been supporting the programme, and to Ford Foundation which supported this valuable project. Finally, we express our gratitude to the entire Toxics Link family, which has always been encouraging and supportive.

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Abbreviations

- 🌱 AWM: Alliance for Waste Management
- 🌱 CBO: Community Based Organisation
- 🌱 CDC: Center for Development Communication
- 🌱 CEE: Center for Environment Education
- 🌱 DSWMS: Decentralised Solid Waste Management Systems
- 🌱 DTDC: door- to –door collection
- 🌱 EGC: Exnora (Green Cross)
- 🌱 FoUP: Friends of Urban Poor
- 🌱 JC: Jan Chaitanya
- 🌱 JSA: Jan Sewa Ashram
- 🌱 KKP KP: Kagad Kach Patra Kashtakari Panchayat
- 🌱 MJS: Muskan Jyoti Samiti
- 🌱 MSW: Municipal Solid Waste
- 🌱 NBJK: Nav Bharat Jagriti Kendra
- 🌱 NGO: Non-Governmental Organisation
- 🌱 NS: Naya Savera
- 🌱 PMCA: People’s movement for Civil Action
- 🌱 SE: Sukuki EXNORA
- 🌱 SMS: Stree Mukti Sangathana
- 🌱 SWM: Solid Waste Management

Contents

- 6 Introduction**
- 7 Decentralised community-based waste management systems**
 - Promoting a community paradigm
 - Constraints in upscaling community projects
- 9 Analysing community-based solid waste management interventions**
 - Models in operations
 - Community based initiatives
 - Success of community projects
 - Upscaling of community interventions
 - Sustainability of community interventions
 - Key challenges in upscaling and sustainability of community interventions
- 20 Waste collectors; some findings**
- 22 Municipalities**
 - Privatisation of municipal services: Is it sustainable
- 25 Composting**
 - Centralised vs decentralised systems
 - Challenges associated with composting
- 28 Developing a model**
 - Benefit of decentralised solid waste management systems

Introduction

Over the next two decades, growing urbanisation in India will result in a massive increase of waste. By the year 2021, as workers migrate to urban areas, the urban population is expected to represent 40% of the overall population. Delhi, alone, is expected to generate 20,000 tonnes of municipal waste every day, up from the current figure of 7,000 mt/day.

The waste problem will be acuter in newly developing townships, as they take on the character of small cities.

The urban poor will unfairly bear the brunt of the waste problem since their living areas, which are usually slums, will most likely be selected as waste dumping sites. The poor can not expect any municipal services to improve their living conditions. Urban poor communities that are engaged in cleaning the city through waste collection, sorting and recycling will themselves be on the receiving end of the waste problem.

The current initiatives for waste management purportedly clean up the cities, while, in truth, they only relocate the waste.

Landfill siting is an issue of environmental injustice, since waste dumps have been made mostly on city fringes or low-value land where the poor live. Such short-sighted moves have already displaced multi-stakeholder community projects in-

volving the poor. Another worrying aspect of this approach is the installation of polluting technologies, such as incinerators, several of which are now proposed in various cities of India. Not surprisingly, all incinerators are planned to be sited in areas where the poor reside.

It is imperative to make efforts to deal with waste in a more decentralised fashion so that it can be diverted from landfills.

All communities, especially those that are most impacted, must have a critical role to play. Ways must be found to integrate livelihoods and waste management issues in a socially just manner. If not, the waste will simply move down the path of least resistance to the economically disadvantaged.



Current waste management initiatives do not take waste pickers into account.

Decentralised community waste management systems

Promoting a community paradigm

Community initiatives in the country have sought to tackle the waste problem through on-the-ground involvement of stakeholders. As municipalities have failed to provide adequate services, there has been greater involvement of individuals, communities and NGO's who have taken local initiatives to not just manage the waste, but to turn it into a resource.

Such community initiatives have been identified as an alternative to centralised waste management systems. However, they are not well publicised. They need to be studied in greater detail and their approach needs to be replicated in other places.

While community projects are working on sound principles and fulfilling the greater objectives of environmental safety and natural resource conservation, they are under great economic and social stress. They do not receive any support from the stakeholders.

There is an urgent need to publicise these community projects and find ways to provide incentives to them. The policy framework needs to recognise these sustainable waste management systems which are succeeding in reducing the waste and generating livelihoods by recycling and composting waste.

Constraints in upscaling community projects

So far, these projects have worked at a micro-level: in a locality or neighbourhood. Without sustained support and participation of the municipality and larger communities it is difficult to upscale these projects in a short time.

Any community project needs the support of its stakeholders – waste pickers, residents, local municipal body, community-based organisations (CBOs), volunteers, etc – to operate and sustain itself. However the terms of such interface or interaction have never been fully examined or adequately documented.

The possibilities of upscaling such community-based projects – either as larger projects or through greater number of such projects – have never been explored. The current rules and regulations of the government (Municipal Solid Waste Rules, 2000) are inadequate to assess the environmental benefits or the economic and social implications of waste projects. There is a strong case for intervention in both upscaling the community projects as well as in making suitable policy interventions to ensure that they are economically and environmentally sustainable.

The traditional system of recycling waste, in which the waste pickers play a crucial role, is being mer-





Community-based solid waste management projects empower the community and strengthen linkages with government bodies.

Organised waste collection through community waste management systems should include waste pickers. This will lead to more, and cleaner, recovery of recyclables and enhanced income for the waste pickers.

The burgeoning waste situation clearly needs a new framework. Decentralised initiatives carried out by numerous groups in numerous ways – in small local pockets as well as larger colony and zonal levels – are showing the direction for the new paradigm. These need to be negotiated into the system of urban planning, municipal partnerships as well as marketing links.

cilessly torn apart and displaced by corporatising waste. As the international waste-to-energy industry gains a foothold in this area, it will burn the future of many urban poor. At the same time, municipalities that appear to support community-based projects have been quietly signing off waste projects to private interests.

For developing countries like India, recycling of waste is the most economical and socially viable option as it generates employment for the urban poor who neither have skills nor capital for investment.

The initiative and incentive for community waste management systems should ideally come from the government. Land for composting and other basic infrastructure should be provided by the local government. Currently, urban planning does not include such needs in its spatial city plans.

Markets need to be developed for compost products made from urban waste. Private sector investment in this area has been floundering owing to its inability to sell the compost due to the competition from the heavily subsidised chemical fertiliser industry. While energy products are being subsidised, the greener compost products need urgent attention.

Analysing community-based solid waste management initiatives

Models in operation

Basically, there are five types of waste management models in the Decentralised Solid Waste Management Systems (DSWMS):

🌱 **Partnership between municipality and NGOs:** In this scenario NGOs/CBOs manage community interventions with the assistance of municipalities. For example, Exnora Green Cross (EGC), Vellore and Jan Chaitnya in Vishakhapattanam have been sustaining their intervention with the help of the local municipality.

🌱 **NGOs/CBOs on their own:** The Muskan Jyoti Samiti (MJS) intervention in Lucknow is a good example of this approach. MJS has been given support by State Urban Development Agency (SUDA), Lucknow District Collector and other government agencies, but never by Lucknow Nagar Nigam, which is constitutionally obliged to provide these services.

🌱 **Municipalities on their own:** Municipalities of cities such as Suryapet, Bangalore, Panjim, Kalyani, Bhadrashwar, etc, are engaged in sustainable management of urban solid wastes purely on their own and as per the MSW Rules, 2000.

🌱 **Private Operators:** In some places (Chennai, Nasik, Surat and Delhi), municipalities have contracted out their solid waste management functions to private operators.

🌱 **Institutions/industrial complexes on their own:** Some institutions/industrial complexes manage their solid waste problems with the help of local NGOs. Some examples are Indian Institute for Technology (IIT) and Jawaharlal Nehru University (JNU) in New Delhi and ITC, Bhadrachalam which are managing their solid wastes with the help of local NGOs.

Community-based initiatives

The following discussion pertains to those DSWMS which have been initiated by the NGOs/CBOs and are being run with some support from municipalities or government agencies. From the municipality they receive support which could be in the form of land allocation for segregation/composting, the issuance of identity kits to waste collectors, etc. These interventions however collect a 'user fee' from the community. The interventions that fall into this category are depicted in the table on the next page.

Of these, all except the intervention of Jan Seva Ashram (JSA), at Solan, have up-scaled and are sustaining themselves. The JSA intervention has failed due to various reasons, which are discussed later. The up-scalability and sustainability of these community interventions, are discussed in detail in the next section.



Community-based initiatives

NGO/CBO	City
Centre for Development Communication	Jaipur
Centre for Environment and Education	Bangalore
Exnora Green Cross	Vellore
Friends of Urban Poor	Thituvanantapuram
Jan Chaithanya	Vishakhapattanam
Jan Sewa Ashram	Solan
Kagach Kach Patara Kashtkari Panchayat	Pune
Muskan Jyoti Samiti	Lucknow
Nav Bharat Jagriti Kendra	Ranchi
Naya Savera	New Delhi
Pramukh	Deharadun
Stree Mukti Sanghathana	Mumbai
Sukiki Exnora	Hyderabad
Swabhimana	Bangalore
Vatavarn	New Delhi
Vikas	Bhuwaneshwar

Here we discuss some significant findings and observations about these projects based on the data collected during the process:

Community projects

A marginal but important presence at the city level: All these community interventions have a very marginal presence. Even if we take the two largest interventions, namely MJS at Lucknow and Centre for Development Communication (CDC) at Jaipur, they deal with only 3.6% and 2.5% of the city waste respectively. However, they make a significant contribution in the form of providing employment to waste collectors. MJS,

CDC and Kagach Kach Patara Kashtkari Panchayat (KKPKP) employ 900, 600 and 300 waste collectors respectively.

Kinds of services: Most of these organisations mainly adopt door-to-door collection, segregation and composting of bio-degradable waste. Thus, NGOs like Naya Savera, Centre for Environment and Education (CEE), Sukiki Exnora, Friends of Urban Poor and Vikas are involved in door-to-door collection of waste and other waste management services. Some NGOs like Vatavarn and Stree Mukti Sangathana (SMS) are also involved in staircase cleaning, tree pruning, etc. However, some organisations like Nav Bharat Jagriti Kendra (NBJK), EGC have also integrated drainage cleaning and road sweeping, though not on a daily basis.

Composting: Out of 16 projects, 11 have undertaken composting. Only MJS, Lucknow; NBJK, Ranchi; KKPKP, Pune are not involved in composting. MJS had to stop its composting initiative due to marketing problems while NBJK has a plan to start composting once the municipality allocates land for it. The table below depicts the allocation of land for composting.

Municipalities have provided land in half the cases which is quite logical since it is the main agency responsible for the solid waste management of the city. In some residential societies – as in Basera Colony, Mumbai – RWAs have provided land

Who provided land for segregation?

		Frequency	Percent
Valid	Municipality	7	50.0
	Residents Association	2	14.3
	Own place	3	21.4
	Other Sources	2	14.3
	Total	14	100.0

for local composting. In the case of Naya Savera and Vatavaran, educational institutions like IIT and JNU have provided the land for the composting.

Landfill diversion rate: One of the most important benefits accruing from these community interventions is their ability to divert waste from landfills. The landfill diversion rate acquires significance when one considers the nature of Indian waste. Urban waste in India usually comprises 60% bio-degradable waste, about 30% recyclables and only 10% is absolute waste. Since about 60% of the municipal waste is organic in composition it can easily be composted. Assuming that there is primary segregation taking place in order to ensure the quality of compost, there is an automatic diversion of 60% of the waste. Moreover, since source segregation ensures separate collection of recyclables and other waste, the rate of landfill diversion goes up further. This is evident from the data collected from Jan Chaithanya's Vishakhapattanam intervention. Jan Chaithanya has been able to achieve a landfill diversion rate of 91.6% through composting of bio-degradable waste and sale of recyclables.

Since, 11 out of the 16 surveyed organisations are engaged in composting, it can be safely inferred that they are able to achieve a landfill diversion rate of more than 80%.

Waste break-up at Jan Chaithanya's Vishakhapattanam intervention

Type of waste	Percent
Organic	67.4
Coconuts Shells	7.8*
Recyclables	15.4
Absolute Waste	9.4
(*Used for Fuel)	

Upscaling of community interventions

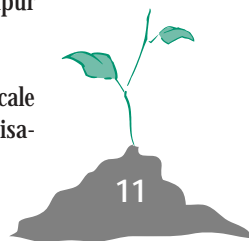
All the ongoing interventions, except JSA, Solan, have scaled up their activities with varying degrees. The upscaling has occurred at different levels:

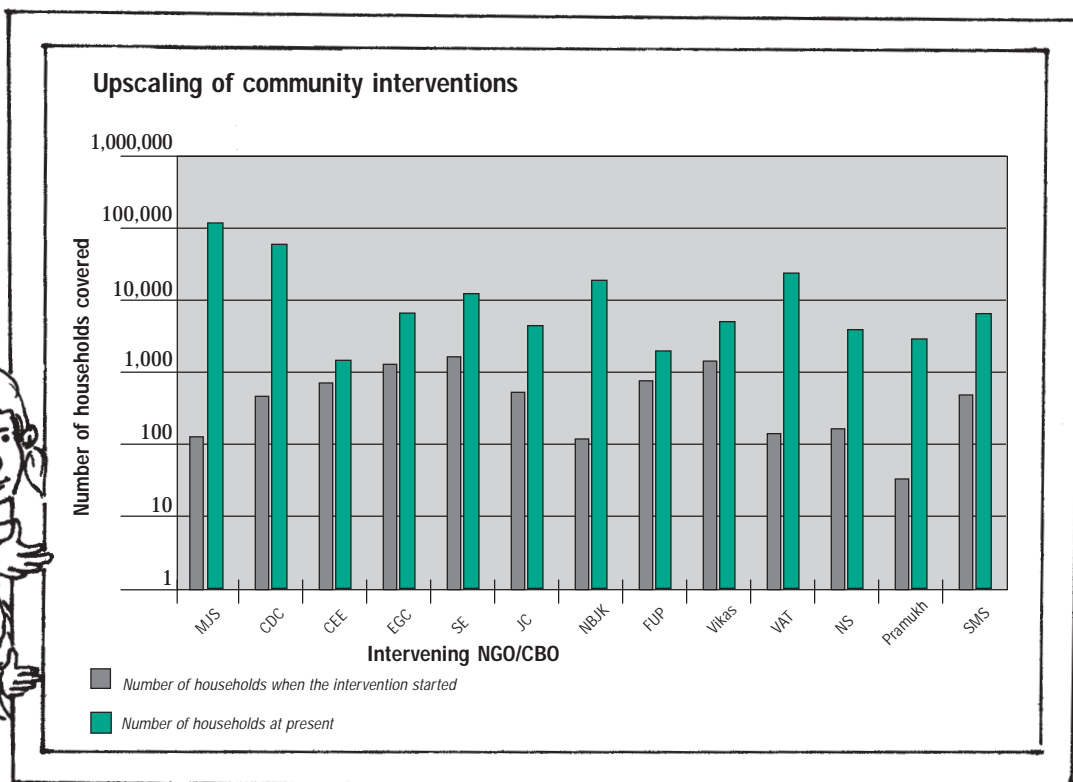
🌱 *Upscaling in terms of the increase in the coverage population:* All the documented organisations have succeeded in increasing their coverage; but to different extents. This has happened through replication of the prototypes at different residential colonies in the same city. This has been the most frequent type of upscaling and all the interventions have succeeded in doing so.

🌱 *Upscaling in terms of different kinds of interventions:* Some organisations have been innovative in their approach and have not only up-scaled but have also started different kinds of interventions. Exnora Green Cross has been spectacularly successful with its interventions in diverse kinds of settings – at the Vellore Institute of Technology, the local fish market, temples, cow sheds, etc.

🌱 *Upscaling in terms of 'replication' in many cities:* CDC is only organisation that has been able to replicate its interventions in many cities. Its interventions have spread to Jaipur, Nanded, Nagpur and Surat. However, the nature of the intervention is different at different places. In Nanded and Surat, CDC is participating as a private operator. It has got contracts in open competitive biddings and as per the terms and conditions of the privatisation process, while in Jaipur it has started a solid waste initiative on its own, though it was later provided with financial assistance of Rupees 200,000 by the Jaipur Nagar Nigam.

A bar diagram depicting the scale of upscaling of these organisa-





tions is presented here. It is clear from the diagram that MJS and CDC have been most successful in their upscaling efforts. Some of the important reasons for their success are:

- Working in a service provider's mode:** Basically, both these organisations are working in the service provider's mode. They are primarily managing waste in collection and disposal mode as is the prevalent practice of municipalities. There is a demand for these services due to the inability of municipalities to provide satisfactory services. Both, MJS and CDC, promote source segregation and composting of bio-degradable waste. They have not allowed themselves to be constrained by the lack of participation from the community. If the community fails to segregate waste at source, they have adopted on-rickshaw segregation of the waste. Similarly, they started

with composting of the waste but have discontinued it now. MJS has stopped composting of bio-degradable waste completely, citing the lack of marketing opportunities for the compost. Composting of bio-degradable waste has many inherent difficulties like finding the land, situating the compost plant which and marketing of the product.

- Minimum spin-offs for waste collectors:** Organisations have found it easier to up-scale when they do not try to provide maximum spin-offs to the waste collectors. For instance, MJS does not provide any salary to its waste collectors but has given them rights over recyclables. The proceeds from the sale of recyclables are the only remuneration which MJS waste collectors get in return for their services. At Jaipur, CDC provides a regular salary to its waste collectors and has given them the rights over

recyclables too. EGC and SMS have formed *self-help groups* comprising of waste collectors. They provide them with several other kinds of training. SMS trains its waste collectors in composting and other entrepreneurial activities and has helped them in forming their own independent co-operatives too. Besides, SMS organises regular literacy classes and health check-up camps for its waste collectors. At Pune, KKP has succeeded in getting the municipality to provide medical insurance to its waste collectors. Again, all these activities require a lot of effort, and are time consuming affairs. These kind of spin-offs are absent in the case of significantly up-scaled organisations.

🌱 Innovative and diversified approach: EGC, by adopting innovative and locally adoptable approaches, has been able to replicate as well as up-scale its interventions at several places. It has ongoing interventions in diverse places: educational institutions, temple, fish and other markets, passenger trains, etc. In its temple intervention, EGC has inspired devotees to use small wooden baskets for their offerings instead of packaged sweet boxes and plastic material. It has opened cattle sheds for street cows and calves; the cow dung from these cattle sheds are being utilised for composting processes. It would be appropriate to mention here that EGC sprinkles cow dung regularly over bio-degradable waste to hasten its composting. By adopting an innovative approach, it has been able to replicate its interventions in diverse social settings.

Sustainability of community interventions

Based on the data gathered during this documentation process, this section seeks to identify some important basic indicators that determine the sustainability and up-scalability of decentralised community interventions in solid waste manage-

ment.

The period of operation is perhaps the most flexible variable in the sustainability of these interventions. There is no fixed time period which can be ascribed to a sustainable intervention. Surprising as it may sound, it appears that a time-scale, though a necessary parameter, is not a sufficient condition to define sustainability.

Ecological sustainability

Ideally, in order to be ecologically sustainable, a community intervention should strive for the following:

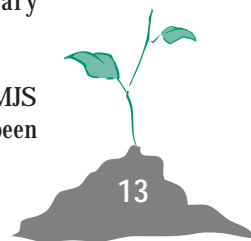
- 🌱 Minimum production of waste.
- 🌱 Reuse and recycling of waste to a maximum.
- 🌱 Bio-degradable waste to be treated separately and only inerts to be dumped in landfills.

To fulfill the last two conditions optimally, waste should be segregated at source. However, not all these conditions are being fulfilled by the documented interventions.

It is difficult to measure the relevance of waste minimisation since none of the organisations have records showing that they have achieved some degree of waste minimisation since the intervention started. It is the same in the case of reuse and maximum recycling of waste. Since the fulfillment of these two conditions requires behavioural changes – which is a long term process – we need to give some more time to these interventions.

Source segregation of waste is the minimal condition to treat bio-degradable waste, and to maximize recycling recovery. Even that is not being met at every place. All these interventions have collectively achieved only 30% primary segregation.

Two of the most up-scaled interventions – MJS at Lucknow and CDC at Jaipur – have been



Source segregation by interventions



managing without primary segregation of waste. They have instead opted for on-rickshaw segregation, which can not be considered source segregation. Considering the experience they have under their belts (MJS has been working since 1994 and CDC since 1996), they can be sited as successful examples.

Separate treatment of bio-degradable waste through composting is being done at 11 out of the total 16 interventions. Thus, it is also not a necessary condition. Though it is definitely an extra source of income and increases the financially sustainability of the project.



CDC, Jaipur has opted for on-rickshaw segregation of waste, instead of primary segregation.

Thus, in the present urban Indian scenario, primary segregation of waste, composting or separate treatment of bio-degradable waste are neither necessary nor sufficient conditions for sustainability of community interventions in solid waste management. However, there is no denying the importance of these conditions for long term ecological sustainability. In other words this means that:

- There is either enough margin in running these operations or there is significant reduction in establishment costs if the intervening organisation does not undertake composting of bio-degradable waste.
- The quality of services being provided by municipalities are so low that the community is ready to pay organisations that are doing just primary collection, without promoting source segregation and composting of bio-degradable.

Financial sustainability

This is, perhaps, the most important aspect of sustainability. It must be recalled that we are discussing only those projects, which are sustaining due to a contribution from the community. This contribution is in the form of a user fee, in lieu of services provided by these organisations. Our field data about these projects vindicates the premise that if satisfactory services are provided, the community will pay for them. With 91% consumers feeling comfortable in paying the user fee and 85% feeling that they are being reasonably charged, it can be safely assumed that there is 'willingness' among the community to pay for it. Some of the important issues which should be considered for attaining financial sustainability are:

- Organisations should be pragmatic in their approach over the issue of the user fee. There should be different user fee slabs for different income categories.
- A significant 39% of the community was either undecided or unwilling to pay more for



Sale of recyclables is an important source of revenue for community-based initiatives.

the services. Hence, organisations should proceed cautiously and should approach the community with sufficient reasons, if there is a need to increase the user fee.

Moreover, extra sources of revenues, from the sale of compost and recyclables, should also be considered. Here, the trend is mixed. Some organisations have rights over recyclables and treat it as a source of revenue. Thus, NGOs like Naya Savera and Sukuki Exnora earn about Rupees 15,000 to 20,000 per month from the sale of recyclables and use it to pay the salary of waste collectors. On the other hand, organisations like CDC exercise no right over recyclables and waste collectors are allowed to keep the proceeds from the sale of recyclables. Similarly, organisations like Exnora Green Cross and Vikas earn about Rupees 16,000 and 8,000 per month respectively from the sale of compost. But, at other places, the income from compost is not substantial. Moreover, not all organisations are able to compost bio-degradable waste and hence, at present, income from composting cannot be relied upon as a substantial means

of revenue. This must be factored in while making projections regarding the financial sustainability of such projects.

However, there is a fresh need to explore the option of proceeds from the sale of recyclables. Mr. Sarvinder Kohli of 'Naya Savera' is of the opinion that he can recover the entire financial cost of the intervention and can generate some profit also from the sale of recyclables only and will not need to collect user fee, provided the community is ready to give him the source segregated waste. At Lucknow, MJS does not pay any salary to its waste collectors but has given them rights over recyclables. According to information provided by MJS, its waste collectors are able to make enough money from the sale of recyclables.

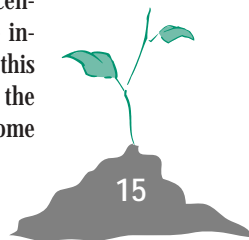
To conclude, we can say that there is enough evidence to suggest that community interventions are financially sustainable though the onus lies on the intervening agency to explore the possible sources of revenue as per local conditions.

Income groups of service areas

Though not emphasised in the literature available on the subject, this has emerged as the key features of a sustainable community project.

On the issue of income group of service areas, the middle-income group habitat has emerged as the common denominator in all these interventions. Of the on-going 15 community interventions, eight are serving in middle and higher income colonies only. The remaining seven are serving all income groups; but they, too, are primarily concentrated in middle income areas.

What are the main reasons behind this concentration of community interventions in middle income colonies? Though, we had not included this question in our questionnaires, a perusal of the field documents and responses does throw some



light on this issue. Higher income areas are generally well served by municipal authorities; in some cases even over-served, as we have found in the case of SMS studies. In the case of low income areas, waste management comes low on the priority as they have to spend on other basic needs first. It is very difficult to motivate them to pay for the services. In middle-income colonies there is demand for these kinds of services but there is lack of requisite supply by the municipality. CBOs/ NGOs therefore find it appropriate to run their operations in middle-income colonies.

While it is not necessary that these interventions are likely to be sustainable only in middle income colonies (many of these interventions are running in all kinds of income colonies), middle income colonies are the common denominator across all the interventions. It appears that it is more feasible to start these interventions in middle income colonies.

Kinds of services

The study points out that, ideally, there should be an integration of all the services related to solid waste management. In other words, the intervention itself should be providing services like door-to-door collection of waste, road sweeping, drainage cleaning, tree pruning, etc. If there are multiple service providers, there should be perfect synchronisation. This improves the public visibility of service areas and keeps residents motivated to continue participating in the intervention. For example, in Mumbai, some ALMS like Diamond Garden have taken upon themselves to arrange for DTDC of waste, drainage cleaning, tree pruning, etc. This has improved the looks of the colony and, hence, residents appeared more convinced about the utility of the interventions. On the other hand, at CEE's intervention in Bangalore, RWA members responsible for management of the intervention explicitly highlighted the point that due to unsatisfactory performance of municipality in

its other civic responsibilities like road sweeping and drainage cleaning, the intervention had failed to make optimum impact. Similarly, Mr. Bisht of Pramukh said that a strike by municipal staff renders them helpless. He is now contemplating to transport waste by a vehicle up to the landfill site, instead of depending on the corporation. At present, the Pramukh waste collectors dump the waste collected from households in municipal containers from there it is transported up to the landfill site by municipal vehicles.

Institutional linkages

Any community intervention involves various stake holders. It is necessary to have some sort of formal or semi-formal arrangement which brings together all the stakeholders on a single platform. This helps in the allocation of responsibilities and makes them aware about each other's responsibilities and difficulties involved in their performance. In order to make these interventions sustainable, the study finds that the two most important stakeholders that need to be involved are the local political leadership and the concerned municipality.

The political structure: Field experiences clearly point out that support of local political leadership is very critical for these interventions; though there is no consensus among community leaders about the involvement of local leadership in these interventions. A community intervention at Vellore had to be abandoned midway because the local council withdrew the land allotted to the intervention. Similarly, at Lucknow, MJS faces a lot of opposition from the local leadership. The majority of MJS waste collectors are Bangladeshi immigrants and the local leadership considers them a potential threat to national security. At Chennai, it is alleged that the government has deliberately contracted out its municipal services to Onyx in areas where Exnora was working because Exnora was considered close to a particu-



Creating linkages with local political leaders and members of the community can be critical to the success of a community initiative.

lar political party.

Whether the active support of the political leadership is needed to run these interventions may be a subject of discussion, but their opposition is definitely troublesome. Hence, in order to make any community intervention sustainable, it is advisable that the local political leadership be kept in good faith.

The municipal linkage: The support of municipalities is crucial to the success of an intervention. The municipality can assist an intervention in many ways: it can issue identity cards to waste collectors which saves them harassment from the police; it can provide land for composting; it can help by performing other services like regular road sweeping, cleaning of drains and local dhalaos (containers). A municipality's decisions can affect the sustainability of these interventions in very direct ways. For example, at Bangalore, the BMC has started door-to-door collection of waste free of cost. They plan to levy a solid waste tax in the coming months. But, this has started affecting the community intervention in HRBR locality, being run with the help of CEE. Residents are now reluctant to pay for services that are being provided free by BMC. Had there been an institutional relationship between BMC and CEE, this problem could easily have been

avoided.

Thus, sustainability of a community intervention requires that there be some sort of forward-backward linkages among the CBO/NGO, municipality and local political leadership. Ideally, all the important stakeholders – CBO/NGO, community, waste collectors, municipality and local political leadership – should be brought together and there should be continuous interaction among them.

Key challenges in upscaling and sustainability of community interventions

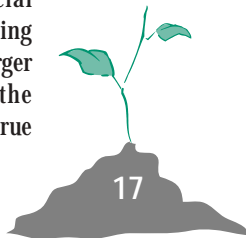
Since community interventions in solid waste management involve many stakeholders, any initiative to up-scale these interventions and make them sustainable will have to grapple with numerous challenges, at different levels.

Moreover, challenges involved in upscaling these interventions are different from the challenges faced in making them sustainable; though, they are not completely de-linked. Even so, there are some common challenges that can be identified in the up scaling and sustainability of these interventions.

Community participation

A community intervention cannot be sustainable unless it evokes a wholehearted response from the community. In fact, the real sustainability of these interventions not only involves issues of community participation but of community ownership as well.

Non-participating members pose a special problem. They may de-motivate participating households. This, in turn, might trigger a larger demonstration effect, which can affect the sustainability of such interventions. While it is true



that some of these interventions are able to sustain themselves on the basis of the user fee collected from the participating households, non-participating households could upset the balance.

In other words, in order to be sustainable, a community intervention has to be owned by the community itself. An NGO or CBO, can, at best, be a facilitating agency. What are the challenges involved in the community participation? As per the findings of the documentation process, some of the main challenges involved in community participation are discussed here.

Awareness generation

The study has found that awareness generation among the community is a continuous process. The intervening agency has to be patient and innovative in its approach.

RWAs: more questions than answers

In India, the locus standi of Residential Welfare Associations is ill-defined. They do not have legal sanctity and therefore cannot take action against non-participating members. Yet, RWAs are being promoted as a legitimate interface between the community and the outside world by several governments. In Delhi, all Bhagidari programmes acknowledge RWAs as legitimate stakeholders. There is a growing trend to allocate more roles to these RWAs.

The rotation of office bearers also poses many challenges for community interventions. Annual elections of RWAs often result in new office bearers who have to be briefed and sensitized. Usually, new elected members have different ideas and solutions for problems. At times, defeated candidates, along with their supporters, create obstacles in the functioning of the newly elected RWAs, affecting the continuity of ongoing interventions.

Municipality: a passive and reluctant partner

The different means being adopted by municipalities to implement various provisions of the rules point towards certain up-coming challenges that a community intervention is likely to face in the near future.

Municipalities are privatising solid waste services and opting for centralised and mechanized compost plants. For instance, an industrial house has signed contracts with 54 municipalities to help them establish centralized and mechanized compost plants.

It seems that the municipalities are not very keen to put in place Decentralised waste management schemes. The co-operation of NGOs/CBOs is being used to create awareness among the target community regarding waste management. The policy of benign neglect towards decentralised community interventions in itself is a critical challenge for the up-scalability and sustainability of these interventions. For instance, the decision of Bangalore Mahanagar Palika (BMP) to start free DTDC of households waste has severely affected CEE's ongoing intervention in Bangalore. This decision of BMP has made several people withdraw from the CEE interventions which requires them to pay a user fee.

The unsatisfactory, or below-par, performance of municipal staff can create challenges even for institutionally linked community interventions.

This is evident from the experience of Pramukh, Dehradun and NBJK, Ranchi. Pramukh was permitted to dump the waste in municipal bins from where the municipal staff would take it to the landfill. A strike by the Dehradun Nagar Nigam staff posed a new kind of challenge for Pramukh as the waste piled up in the bins. At Ranchi, NBJK workers used to supervise the

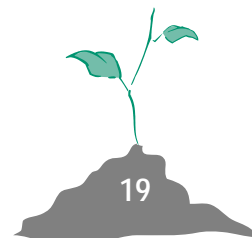
works of Ranchi Nagar Nigam's (RNN) sweepers and drainage cleaners. To protest against this external supervision, the RNN staff went on strike. As a result, RNN asked NBJK to stop on-site supervision of its staff.

Besides these challenges, community interventions have to deal with many other issues that affect their smooth functioning and have an impact on their sustainability as well. At some places, community members expressed their concerns over the frequent turn over rate of waste collectors. According to them, it disrupts the continuity and the waste collectors have to be instructed and trained afresh as per the residents' preferences. Some women residents said that this frequent turnover of waste collectors creates a sense of insecurity too in affluent urban residential areas.

Challenges in upscalability

Some of the basic challenges involved in upscaling/ replicability of community interventions are:

- 🌱 Every new intervention may have to start afresh. Geographical locations, community composition and its income category may all be different, though, the previous experience will definitely provide a road map to proceed farther and faster in terms of output.
- 🌱 Change in the physical location – even a change in the municipal area within the same municipality – might create challenges. For example, the new municipal authorities may not be as receptive to such interventions.
- 🌱 Different habitats require different approaches. For instance, private residential colonies, government staff quarters, educational institutions, working offices, etc, all have different rules and regulations governing the conduct of their inhabitants. This, in turn, engenders different kinds of awareness and behaviour patterns among people that necessitates different kinds of interventions at different places.



Waste collectors

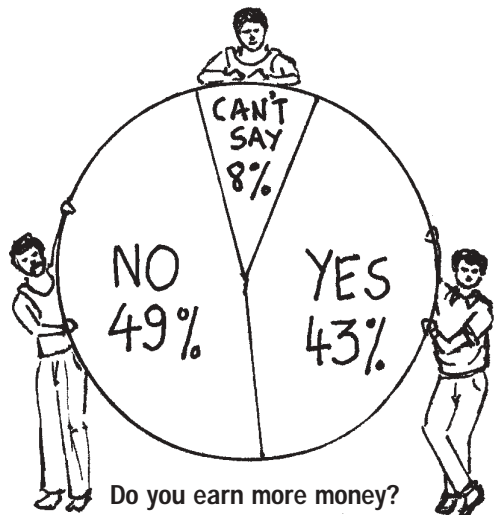
Waste collectors are a key component of a decentralised solid waste management system. Working in the informal sector, they treat about 10 to 15 % of the total waste of a city. There are serious occupational and safety hazards associated with the work. In addition they are subjected to different kinds of social and economic harassments, especially in the case of women waste collectors. Here, is a situational analysis of waste collectors working in the community projects.

Earning more money: one among the motivators

Earning more money is definitely a basic motivation, but it is not the most important motivation, especially in the case of socially low ranking occupations, as is depicted in the diagram.

Here, 49% waste collectors claimed that they were earning less money than in their previous work situation, or when they were working as informal waste collectors. Some of the important reasons cited by waste collectors to continue working in community interventions despite earning less are:

- 🌱 *A distinct identity:* The practice of providing uniforms to waste collectors has helped them acquire respectability in the eyes of the community.
- 🌱 *Assured livelihood:* A monthly salary guarantees a constant flow of income and protects



the waste collectors from a fluctuating income which is inherent in informal work; though, at times, they may be earning less.

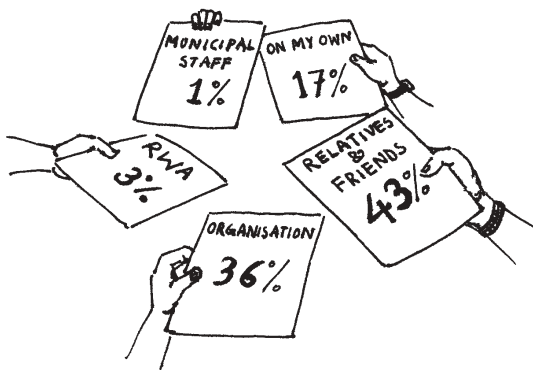
- 🌱 *Reduced harassment:* The formal or informal arrangement of community interventions with concerned authorities has provided legitimacy to the work of waste collectors. As a result the harassment that they had to face at the hands of municipal and police personnel has ended.
- 🌱 *Greater social acceptance:* Waste collectors were of the opinion that the community understands their contribution better and values their work. This change in perception is a big motivation to work in these community projects.

An informal sector indeed

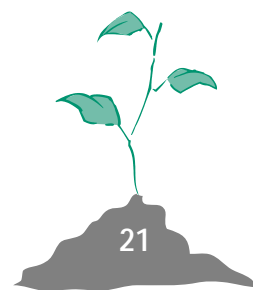
Despite all the efforts of community organisations to formalise the work of waste collectors there is still a continuing degree of informality associated with their work. This is evident from the method of recruitment of waste collectors.

The methods of recruitment of waste collectors are quite informal. 60% of waste collectors got their present job either through their relatives and friends or by their own efforts. Only 36% were employed due to efforts of the service providing organisations. The remaining 4% were recruited on the recommendations of RWAs and municipal staff. Moreover, majority of them (74%) are working as waste collectors for the first time. Hence it is not that all ragpicker livelihoods are substituted with that of a formal waste collector as there has been no specific attempt to recruit them on a priority basis.

How were you recruited?



This is understandable since the waste picking is a low skilled job and can be learned easily. Though community organisations claim to train them before appointing, our survey reveals that only a small percentage of the total respondents have been given any kind of training in waste management.



Municipality

During the documentation process, we visited 31 cities and have prepared a status report on the implementation of MSW Rules by concerned municipalities. The documented municipalities are: Lucknow, Jaipur, Solan, Bangalore, Vellore, Chennai, Pune, Nanded, Mumbai, Panjim, Suryapet, Vizag, Hyderabad, Kalyani, Bhadrashwar, Kancharapara, Nasik, Ranchi, Thiruvananthapuram, Calicut, Surat, Ahmedabad, Bhuvaneshwar, Cuttack, Chandigarh, Ludhiana, Jalandhar, Amritsar, Bhopal, Indore and Delhi.

SWM: Still a low priority

The MSW Rules, 2000, were to be implemented in letter and spirit from January 1, 2004. This timeline was expected to create a sense of urgency among municipalities to implement the various provisions of the rules in a timely fashion. Our survey reveals that even after a three-year grace period solid waste management has a low priority. This is evident from the following:

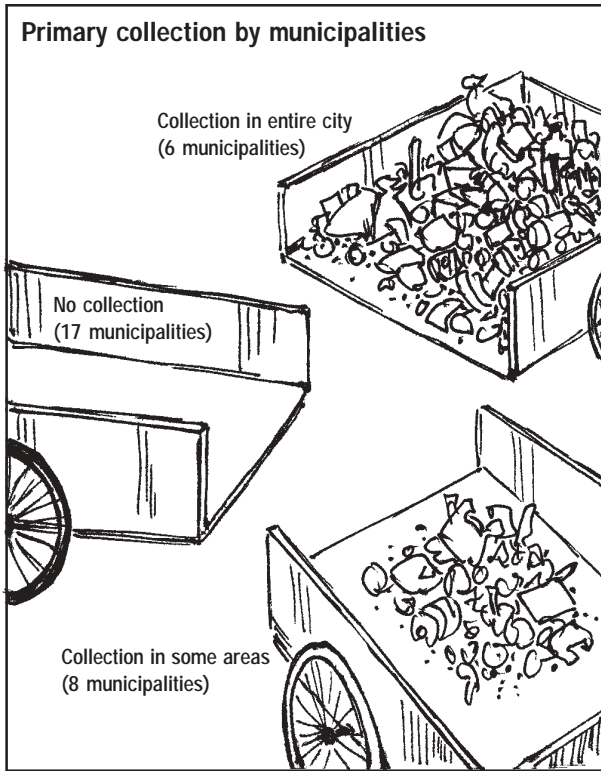
- ☛ There has been no departmental restructuring to streamline solid waste management functions. Most municipalities reported that there had been no internal capacity building to develop requisite skills to implement these rules.
- ☛ Even the responsibilities for solid waste management vary from place to place. At some places it is the Health Commissioner who holds the ultimate responsibility for these functions,

while at other places it is the Chief Civil Engineer who is responsible for SWM. It appears, from general discussion with municipal officials and lower level staff, that there is no clear-cut division of roles and responsibilities.

- ☛ It seems that there is no provision to have separate budgetary allocations to perform solid waste functions. Moreover, even if there are specific funds allocated for this, they remain unspent. For example, municipalities in Jharkhand could not spend a fund of rupees 8 crores specifically allocated for SWM services in the state.
- ☛ There is a prevalent belief among municipalities that the deadline for implementation of these rules will be extended. Moreover, some municipal officials of small cities point towards metropolitan cities which have better resources and have still not been able to implement the rules within the given time frame.

House-to-house collection of waste

Out of 31 municipalities surveyed so far, 14 have initiated household collections of waste, though not at the entire city level. Seven municipalities have been documented in this report. Again, it needs to be mentioned that these municipalities are at different stages of primary collection of waste. Suryapet, Nasik and Panjim have reported more than 90% door-to-door collection.



services. All of these have a critical bearing on sustainability of these services as well as of the environment.

In order to critically examine the privatisation issue, it is important to review some of the privatization efforts.

Nanded: In Nanded, the corporation has signed an MOU with CDC for collection, segregation and transportation of some portion of the city's solid waste. As per the agreement, the municipality will pay a sum of Rupees 476 per house per annum to CDC for collection and transportation of solid waste from households. The corporation plans to levy a solid waste tax to recover this cost. This contract will be renewed every year after a performance review of the services. For this, a complaint book is maintained, which needs to be filled up by residents every month.

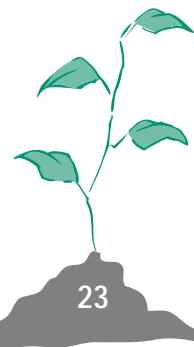
Suryapet, Nasik, Panjim, Kanchapara, Bhadreshwar and Kalyani municipal authorities have initiated household collection of waste in the entire municipal area. On the other hand, municipalities like Mumbai, Delhi, Chennai, Bangalore, Nanded and Indore have started household collection of waste in some parts of their service areas. Rest are yet to start primary collection of municipal waste.

Privatisation of municipal services: is it sustainable?

Privatisation of solid waste services by municipalities needs a careful examination. At stake are several issues such as livelihoods of waste collectors, 3R principles of waste management (Reduce-Reuse-Recycle), cost-efficiency of

Nasik: Here, the collection and transportation of the city waste has been leased out to a single private operator named Adarsh Ghanta Gadi Prakalp. Nasik Municipal Corporation pays Rupees 475 for every tone of garbage collected and transported up to the landfill site. The contract is to be renewed every year subject to the satisfactory performance of the operator.

Surat: The Surat Municipal Corporation has contracted door-to-door collection to three private operators, namely: CDC of Jaipur, Jigar Transport of Surat and Global Waste Management Cell (GWMC) of Mumbai. Each contractor is to be paid at the rate of Rupees 645 per tonne of garbage collected from households and transported to the transfer station. The contract has been signed for seven years but there will be a continu-



ous monitoring of the performance of the private operators by municipal officials. A different contract has been signed for the transportation of waste from the transfer station to the landfill at Khajod. The contractor is paid Rupees 7.71/km/tonne of waste transported.

New Delhi: A consortium of three companies, Subhash Projects Marketing Limited, Dooars Transport and Tetrattech India Limited would be responsible for collection, segregation, storage and transportation of Delhi's central and south zones respectively. At present, MCD will pay Rupees 600 per metric tonne of garbage transported to the landfill site. The payment will be made after a third party verifies the expenditure.

The privatisation of waste collection, segregation and transportation raises several critical questions:

- ❧ The practice of making payments on the basis of the amount of waste collected creates a bias in favour of more waste creation. The contractor makes more money if there is more waste. This practice ignores the basic principles of waste management – reduce, reuse and recycle. Even in the cases where payment is made on the basis of number of households covered; there is no incentive for the contractor to make efforts to reduce the waste generation. Most importantly it negates segregation which in turn negates better recycling and composting.
- ❧ Where the contract is renewed every year, it is detrimental to the interests of both parties. For instance, in Nasik, the entire waste collection of the city requires more than 110 vehicles and a corresponding workforce; this is a huge infrastructural investment which is very difficult to arrange by another contractor in a short time span. This might lead to complacency on the part of the private operator.
- ❧ The system of monitoring also leaves much to be desired. Monitoring is to be done either by municipal staff or by a third party, as in the case of MCD. This monitoring system has

failed to provide any roles to community or community-based organisations. This inverts the logic of implementation of MSW Rules. The implementation of these rules demand that residents should do source segregation and NGOs/CBOs should be involved to create awareness among residents.

- ❧ Above anything else, this privatisation process has the potential to work against the interests of the traditional waste collectors. The cost-benefit calculations of these contracts motivate private operators to adopt more mechanised and high-tech equipments, which necessarily entails reduction in labour costs. This might render several waste collectors jobless.

Composting: centralised vs decentralised systems

In India, the need for composting bio-degradable waste is much more pronounced since it constitutes about 60% of the total municipal waste. There are two types of composting systems prevalent in the country. On the one hand, municipalities have established capital-intensive technology-based centralised compost plants where the mixed waste is composted. For instance, Municipal Corporations of Delhi, Nasik, Jalandhar, Trivandrum, Calicut, Bhopal and Ahmedabad have established centralised and mechanised compost plants under different arrangements.

On the other hand, several communities are engaged in locally composting their bio-degradable waste by adopting indigenous and labour intensive technologies. Here, we have examples of Exnora Green Cross Vellore, Jan Chaithanya Vishakhapattanam and Stree Mukti Sanghathan Mumbai.

Which of these two systems is better? To answer this question, we need to do a comparative study of both the systems.

Centralised composting systems

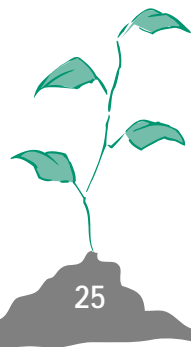
Information about mechanised compost plants was difficult to obtain due to the reluctance of municipal and plant authorities to share any information with the research team. However, we do have

relevant data of the compost plants in Ahmedabad, Nasik, Bhopal, Gwalior and Jalandhar. All the plants produce compost from mixed waste.

Ahmedabad: Excel Industries has set up a compost plant with an investment of about Rupees 6-7 crores. The plant has been able to reach a break-even point in four years.

Nasik: The Municipal Corporation has set up a compost plant at the cost of Rupees 5 crore. Though the plant is running, its long-term sustainability is questionable. The compost is produced at a cost of Rupees 2,500/tonne whereas it is sold at Rupees 1,700/tonne. Owing to this fact, Leaf Biotech Private Limited, a Thane based firm, which had established and run the plant for two and a half years, has backed out of the contract.

Bhopal and Gwalior: In 1993, M. P. State Agro Industries (MPSAI) had set up two compost plants at Bhopal and Gwalior. As has been the pattern across the country, these two compost plants were set up with the technical help of Excel Industries. The compost produced is being sold under the brand name of 'Agrorich'. But, MPSAI had to shut down its Gwalior compost plant since it could not find a market for its compost. Till last year, the Bhopal plant was also running at a loss. This year, it has been reported



that the plant will make some profit as it has received a bulk order for 5,000 tonnes of compost from a Jaipur-based firm. According to the agreement the plant will have to supply the compost under the brand name of 'Croprich Gold'.

Jalandhar: Here the agreement was originally signed between the Jalandhar Municipality and Excel Industries. Later, Excel Industries sub-contracted the compost plant to Punjab Grow More Fertilizers Limited, Jalandhar. The brand name of the produced compost is Shakti Jaivik Khad. This plant is also running at a loss.

To sum up, except the Excel plant at Ahmedabad, no other mechanised compost plant has reported breaking even. As the Nasik plant's figures show, the production cost is greater than the selling cost. With establishments costs of these centralised compost plants running into crores and their economic sustainability yet to be demonstrated, there is a need to re-consider the decision of municipalities opting for centralised compost plants.

Decentralised compost systems

According to data collected during the documentation process, 11 out of 16 community based interventions are composting bio-degradable waste. Out of these, Exnora Green Cross Vellore (EGC) and Stree Mukti Sanghathana (SMS), Jan Chaitnya stand out for their innovative approach and the amount of bio-degradable waste composted. SMS workers compost about 20 tonnes of bio-degradable waste daily. SMS, with the help of ALMs, has been able to construct and run compost systems on roadside drainages and even in multi-storey apartments. SMS, has trained its waste collectors in composting and in the process has provided them with an extra source of income.

EGC has set up compost sheds in places like fish



The compost plant of Exnora Green Cross (EGC) uses indigenous technology and provides many jobs.

markets, temples and on land allotted by the municipality or panchayats. It uses cattle dung to expedite the process of decomposition. EGC, at its Palavansethu village intervention, has produced compost worth more than Rupees 800,000 and has tied up with the district forest department to sell compost manure.

Other community interventions have not been so successful in marketing their compost. MJS was forced to discontinue its compost because its tie-up with the Central Government fell through and it could not find an alternate market. However, since the establishment costs are low for these decentralised compost systems, they do not run the risk of running into losses.

Challenges associated with composting

Infrastructural problems

The most important requirement for a composting site is land which is high-priced in an urban area. Government agencies that own most land in urban areas usually do not work in coordination.

Siting a compost plant at a socially acceptable place is also a challenge. The NIMBY (Not In My Back Yard) syndrome has to be dealt with tactfully.

Procedural and technical problems

All the processes and technologies used in composting cannot succeed in producing good quality compost unless they get segregated waste. The myth of odour in composting is more of a maintenance problem than a process problem.

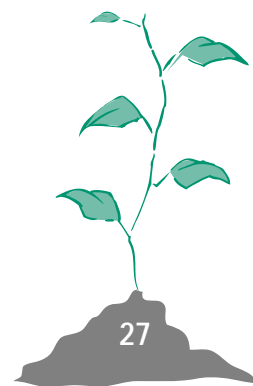
Quality assurance

The quality of compost is generally based on the nature of bio-degradable waste. The presence of weeds, heavy metals and other objects, and the technologies used in composting, all have a bearing on its quality. Compost plants also reported that their operation and maintenance costs escalate due to mixed feed stock.

In the absence of primary source segregation in India, producing good quality compost is challenging. Without government guidelines and a certification authority there is no way of judging the quality of compost.

Marketing challenges

To market compost at affordable as well as economically viable price is another challenge, which is inextricably linked with issues of quality control and government policies. In absence of any certification authorities, compost makers are not able to put up their case strongly before the consumers, who have more faith in scientifically certified chemical fertilizers. Moreover, these fertilizer units are provided with government subsidies, which enable them to remain in the market while compost, which is organic by nature, fails to find market for itself. In order to create a level playing field, it is necessary that compost products should also be provided subsidy and government should set up a new agency to specifically cater to and promote compost manure.



Developing a model

Considering India's diversity – cultural, socio-political, geographical and economical – it is unlikely that a single model of a community-based solid waste management system will be applicable to all areas. Still, such an exercise can provide a benchmark against which we can measure field interventions.

Any such exercise will necessarily have to be based on some assumptions, which, in order to be realistic, will need to take into account the ground realities. Having collected data from 25 community and municipal interventions in solid waste management across the country, the research team has attempted to make such assumptions.

Across the world, it has been found that when solid waste management is being provided at the community level, the economies of scale are not so pronounced. But, as per the Full Cost Accounting Handbook of EPA, no economies of scale are thought to exist for communities comprising more than 50,000 people. Given the joint family tradition in India, if we assume that there are five members in each family, it will equal to 10,000 households. Moreover, this assumption seems valid against the actual field data. For instance, as per the calculations of Kancharapara municipality, a solid waste management intervention covering 14,000 households will need an initial investment of about Rupees 122 lakh. Obviously, this scale of investment cannot be

expected from community level interventions. Hence, we can assume that community based interventions may be considered up to a maximum of 10,000 households: though, even this will require a substantial investment.

Cost breakups

Ideally, there are two ways through which one can calculate the cost of solid waste services in a community: activity-based calculations and path-based calculations. MSW activities are:

- 🌱 Collection of waste
- 🌱 Transportation of waste to transfer station
- 🌱 Processing/disposal of waste
- 🌱 Any sales of recyclables or compost

Solid waste management paths are:

- 🌱 Recycling
- 🌱 Composting
- 🌱 Waste-to-energy
- 🌱 Land disposal

However, in actual practice, these categories are not discrete; there is an overlap among them. In order to keep calculations simple, it has been decided to break these activities and paths into two categories: costs likely to be incurred and revenues likely to be generated. In an ideal decentralised community-based solid waste intervention, the elements of costs will be as follows:

- 🌱 Collection cost
- 🌱 Transportation
- 🌱 Operation at transfer/disposal station: this includes operation and maintenance of compost sheds too.
- 🌱 Awareness materials/ trainings of personnel.
- 🌱 Organisational expenditure.

Elements of revenue will be as follows:

- 🌱 User fee
- 🌱 Sales of recyclables
- 🌱 Sales of compost (if any)

In order to arrive at cost-benefit calculations for a 10,000 household solid waste intervention, we need to make following assumptions. As already mentioned, most of these assumptions are based on actual ongoing filed experiences that have been documented. Some of the basic assumptions are as follows:

- 🌱 All likely costs and revenues are calculated at the present and fixed value.
- 🌱 Land and shed for segregation and composting has been provided free of cost by municipality/ some other agency.
- 🌱 Kinds of services offered: door-to-door collection and sweeping of nearby roads.
- 🌱 One waste collector collects waste from 150 households, sweeps the nearby roads and then works on the compost shed.
- 🌱 There is one supervisor for every six waste collectors.
- 🌱 Two waste collectors share one rickshaw trolley covering 300 households.
- 🌱 Each waste collector is paid a salary of rupees 2,400 per month. Basically, his/her salary is rupees 1,800 per month. The remaining 600 are being given for recurring expenditures like primary medical health, maintenance of rickshaw trolleys and uniforms and other equipments given for the waste collection.
- 🌱 Each supervisor is paid a monthly salary of rupees 3,000.
- 🌱 Only 80% of the households are expected to

pay the user fee.

- 🌱 Each Rickshaw trolley costs about Rupees 9,000.
- 🌱 Each waste collector is provided with one time inventory worth rupees 2,500. This includes items like uniform, gloves, shoes and other equipment.

Based on the above assumptions, we can calculate the likely expenditure to be incurred and revenues likely to be generated for any number of households. Let us first, attempt this calculation for 10,000 households.

Estimation of Cost

For reasons of simplicity, it will be better to first calculate one-time establishment charge and then calculate the recurring monthly expenditure. One-time establishment cost can be broken down into following cost elements:

1. Expenditure on Rickshaw Trolleys:

Number of rickshaw trolleys needed is $10,000/300 = 34$.
 Cost of one trolley = Rupees 9,000
 Total expenditure on rickshaw trolleys = $9,000 \times 34 =$ Rupees 3,06,000.

2. Expenditure on accessories for waste collectors

Cost on accessories such as uniform, gloves, boots, etc worth Rupees 2,500.
 Total expenditure = $2,500 \times 67 =$ Rupees 1,67,500.

3. IEC material/ awareness workshops for the community

Assuming that at if at least 40 awareness workshops, catering to 500 residents per campaign, are organised and expenditure incurred on each workshop is Rupees 5,000, the total expenditure on awareness workshops of residents will be Rupees 200,000. Finally,

we can assume that there will be an expenditure of about Rupees 1,00,000 in publication and distribution of the IEC material. Thus, the total expenditure incurred under this head will be $(2,00,000 + 1,00,000) = \text{Rupees } 3,00,000$.

4. Training of waste collectors/ supervisors:

Assuming that all the waste collectors and supervisors are trained for a minimum of 30 days and they are paid as per their monthly salary, total incurred expenditure will be Rupees 1,96,800.

5. Organisational overheads

One-time establishment cost of intervening organisation can be safely assumed to be about Rupees 40,000.

Total one time establishment cost (in Rs.) is $1 + 2 + 3 + 4 + 5 = 10,10,300$.

Recurring cost per month: Having calculated the one-time establishment cost, now we need to calculate the recurring expenditure per month, since salaries to the workers will be paid on a monthly basis and the user fee will also be collected on a monthly basis. The elements of recurring cost per month will be as follows:

1. Salary to waste collectors = $67 \times 2,400 = \text{Rupees } 160,800$.
2. Salary to supervisors = $12 \times 3,000 = \text{Rupees } 36,000$.
3. Organisational expenditure = Rupees 15,000.
4. Incidental expenditure = Rupees 10,000.

Based on the above assumptions, the cost-revenue calculations, for different number of households

can be put down into tabular forms as shown in the opposite page.

Now, all these elements of costs and revenues can be put up into a simple linear equation to calculate the time period needed for the attainment of break-even point of the intervention and the subsequent profits thereof. If we denote:

- ☞ Recurring monthly expenditure as M_c
- ☞ Revenue from sales of recyclables as R_r
- ☞ Revenue from sales of compost as R_c
- ☞ Revenue from user fee as R_f
- ☞ Total establishment cost as E_c .

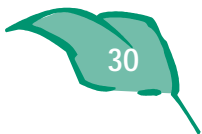
If the intervention attains the break-even point in n months, then this equation will be:

$$R_f \times n + R_c \times (n-3) + R_r \times n = E_c(1 + r/12)^n - M_c \times n$$

* r is the rate of interest per annum, which has been assumed as 6 percent.

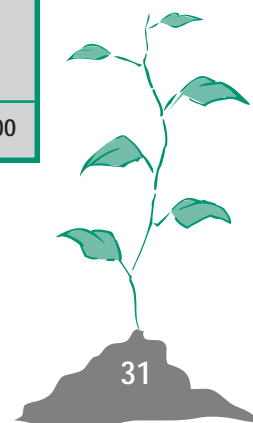
Based on the above equation, break-even periods (in months) for different number of households can be presented in the following tabular format:

Number of households	Break-even period (in months)	
	No Revenue from compost	Recyclables to workers and user fee @ 35
10,000	17	20
5000	24	31
2000	44	63



Cost calculation for 2,000 households					
Cost (in Rupees)				Revenue generated per month (in Rupees)	
<i>Establishment cost</i>		<i>Recurring cost</i>			
Elements	Cost	Elements	Cost	Elements	Revenue
Rickshaw trolleys (6@9,000)	54,000	Salary-waste collectors (12@2,400)	28,800	User fee (@ 30)	48,000
Cost of accessories (12@2,500)	30,000	Salary-supervisors (2@3,000)	6,000	Recyclables	10,000
Capacity building-workers	34,800	Organisational expenditure	15,000	Compost	-
IEC material/training	60,000	Incidental expenditure	2,000		
Organisational overheads	40,000				
Total	2,18,800		51,800		58,000

Cost calculation for 5,000 households					
Cost (in Rupees)				Revenue generated per month (in Rupees)	
<i>Establishment cost</i>		<i>Recurring cost</i>			
Elements	Cost	Elements	Cost	Elements	Revenue
Rickshaw trolleys (17@9,000)	1,53,000	Salary-waste collectors (34@2,400)	81,600	User fee (@ 30)	1,20,000
Cost of accessories (34@2,500)	85,000	Salary-supervisors (6@3,000)	18,000	Recyclables	25,000
Capacity building-workers	99,600	Organisational expenditure	15,000	Compost	-
IEC material/training	1,50,000	Incidental expenditure	5,000		
Organisational overheads	40,000				
Total	5,27,600		1,19,600		1,45,000



Cost calculation for 2,000 households					
Cost (in Rupees)				Revenue generated per month (in Rupees)	
Establishment cost		Recurring cost			
Elements	Cost	Elements	Cost	Elements	Revenue
Rickshaw trolleys (34@9,000)	3,06,000	Salary-waste collectors (67@2,400)	1,60,800	User fee (@ 30)	2,40,000
Cost of accessories (67@2,500)	1,67,500	Salary-supervisors (12@3,000)	36,000	Recyclables	50,000
Capacity building-workers	196,800	Organisational expenditure	15,000	Compost	-
IEC material/training	3,00,000	Incidental expenditure	10,000		
Organisational overheads	40,000				
Total	10,10,300		2,21,800		2,90,000

Benefits of decentralised solid waste management systems

The different models discussed above have different spin-offs, though many of these are common across the models. However, here, we will be primarily concerned with the ideal model identified by us which would be applicable in practice as well. The ideal model will be one in which:

- 🌱 There is source segregation of waste.
- 🌱 There is door-to-door collection of waste.
- 🌱 There is no mechanical vehicle involved in primary transportation of waste. They are used only for secondary transportation (to transfer the inerts and other remains from the composting and recycling shed up to the landfill site by the municipality).
- 🌱 Biodegradable waste is being composted.

Apart from providing a sustainable solution to waste management, this system has many direct as well as indirect economic, social, health and

environmental benefits. Some of the important benefits are:

Economic benefits

- 🌱 **Livelihood creation:** As has been described earlier, this model is labour intensive rather than capital intensive. Thus, a solid waste management system of this kind covering a household population of 10,000 has the potential to provide employment to 67 waste collectors, 12 supervisors and 2-3 persons of the intervening organisation.
- 🌱 Source segregation keeps the recyclable material cleaner, which, in turn, fetches higher prices.
- 🌱 Consequently, the quality of end products made from these recyclables improves many folds, which in turn, fetches higher prices and helps in preserving and promoting the faith of committed consumers in these recyclable goods. Plus, it can give a new fillip to the recycling industry.

Economic benefits for municipality

- 🌱 Municipality can save up to Rupees 4,32,000 per annum in secondary transportation for a 10,000 household programmes.
- 🌱 Municipality can save labour cost, as there will be no need for it to employ people for primary transportation of waste.
- 🌱 It will reduce the burden of municipal staff as there will be less need of regular road sweeping and drainage cleaning.

High landfill diversion rate

Apart from offering direct economic benefits, the model offers many types of indirect economic benefits. For instance, this model succeeds in attaining a landfill diversion rate of more than 80%, which not only saves money in terms of excess land to be acquired for the new landfill site but also conserves such a natural resource for some other useful work.

Health benefits

The provision of formalising the working conditions of waste collectors provides them with the opportunity to work in healthier conditions. The provision of gloves, uniforms and other safety equipment improves their working condition.

The neat and clean neighborhood makes the area less prone to diseases.

The reduction in number of mechanised vehicles used for primary transportation of waste results in reduced emission of many harmful gas, which indirectly benefits the health of the all the residents of the city.

Social benefits for waste collectors

The waste pickers could be substituted as waste collectors and their livelihood would be formalised.

They get better recognition and dignity by working as formal waste collectors than as waste pickers.

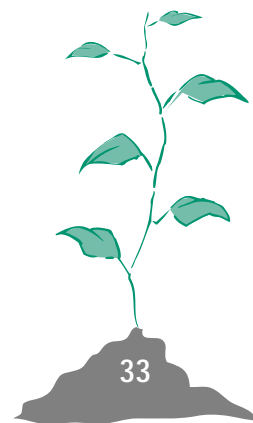
There is reduced or no harassment by municipal staff and police working as formal waste collectors.

Compost

The practice of making compost not only provides an extra source of revenue for the system but also helps reclaim the lost fertility of the soil. The use and abuse of chemical fertilisers are well known and promotion of compost as a natural manure is a pressing need of the time.

Empowered citizenry

Decentralised solid waste management systems, premised upon the management and ownership of local people, have a lot to contribute to the strengthening of civil society and will result in creation of a much more aware and empowered citizens, who will carry forward these new skills in various other walks of life.





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