Inspiring Progress

Learning from Exnora Green Pammal's Solid Waste Management Partnerships in Four Localities

L.V. Saptharishi, IAS(Retd.)
Hony. Co. Chairman

Message

I am happy to note that Exnora Green Pammal's solid waste management partnerships in four localities covering Tamil Nadu and Haryana have brought out an interesting account of the progress of the project in this valuable publication. The initiative to implement the plan of action is that of PepsiCo India Region in association with Exnora Green Pammal's staff at Pammal, Panipat, Mangadu and the Dept. of Atomic Energy Townships, Kalpakkam, Anupuram and Bhavani.

The normal tendency in today's context of global warming and climate change is to generally philosophize and intellectualize the phenomenon at the macro level without bothering to do anything concrete or demonstrable at the ground level. Solid waste management is an open challenge to the population of India not only in its sprawling urban centers but also in every part of rural India experiencing the throb of urban penetration.

This situation has necessarily contributed to the overall phenomenon of global warming and can be tackled only by addressing the problem at the ground level. In fact, solid waste management offers endless opportunities for cleaning up our environment on eco-friendly lines and also paves the way to mitigate the effects of the impact to whatever extent it can. Implementation of the project simultaneously opens up avenues of employment, income generation and renewable sources of energy in a cleaner environment.

The programme currently under implementation in the specified areas in India under the guidance and stewardship of Mrs. Mangalam Balasubramanian constitutes the first major step in fulfilling the objectives under this concept. This step forward will herald many new chapters in the coming days to help overcome one of the gravest perils encountered by humanity.

The Confederation of NGOs of Rural India, being dedicated to the progress of India – rural and urban – on seamless lines, wishes to congratulate Mrs. Mangalam Balasubramanian and her highly motivated team on the success of their efforts and all the best in the years to come.

L. V. Saptharishi
Co-Chairman, CNRI

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Foreword

The municipal solid waste crisis is evident in nearly every intersection, vacant lot and drain throughout the nation. Pollution of our land, air and water undermines efforts to improve public health and safeguard our environment. If we don't rigorously study this challenge and take corrective action, the consequences will be disastrous.

The past decade holds important lessons for those concerned with improving solid waste management. On one hand, we've learned that incessant burning and burying of garbage leave the nation only more polluted because such actions fail to correct the cause of the crisis. By burning and burying waste, we poison ourselves and our descendants.

On the other hand, we've learned a far more encouraging lesson from efforts that address the solid waste crisis by adopting a responsible, holistic and far-sighted strategy. In localities throughout the country, authorities, residents, corporate sponsors and other stakeholders are collaborating to dramatically reduce waste by implementing practices prescribed by the government's municipal solid waste management rules; a package of guidelines that emphasize segregating waste at its source, recycling and composting. Such practices significantly reduce waste and pollution, and have the additional benefits of earning revenue, generating employment, producing rich compost and salvaging recyclable resources.

Exnora Green Pammal has 15 years of experience with such innovative partnerships. This report presents the lessons and impact of our efforts in four localities. In addition to highlighting the reflections of authorities and residents who were instrumental in improving waste management services, this document also suggests steps that the government should take to encourage and enable all localities to implement its rules. Such steps include;

- launching a continuous and compelling public awareness campaign nationwide to motivate everyone to reduce their waste through segregation and recycling
- establishing facilities to process and safely dispose of waste within five km of every locality so that garbage does not travel long distances in motorized vehicles
- introducing a Green Tax on local residents to be spent in a transparent manner for waste management
- making waste reduction the prime objective of solid waste management, rather than rewarding waste managers on the basis of tonnes of trash transported and dumped

We hope that this report spreads awareness, stimulates discussion and, most importantly, inspires action that makes India a clean and healthy nation.

Ms. Mangalam Balasubramanian
Managing Trustee, Exnora Green Pammal

Brooks Anderson
Clear Impression Documentation Services

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Abbreviations

ADC	Additional Deputy Commissioner
DAE	Department of Atomic Energy
DC	Deputy Commissioner
EGP	Exnora Green Pammal
EO	Executive Officer
EPNS	Exnora Panipat Navnirman Samiti
Exnora	Excellent Novel Radical
GA	Exnora's Green Ambassadors, who collect and process waste and sweep streets
IGCAR	Indira Gandhi Centre for Atomic Research
MDGs	Millennium Development Goals
ME	Municipal Engineer
MSW	Municipal Solid Waste
NGO	Non-governmental Organisation
RWA	Residents Welfare Association
SWM	Solid Waste Management
WSP	Water and Sanitation Program

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Executive Summary

"I think that our cities have the dubious distinction of being the dirtiest cities in the world. There is no doubt about it. . . If there is a Nobel Prize for dirt and filth, India will win it hands down. There is no competition for that and we have to do something dramatic on municipal solid waste." *Jairam Ramesh, Union Minister for Environment and Forests. 20 November 2009*

India's solid waste crisis is undermining the nation's efforts to improve public health, protect the environment and stop climate change. India produces a staggering amount of municipal solid waste every day, and the rate of production is expected to climb steadily as the nation becomes more populated, urbanized and economically developed.

In 2000, the Indian government enacted rules for the management and handling of municipal solid waste (hereafter referred to as the rules). The rules prescribe a package of practices that emphasize recycling and composting to significantly reduce waste, with the objectives of improving public health, protecting the environment and easing the burden on landfills. The government directed the authorities of all localities to comply with the rules by December 2003. The government also appropriated funding through many grants and schemes for local bodies to construct new waste management facilities and purchase necessary equipment. However, as of 2010, most localities have not fully complied, with the result that indiscriminate littering and dumping pollute roadsides, street corners and waterways throughout the country.

India's solid waste management (SWM) policy is at a crossroads. Widespread, prolonged noncompliance with the rules, and rapid, highly-visible environmental degradation have led to calls for changes to the nation's waste management policy, changes that include the creation of landfills large enough to hold all of the nation's waste.

Such drastic revision of policy would bring about consequences that work against several objectives of the rules. Therefore, changes to India's waste management policy must be considered carefully, and should be informed by thorough study of existing waste management systems, so that policy can be fine tuned to achieve only the changes that are needed, without unwanted or undesirable outcomes. Furthermore, all proposals for change must be accompanied by rigorous disclosure and scrutiny of their associated costs and consequences, and their empirical track record.

The rules are *not* in need of drastic overhaul. Rather, the rules should be refined according to lessons learned by existing efforts to bring localities into compliance. Review and analysis of such efforts will identify bottlenecks and gaps that impede widespread implementation of the rules, thereby revealing points where policy requires attention and action.

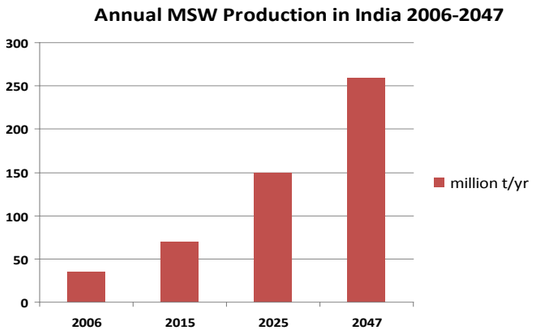
This document is a product of such an exercise. For over 15 years, the leaders of Exnora Green Pammal (EGP), an NGO based in Chennai, have been implementing solid waste management projects with a variety of local bodies in accordance with the government's rules. This document is the product of a month-long review of four models of partnership between EGP, local bodies, residents, socially responsible corporations and other stakeholders. The review was to determine the impact and distill the lessons of such partnerships and use such insights to assess the nation's SWM policy. After analyzing EGP's records and conferring with stakeholders, our findings verify the strengths and efficacy of the rules, pinpoint impediments hampering widespread compliance, and indicate specific steps to remove these roadblocks and enable localities to implement the rules.

This document points a practical way toward a cleaner and healthier nation.

Introduction

Widespread littering and indiscriminate dumping of municipal solid waste (MSW) hamper India's efforts to achieve several Millennium Development Goals (MDGs) (Gonzenbach et al. 2007) and combat climate change. If corrective action is not taken, the solid waste crisis will increasingly counteract development efforts as India's population grows and moves to urban areas.

If current trends continue, the amount of solid waste produced in India in 2047 is likely to reach 260 million tonnes, five times the present level of production, requiring an area of 1,400 square kilometres for disposal in landfills that would emit 39 million tonnes of methane (Singhal and Pandey 2001; Hanrahan, Srivastava and Ramakrishna 2006).



Plastic and electronic wastes illustrate the dramatic rate of increase in waste production. Plastic waste has increased four-fold since 1999, and is likely to increase another ten-fold by 2030. Electronic waste, which is now approximately 0.15 million tonnes per year is expected to increase to 1.6 million tonnes per year by 2012 (Pandey and Saraswat 2009).

The enormity of the waste crisis is difficult to comprehend because most consumers see only the final products of a very long and dirty supply chain. For each tonne of material discarded by consumers, an additional 71 tonnes of waste were generated during that material's production and transport (Platt et al. 2008)

In 2000, the Indian government enacted the Municipal Solid Wastes (Management and

Handling) Rules, 2000 (hereafter referred to as the rules) to significantly reduce the volume of municipal solid waste by mandating standardized practices that included segregating biodegradable from non-biodegradable waste at source, recovering recyclable materials and composting biodegradable matter. The government's prescribed practices have the objectives of safeguarding human health, conserving resources, protecting the environment and reducing the burden on landfills. The government directed all local authorities to establish waste management services that comply with the rules by December 2003, but as of 2010 noncompliance is widespread.

India's solid waste management policy is at a crossroads. Widespread, prolonged noncompliance with the rules, and rapid, highly-visible environmental degradation have generated frustration, leading to calls for changes to the nation's waste management policy. For example, the World Bank-administered Water and Sanitation Program (WSP) advocates the creation of regional landfills large enough to receive all municipal solid waste, inert as well as biodegradable, from up to 20 cities and towns for a minimum of 20 years (Water and Sanitation Program 2007, 20).

There are several reasons to question the wisdom of the WSP's proposal. Rather than abating the crisis by correcting its cause, such landfills would create additional problems. The creation of massive, centralized landfills designed to hold

Cartoon reprinted with permission from *What a Waste: Solid Waste Management in Asia* (Washington, DC: World Bank 1999)

all waste is a stopgap measure that would only postpone the profound changes we inevitably must make in our relationship with waste. Landfills are an extremely expensive way to buy time, during which their existence would significantly undercut the rationale to minimize waste. After the creation of such landfills, many people would probably declare, "problem solved," and feel no enthusiasm for establishing systems to collect recyclables and produce compost. In addition, a set of social interests is likely to coalesce around the construction and operation of such landfills, establishing a group with vested interests that may oppose competing waste management systems or agendas, particularly measures to minimize waste.
The costs of constructing and operating landfills presented by the WSP do not acknowledge landfills' considerable externalities, meaning the unwanted impact of landfills on health, the environment and land values (Water and Sanitation Program 2007, 18-19). By disregarding the costs that landfills externalize, the WSP deceptively discounts the costs of landfilling waste.
Landfill externalities have been rigorously studied elsewhere and have been estimated to range between $200 and $280 per tonne of waste in Australia (Partl 2006), $3 to $77 per ton of waste in the USA (Resource Recovery and Recycling Authority of Southwest Oakland County 2007), and between 6€ and 44€ per tonne of waste landfilled in Europe (European Commission 2000, 59). These ranges clearly demonstrate that the cost of landfill externalities is substantial.
Finally, landfills are massive sources of methane, especially when they contain biodegradable waste (Platt et al. 2008). Every tonne of wet kitchen waste landfilled generates approximately 0.2 metric tonnes of carbon equivalent as the waste decomposes (Platt et al. 2008, 48, cite US EPA 2006). Methane from waste is estimated to account for 31% of methane emission in India (Ravindranath no date). Although some methane may be captured from landfills, the quantity captured may be as low as 20% of total methane generated over the life of the landfill (Platt et al. 2008, 7). The remainder is likely to escape and warm the atmosphere. Landfilling recyclable material indirectly generates greenhouse gases in the sense that far less energy is required to recycle aluminum, copper, iron, steel, paper and plastic than to extract and refine virgin raw materials (Platt et al. 2008, 19). So when recyclables are landfilled, we must extract and use virgin resources at far greater energetic cost to make new products. Recycling a tonne of mixed recyclable materials saves 0.87 tonne of carbon equivalent that would be generated if the materials were landfilled (Friends of the Earth 2000, 4).
Proposed changes to the nation's waste management policy must be accompanied by complete disclosure of the associated costs, as well as thorough consideration of the biophysical and socioeconomic impacts. When all costs and consequences are considered, it becomes clear that landfilling is neither a sensible nor an efficient way of managing resources. Rather than creating landfills to hold all waste, solid waste management policy should aim to minimize the amount of waste landfilled.
Rather than regarding the waste crisis as a business opportunity, the government's rules correctly appreciate that solid waste management is an important instrument to combat climate change, create employment, generate revenue, recover valuable resources, protect the environment and safeguard public health. In short, minimizing waste by recycling and composting yields multiple benefits, whereas landfilling waste unleashes a legacy of enduring liabilities. India needs to construct sanitary landfills, but their size and use should be minimized by measures that prevent and reduce waste.

"Several landfills can come up in the coming years . . . provided of course that we have the land."

Reprinted with permission from *Improving Management of Municipal Solid Waste in India: Overview and Challenges.* (Washington, DC: World Bank 2006)

Is Privatization the Answer?

The World Bank promotes privatization as a "new concept and approach" (Zhu et al. 2008, 74) for municipal solid waste management in India. We see no novelty in the privatization of solid waste management, and have yet to find a single example of privatized waste management services in India that are highly appreciated by residents, significantly reduce burdens on landfills, comply with the MSW rules, cut greenhouse gas emissions and dramatically improve the cleanliness of neighborhoods. The lack of such examples is understandable because corporations primarily serve the interests of their shareholders, not the public interest. Achieving multiple, socially and environmentally beneficial objectives requires a holistic approach that doesn't primarily aim to maximize one's profit margin.

Perhaps the greatest drawback of privatizing solid waste management is that such contracts tend to reward private contractors on the basis of the amount of waste that they collect, transport and dump. In such an arrangement, the waste manager has a strong incentive to maximize, rather than minimize waste. In addition to sending the wrong economic signals, privatization also effectively excludes the public from responsible participation in waste management. In a privatized scenario, residents are regarded as mere consumers, rather than as citizens who have a responsibility to keep their neighborhood and nation clean.

Like the proposal to create massive landfills to hold all waste, privatization of waste management is an illusory panacea, with a track record far more cautionary than encouraging.

Solid waste management should satisfy residents, safeguard public health, minimize waste to landfills, protect the environment, avoid greenhouse gas generation, and recover valuable resources. Achieving all of these outcomes will not be inexpensive, but the value of their benefits will show that these outcomes are far less costly than the damage done by pollution.
For over 15 years, the leaders of Exnora Green Pammal have been promoting and providing solid waste management services that reduce and responsibly manage waste by educating and involving the public, recovering recyclable materials and composting biodegradable matter, in accordance with the government's rules.
This document is the outcome of a month-long review of four models of partnership by which EGP collaborates with localities to bring their waste management systems into compliance with the government's rules. An objective of the review was to use EGP's experience to assess the impact and feasibility of the government's rules. During visits to each of the four localities, we conferred with local authorities, residents and staff to identify the strengths, achievements and shortcomings of the models.
Based on EGP's records and the feedback gathered during the review, this document;

- presents the background, structure and impact of each model of partnership
- distills officials' reflections on their experience with the MSW rules
- identifies aspects of the rules requiring clarification
- pinpoints bottlenecks impeding wider implementation of the rules, and
- recommends steps for a way forward

We hope that this document will inform assessment of the nation's SWM policy, and show a way to a cleaner future.

Profiles of Exnora Green Pammal's Partnerships in Pammal, Panipat, the Department of Atomic Energy Townships and Mangadu

Exnora Green Pammal's experience demonstrates that successful implementation of the government's rules depends upon determined local leadership, public awareness, involvement and cooperation, qualified staff, attentive human resource management, proper physical facilities and on-going financial support. Together, such elements can achieve major improvements in the cleanliness of neighborhoods, as well as a significant reduction in the amount of waste.

In these four localities, Exnora Green Pammal and its partners serve over 200,000 residents and employ over 400 people. Every day, nearly nine tonnes of recyclable material and nearly 25 tonnes of biodegradable matter are removed from the waste stream, reducing the waste stream by as much as 80%.

Pammal

Pammal is a third grade municipality with 21 wards and a population of approximately 100,000, located 17 km from Chennai. The area of Pammal is 14 sq. km. There are 538 streets (length - 72 km), 1,028 business establishments and 228 factories.

Background

In 1994, Mrs. Mangalam Balasubramanian and a group of women formed a Mahalir Mandram (women's association) to address the challenge of waste management in Pammal. The Mandram began by hiring a few workers, buying a tricycle, and collecting waste from 264 houses in Sri Sankara Nagar. This waste was deposited in the neighborhood bins. Awareness-raising street plays were held to educate residents about pollution and the benefits of waste management. In July 1994, the Mandram began collecting a user fee of Rs 10 per household, which was used to pay employees.

Residents living near the waste bins soon objected to the accumulation of mixed waste, so the Mandram was forced to innovate. At that point, the Mandram began segregating the waste and making vermicompost from the biodegradable material. The successful production of compost inspired the Sankara Eye Hospital to allocate space on a portion of their land in Sankara Dhyana Mandapam for the Mandram's vermicompost production.

In 1995, the Mandram registered itself as a self help group and obtained a loan, which was used to construct a vermicomposting shed. The impact of their work attracted the attention of many officials and impressed Pammal municipality's executive officer.

In 2004, representatives of PepsiCo visited the project and subsequently suggested that the activities be expanded to cover a larger area. With PepsiCo's sponsorship of Rs 32 lakhs, the work expanded to seven wards, employing 52 people. In 2005, using PepsiCo's support, a larger shed with 108, one-tonne vermicompost tanks was constructed on 1.1 acres provided by the municipality. To help cover the running costs, the user fee was increased to Rs 15 per household in more affluent areas.

The municipality then invited Mrs. Balasubramanian to expand the service to cover all 21 wards in Pammal. The Mandram registered itself as an NGO named Exnora Green Pammal and signed a contract with Pammal municipality. The municipality provided 70 tricycles, and PepsiCo provided 80 tricycles. The collection of a user fee from the households was discontinued, and instead the municipality paid Exnora Green Pammal 95 paise per house per day.

The contract stipulates that EGP will pay Rs 500 to the municipality for each tonne of compost that EGP produces from the municipality's waste, and Rs 100 per tonne of recyclable material recovered. This payment from EGP to the municipality ranges between Rs 35,000 and Rs 45,000 per month.

Following the December 2004 Tsunami, PepsiCo sponsored the replication of Exnora Green Pammal's waste management practices in Cuddalore, Nagapattinam and Tenkasi. Thus began the process of replicating Exnora Green Pammal's work in other localities.

Partnership Structure: Roles and Responsibilities

Exnora Green Pammal – collection of waste and street sweeping, transport and processing of waste, educating the community about waste management

PepsiCo – sponsorship for infrastructure and provision of some equipment

Pammal Municipality – fee payment to Exnora Green Pammal, provision of land, provision of transport vehicles

Residents – cooperation in the segregation of waste

Challenges Encountered in Pammal

The operation in Pammal has encountered some common challenges that have arisen in several locations.

Although red and green dustbins were provided to all homes at the commencement of the project, and an awareness campaign instructed residents to segregate biodegradable from non-biodegradable waste, 60% of residents still combine their waste. Each morning, soon after the roads are cleaned, many shopkeepers open their shops and deposit trash on the roads. Vacant lots are another problem, because some people still have a habit of throwing their waste in any vacant lot.

These problems indicate that efforts to change residents' behavior must be intensified and sustained. Compelling messages must be identified and emphasized, and delivered in an effective manner to the appropriate segment of the public. The poor condition of Pammal's roads accelerates wear and tear on collection vehicles. The municipality needs to upgrade the roads, and also allocate proper parking space for collection vehicles in the respective wards.
The municipality has yet to provide land for the sanitary disposal of waste. Collection vehicles must get a fitness certificate (FC) once a year. During the process of getting the FC, substitute vehicles are not provided by the local body, causing a shortage of vehicles.

Panipat

Located approximately 90 km north of New Delhi, Panipat has a population of approximately 300,000. Panipat is a major producer of textiles, with exports worth 2,500 crore.

Background

After seeing Exnora Green Pammal's impact and performance in Pammal, PepsiCo asked Exnora to initiate similar services in Panipat, Haryana, where a PepsiCo plant is located. In May 2006, PepsiCo invited Exnora International's founder, Mr. M.B. Nirmal, to Panipat to discuss introducing services there. In November 2006, Mrs. Mangalam Balasubramanian visited Panipat and held more detailed discussions with officials, residents and representatives of PepsiCo. She found that the district administration and the Panipat municipal engineer were eager to initiate door-to-door waste collection.

Although waste management is a responsibility of the Panipat municipality, many residents hired private waste collectors because collection by the understaffed municipality was irregular. Residents report that private collectors dumped domestic waste at intersections and in Panipat's neighborhood parks. Animals rummaged through the heaps of rubbish, and waste was scattered by wind, and often burned. According to the president of a residents' welfare association (RWA), Panipat's neighborhoods used to look very shabby.

In March 2007, Mr. N.K. Jindal, Panipat's municipal engineer, and a team of junior engineers visited Pammal to become familiar with the new system.

Panipat has a network of RWAs, which maintain Panipat's neighborhood parks. To strengthen local ownership of the new, door-to-door waste management services, RWA leaders created an

NGO, Exnora Panipat Navnirman Samiti (EPNS), which helps to administer services by educating residents, collecting user fees from the households and paying green ambassadors. In April 2007, EPNS signed a memorandum of understanding with EGP, formalizing their partnership.

An awareness campaign, involving rallies and public meetings in the parks, commenced in June 2007 to educate residents about door-to-door collection and source segregation of waste. Representatives from the RWAs, EGP, EPNS, PepsiCo and the municipal and district administrations participated actively in the campaign. Red and green wastebaskets were distributed to all homes and shops.

The municipality identified a three-acre site on the edge of town for construction of compost sheds and a dump yard. PepsiCo provided funds to lease the land and sponsored construction of the necessary buildings with 80 vermicomposting tanks. In town, the municipality allocated an office for the project management unit.

Services were launched in November 2007. Door-to-door waste collection has dramatically improved the cleanliness of participating neighborhoods, inspiring neighboring residents to invite EPNS to extend services to their areas. The number of homes covered has increased from 3,000 to 10,000 in two years.

Partnership Structure: Roles and Responsibilities

Panipat Municipality – identified land for the compost sheds and dumpsite, allocated office space for the project management unit, laid the access road from the highway to the compost sheds and dumpsite, provides transport vehicles, push carts, tools and tackle, and red and green dust bins for every residence

PepsiCo – sponsors the project management unit, the awareness campaign, staff training and uniforms, operating costs, and a consultancy fee to EGP. PepsiCo also sponsored construction of the compost sheds, and pays the rent for land for the dumpsite and compost sheds.

EGP – provided technical assistance in setting up the SWM system in Panipat, trained EPNS, and provided professional guidance for management, training and shed construction

EPNS – collects user fees, pays green ambassadors and encourages residents to sort their waste

Residents – pay the prescribed monthly user fee of between Rs 20 and Rs 40 per house, according to income level, and segregate their waste. Shops pay Rs 50 per month. Small hospitals pay Rs 100 per month. Large hospitals pay Rs 200 per month, and schools pay Rs 500 per month.

Challenges in Panipat
The area covered and number of homes served by EPNS in Panipat are growing rapidly. The primary problem encountered in Panipat is that a few households in areas served by EPNS still hire private collectors to remove their domestic waste, yet EPNS is responsible for cleaning the street in front of such houses. Some private waste collectors litter the streets, creating additional work for the Exnora green ambassadors and complicating quality control. Panipat needs to create a proper landfill. Many residents do not segregate their waste.

Exnora's project is a good model. It is a way of the future and is worth emulating.
Mr. Vijay Dhiya, IAS, DC, Panipat

Where Exnora people are working, the results are excellent. They come, take waste, and there is no problem that people are throwing waste on the road. No blockage in sewage. Wherever they are working, they are working well.
Shri Balbir Palsha, MLA, Panipat

Panipat is a good model. The result is good.
Dr. Amit K. Agrawal, IAS, DC, Yamunanagar

Department of Atomic Energy Townships: Kalpakkam, Anupuram and Bhavani

The Department of Atomic Energy (DAE) townships of Kalpakkam, Anupuram and Bhavani have approximately 30,000 residents who work in atomic energy production and research facilities operated by the Indian government. The townships occupy 870 acres, approximately 60 kilometers south of Chennai.

Background
Mrs. Balasubramanian was invited by the Indira Gandhi Council for Atomic Research (IGCAR) to initiate solid waste management in Kalpakkam, Anupuram and Bhavani after she delivered a lecture at Kalpakkam in 2006. Finalizing the contract and preparations took several months. Staff were recruited primarily from neighboring fishing communities.

Previously, waste management services in the townships were contracted to private parties that collected waste from community bins and transported it to a dumpsite. According to residents, the previous services were performed irregularly, leaving neighborhoods very dirty.

Now the townships' waste is transported to Exnora Green Pammal's 3,000 square-foot vermicompost shed situated at Natham Kariacheri Village, eight km from Kalpakkam, and to a dumpsite leased by EGP. In addition to collecting waste from 6,000 residences, EGP also collects waste from six schools, six office buildings, three marriage halls, two hotels, 15 shops and tea stalls, and the bus stand. EGP is also responsible for keeping the entire open area of the townships free of litter.

There is a quantum improvement in the way the township looks in respect to cleanliness.
Dr. Baldev Raj, Director, IGCAR, Kalpakkam

Partnership Structure: Roles and Responsibilities

EGP – responsible for all aspects of solid waste management in the townships

The DAE townships – pay the fees according to a contract with EGP and monitor EGP's performance

PepsiCo – provided a bank guarantee so that EGP could get an advance from the IGCAR to start

Residents – segregate their waste

Challenges in Kalpakkam, Anupuram and Bhavani
The townships do not have a proper landfill. Many residents do not segregate their waste.

Mangadu

Mangadu town panchayat is famous for its large Kamatchi Amman temple, which is a pilgrimage destination. Mangadu is approximately 20 km from Chennai, near Poonamallee. The town's population is approximately 40,000.

Background
In January 2009, Mr. Ravikumar, a resident of Pammal, was posted as the executive officer in Mangadu town panchayat. Impressed by the work of EGP around his own home in Pammal, Mr. Ravikumar invited EGP to manage solid waste in Mangadu. Meetings were held to work out a partnership between EGP and Mangadu town panchayat, and a resident awareness campaign commenced.

Collection services were launched in February 2009. Initially, door-to-door collection covered three wards. Coverage increased to seven wards by the end of 2009. The present EO of Mangadu, Mr. N. Ravi, expects that all 18 wards of the town will be covered by EGP by June 2010.

In Mangadu, the costs of waste management services are shared between the panchayat, residents and PepsiCo. Residents pay a monthly user fee of Rs 20 per house. The panchayat has used grants to construct a storage shed and a vermicomposting facility with 10 tanks.

Partnership Structure: Roles and Responsibilities

EGP – provides labour, technical guidance, monitoring, shed maintenance and managerial staff

Mangadu Town Panchayat – provides tricycles, a truck, facilities, a pump for the compost shed, and an executive order for EGP to operate

PepsiCo – contributed Rs 150,000 to support processing costs, the awareness campaign, supervisor's salary and monitoring

Residents – pay a monthly user fee of Rs 20 per house and segregate their waste

Challenges in Mangadu
In Mangadu, the road from the town to the dumpsite and vermicompost shed is in very bad condition, accelerating wear and tear on tricycles and slowing the pace of work considerably. The town has yet to create a proper landfill.

Site Vital Statistics Using November 2009 Data				
	Pammal	**Panipat**	**DAE Townships**	**Mangadu**
date service launched	**1994**	**Nov 2007**	**Feb 2008**	**Feb 2009**
# houses served initially	264	3,000	5,500	300
# houses served November 2009	26,000	10,000	5,500	4,250
total population	100,000	300,000	30,000	40,000
population covered as of November 2009	100,000	60,000	30,000	21,250
ave. total waste (kg per day)	20,911	9,009	11,050	3,759
ave. biodegradable (kg per day)	13,170	5,598	6,558	964
ave. recyclables (kg per day)	3,560	1,823	2,723	327
ave. compost produced (kg per day)	1,100	586	678	262
ave. waste dumped (kg per day)	4,181	1,588	1,769	2,468
ave. waste averted (kg per day)	16,730	7,421	9,281	1,291
% of total waste stream not landfilled	80.01%	82.37%	83.99%	34.34%
per capita waste (kg per day)	0.21	0.15	0.37	0.18
# of GAs	159	73	128	17
# of supervisors	6	7	9	2
other employed		2	10	2
total employed	165	82	147	21
ratio of residents per employee	606	732	204	1,012
ratio of GAs per supervisor	26.5	10	14	9
ave. cost (Rs per day)	13,917	11,667	24,267	2,566.67
ave. cost (Rs per house per day)	0.54	1.17	4.41	0.60
ave. cost (Rs per tonne of waste per day)	493.50	1,169.00	4,146.73	747.65
revenue from compost (Rs per day)	1,000.00	133.33	283.33	91.67
revenue from recyclables (Rs per day)	3,133.33	2,000.00	550.00	280.00
revenue from user fees (Rs per day)	0.00	4,166.67	0.00	400.00
revenue (Rs per day)	4,133.33	6,300.00	833.33	771.67
daily revenue as a percentage of cost	29.70%	54.00%	3.43%	30.06%

Lessons Learned

- The success of solid waste management depends upon people's participation. The rate of recovery of recyclables is not as high as it could be, largely because some residents do not segregate their waste. When residents don't segregate their waste, the workload of green ambassadors is increased because they have to segregate the residents' waste, the value of recyclable material is reduced because the recyclables become dirty, the quality of biodegradable material is reduced, and the amount of landfilled material increases. A much more intensive and sustained awareness campaign is needed to encourage more residents to segregate their waste. If more residents segregate their waste properly, the recovery rate of recyclable materials will increase, and the amount of landfilled waste will be lower. Raising awareness to achieve widespread public cooperation in terms of segregation of waste requires continuous effort and is likely to take several years. Changing people's habits is a gradual process.

- Solid waste management requires money for startup and for operation. Services cannot be sustained from one-time grants. The revenue earned by the sale of compost and recyclable materials and the collection of a user fee covers less than half of the operating costs in three of the four locations. In the fourth location, Panipat, such revenue covers only 54% of operating costs. The government should significantly increase spending on SWM and recognize that SWM is a social service, not a business. The cost of SWM to the local body can be reduced if private parties provide sponsorship, as PepsiCo is doing in nine localities.

- Funds for SWM should be raised by local bodies by imposing a Green Tax on all residents. Collecting a user fee is not an ideal way to generate revenue for solid waste management because payment is irregular, and collecting the fee is a considerable burden for the service provider. Although collection of a user fee strengthens rapport between the service provider and residents, such collection becomes a very costly task because collecting the fee consumes an enormous amount of the service provider's time. The cost of door-to-door waste collection, transportation and processing has been estimated to be between Rs 115 and Rs 120 per household per month (Pandey and Saraswat 2009, 188). This is approximately the rate paid to EGP by the DAE townships.

- Nearly all localities lack a proper facility for safe and sanitary disposal of solid waste. Sanitary landfills urgently need to be constructed for disposal of waste that cannot be recycled or composted.

- Localities should prohibit multiple SWM service providers from operating in the same neighborhood. In areas of Panipat served by Exnora Panipat Navnirman Samiti, some households hire private waste collectors. Some of these private collectors litter the area served by EPNS, while also reducing the revenue available for EPNS, yet EPNS is responsible for cleaning the area where private collectors work. This collision effect complicates quality control.

- Contracting solid waste management services to NGOs or SHGs is unlikely to solve a significant share of the nation's waste crisis. Generally, such groups lack the professional expertise required to anticipate and satisfy a contract's legal and financial obligations. Few NGOs or SHGs are able to pay the compulsory caution deposit, afford start-up costs and secure bank guarantees required by standard contracts. Furthermore, contractors are seldom appreciated or respected by residents and local authorities. Contracts establish a business-oriented relationship between residents, officials and the service provider, which sets all parties in a competitive, rather than a collaborative relationship. Solid Waste Management is a science that should not be treated as a casual cleaning assignment.

- Frequent turnover of government staff is detrimental to the continuity of SWM. Transfers of local and district officials make it additionally challenging to initiate and establish new solid waste management services.

- Removal of street bins, together with punctual, daily door-to-door collection of waste result in a dramatic improvement of neighborhood cleanliness. After residents experience the benefits of daily waste collection at their doorstep, they will not go back to the street bin collection system.

- Solid waste management should be decentralized. Every local body should create facilities to process and dispose of their waste within their vicinity. Waste should not travel more than five kilometres from its source.

The MSW Rules – Fundamentally Sensible, Although Some Points Require Clarification

Based on the principles of Reduce, Reuse and Recycle, the government's rules prescribe sensible, economical and appropriate waste management practices. For a country with a large population, financial constraints and scarcity of land, it is imperative to minimize landfilling by removing and reusing as much material as possible from the waste stream. House-to-house collection of segregated solid waste is an ideal method for collecting uncontaminated biodegradable matter for composting, maximizing the recovery and value of recyclables and preventing methane generations in landfills.

European studies have found that compost made from source-segregated waste contains on average one-fourth the heavy metal contamination of compost made from mixed municipal waste (Brinton 2000, 9). Heavy metal contamination of compost made from mixed municipal waste was so high that Germany, Switzerland, France and Austria have stopped producing compost from mixed waste.

It is important to minimize heavy metal levels in compost that might be used in horticulture or agriculture because some crops, including brinjal (Topcuoglu and Onal 2007), mushrooms (Woodbury 1993), rice (Bhattacharyya et al. 2008) and spinach (Brinton 2000, 10), have been found to take up such metals. India's Central Pollution Control Board tested compost made from mixed municipal waste and found that it contained 108-203 mg of lead per kg of compost, a range that exceeds the 100 mg per kg safety standard for lead levels in compost, established in Schedule IV of the rules (CPCB no date). Analysis of three samples of EGP's EXORCO compost detected lead levels of 11, 33 and 16 mg per kg.

According to scientists at Cornell University, "Source separation composts have the lowest contaminant levels, . . while delaying separation until after composting normally results in the highest levels of metal contamination."

"Those metals of greatest concern in compost –cadmium, mercury, and lead – can be harmful to animals and humans at relatively low concentrations and tend to accumulate in soil, plants, and animals."

"Batteries, consumer electronics, ceramics, light bulbs, house dust and paint chips, lead foils . . . , used motor oils, plastics, and some glass and inks can all introduce metal contaminants into the solid waste stream. . . . Plastics are estimated to contribute approximately 30% of the cadmium as well as significant amounts of nickel and lead."

Richard and Woodbury 1993

Composting biodegradable waste also prevents such waste from generating methane in landfills. Methane produced by waste is estimated to account for 31% of methane emission in India (Ravindranath no date).

"Although centralized composting plants have a very bad track record, decentralized composting can play an important role in the process of improving overall solid waste management services leading to better health conditions in urban areas. This requires a shift of mindset of municipal administrations towards promotion of appropriate technologies. For small towns it may even suffice to rely solely on decentralised composting schemes.
For large cities, decentralised small-scale composting in combination with medium-scale centralised composting schemes seems to be an ideal organic waste management strategy. Decentralised composting can assist in attaining a number of MDGs which are relevant for the improvement of urban living conditions, national food security and global environmental sustainability."

Drescher and Zurbrügg 2006

Recovering recyclable material from the waste stream is an important strategy for conserving valuable resources, reducing environmental degradation, and minimizing the burden on landfills. Recycling materials also helps reduce greenhouse gas emissions because, on average, 75% less energy is required to recycle aluminum, copper, iron, steel, lead, zinc, paper and plastics than to extract and refine such materials from virgin resources (Resource Recovery and Recycling Authority of Southwest Oakland County 2007, 4).

According to the ExNoRa Environmental Certification Corporation, by composting biodegradable waste and salvaging recyclable materials in these four localities, EGP prevents the emission of 5,062 tons of carbon dioxide annually.

Recycling also creates jobs and supports local enterprises. There were only four local scrap dealers when Exnora Green Pammal started recovering recyclable materials from waste in Pammal in 1994. Today there are 24 scrap dealers in Pammal.

A study in the USA concluded, "On a per-ton basis, sorting and processing recyclables sustains ten times more jobs than landfilling or incineration."

Platt and Seldman 2000

While the rules are generally sound, from an operational standpoint the rules require clarification of a few points that cause confusion among officials, residents and service providers. For example:

A. Schedule II 1.i. This section reads, "Organizing house-to-house collection of municipal solid wastes through any of the methods, like community bin collection (central bin), house-to-house collection…"

Are both community bin (central bin) collection and house-to-house collection permissible? Community bins tend to be points where waste gets combined. Community bin collection should be replaced with house-to-house collection to facilitate the segregation of waste.

B. Schedule II 3. iv. "Manual handling of waste shall be prohibited."

The prohibition of manual handling of waste is not a practical rule. Waste that is collected manually must be handled manually. Automation of the entire process would be very costly. It would be better for this directive to read, "Manual handling shall be carried out under proper precautions, with due care for the safety of workers."

C. Schedule II 5. ii. "Mixed waste containing recoverable resources shall follow the route of recycling. Incineration with or without energy recovery including pelletisation can also be used for processing wastes in specific cases."

Those cases in which incineration can be used need to be specified for clarification.

Reflections from Officials on the MSW Rules

While conducting this review, we met with the following officials who were instrumental in initiating and establishing daily house-to-house collection of segregated waste in Pammal, Panipat, the DAE townships and Mangadu:

- **Dr. Baldev Raj**, Director, Indira Gandhi Center for Atomic Research, Kalpakkam
- **Mr. N. Ravi,** EO in Mangadu
- **Mr. Ravikumar,** formerly EO in Mangadu, presently EO in Sevilimedu
- **Mr. M. Chandrasekaran,** formerly EO in Pammal, presently Assistant Director in Tiruvallur
- **Mr. K. Kalathi,** formerly EO in Pammal, presently EO in Thiruverkadu
- **Dr. Amit K. Agrawal,** formerly ADC in Panipat, presently DC in Yamunanagar
- **Mr. N.K. Jindal,** formerly Municipal Engineer in Panipat, presently Executive Engineer in Rohtak

We asked them to describe:

- benefits that they have observed after initiating door-to-door collection of MSW
- factors that impede localities from complying with the MSW rules
- the keys to successful implementation of the rules

What benefits have you observed after launching door-to-door collection of segregated waste?

"Waste is collected door to door, so drains are no longer clogged by waste dumped in the street. The streets are kept neat. Previously, we had to clean the streets every two days. Now we have to clean only once per week." ***Mr. N. Ravi***

"The major advantage of this system is that waste is being converted into a product, and with this system it is possible to give many people a salary and a sense of purpose. That is a very tangible benefit." ***Dr. Baldev Raj***

"There's no sanitation problem in Pammal, because waste is collected properly." ***Mr. K. Kalathi***

"Before we introduced house-to-house collection there was waste everywhere, and animals came and fed on the waste. There were many areas where there was no sanitary worker. Now the areas are clean." ***Mr. N.K. Jindal***

"If you do door-to-door collection, 50% of your waste can be converted to manure, so you considerably reduce the area required for waste disposal. Finding small parcels of land is much easier than finding large areas of land. In Pammal, we showed that in a small space we can manage our waste." ***Mr. M. Chandrasekaran***

What factors impede localities from complying with the MSW rules?

"What is needed is money. . . An additional 10% or 15% (of the town's budget) should be designated for collecting and processing solid waste. Annual grants don't cover operating costs for municipal solid waste managment."
Mr. Ravikumar

"Wider implementation of the MSW rules will be possible only if the government provides money."
Mr. N.K. Jindal

"The government's norms for staffing for sanitation are too low. As per the norms of the government, for every one km there should be a sweeper to clean the streets. That person can't do the door-to-door waste collection. The number of staff must be increased. For additional staff, money is needed. The municipality must cover the operating costs. If the municipality is to perform public awareness raising, then qualified staff need to be appointed. Awareness raising is an activity in and of itself."
Mr. M. Chandrasekaran

"The EO's workload is too heavy to permit the EO to overhaul and oversee SWM services. The EO has to look after many things and attend frequent meetings. Routine, day-to-day administration doesn't permit the EO to devote full attention to any single matter."
Mr. N. Ravi

"The Pollution Control Board should revise its requirements for composting sites. The present requirements make it very difficult to find suitable locations. Composting, as is done in Pammal, is an eco-friendly activity that can be done locally without any risk or nuisance to residents."
Mr. M. Chandrasekaran

What is essential for successful implementation of the MSW rules?

"Continuous, consistent awareness-raising is needed to increase public cooperation."
Mr. M. Chandrasekaran

"Public participation is essential for success."
Mr. K. Kalathi

"If residents do not sort their waste, you cannot proceed further." ***Dr. Baldev Raj***

"If you want any project to succeed, there has to be public participation. People's participation is a must. There has to be a sense of ownership of common spaces by the people." ***Mr. N.K. Jindal***

"Cleanliness is everybody's business. The key thing is community involvement. There has to be people's involvement, the community has to be involved, responsibility of community has to be fixed. People have to be awakened that if they get involved things will improve. Responsibility, ownership is the key thing. If things are done in such a way that the community is involved, then wonders can be done."
Dr. Amit K. Agrawal

Bottlenecks Impeding Wider Implementation of the Rules

The government has enacted comprehensive rules for solid waste management and appropriated funds to initiate such work. However, the following factors impede widespread compliance with the rules:

- Localities cannot afford the recurring costs of SWM activities mandated by the rules.
- The public is not adequately aware of the hazards of pollution, the benefits of recycling and composting, and ways that they can prevent waste.
- Localities do not have enough staff to implement the rules.
- Sanitary workers need training for effective implementation of the rules.
- The government is not enforcing its waste management directives and deadlines.
- Localities lack proper sites for the safe and sanitary disposal of waste that cannot be recycled or composted.

Recommendations - A Way Forward

Throughout the course of this review, we compiled the following list of actions that the government should take to enable more localities to implement the MSW rules:

1. Launch an intensive and sustained awareness campaign to end littering, promote waste reduction, reuse and recycling, and increase public awareness about the hazards of pollution.

2. Local bodies need to acquire proper space for, and construct landfills. The lack of a proper disposal facility is a problem in most localities. Ideally, this site should be within five kilometres of the source of waste so that energy is not wasted by transporting waste long distance.

3. Levy a Green Tax on all residences, or introduce a small levy similar to the educational cess to cover the cost of solid waste management.

4. Induct and train more officials in waste management to meet the shortfall of qualified staff to coordinate and implement SWM.

5. If SWM is outsourced or privatized, the contract must be designed to reward reduction of waste and specify measures to monitor compliance and ensure accountability.

6. Solid waste management should be made a responsibility of the sanitation department, not the engineering department of each locality.

7. Clarify the law by eliminating the ambiguity and inconsistencies of the MSW rules. Is house-to-house collection mandatory? Is source segregation of waste mandatory? Are community/street bins permissible?

8. The government should procure all compost made from solid waste, certify its quality and safety, and supply this compost to farmers.

9. Solid waste management should be done in a holistic way, rather than assigning stages of the process to separate parties. Assigning the tasks of primary collection, transport, processing and disposal to separate parties is likely to result in discord and friction between service providers because poor quality control at any stage will be detrimental to the subsequent stages. For example, primary collection of segregated waste might be done well, but mixing of waste by the transporter will create problems for those who process and dispose of the waste. If a single party is responsible for waste management from start to finish, it is in their interest to ensure that each step is done properly.

10. Local bodies should encourage corporations and businesses to sponsor SWM services, as PepsiCo is doing in nine localities. Public-private-partnership reduces the cost of SWM for local bodies, while private sponsors benefit from publicity as well as concessions under the income tax rules.

11. A module on pollution and waste management should be introduced in the school curriculum.

12. Extend the posting of executive officers. Frequent turnover of EOs makes it difficult to establish and operate SWM activities and jeopardizes continuity of services.

13. Enforce the rules and encourage compliance. Impose penalties on localities that are not in compliance, and reward localities that are in compliance with the rules.

14. Authorities should make allowances and provisions for waste management and prompt waste removal after special events, festivals and celebrations.

15. Develop proper vehicles, equipment and tools to increase the efficiency and safety of waste collection and transport.

16. Promote household composting to reduce the amount of biodegradable waste that must be collected and processed.

17. Introduce waste prevention measures of all kinds, including incentives and bans.

18. SWM must be incorporated in the green building concept, just as rainwater harvesting and wastewater recycling are being incorporated, especially when residential lay-outs are being designed.

PEPSICO
India Region

Highlights and Strengths of the Waste to Wealth project:

This project is closely aligned to PepsiCo's 'Purpose agenda in creating replicable, community models through a successful 4 way Partnership: PepsiCo + pioneer NGO Exnora + Municipality + Community. The Waste to Wealth project recycles 80% of household waste. Community members enjoy benefits of a clean environment and are educated on how to recycle waste, not just relocate it.

The winning aspect of the programme is the maximum community and Government participation that helps the programme evolve into a self sustaining mode.

Households segregate their bio-degradable waste from their recyclable waste.
Bio-degradable waste is converted into organic manure through the process of vermi-culture.

The project provides livelihood to more than 500 community members. The Exnora team has evolved an efficient model where bio-degradable waste is converted into high quality organic manure through vermi-culture. Recyclable waste such as PET and plastics, waste paper and tetra packs are recycled. The community awareness programme included door-to-door campaigns and street plays to motivate people to segregate organic and inorganic garbage at source to enable recycling.

In 2010 the Waste to Wealth initiative and PepsiCo's solid partnership with the pioneers and strongly committed NGO EXNORA expands to reach more than half a million or 5 lakh people, and several communities will also achieve sustainability in 2010.

Annie Kishen
Head, Corporate Social Responsibility
PepsiCo India Region

Testimonials

Mr. N.K. Jindal, *former Municipal Engineer, Panipat*
Before we introduced this, there was waste everywhere, and animals came and fed on the waste. There were many areas where there was not sanitary worker. Now the areas are clean.

Mrs. C. Shyamala,
Green Ambassador, Anupuram
Now we can stand on our own legs because we earn our own income.

Mrs. Saroj Rani, *664 New Divan Nagar, Panipat*
The previous system of waste collection was not good. The collectors troubled us, and came irregularly. Now the door-to-door collection by green ambassadors keeps our street clean. There are many benefits for us.

Mrs. Sakshi, *New Divan Nagar, Panipat*
Before, the road was very dirty and the drains were clogged. Now everything is always clean. The green ambassador has a good attitude and collects our waste from our gate even if we are not at home.

Mr. N. Dhandapani, *Joint Secretary, VOC Nagar RWA, Pammal*
Previously, the municipality occasionally collected waste from overflowing street bins. Animals scattered our waste. EGP's service is a boon to Pammal's residents.

Mr. M. Murugan, *Ward 1 Councilor, Mangadu*
We're very happy that waste is collected door to door, and we're preparing a campaign to increase residents' awareness.

Mr. Rajiv Sariin, *328L Model Town, Panipat*
Door-to-door collection of waste has made our street very clean. I purchase and use the compost that is made from our kitchen waste, and it beautifies my houseplants. We also use the compost in our neighborhood park.

Mr. Harjinder Singh Dilawari,
326 Model Town, Panipat
Now residents are more healthy, so we have less medical expenses. The residents are very happy and appreciate this greatly.

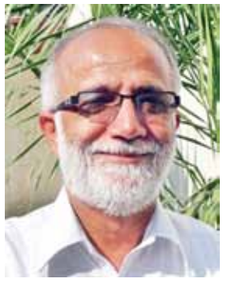
Mr. Sekar, Supervisor,
Kalpakkam
Before becoming a supervisor for Exnora, I worked for a private contractor who collected the waste. The contractor paid me very poorly. Now I earn well, and we are keeping the township much cleaner.

Mrs. Nitu Jha, *290 A. Shanti Nagar, Panipat*
Door-to-door collection of waste from our home is punctual. The collectors don't take leave, and now the street is very clean.

Mrs. Anandavalli,
Green Ambassador, Kalpakkam
Before becoming a green ambassador, I sold fish from house to house. That income was irregular. Sometimes, I lost money. This job is better because it gives my family assured income.

Mrs. Ranjana Jawa, *principal, Bal Vikas School, Model Town, Panipat*
This system has made a marked difference in the town. We must work to make it even better.

Mrs. A. Kumari,
Green Ambassador, Anupuram
I'm happy because I feel that we are performing a social service.



Mr. Satish Guglani, *576 Model Town, Panipat*
Our waste used to be dumped in low areas and people threw garbage in our park. Now our quality of life has been improved, we are more healthy, and our park is clean and beautiful. Now people are smiling.

Mr. A. Soundararajan, *farmer, Kalpakkam*
By using Exorco compost on my paddy crop, I've seen an improvement in crop health and yield.

Mrs. W. Langlentombi,
Kalpakkam
Our street bins used to be emptied irregularly, so waste smelled and attracted insects and dogs. It is much better that our waste is collected daily at our front door.

Mr. L.B. Suresh *CTA Garden, Mangadu*
Before, our money went to doctors because we became ill from pollution. Now money is saved because disease is prevented. They should do this everywhere.

Mr. G. Rajendran, *Ward 18 Councilor, Mangadu*
Door-to-door collection has made our area much cleaner. And we want to make it even better.

Mr. Madan Lal Kalra, *RWA President, Shanti Nagar, Panipat*
Previously, private collectors dumped waste from our homes on the street corners. Now, door to door collection has made a difference in the life of the residents. We live in a neat and clean place now. Pests and insects are reduced.

Mrs. Raj Kumari, *Divan Nagar, Panipat*
Earlier, we deposited our waste on the street corners. Now the green ambassador comes to our home each morning and removes our waste. His tremendous service provides more and more benefits for us.

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