India

Source Separation Of Organics In Delhi

Pilot project was implemented to stop dumping in nearby woodlands and turn residuals into marketable compost.

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SOLID WASTE poses a major threat to the environment of Indian towns and cities. To address this problem, the New Delhi-based NGO ACORD performed a pilot project to demonstrate an integrated approach to waste management and recycling in the Harkesh Nagar neighborhood on the southern outskirts of Delhi. About 7,000 (910 households and ten businesses) of the approximately 50,000 inhabitants participated from June, 1996 to January, 1998.

Harkesh Nagar is a typical Indian "basti," i.e. an improved former slum. There are single-family, multifamily, and small apartment buildings, which are accessed via a shopping street that runs across the settlement, and then through a maze of narrow alleys. Wastewater is discharged into ditches that run along these alleys and the main street.

Before ACORD's pilot project, there was hardly anything that could be called solid waste management in Harkesh Nagar. Waste was dumped into the woodlands and empty lots surrounding the settlement, which also serve as toilets. A number of rag pickers searched the dumps for generally low-value recyclables like plastic film and low-grade paper and sold them to used materials dealers. Waste was (and, to a lesser extent, still is) also dumped into the wastewater ditches, causing them to clog. These problems were exacerbated by a myriad of flies inhabiting the dumps. The flies are still there, but their number seems to have gone down, probably due to the efforts of both ACORD and the Municipal Corporation of Delhi (MCD).

A new waste dropoff site has been built by MCD, which is officially responsible for waste management in Harkesh Nagar. This dropoff site is the only one available to residents. In addition, residents generally sell high-value residuals to street merchants.

Based on figures derived from the pilot project, the average waste generation rate during December, 1997 and January, 1998 was 83 grams/person/day. This appears to be extremely low even for Indian standards, but it is explained by both the low income of Harkesh Nagar residents and the small number of businesses that participated in the pilot project. A waste composition analysis showed 81 percent organic residuals, 6.5 percent paper, 5.2 percent plastic and rubber, 2.3 percent textiles (rags), 2.3 percent glass, 0.1 percent metal and 3.6 percent miscellaneous.

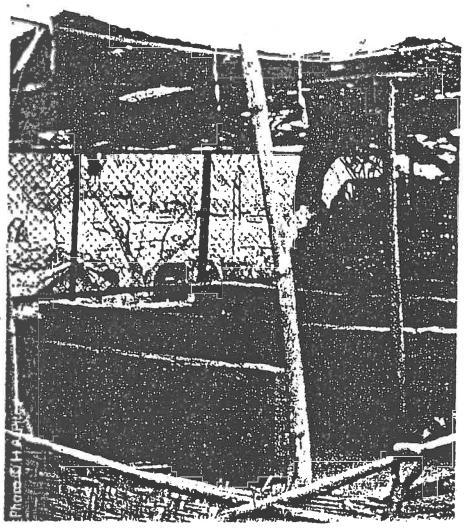
Separation and collection

The project addressed both household waste and similar commercial waste, such as that from shops and restaurants. Industrial waste and construction and demolition debris were excluded. Commercial participants like shops were treated as regular households.

Participants separated their waste into organics (excluding plastic, wood and clean paper, but including clean wood ash) and the remainder. Each household that had agreed to participate received a small bin for the organics and some promotional material. In some instances, apartment buildings received larger communal bins, but this did not work out very well.

The two fractions were collected by personnel recruited among the rag pickers working on the dumps surrounding the settlement. Collection was performed on a daily basis in groups of two using specifically designed handcarts. One collector gathered the organic material and the other one took the remainder.

The fraction of remaining waste was made up primarily of low-value recyclables like plastic film, low-grade paper and mixed waste that had not been segregated properly. A small portion of this (15 percent of nonorganics) generally consisting of high-value materials was



sorted out by the collectors and sold to dealers. The other remaining materials were taken to the municipal dropoff site.

Composting activity

Organics were brought to a woodland site next to the settlement and composted in a small facility with a design capacity of about 0.6 tons/day. Area requirements of such a facility — a few others have been built by ACORD — are 70 square meters for composting and another 50 square meters for delivery, weighing, parking the collection equipment, and a tricycle for transporting compost.

The main portion of the composting process was performed in a shed, where piles were stored in specifically designed compartments and shifted from one to the next on a twice weekly basis. The compartments were sized to match the decreasing volume of the material. Chopped straw was added to maintain the right moisture for decomposition. After 30 days, the compost was screened and cured for about another month. Many of the overs were hand picked for rejects and returned to the second compartment of the compost shed as the fresh material was being shifted.

The finished compost was packaged into bags of various sizes and sold (depending on volume) for two to three rupees/kg, or about U.S. 4.5 cents to ~~nine~~ 7 cents/kg. Marketing proved to be a problem because the site was difficult to reach and because of the heavy competition by two large mixed urban waste composting facilities in the vicinity. It was generally agreed, however, that the quality of the Harkesh Nagar compost was best, and it can be assumed that the level of contaminants, particularly heavy metals, was much lower. A test performed by the Indian Agricultural Research Institute revealed the following macronutrients: N — 1.08 percent, P — 0.88 percent, and K — 1.45 percent of dry substance.

Composting lasted 30 days in compartments sized to match the decreasing volume of material.

Public participation

Participants in the project were ~~paid~~ paying a small monthly fee of seven rupees, or about U.S. 16 cents/month. (The minimum wage is roughly 2,000 rupees, or U.S. $45/month.) Volunteers were targeted by a public awareness campaign on the importance of waste separation at the source and the relationship between clean environment and health. This was followed up by visits to households from field workers and local volunteers. School children participated enthusiastically in both the campaign and the field work.

Toward the end of the project, the organics received at the composting facility were relatively clean and comprised 56 percent of the total organic residuals generated by participants. Overall, about half of the waste was recycled and the other half was picked up by MCD. Unfortunately, some of the households were not adequately separating their waste by the end of the project. In the future, a monthly bonus for those households who properly segregate their waste is recommended in conjunction with an overall higher waste collection fee.

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Feasibility analysis

A detailed feasibility analysis was performed on the results of the project in order to assess the viability of expanding the proposed waste management approach to the whole of Harkesh Nagar or similar "basti" areas in India. It was estimated that the composting facility can operate at a profit if the average selling price for compost is maintained at about 2.5 rupees/kg (U.S. 5.8 cents/kg), and that collection fees would stay affordable at a rate of 11.3 rupees/month (U.S. 26 cents/month).

Unit costs are roughly 585 rupees/ton (U.S. $13.50/ton) for collection; this does not include the municipality's cost of picking up and disposing of the 50 percent of remaining waste that is not recycled. It also does not account for the expense of an initial public awareness campaign that may be required to get a new project started, but it does include ongoing public relations activities and similar costs.

In India, organic fertilizers are exempted from turnover tax and municipalities generally provide the land required for waste management activities. The composting facility at Harkesh Nagar was able to benefit from both of these arrangements, and hence the breakdown of actual costs at the composting facility does not reflect the potential expenditure for land. It may be preferable to link subsidies to waste diversion/utilization quantities rather than providing free land. These subsidies should at least reflect the transportation and landfilling costs avoided through composting.

Adoption of the project's system, if introduced to the whole neighborhood, would solve a good deal of its waste management problem. The lanes of Harkesh Nagar, including the wastewater ditches, would be kept clean by the owners of the adjacent houses, and sweeping the main street could continue to be the responsibility of MCD. ■

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