Policy Brief

Decentralised and inclusive waste management policy and practices: lessons for the South Asia region

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Summary

The waste management crisis in the world's towns and cities continues to grow, but still receives limited attention in policy debates. However, for Local Authority leaders and managers, it is a priority. It is one of the biggest costs for municipal budgets and waste workers often make up a large part of the municipal workforce. Global agreements in 2016 may mean it will receive greater attention, with a target included in the Sustainable Development Goals, and its contribution to climate change recognised as part of many Intended Nationally Determined Contributions under the Paris Climate Agreement.

At the same time, there are few examples of successful waste management solutions which are cost-effective for municipalities; secure dignified livelihoods for the many workers involved, both formal and informal; and reach all areas of the town, both low and higher income. This policy brief summarises experiences of solid waste management of Practical Action and our partners in a variety of cities across South Asia: Bangladesh, Nepal and Sri Lanka. These examples are decentralised, look across the entire value chain, and seek to involve the informal sector and enhance the quality and dignity of their work. At the same time, they offer the potential for at-scale solutions which can make a measurable difference to city-wide waste collection, recycling and disposal. The examples we draw on include:

- Waste collection services run by a local NGO in Faridpur, Bangladesh, and now reaching 5,100 households (around 15% of the town)
- The formation of informal waste workers' associations in Kathmandu Valley in Nepal to provide collective bargaining power for better prices, to facilitate running various social protection schemes, and to improve the perception and treatment of waste workers by the general public
- Experiences of home composting, and the city-wide promotion of compost bins, in Sri Lanka reducing the amount of organic waste requiring collection by 20-30%
- Experiences with composting and waste-to-biogas including innovate technologies for both which are modular, can be deployed on a decentralised basis. They are cost-effective, generating useful end-products which can be sold to recoup costs
- Development of women-led micro entrepreneurship for organic waste processing, organic fertilizer and safe food production.

We draw lessons for policy makers and practitioners from these experiences. In collection and transportation, the key challenges are to reduce transport distances and hence costs; and second, to encourage separation at source. Constant promotion of household separation can reap dividends, but needs significant political will from Local Authorities who need to take the lead. Home composting is popular where the conditions are favourable. It can reduce waste collection needs, but is unlikely to be suitable for all households. Finally, in composting and biogas production, care should be taken to choose the right technologies for a given situation. For composting, sales can be inhibited by strict rules around fertilizer marketing. There is a strong case for relaxing rules and allowing compost from waste to be sold as a soil improver: a much-needed product given the depletion of organic matter in the region's soils.

The challenge of waste management is too large to be tackled by either the Local Authorities, or the formal private sector, or the informal sector alone. Partnerships are needed, and we must make more use of decentralised, cost-effective solutions that can reach all the residents of a town: rich and poor.

Introduction

Globally, the issues of solid waste management has never attracted as much attention as other development priorities. However, as the world's urban population continues to increase, towns and cities are facing a growing crisis. A World Bank report from 2012 estimated that the total amount of municipal solid waste will rise from 1.3 billion tons per year to 2.2 billion tons by 2025 (Hoornweg and Bhada-Tata, 2012). For the South Asia region, the rise will be even greater as the urban population grows and waste generation per person increases as incomes grow. The total quantity of municipal waste per year is predicted to rise from 192,400 tons to 567,500 tons: a rise of nearly three times. Inadequate systems for collecting and safely disposing of waste create a range of problems, often affecting poor communities most severely. This includes the health and environmental impacts of living near large quantities of uncollected waste. Beyond this, waste blocks drainage channels causing flooding; it pollutes water sources, and is a source of greenhouse gas emissions. Methane emitted from landfill sites represents 12% of total global methane emissions.

This policy brief outlines the policy context for waste management in the SAARC region. It describes Practical Action's regional waste management experiences, arguing that greater involvement of the informal sector, and a more decentralised approach will help meet the challenge faced by municipalities across the region.

Regional priorities and co-operation on waste management

In the SAARC region, waste management has occasionally been raised as an area for regional co-operation. It fits in with other more pressing regional concerns such as environmental degradation, food safety, power generation, poverty alleviation and trans-boundary technology transfer. The Dhaka Declaration on Waste Management of 2004, for example, recognises the environmental imperative to promote more effective waste management systems 'with special attention to addressing the needs of the poor'. Similarly, the SAARC action plan on Climate Change of 2008 listed waste management as an area for nationally appropriate mitigation actions where regional sharing of best practices could be useful. The 2010 convention on co-operation on the environment, also included waste management among a list of 19 areas for the exchange of best practices and knowledge, and transfer of eco-friendly technology (SAARC, 2014). However, these commitments have rarely turned into concerted action.

> "For the South Asia region, waste collection rates are on average **65%**, with wide variations between towns"

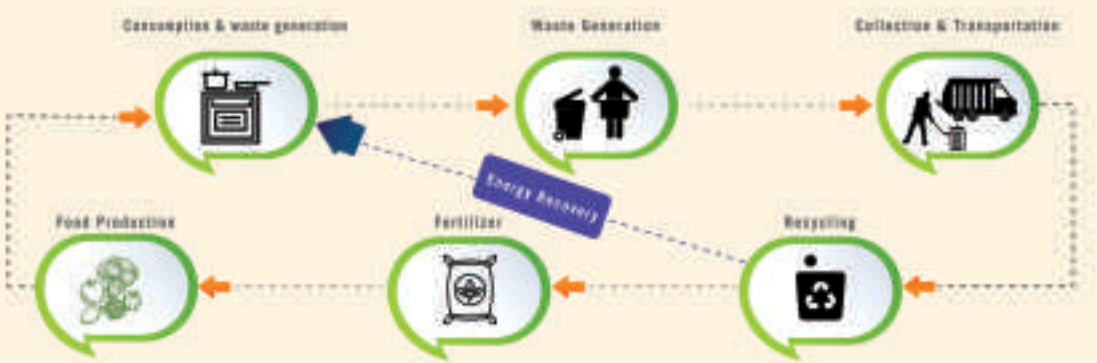
Effectively tackling the growing waste management crisis has not proved easy for most municipalities. Their capacity to cope has not kept pace with the increasing quantities of waste generated, and yet waste management can be one of the biggest costs of municipal budgets. Often they are able to collect waste only from limited areas of their towns. For the South Asia region, waste collection rates are on average 65%, with wide variations between towns. At the same time, there is often a very active recycling system through waste pickers and the informal sector, involving large numbers of poor people. Large schemes to recycle, separate and produce useful end-products such as compost have often run into problems if they relied too heavily on donor inputs. Once these were phased out they failed to generate sufficient income from sales to be sustainable.

Two global agreements signed in 2015 may help to raise the profile and stimulate greater action on solid waste management. First, the Sustainable Development Goals which include a goal focused on cities and sustainable urban development. Within this, target 11.6 is to "by 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management". This is the first time a global agreement of this sort has included commitments on waste management. Second, the Paris Climate Agreement, with a number of South Asian countries including better management of urban waste as part of their ***Intended Nationally Determined Contribution***[1] (UNFCCC, 2015).

Model for Change:
Practical Action's experience

Waste management systems can be divided into a number of steps from collection, storage, transportation, processing, treatment, recycling and final disposal. **Integrated solid waste** management refers to this entire process and aims to maximise resource use efficiency, with minimal amounts ending up in final disposal sites. As the diagram illustrates, large portions of separated waste can be recycled, and organic material can be used for composting or generating biogas.

Integrated Solid Waste Management



In our recent work in the South Asia region we have gained particular experiences in terms of firstly waste collection, storage and transportation; and secondly waste processing in particular of organic waste .

Collection and transportation

In many cities, waste collection services fail to reach all areas of the town or city. People are left to manage their own waste, which they do by burning and burying it, or dumping on open spaces. Sometimes large bins or skips are provided but they may be irregularly emptied, and also overflow when the contents is picked over by waste pickers and animals.

In Bangladesh, in order to help increase the overall capacity for collecting household waste, Practical Action has

promoted a door-to-door collection service run by local NGOs. Residents pay a service charge in addition to their municipal rates, but in return they receive a regular service, leading to a cleaner neighbourhood.

In Faridpur, the local NGO, WORD, with technical backstopping from Practical Action serves more than 5,000 customers with waste collection. There are three main types of customer, non-slum households, slum households and institutions. Slum-based households are charged the lowest tariffs (minimum BDT 10) while the institutional rate is highest (minimum BDT 150). The numbers of slum households is small because the alternative option of localised composting (with a barrel system) was widely taken up. This is easier than collection through vans and is useful for slum people as they can use the compost later.Waste collectors use

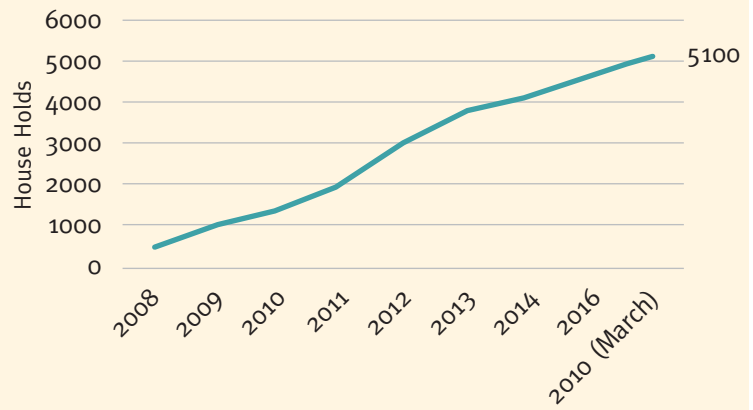
Table: Door to door waste collection in Faridpur municipality

Customer	Category	Coverage	Tariff Rate (BDT)*		Payment Mode
			Minimum	Maximum	
Non-Slum HH	1. High Rise Apartments; 2. 1-3 storied with single apartments; 3. Tin-Shed House Low income households	5,060	50	100	Monthly
Slum HH	Office/ Madrasa/ Restaurant/ Student	40	10	20	Monthly
Institutional	Dormitories/ etc.	15	150	500	Monthly

(* 1 GBP = 115 BDT)

small rickshaw vans for the collection service. Recently we have also introduced small motorised versions. The waste is taken to a composting facility where it is sorted and the organic portion is separated for composting, and in some cases for generating biogas. In 2008, WORD started the waste collection business with only 525 customers. In the last 8 years, the number has increased more than tenfold (5,100 customer per month) making the solid waste management a viable business. It has not only contributed to a better living environment, but also generated green and dignified jobs for 21 waste workers.

Table: Household coverage (2008-2016) by WORD, Faridpur



The municipal conservancy department continues to play a regulatory and co-ordinating role through the Waste Management Steering Committee. This meets regularly to discuss any emerging issues and review the progress of door-to-door collection services. The conservancy department continues to manage the sweeping of streets and drains, and collection of waste from some areas of the town, from vegetable markets and slaughter houses. The only recycling and reuse of organic waste is done by WORD, as all municipal waste for now continues to be disposed at an open dumping site where no further treatment, sorting or reuse takes place.

In Nepal, Practical Action have facilitated organic waste management under a public-private partnership model. For example, in Butwal Municipality, a private firm, Marry Gold Concern, collects and manages wastes from 400 households with a monthly service fee of NPR 50 (GBP 0.33) in an area called Ramnagar. The company employs three operators for collecting and managing waste from low income communities. A compost plant has been set up which processes up to 10 metric tonnes of organic waste and generate 5 metric tonnes of compost per month. In addition, recyclable waste, mainly plastic, is sold to scrap dealers, creating another source of income.

public-private partnership model for organic waste management

Recycling and disposal through forming associations and enterprises

In Bangladesh, collection services have been organised through existing local NGOs. In Nepal, Practical Action has instead helped to form different groups of Informal Waste Workers (IWW) such as street waste pickers, waste segregators, pheriya (dry waste pickers), scrap owners and door to door collectors. We have worked intensively with IWW from five municipalities of Kathmandu Valley. We have facilitated the establishment of a IWWs association called Samyukta Safai Jagaran (SASAJA), and the first waste workers' cooperative with the same name. These organisations have distributed identity cards to members to increase their recognition as an 'official' part of the waste management system. We provided basic safety equipment to 5,622 IWWs, including rain boots/shoes, gloves, masks, raincoats, windcheaters with trouser and wrapper, aprons, cap etc. to minimize health risks. Following capacity building and skill enhancement trainings from Practical Action, many of the IWW group members have established waste-based enterprises. For example, plastic tearing (PET bottle and carton crushing or pressing) for recycling and reuse; paper recycling and mechanical composting of organic waste.

This approach has been scaled up in other municipalities in Chitwan and Rupadehi districts reaching around 350 IWWs there.

Reducing waste through home composting

In Nepal and Sri Lanka, and in some slum communities in Bangladesh, we have promoted barrel composting of organic waste. This has the dual benefit of producing compost locally which can be used for home gardening, and reducing the amount of waste that needs to be collected and disposed of elsewhere. It can reduce the amount of organic waste coming in to the waste collection stream by about 20-30%. It requires community involvement in waste management system as well as frequent monitoring and troubleshooting. This process ensures source segregation of waste, a necessary condition for proper implementation of the 3R system (reuse, reduce and recycle).

Practical Action has distributed more than 2,000 compost bins in Sri Lanka. Especially in Galle, Kurunegala and Akkaraipattu cities where we have distributed about 1,500 home composting

bins from 2006 to 2016. More than 65% of the bins are being regularly used. Our experience shows that once a locality is provided with home composting, the volume of organic waste into the municipal collection system is reduced around 20-30%. However, this varies greatly by locations. If the local authority strictly monitors the compost bin usage and provides troubleshooting support, waste reduction can reach up to 30%.

waste can be reduced up to 30%

Both Kurunegala and Galle municipal councils have upscaled the distribution of bins city-wide with the support of national government funding. This technology was taken up by the private sector and other municipal councils. It has been used widely in the country as a solution for reducing organic waste coming in to the waste collection system. For example, Kandy municipal council has adopted the technology with strict restriction on organic waste collection in the municipality collection system.

The Provincial Agriculture department in Kurunegala and the Coconut cultivation board in Akkaraipattu are both promoting organic agriculture with the usage of composting and are using Practical Action's work as examples for expansion. The central government has provided seeds and fertilizer to city dwellers, including the urban poor, to promote home gardening. This has been further expanded by Kurunegala municipal council which has distributed potted plants. Some of the vertical gardening structures promoted by Practical Action are now included in urban gardening models of the Western Province Urban Agriculture unit.

Processing organic waste: producing biogas and compost

Over the last 5 years we have demonstrated a number of different technologies and approaches to processing organic waste. This has included techniques for the production of compost, with various improvements to simple technologies for promoting the breakdown of organic matter, and for sieving the compost.

Technologies used to generate organic compost from municipal kitchen waste

Technology	How	Where	Result
Windrow System	Windrow composting is the production of compost by piling organic matter or biodegradable waste, such as animal manure and crop residues, in long rows (windrows).	Bangladesh: Faridpur, Jessore, Gazipur Nepal: Butwal	Suitable for community scale. Odour, flies, vermin may be a problem
Box System	Aerated Static Pile (ASP) composting, refers to any of a number of systems used to biodegrade organic material without physical manipulation during primary composting. Composting with a perforated brick/RCC/ Wood made rectangle box with provision of passive aeration system.	Bangladesh: Faridpur, Jessore, Mymensingh, Gaibandha Nepal: Butwal	Suitable for household & community scale
Barrel Composting	Composting inside a round shaped container made of brick/RCC/steel/plastic with provision of passive aeration	Bangladesh: Faridpur, Mymensingh	Suitable for household scale

Technology	How	Where	Result
		Nepal: Butwal, Bharatpur, Sri Lanka: Akkaraipattu, Kurunegala	
Vermicomposting	Vermicompost is the product or process of composting through the utilization of various species of worms, usually red wigglers, white worms, and earthworms, to create a heterogeneous mixture of decomposing vegetable or food waste (excluding meat, dairy, fats, or oils), bedding materials, and vermicast.	Bangladesh: Faridpur, Gazipur, Mymensingh, Gaibandha, Khagrachari, Rangamati, Rangpur, Chapainawabganj	Suitable for household scale

We have successfully demonstrated the following waste-to-biogas technologies. The advantage of generating biogas is that you produce both the gas, and useable compost as end products. The gas can be piped to nearby houses and used as a cooking fuel, or sometimes to power small-scale machinery that otherwise requires a diesel engine such as water pumps for irrigation.

Municipal Kitchen Waste to Biogas technologies			
Technology	**How**	**Municipality area**	**Result**
Dry Fermentation	Digestion uses a batch-style anaerobic process approach where waste material without mixing additional water remains stationary during anaerobic digestion, requiring no internal moving parts. This system allows to recover energy/methane from almost any kind of organic waste.	Bangladesh: Jessore	Suitable for kitchen waste (High solids content)
Wet fermentation Fixed dome- Complete mix	Complete mix digester is basically a tank in which manure is mixed with water an active mass of microorganisms of old feed stock. Incoming liquid displaces volume in the digester, and an equal amount of liquid flows out. Biogas production is maintained by adjusting volume so that liquids remain in the digester for 20 to 30 days.	Bangladesh: Faridpur, Gaibandha, Mymensingh	Suitable for kitchen waste from small scale to large scale require energy input
Wet fermentation Fixed dome- Plug flow	Digester with waste entering the digester which in turn, displaces digester volume, thereby causing an equal amount of material to exit from the digester. The difference	Bangladesh: Bagerhat Sri Lanka: Kurunegala, Akkaraipattu	Suitable for kitchen waste from small scale to medium scale require energy input

Technology	How	Municipality area	Result
	with the plug flow digester is that the contents within the digester are thick enough to keep particles from settling to the bottom of the tank. Plug flow digesters do not require mechanical mixing as in other types of digesters such as the complete mix digester.		
Wet fermentation Flexible- Plug flow	Flexi Biogas, a flexible above - ground system that is simpler and less costly to build and operate. This system does not require agitation and the digester is not a sealed tank but simply a plastic bag made of PVC tarpaulin. Very cheap and portable.	Bangladesh: Gaibandha	Suitable for kitchen waste from small scale to medium scale

Lessons learned

As with all waste management experiences, we have learned lessons and can see scope for improvement.

Collection and transportation

There are two factors which have a significant impact on the costs and viability of a waste management system as it relates to collection and transportation: first, the distance travelled between collection and disposal point; and second, the extent to which 'wet' kitchen waste can be kept separate from dry waste much of which can be recycled. Separating waste in this way reduces the costs of manual sorting later on, and increases the prices for recyclable materials.

In many larger towns distances become too great for door-to-door collectors to dispose waste directly at the dump site. Arrangements are made to dispose of waste at secondary storage points (large skips) provided by the municipality. However, where these are not regularly emptied, the waste is likely to be spread beyond the bins, creating a further environmental hazard.

Ideally, and if suitable land can be found, a number of smaller waste disposal sites located around a town would eliminate this problem. With significant public awareness efforts on our part, and continual daily reminders to home-owners, we were able to raise the rate of household separation to about 60%, but once these reminders became less frequent, the rate dropped rapidly back to around 25%. The problem is compounded in larger cities by the unavailability of separated secondary storage bins, so everything is mixed up again at this point anyway, despite the best efforts of householders.

If rates are to be sustained, it requires continual and on-going promotion in the long-term. The cost of this has to be weighed against the financial benefit of cleaner separated waste and reduced sorting costs. Our experience in Sri Lanka shows how important a role the Local Authority can play in continuing to promote good solid waste management practices at the household level.

Home composting

Our experience with home composting shows that complete coverage, with every household using the system, is very unlikely to be achieved. Where we have promoted it heavily and in co-operation with the Local Authority we have found the sustained use of about 65% of the bins. Even this level of coverage, however, can have an important impact on waste volumes needing to be collected and disposed of. At the same time it can provide important, organic inputs to home gardening, providing a more varied and nutritious diet for poor householders.

Waste to compost and energy

The variety of technologies we have demonstrated have different advantages and disadvantages. For some, maintenance is more complicated and there can be issues of clogging. For the dry-fermentation chambers, there is a need for a regular supply of fresh waste that has not already decomposed. For other systems requiring water, quite large amounts may be needed. All of these technical challenges can be overcome with good operation and maintenance practices, but need to be factored in when choosing the appropriate technology for a given location.

The major challenge for compost production has been to secure regular sales. The market for compost is seasonal, and this creates an irregular cash flow that needs to be factored in to the business model. In Bangladesh, a significant barrier has been the need for the product to be officially licenced. The requirements for product quality are exacting in order to ensure farmers are buying a product they can trust. However, the need for on-site testing facilities may be too prescriptive, creating a barrier for smaller-scale operations of this sort. Possibly a second tier of licence could be created for compost from waste which would allow sales more easily but with lower levels of guarantees for farmers.

Safe food production and consumption

Community people highly welcomed the concept of safe food using organic waste generated compost. In Sri Lanka, women been practicing vertical gardening which meeting the daily consumption needs became source of extra income for the family. Female organic fertiliser entrepreneurs in Bangladesh are growing seasonal vegetables and fruits with compost and harvesting more quality products. They sell these products with higher price in local and regional markets as this is still a niche market in the country. The safe food producers require financial and regulatory support from the government and relevant agencies on certification and quality control to raise and sustain market demand.

Conclusions

Solid waste management is already a significant concern for municipal governments across the South Asian region. It constitutes one of their largest costs and the problem is growing year on year as urban populations swell. And yet it is an area that has not received the attention it deserves from policy-makers. There are signs this may change, with its inclusion in the SDGs and in many INDCs which are the basis of the Paris Climate Agreement.

If we are to meet the challenge, we will need new approaches to partnerships, and the adoption of different kinds of systems and technologies. This will require greater awareness and capacity building at the Local Authority level. If national climate or SDG targets are to be met, they will need to be localised through municipalities. Greater knowledge sharing at national and regional levels through municipal associations, regional bodies such as SAARC and regional local authority associations such as Citynet, will be an important part of this.

Our key messages for regional and national policy makers, based on our experience in the region in the last 5 years, are about the need for:

- creating new partnerships for waste collection with NGOs and the informal sector,
- considering more decentralised approaches to processing and treatment, and
- recognising the exciting potential for viable technologies for generating more value from waste.

Further readings

- Hoornweg, Daniel; Bhada-Tata, Perinaz. 2012. What a Waste : A Global Review of Solid Waste Management. Urban development series;knowledge papers no. 15. World Bank, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/17388 License: CC BY 3.0 IGO.
- "Area of Cooperation". 2014. http://www.saarc-sec.org/userfiles/Webupdate-AreaofCooperation-ENBNov2014.pdf.
- "INDCs as communicated by Parties". http://www4.unfccc.int/submissions/indc/Submission%20Pages/submissions.aspx
- Intended Nationally Determined Contributions, 2015 United nations Framework Convention on Climate Change.

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[1] Urban Waste Management and waste-to-energy solutions feature in the INDCs for all of Bangladesh, Nepal and Sri Lanka where our regional programme has concentrated.

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