



Environment

Water Community



Solution Exchange for the Water Community Consolidated Reply

Query: Safe and Sustainable Disposal of Solid Waste at Village Levels - Experiences; Examples

Compiled by [Nitya Jacob](#), Resource Person, [Sunetra Lala](#), Research Associate and [Shweta Tyagi](#), Consultant

Issue Date: 1 December 2009

From [Shailja Kishore](#), Total Sanitation Campaign, Ahmedabad Posted 1 October 2009

I work for the Total Sanitation Campaign (TSC). Under this campaign, we are looking for various safe disposal mechanisms for solid waste that can be replicated at the community level in the rural areas of Gujarat. The focus is on sustainable and economically viable options which can be operated and maintained by the local communities.

Some of the major challenges in the management of solid waste in these areas are: handling the large volume of waste; grabbing public land in the guise of Ukedas (cow dung heaps); the inability of panchayats to take action against the strongmen; shortage of water during the summer, especially in areas where the sewage systems do not work and; collection of service charges for supplying drinking water by the panchayats.

In this context I would like members of the Community to share experiences of instances where solid waste has been safely disposed and used as a resource for:

- Employment generation activities for different groups by providing livelihood options
- Educating communities, especially children and women on the 3Rs - reduce, recycle and re-use
- Increasing productivity, thereby leading to better nutrition and living conditions.

The information will help us in identifying a range of options for implementing similar activities in the rural areas of Gujarat.

Responses were received, with thanks, from

1. [Jagdish Barot](#), World Health Organisation, Maldives
2. [Harshad Gandhi](#), Excel Industries Ltd, Mumbai
3. Jürgen Tümmler, ECHO, New Delhi ([Response 1](#)) ([Response 2](#))
4. [Leo Saldanha](#), Environment Support Group, Bangalore
5. [Junaid Ahmed Usmani](#), Department of Drinking Water Supply, Ministry of Rural Development, New Delhi

6. [Suneet V. Dabke](#), Concept Biotech, Vadodara
7. Gaurang Mishra, Directorate of Economics and Statistics, Port Blair ([Response 1](#)) ([Response 2](#))
8. [D.K. Singh](#), Craftsworld, Agartala
9. [Uday Bhawalkar](#), Bhawalkar Vermitech Pvt Ltd, Pune
10. [Bhargavi S. Rao](#), Environment Support Group, Bangalore
11. [Murali Kochukrishnan](#), Action for Food Production (AFPRO), Bhubaneswar
12. [Asit Nema](#), Foundation for Greentech Environmental Systems, New Delhi
13. [Venkatesh P.](#), Bangalore Medical College, Bangalore
14. [Arunabha Majumder](#), Jadavpur University, Kolkata
15. [Kalyan Paul](#), Pan Himalayan Grassroots Development Foundation, Ranikhet, Uttarakhand
16. [Anand Ghodke](#), CCDU Government of Maharashtra, Mumbai
17. [Gaurav Aggarwal](#), Indian School of Business, Aligarh
18. [R. K. Srinivasan](#), Centre for Science and Environment, New Delhi
19. [Sacchidananda Mukherjee](#), National Institute of Public Finance and Policy (NIPFP), New Delhi
20. [Krupa](#), Sahjeevan, Bhuj

Further contributions are welcome!

[Summary of Responses](#)
[Comparative Experiences](#)
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[Responses in Full](#)

Summary of Responses

Solid waste produced in villages is largely organic, and lends itself to composting by various techniques. The left-over inorganic waste can be either segregated and sold to recyclers or burnt. Those managing rural solid waste can earn through selling the compost and segregated solid waste; thus, even in rural areas solid waste can provide a livelihood to those engaged in its collection, treatment and disposal. In many cities, solid waste is segregated and lakhs of ragpickers make a living off the millions of tonnes of garbage that urban India generated.

Under the Total Sanitation Campaign, there is a provision for solid and liquid waste management. Up to 10 per cent of the project cost for a gram panchayat's sanitation programme can be used for this purpose. Thus, villages can generate employment for people engaged in handling waste by using this money, as well as processing and disposing off the waste. However, the involvement of the authorities, NGOs and self-help groups is necessary for the success of such projects. The focus is on reuse and recycling, rather than reducing waste since waste production in rural areas, at 100-200 gm per capita per day, is already very low.

Making waste profitable involves reusing waste. The process begins with segregating organic and inorganic waste, preferably at the household level. This is easy to do if all households have two bins for the two types of garbage. The second step is to compost the organic waste. Households can do this themselves through a selection of processes. A bucket with holes, lined with bricks and bagasse, can compose vegetable and fruit peels. Human and cattle excreta are the feedstock for biogas plants, that can turn this into cooking gas and manure. Vermi-composting can take care of other organic waste such as fallen leaves and left-over food.

Panchayats can engage sweepers to collect the waste. They can recycle inorganic waste, paper and cardboard to kabadi-walas (garbage recyclers), earning a small income in the process. The same people can make more money by selling vermi-compost, that is high quality manure. A third source of income for those engaged in solid waste management at the village level is handling the excess cow-dung that is not used up by biogas plants; they can compost and sell it as well. The Asgaon gram panchayat in Ahmednagar, Maharashtra, is one example where this process is working well. It has won the Sant Gadge Baba Gram Swachata Puruskar several years in a row for environmental sanitation.

In [Tamil Nadu](#), an NGO called Exnora works in urban areas, but their experiences are applicable to rural areas as well. They segregate the inorganic and organic waste into several categories. They spend 70 per cent of their budget on collection, 20 per cent on transport and just 5 per cent on disposal. They reuse organic waste, and recycle inorganic waste. In Vellore, their project is self-sustaining and takes care of the entire town's waste.

Another study in the [Erode](#) district to understand the best management practices for livestock waste management, indicated that a mix of biogas plants and bio-composting could dispose off all the livestock waste, while meeting the village's need for nitrogenous fertilisers.

In Bhavnagar, [Gujarat](#), Excel Industries has developed an organic waste management system to process the organic waste of the city's vegetable market. They have also a unit in Ahmedabad. These examples can be used for either a large village, or a cluster of small ones. In Gandhinagar, the waste managers segregate and compose organic waste. This shows it is possible to make money from waste.

One estimate says a village of around 1,000 people may produce 200 kg of solid waste, of which about 120 kg will be organic. Annualizing this, the village can produce about 22 tonnes of compost valued at Rs 44,000. The inorganic recyclable waste will fetch another Rs 22,000 per year. Thus, the waste handlers can earn Rs 66,000 through recycling and disposing solid waste; the process becomes more effective if the village SHGs handle it and charge households a small fee for garbage collection.

The manure or compost can go a long way to regenerate soil fertility and reduce the need for chemical fertilisers. Several studies have shown that these 'organic' methods can increase crop yields while reducing the health impact of using and consuming pesticides and chemical fertilisers. Organic crops command better market prices, and effective market linkages can encourage farmers to switch to this method of farming.

Nearly all communities had their own ways to handle solid waste, depending on their culture and geographic conditions. However, these have been largely forgotten and now need to be revived. The communities can use these along with modern approaches for proper disposal of waste. The organization charged with this responsibility can educate local people on ways to reduce waste generation. Using the examples and approaches above, it can work with the communities to recycle as much of the garbage as possible. Things like plastic, paper, metal and wood can be recycled as appropriate.

Ecosan is a relatively new concept that can reduce the amount of human excreta produced, and convert it into compost. It separate urine from faeces; the former is applied to plants directly and the latter is composted into manure. Additional [research](#) also shows that using human urine directly on crops increases yields significantly.

All these examples indicate it is possible for Panchayats to create jobs around solid waste collection, processing and disposal. In the process, it reduces environmental pollution; in India, animal waste is one of the main non-point sources of groundwater pollution. However, the authorities, an NGO or SHGs have to be part of the process for it to be effective. The attraction for the villagers is that their environs are clean; there is a reduction in disease causing vectors; some people in the village can get jobs by handling waste and; there is a regular supply of cheap organic fertiliser that can boost crop productivity.

Comparative Experiences

Gujarat

Organic Waste Management Technology helps in dealing with Wastes at Village Levels, Ahmedabad (from [Krupa, Sahjeevan, Bhuj](#))

The Organic Waste Management (OWM) technology has been provided by Excel Industries for dealing with organic wastes at the Bhavnagar municipality vegetable market. This has also solved the problem of waste disposal in surrounding village level in addition to providing manure for farmers. Similar strategies can be employed elsewhere in dealing with issues of solid waste management. Read [more](#)

Tamil Nadu

Human Excreta successfully used as Soil Fertilizer by using ECOSAN Concept, Erode District (from [Venkatesh P., Bangalore Medical College, Bangalore](#))

SCOPE, an NGO, has been converting human night soil into fertilizers by using the ECOSAN concept. By doing so, the human excreta are being disposed off in a sanitary way by converting it into compost. This then serves as a fertilizer for the fields to rejuvenate and sustain soil fertility. The initiative has also helped to change the mindsets of the people about the proper disposal of excreta and its usefulness if treated properly. Read [more](#)

Waste converted to Organic Manure brings in Financial Benefits, Vellore (from [Junaid Ahmed Usmani, Department of Drinking Water Supply, Ministry of Rural Development, New Delhi](#))

Exnora has launched a self sustaining project on solid waste management, which has lead to zero waste disposal in the area. To create awareness, Exnora has been conducting street plays. The waste is segregated and the biodegradable waste is treated for composting by vermi-composting or using cow dung. The manure produced is sold in markets and the non biodegradables are also sold in the market. This process has been very eco-friendly and cost effective. Read [more](#)

Related Resources

Recommended Documentation

From [Uday Bhawalkar, Bhawalkar Vermitech Pvt Ltd, Pune](#)

Environmental Building Guidelines for Greater Hyderabad Sewage

Paper; by Exploratory Developmental Bioengineering Research Grants (EBRG); February 2009;
Available at: <http://www.hmda.gov.in/EBRG/site/the%20guidelines/images/pdfs/EBRG%20-%20Sew%20Bg%201-Rev%20D%20-%20SK.pdf> (PDF; Size: 826KB)

Details regarding the dual plumbing mechanism used for management of wastewater, and how it can be beneficial for waste management in villages as well

Environmental Building Guidelines for Greater Hyderabad- Solid Waste Management

Paper; by Exploratory Developmental Bioengineering Research Grants (EBRG); February 2009; Available at:

<http://www.hmda.gov.in/EBRG/site/the%20guidelines/images/pdfs/SWM%20Nh%201.pdf> (PDF; Size: 496KB)

Explains the process of solid waste management which can be applied in Hyderabad, also elucidates the best practices that can be followed in this regard

Economics of Agricultural Nonpoint Source Water Pollution: A Case Study of Groundwater Nitrate Pollution in the Lower Bhavani River Basin, Tamil Nadu (from [Sacchidananda Mukherjee](#), National Institute of Public Finance and Policy (NIPFP), New Delhi)

Paper; by Sacchidananda Mukherjee; WWF-India; New Delhi; 2008; Permission Required: Yes, contact Sacchidananda Mukherjee for obtaining details at sachs.mse@gmail.com

Discusses groundwater pollution caused by nitrates from livestock waste in the Lower Bhavani River Basin, Tamil Nadu, which is affecting the water resources of the area

Human Excreta Potential for Reuse (from [Nitya Jacob](#), Resource Person)

Presentation; by C. A. Srinivasamurthy; University of Agricultural Sciences; Bangalore; 2009; Available at <http://solutionexchange-un.net.in/environment/cr/res-01100901.ppt> (PPT; Size: 27MB)

Describes the process of eco-sanitation. This can reduce the problem of disposing human excreta and the direct application of urine can improve crop yields substantially

From [Sunetra Lala](#), Research Associate

Handbook of Solid Waste Management

Book; by Frank Kreith and George Tchobanoglous; McGraw-Hill Publishing; June 2002; Permission Required: Yes, paid publication

Ordering information at <http://www.amazon.com/Handbook-Solid-Waste-Management-Kreith/dp/0071356231>

Handbook offers an integrated approach to the planning, design, and management of economical and environmentally responsible solid waste disposal system

Solid Waste Management in India

Book; by R. K. Sinha; Vedams eBooks Private Ltd; New Delhi; 2000; Permission Required: Yes, contact Vedams eBooks for a copy

Ordering information at <http://www.vedamsbooks.com/no18249.htm> or vedams@vedamsbooks.com

Contains 12 chapters on various aspects of solid waste management (SWM) including modernisation of SWM systems, management information system, financial aspects, etc

Solid and Liquid Waste Management in Rural Areas: A Technical Note

Report; United Nations Children's Fund (UNICEF) and Department of Drinking Water Supply; New Delhi

Available at http://ddws.gov.in/popups/SLWM_2.pdf (PDF; Size: 3.21MB)

Presents some cost-effective technologies for solid and liquid waste disposal and recycling, includes detailed scientific inputs outlining the technological aspects of SWM

The Municipal Solid Wastes (Management and Handling) Rules, 2000

Notification; Ministry of Environment and Forests, Government of India; Publisher; New Delhi; 25 September 2005

Available at <http://envfor.nic.in/legis/hsm/mswmhr.html>

Rules that apply to every municipal authority responsible for the collection, segregation, storage, transportation, processing and disposal of municipal solid wastes

Municipalities Overruling the Supreme Court

Article; by Surekha Sule; India Together; Bangalore; July 2004

Available at <http://www.indiatogether.org/2004/jul/env-muniswm.htm>

Describes how except for one municipality in Andhra Pradesh, no other towns and cities in India are complying with the Supreme Court directive on solid waste management

Whose Garbage Is It, Anyway?

Article; by Surekha Sule; India Together; Bangalore; January 2005

Available at <http://www.indiatogether.org/2005/jan/env-ragpick.htm>

Explains how with municipalities outsourcing city solid waste collection to private contractors, rag-pickers are losing their livelihood

Risk Factors associated with Solid Waste Treatment Technology Options in the Indian Context

Article; by Asit Nema; Foundation for Greentech Environmental Systems; New Delhi; Available at http://www.green-ensys.org/site/publications/RISK_FACTORS_MSW_TREATMENT2.pdf (PDF; Size: 52KB)

Discusses the case study of 11 municipal solid waste treatment plants to understand the effect of diverse risk factors associated with various waste treatment technologies

Recommended Contacts and Experts

From [Gaurang Mishra](#), Directorate of Economics and Statistics, Port Blair

Prof. Anil Gupta, Indian Institute of Management (IIM), Gujarat

Vastrapur, Ahmedabad 380015, Gujarat; Tel: 91-79-66324927; Fax: 91-79-26306896, 26307341; anilg@iimahd.ernet.in; <http://www.iimahd.ernet.in/~anilg/>

Expert who has been promoting the concept of grassroots innovation across India, including innovations in the area of solid waste management at village levels

Dr. Vandana Shiva, Navdanya, New Delhi

A-60, Hauz Khas, New Delhi 110016; Tel: 91-11-26535422, 26532561; Fax: 91-11-26856795; vandana@vandanashiva.com; <http://www.navdanya.org/about-us/from-the-founder>

An environmental activist, who heads Navdanya, and has been working to protect people's rights to knowledge, biodiversity, water and food

Recommended Organizations and Programmes

From [Jagdish Barot](#), World Health Organisation, Maldives

Water and Sanitation Management Organization (WASMO), Gujarat

3rd Floor, Jalsewa Bhavan, Sector 10-A, Gandhinagar 382010, Gujarat; Tel: 91-79-23247170; Fax: 91-79-23247485; wasmow@wasmow.org; http://www.wasmow.org/cms.aspx?content_id=16

Works on water, and promotes waste management campaigns in villages to ensure safe disposal of solid wastes to ensure cleanliness and hygiene

Total Sanitation Campaign (TSC), New Delhi

Department of Drinking Water Supply, Ministry of Rural Development, Government of India, 9th Floor, Paryavarn Bhawan, CGO Complex, Lodhi Road, New Delhi 110003; Tel: 91-11-24361043; Fax: 91-11-24364113; jstm@nic.in; http://www.ddws.nic.in/tsc_index.htm

A comprehensive government programme aimed to ensure provisions of sanitation facilities in rural areas to deal with problems of human waste

Médecins sans Frontières (MSF), New Delhi (from [Jürgen Tümmler](#), ECHO, New Delhi)
C-106, Defense Colony, New Delhi 110024; Tel: 91-11-24332419, 24337225; Fax: 91-11-24336834; msfh-india@field.amsterdam.msf.org; http://www.msfindia.in/content.php?con_id=16

An international medical aid organization that delivers emergency aid to affected people and has experience of adapted incinerators used for safe disposal of medical wastes

Department of Drinking Water Supply, New Delhi (from [Junaid Ahmed Usmani](#))
Ministry of Rural Development, Government of India, 9th Floor, Paryavarn Bhawan, CGO Complex, Lodhi Road, New Delhi 110003; Tel: 91-11-24361043; Fax: 91-11-24364113; jstm@nic.in; http://www.ddws.nic.in/tsc_index.htm

Has launched the TSC and encourages panchayats, particularly the Nirmal Gram Panchayats to undertake activities on solid and liquid waste management (SLWM)

From [Suneet V. Dabke](#), Concept Biotech, Vadodara

Centre for Environmental Planning and Technology (CEPT), Gujarat
Kasturbhal Lalbhal Campus, University Road, Ahmadabad 380009, Gujarat; Tel: 91-79-26302470, 26302740; Fax: 91-79-26302075; <http://cept.ac.in/main.php?pageid=2&LPO=1>

Offers programmes in the areas of natural and built environment and related disciplines, training its students to carry out research on water, sanitation and waste management

Society for Environmental Protection, Gujarat
6 - A, Kalamvadi Society, Near Shreyas Crossing, Ahmedabad, Gujarat; Tel: 91-79- 65137987
A multi-disciplinary youth organization working in the fields of education for development, environment management, solid waste management, etc

From [Bhargavi S. Rao](#), Environment Support Group, Bangalore

Environment Support Group (ESG), Karnataka
1572, 36th Cross, 100 Feet Ring Road, Banashankari II Stage, Bangalore 560070, Karnataka; Tel: 91-80-26713559, 26713560; esg@esgindia.org, esgindia@gmail.com; <http://www.esgindia.org/projects/projects.html>

NGO working on projects that include segregation, collection and disposal of solid and hazardous waste and has conducted solid waste management trainings in Karnataka

United Nations Development Programme (UNDP), New Delhi
55 Lodhi Estate, New Delhi 110003; Tel: 91-11-46532333; Fax: 91-11-24627612; webadmin.in@undp.org; http://www.undp.org.in/index.php?option=com_content&view=article&id=411&Itemid=634

Environmental sustainability being one of the Millennium Development Goals, UNDP works to promote sustainable access to safe drinking water and basic sanitation

Indo Norwegian Environment Programme (INEP), Karnataka
No. 49, 2nd Floor, Parisara Bhavan, Church Street, Bangalore 560001, Karnataka; Tel: 91-80-25326185; Fax: 91-80-25326186; ineptwo@vsnl.net; <http://www.inep-karnataka.org/solidwaste.htm>

Works in the areas of sustainable management and utilisation of natural resources, is implementing Integrated Solid Waste Management in Chikkamagalur and Raichur

National Rural Employment Guarantee Scheme (NREGS), New Delhi (from [Murali Kochukrishnan](#), Action for Food Production (AFPRO), Bhubaneswar)

Ministry of Rural Development, Krishi Bhawan, New Delhi 110001; Tel: 91-11-23063581, 23034922; Fax: 23385466; singhrp@sansad.nic.in; <http://nrega.nic.in/guidelines.htm>;

Provides for 100 days of work per year to each person in a family below the poverty line; works taken up under the scheme include construction of water structures, etc

WASH Institute, Kodaikanal (from [Venkatesh P.](#), Bangalore Medical College, Bangalore)

Ashwat Nivas, 5-296, Anandhagiri 7th Street, Dindigul District, Kodaikanal 624101, Tamil Nadu; Tel: 91-45-42240881; Fax: 91-45-42240882; secretariat@washinstitute.org;

http://www.washinstitute.org/about_us_background.php

Has been promoting the ECOSAN concept of solid waste management, by converting human night soil to fertilizers which can be used for agriculture

MS Swaminathan Research Foundation (MSSRF), Tamil Nadu (from [Gaurang Mishra](#), Directorate of Economics and Statistics, Port Blair)

3rd Cross Street, Institutional Area, Taramani, Chennai 600113, Tamil Nadu; Tel: 91-44-22542698, 22541229; Fax: 91-44-22541319; hmrc@mssrf.res.in;

http://www.mssrf.org/about_us/index.htm

Works extensively for agricultural and rural development, MSSRF could be useful for training the PRIs on sanitation, solid waste management, etc

Excel industries, Maharashtra (from [Krupa](#), Sahjeevan, Bhuj)

184-87, S.V. Road, Jogeshwari (West), Mumbai 400102 Maharashtra; Tel: 91-22-66464200; Fax: 91-22-2678-3657; excelmumbai@excelind.com; <http://www.excelind.co.in/envandbiotech.htm>

It is a leading industry in the area of agro-chemicals and agro-chemical intermediates, has been devising systems for safe and sustainable disposal of solid waste

Foundation for Greentech Environmental Systems, New Delhi (from [Asit Nema](#))

D-208, Sarita Vihar, New Delhi 110076; Tel: 91-11-41054084; greentech@airtelmail.in;

www.green-ensys.org

Working towards implementing innovative solutions at the grassroots level for solid waste management, including promoting home composting, etc

National Solid Waste Association of India (NSWAI), Maharashtra (from [Shweta Tyagi](#), Consultant)

B-703, Customs Colony A, Military Road, Marol, Andheri (E), Mumbai 400059, Maharashtra; Tel: 91-22-29207577; Fax: 91-22-29202951; nswai@envis.nic.in;

<http://www.nswai.com/aboutnswai.php>

Aims at developing a national policy on solid waste management in India, also working towards devising best practices on safe disposal of solid waste

From [Sunetra Lala](#), Research Associate

Exnora International, Tamil Nadu

#20, Giriappa Road, T. Nagar, Chennai 600017, Tamil Nadu; Tel: +91-44-28153376; Fax: +91-44-42193595; exnora@gmail.com; http://exnorainternational.org/project_pammal.shtml

Exnora International is an environmental movement, focusing on mobilising and empowering communities to, among other things, manage waste effectively

Kudumbashree, Kerala

State Poverty Eradication Mission, TRIDA Rehabilitation Building, Medical College P.O, Trivandrum, Kerala; Tel: 91-11-471-2554714; Fax: 0471-2554717; info@kudumbashree.org; <http://www.kudumbashree.org/>

Kudumbashree promotes women's self-help groups for building houses, toilets, access to drinking water, sanitary facilities and garbage collection

Toxics Link, New Delhi

H2 (Ground Floor), Jungpura Extension, New Delhi 110014; Tel: 91-11-24328006; Fax: 91-11-24321747; tldelhi@toxicslink.org; <http://www.toxicslink.org/ovrvw-prog.php?prognum=2>;

Contact Ravi Agarwal; Director; tldelhi@toxicslink.org

Toxics Link has developed decentralized waste management systems to create sustainable waste management models based on community participation

Arpana Trust, New Delhi

Arpana Trust, Arpana Research and Charities Trust, Madhuban, Karnal, Haryana; Tel: +91-184-2380801; Fax: +91-184-2380810; at@arpana.org; <http://www.arpana.org/participatory-community-health-care.html>;

The Trust works with slum communities in the Molar Bund area of Delhi, and has organized a system of solid waste collection and disposal

Society for Community Organization and Peoples Education (SCOPE), Tamil Nadu

P/17, 6th Cross, Ahmed Colony, Ramalinganagar, Tiruchirapalli 620003, Tamil Nadu; Tel: 91-431-2774144; scopeagency86@rediffmail.com, scopeagency86@sify.com;

<http://www.scopetrichy.org/sanitation.html>

Works on solid and liquid waste management, sanitation, health and hygiene issues among disadvantaged communities in Tamil Nadu

Recommended Portals and Information Bases**Organic Waste Converter, Excel industries, Maharashtra (from [Harshad Gandhi](#))**

<http://www.excelind.co.in/cat.htm>; Contact Anupam Biswas; Tel: 91-22-66464358; anupamb@excelind.com

Provides information on organic waste converters and how they can be efficiently used for effective solid waste management

Bioprospecting for Novel Compounds, MS Swaminathan Research Foundation (MSSRF), Tamil Nadu (from [Uday Bhawalkar](#), Bhawalkar Vermitech Pvt Ltd, Pune)

<http://www.mssrf.org/bt/204/index.htm>; Tel: 91-44-22542698, 22541229; hmc@mssrf.res.in

Describes Pancha Gavya – a cow-based pest repellent that is used widely in organic farming practices, and is an effective way of stabilizing organic waste

MSW and Home Composting, New Delhi (from [Asit Nema](#), Foundation for Greentech Environmental Systems, New Delhi)

<http://indiahomecompost.blogspot.com/>; Contact Asit Nema; greentech@airtelmail.in

It is a blog on home composting and solid waste management, explains constructive ways to dispose and utilize solid waste

From [Shweta Tyagi](#), Consultant

Solid Waste, Karmayog, Maharashtra

<http://www.karmayog.org/solidwaste/>; Contact Vinay Somani; info@karmayog.org

Contains relevant articles and news on solid waste management, including information on projects and proposals on solid waste management

India Environment Portal, Centre for Science and Environment, New Delhi

<http://www.indiaenvironmentportal.org.in/taxonomy/term/2165>; Tel: 91-11-29955124; Fax: 91-11-29955870; cse@cseindia.org

A portal on environmental issues initiated by the Centre for Science and Environment, contains useful resources on solid waste management, including those at village levels

Related Consolidated Replies

Solid waste management in urban settings, from Nidhi Prabha Tewari, Sanket Information and Research Agency, New Delhi. Water Community, Solution Exchange India,

Issued 16/08/2005. Available at <http://www.solutionexchange-un.net.in/environment/cr/cr-se-wes-16080501.htm>

Highlights successes and failures of recycling and revenue generation potential of solid wastes through case studies

Treatment of Wastewater for Reuse, from K.A.S Mani, APFAMGS, Hyderabad, (Experiences). Water Community, Solution Exchange, India,

Issued 14 March 2006. Available at <http://www.solutionexchange-un.net.in/environment/cr/cr-se-wes-14030601.doc> (DOC,, Size: 135 KB)

Explores range of approaches in wastewater treatment covering small household level treatment devices, middle range technologies and large intensive solutions

Popularizing Treatment Technologies for Kitchen Wastes, from Gopal Sane, Samruddhi, New Delhi (Experiences). Water Community, Solution Exchange, India,

Issued 13 April 2006. Available at <http://www.solutionexchange-un.net.in/environment/cr/cr-se-wes-13040601.htm>

Provides range of experiences and lessons learned by trying to promote adoption of ecologically friendly technologies and related innovations into communities

Biomedical Waste Management in Rural PHCs, from Venkatesh Harvoo, Exide India, Bangalore (Experiences). Water Community and Maternal Child Health Community, Solution Exchange India,

Issued 5/05/2006. Available at <http://www.solutionexchange-un.net.in/health/cr/cr-se-mch-wes-21040601.htm>

Provides details on the kinds of waste generated, the treatment options available and recommendations that require consideration when establishing treatment facilities

Comparative Analysis of Biogas Digester Models, from Sheldon Mendonca, Watershed Organisation Trust (WOTR), Ahmednagar (Experiences, Examples). Water Community, Solution Exchange, India,

Issued 18 July 2006. Available at <http://www.solutionexchange-un.net.in/environment/cr/cr-se-wes-18070601.htm>

Provides experiences in working with different biogas models, criteria for evaluating models and dos and don'ts while implementing biogas programmes

Waste Management at Tourism Sites, from R. K. Anil, Endogenous Tourism, UNDP, New Delhi (Experiences; Referrals). Water Community, Solution Exchange India,

Issued 31/03/2007. Available at <http://www.solutionexchange-un.net.in/environment/cr/cr-se-wes-21020701.pdf> (PDF,Size: 160KB)

Provides experiences in designing, and implementing waste management programmes in tourism sites, also providing broad application strategies based on the experience of several successful case studies

Urban Waste Composting Methods and Uses for Agriculture, from Avanish Kumar, Toxics Link, New Delhi (Examples; Experiences). Water Community and Food and Nutrition Security Community, Solution Exchange India,

Issued 31/12/2007. Available at <http://www.solutionexchange-un.net.in/environment/cr/cr-se-wes-food-31100701.pdf> (PDF, Size: 160KB)

Recommends various composting approaches and techniques, highlights issues for deciding on composting options for urban areas, and outlines lessons learned from ongoing MSWM initiatives

Scaling up Solid and Liquid Waste Management, from Yusuf Kabir, United Nations Children's Fund, Kolkata (Discussion). Water Community, Solution Exchange India,

Issued 27/01/2009. Available at <http://www.solutionexchange-un.net.in/environment/cr/cr-se-wes-15120801.pdf> (PDF, Size: 196KB)

Inputs regarding how to make SLWM a demand-driven activity through community participation; and the available SLWM technology options

Privatization of Waste Management Services, from Vandana Tripathi, Sahbhagi Shikshan Kendra, Lucknow (Experiences; Examples). Water Community and Decentralization Community, Solution Exchange India,

Issued 07/09/09. Available at <http://www.solutionexchange-un.net.in/decn/cr/cr-se-decn-wes-27070901.pdf> (PDF, Size: 236KB)

Invites inputs on the impact of privatization of waste management services on efficiency of these services and on labour conditions

Responses in Full

Jagdish Barot, World Health Organisation, Maldives

It is nice to hear from you Kishore since we worked together in Bhavnagar district to promote community management of village WASH facilities. It was a unique experience with a lot of enthusiasm of the people and the government (WASMO team in particular).

The issues raised by you are very genuine and needs careful consideration. What comes to my mind immediately are the following:

- It is important to educate the community that waste is a misplaced resource and every component of it is useful – people from Gujarat believe in conservation and reuse so they need to be approached keeping this in mind
- The second option is to promote garbage composting. In line with *ukedas* you can initiate pit composting. The practice is in vogue and could be picked up by people easily
- Again, the concept of the 3Rs is also very much in their mind due to recurring droughts and could be popularized through awareness, demonstration and motivation

Lastly, for the success of the Total Sanitation Campaign make use of Mahatma Gandhi's messages to make your awareness drive more appealing. I quote some of Gandhi's messages:

- "Tatti pe mitti" (cover the excreta by soil after defecation like a cat, dig and hide)
- "Every one should clean his/her toilet" (not to depend on scavengers)
- "The sanitation reforms are slow. Changes do not occur overnight, so we have to have patience and dedication"

- "Cleanliness is not as costly as illness. It cost only a broom and a bin"
- "I am not ashamed of India's poverty (*garibi*) but of its dirtiness (*gandagi*)"

You are close to the Mahatma Gandhi Ashram at Sabarmati, so take advantage of the library of the Ashram to develop your awareness campaign.

Harshad Gandhi, Excel Industries Ltd, Mumbai

Please find information about the OWC System that provides Decentralised Waste Management Solution at www.excelind.co.in/cat.htm. The system not only promotes sustainable decentralised/at source solution for organic waste treatment but also provides additional livelihood opportunities to the urban poor/ragpickers community.

If anyone wishes to see the OWC System in operation please write to me. I will be glad to send the OWC site address nearest to your neighbourhood.

Jürgen Tümmler, ECHO, New Delhi (response 1)

I am sharing examples from emergency situations and from Europe:

If you separate just the organic and inorganic components, the first can be composted or fed to animals, whereas the latter have to be deposited safely. In most cases this would be an earth fill in a geologically safe place. However, with regard to the rainfall under monsoon, earth fills are tricky, because they will fill up with huge amounts of water, which will take in solvents from the waste and wash these into aquifers and surface water - a slow but permanent pollution of urgently needed natural resources already under threat.

It might be a better idea to think of building adapted incinerators and to do controlled burning of the solid waste (very often predominantly plastic) periodically. This reduces the volume (to be deposited safely thereafter) and will already destroy many toxic substances. In high-end incinerators, temperatures above 1200 °C will be reached, but on an adapted level, temperatures > 800 °C are still realistic and will deal with most substances contained in plastic waste. The heat produced may be used in burning bricks and pottery simultaneously.

Leo Saldanha, Environment Support Group, Bangalore

I will be grateful if [Jürgen Tümmler](#) can provide information on how "adapted incinerators" work and how this aids "controlled burning of the solid waste (very often predominantly plastic) periodically"

I ask this question also in regard to its applicability to Indian conditions, and the general understanding that incinerators are dangerous to public health and environment.

Jürgen Tümmler, ECHO, New Delhi (response 2)

I would like to respond to [Leo's](#) questions. Incinerators become dangerous, if you start burning toxic waste in them and do not keep the temperatures up > 1200° - that's true. As long as you burn household waste, they are not overly dangerous. So you have to separate the waste, that's one point. Toxic waste must not be burned but in high-tech incinerators, which are in use in Europe and other parts of the world, but need specialized staff to be operated routinely.

The other point is, that household waste dumped in earth fills or scattered across the landscape is dangerous, too. It chemically decomposes and infiltrates into groundwater and surface water bodies permanently and over decades and permanently, a problem that is by far more difficult to solve, than controlling incineration.

Adapted incinerators for villages are of the same models used for burning medical waste of clinics and dispensaries; they are found and installed in many villages and minor towns already and are pretty much standardized. I do not want to recommend certain models - all I have seen so far are working. Médecins sans Frontières certainly have lots of experience with it, if you need information concerning standard models in use.

Junaid Ahmed Usmani, Department of Drinking Water Supply, Ministry of Rural Development, New Delhi

I work with the Department of Drinking Water Supply, Ministry of Rural Development, Government of India. The Total Sanitation Campaign (TSC) was launched in 1999. TSC has prompted the Government particularly the Nirmal Gram Panchayats to undertake the next generation sanitation activities namely environmentally safe system of solid and liquid waste management (SLWM) activities. Accordingly the Department of Drinking Water Supply has modified the TSC guidelines and included a component of solid and liquid waste management and allocated "upto 10% project cost" for SLWM.

In this regard a National Workshop on Solid and Liquid Waste Management was organized with a view to bring together all stakeholders to discuss and deliberate on the various technological options and policy framework for implementation of Solid and liquid Waste Management (SLWM) on 31st July 2009 and 1st August, 2009 at Trivandrum, Kerala jointly by the Department of Drinking Water Supply, Ministry of rural Development, GoI and the Government of Kerala. In this workshop various best practices on the Solid Liquid Waste Management were presented.

One of the case studies was presented by **C. Srinivasan**, President Exnora Green Cross, Vellore, Tamilnadu. The Exnora Green Cross organization works jointly with UNICEF, DRDA and Municipalities also. They segregate the inorganic waste after collecting in 8 categories and organic waste into 21 categories. Garbage collection has been done in decentralized way. The waste collected from different sources is categorized on that basis. Like saloon waste is categorized as blade, hair etc. marriage halls produce huge garbage. On an average Rs. 40,000 is spent on paper plates, cups etc. At such places recyclable material should be used. They spent 70% on waste collection, 20% on transport and 5 % on disposal. The project at vellore by Exnora is a self sustainable project leading to zero waste. It is the resource management and not the management. Garbage is as valuable as gold. Such projects require awareness education in street. Exnora conducts street meeting to create awareness amongst the people. The waste is separated as biodegradable waste and non biodegradable waste. The biodegradable waste is treated in composting. Composting is done by 2 ways viz. Vermi-composting and by using cow dung. The manure produced is sold in market. The non biodegradable waste is separated and sold to buyers. Every worker in the project is entitled to medical checkup. The cost effective analysis shows that this process is cost effective as compared to previous municipal disposal methods. Another project at Gandhinagar is also worth commenting project. It is a garbage composting project. Segregation of waste is the main key in these projects. The main learning is don't waste money on waste rather get money from waste. The involvement of local bodies, district authorities, local NGOs and SHGs is necessary in such projects. For the detail information you may contact at E-mail: velloresrini@hotmail.com

Suneet V. Dabke, Concept Biotech, Vadodara

This response is with respect to the query by Shailja Kishore. SWM is practised in various ways and methods in many parts of Gujarat and India. Everybody knows the problem and its solution but the question comes in implementation.

As in previous response we saw there are techniques and machinery which can take care of our waste but no system to sustain these efforts. Panchayats are by themselves strong and they do not want to solve the problem fully. Certainly they wish to solve the problem partially to get political mileage but a solution to the problem will not give them a better issue next time.

A good study by a CEPT student Reema was done on the SWM problem in village on the outskirts of Ahmedabad or surrounding Ahmedabad and which was really good to understand the problem.

I personally feel that we can have decentralized systems of solid waste management and empower the small community workers on the product production basis which will generate income for them and will keep the strong men away. Society for Environment Protection (NGO) can help to give sustainable solution. Green Environment services (Private small waste collection and processing service provider) started by an EDI student will be certainly helpful as he has started the service for village area.

Gaurang Mishra, Directorate of Economics and Statistics, Port Blair (response 1)

Earlier the communities had their own methods to dispose solid waste. But after Independence communities at large have forgotten their role and duties. Communities now look at the Government for everything or they hope that some outside agency should come and do everything for them. However the methodologies used earlier by communities have been questioned but no alternatives have been provided or researched upon thereby creating a huge gap.

Awareness could be generated in the villages for the safe disposal of waste. Commercialisation of land has also inculcated the thinking among villagers to grab the land (not the fault of villagers). Earlier in the village there were separate places for each family to live and keep the garbage and cattle (depending upon the local tradition). Due to population explosion land availability is less. This resulted in bad sanitation habits. Disposing cowdung and house waste had never been a problem in villages. However in the same breath I would say the use of pesticide and fertilizers (in disguise to promote the hybrid varieties of crops) did help in creating this problem. Therefore communities have to be taught about the use of garbage as bio fertilizer. Use of gobar gas as a form of fuel for household has to be taught. Clusters of few houses depending upon the cattle can be formed to use gobar gas. Promotion of the toilets in every house (under TSC) should be taken in a more planned fashion keeping in mind the design of houses and neighbourhood.

Promotion of the community bathing or toilet complex could also be given a thought especially in villages where we don't have pucca drainage and good sewerage treatment plants. The toilets with the use of water also contaminate the ground water if taken not seriously or not planned in a proper way. The ECOSAN concept about which I have read in some journal is a good concept where the toilets are made using low cost methods and designs without using water. Only dry soil is used to cover the pit. There are two methods one is within the premises and other is in the nearby garden or the places where crops can be grown. Water outlets (the water and urine) take the waste for irrigation purposes.

Panchayats have been given the power to make their plans under the sanitation and water sector. They can collect taxes on sanitation (drainage) from the houses depending upon the size of house or premises and or the household population. Or as per their Panchayati raj regulation/rules they can collect the fees where the garbage cleaning is managed by respective

PRIs (panchayat samity, gram panchayat or the zilla parishad as the case may be). This levy of taxes and fee may enable the panchayat (read PRIs) to hire sanitation workers in their areas.

D.K. Singh, Craftsworld, Agartala

In reference to your query, I am not sure about your level of involvement with Total Sanitation Campaign (TSC). If your involvement is in the state/district level institution, then it will be easy to execute the suggested solutions. If you are involvement in execution of TSC at the VO/NGO level, even then it also good to take action at grass root level to get your desired results as tried to visualize with bullet points.

First of all, you need to **categorize your solid waste** and think how to **deal with these types of wastages**. You have mentioned that availability of cow dung heaps are there and also mentioned that in summer shortage of water caused dryness. On the other hand you also need solutions using **3Rs**. **Therefore, you need first to focus on your categorized solid waste** to find out suitable solutions using other available resources (even as demonstrations to encourage the strongmen to do that on commercial basis) using as alternative options for **3Rs** as mentioned below:

Options	Available Resources	Possible initiatives	Alternative Resource needs	Remarks
1.	Raw cow dung	Installation of small plants of Gobor Gas	Approved Schemes for Gobor Gas from specific dept./instt. needs to be acquired.	Demonstration will encourage people even the strongmen for its commercial values.
2.	Semi dry/dry cow dung	Introduced the process to make the available raw materials into fertilizer cake for better agricultural production	Approved schemes for vermi compost/ organic farming may be utilized for this purpose.	Making fertilizer cakes having commercial value will motive the strongmen to enter in the process of 3Rs
3.	Street children and Cow dung	Introduce programme for organizing Street Children in SHGs and provide self-employment opportunities	Approved Schemes of Street Children both for employment & education (day time work & education in the evening)	Development will reflect using 3Rs and seeing the impact the strongmen get motivated.
4.	Solid waste (wastage in true terms)	Transporting the wastages to low land and developing a new area for peoples living.	Approved schemes for transporting wastages with Town & Country Planning department also land development schemes for human living (can also develop & seek new plan too)	Solving problems of the department, development new initiatives in your area and providing new development initiatives in your areas.

5.	Solid Waste, Women SHGs (with NREGA), Street Children	Installation of an appropriate grinder to grind solid waste and make final raw materials for hollow brick making unit(s).	Needs trained persons for running big grinder machine(s) and preparing hollow bricks for making low cost house. Deptt./Instt. dealing with these bricks/low cost house may be contacted.	Panchayat may also sponsor to provide low cost houses to the BPL candidates of your area or even use the bricks for making community place, Latrines etc.
Accordingly, based on your categorized your solid waste various solutions may be opted as suggested above. <i>NB: If you have any problem in categorization of the Solid Waste kindly get in touch with the Dept. of Environment, Govt. of Gujarat or post another question on solution exchange).</i>				

You please also note that, your initiatives will definitely be hijacked by the strongmen or others but your initiative(s) will improve the existing situations as assessed by yourself and the results and impact will surely provide a special level of satisfactions to you and your campaign team members to improve the conditions of the area you have mentioned.

Uday Bhawalkar, Bhawalkar Vermitech Pvt Ltd, Pune

I have the following points to offer to this community. These have emerged out of 36 years of my experience with organic wastes:

1. 'Organic wastes' should be viewed as 'wasted organics'. While the conventional term leads us to its disposal techniques, the latter term suggests us that we should manage 'wasted organics' only through their utilization, just by stopping their waste.
2. As per Nature's cycles, all wasted organics should be fed to the soil. This is what happens in Nature. Indian soils are depleting organic content and this has adverse effect in soil's ability to hold moisture and plant nutrients (in short, its fertility).
3. Conventional composting that starts with N-augmentation using urea (or other high-N materials) necessarily produces toxic leachate, heat and greenhouse gases(CO₂). This method of composting also reduces about 50-80% of the organic matter. This is a big loss for the soil. The composting method is also wasteful and has negative impact on the environment.
4. Traditional composting has been 'cold composting' using the 'N-locking' properties of cowdung that used to form a major ingredient of FYM pit, where it was storing without much loss of C or N. Pathogen control in this method is by 'N-locking'. After all, pathogens (and pests) come only in high N environment.
5. It is much easier to teach farmers what is close to the traditional approach, rather than what comes from the advanced countries (these happen to be in the cold region). Technology should be local ecology specific, science can be universal.
6. Any practice/suggestion to grind the wasted organics or mix/aerate them implies that there are ecological mistakes in the process. In eco-logical natural composting, all these steps are unnecessary, in fact they are wasteful.

7. Aim of composting is not to get something with large N-P-K value, but to get a bio-culture that can rejuvenate the soil. Small amount can do wonder, if it is produced in the right manner. Healthy soil can supply the crops with genuine nutrient needs and water need is substantially reduced. After all, major water need is to reduce the harmful effect of high-N soluble fertilisers.

8. We have been promoting VERMI+++ bio-culture produced from 'wasted organics'. Just a 10 g of dry culture packet is enough for 1 acre of land. It is mixed with waste organics to lock the N, root cause of all sanitation problems such as odour-pathogens-pests. Such a high power is produced through long ageing period, but farmers can give 1 year's ageing and use it locally. The bio-culture, thus, can be propagated by farmers, in a sustainable manner and repeat expenditure is unnecessary. This method does not require use of water, machinery, etc. Hence it is very much suitable to rural conditions that exist in India and other developing countries.

9. Carbon (and not N) is the limiting plant nutrient; hence it is necessary to conserve the C in wasted organics and soil by locking the N. This lock can then be selectively opened only by growing plant roots, thus achieving N economy. There are reduced N losses due to leaching or volatilisation, in this method. If this principle is neglected, use of N-fertilisers leads to mining of soil and that is hardly sustainable. We have seen this in green revolution.

10. 'Panch Gavya' also has been found useful in such N-locking method of stabilisation of wasted organics. The locked N cannot be used by wasteful (harmful) bacteria, viruses or pests. Thus we also get healthy environment in farms and villages. There is lot to learn from the enterprising farmers than from the university scientists who are fused on 're-search', rather than on 'search' for new ideas that suit local conditions. Panch Gavya has many applications, including those for 'nontoxic pest control', please see <http://www.mssrf.org/bt/204/index.htm>.

11. A packet of VERMI+++ can produce life-long 'Panch Gavya' equivalent plant tonic/pest repellent without any purchased inputs by the farmers. Use of this tonic also helps in reducing the soil salinity, a major universal problem today. Here the salts are not 'managed' by driving them out, but through their utilisation (after they are made eco-friendly) by the crop.

12. Please see

<http://www.hmda.gov.in/EBRG/site/the%20guidelines/images/pdfs/EBRG%20-%20Sew%20Bg%201-Rev%20D%20-%20SK.pdf>

and

<http://www.hmda.gov.in/EBRG/site/the%20guidelines/images/pdfs/SWM%20Nh%201.pdf> for more details.

Bhargavi S. Rao, Environment Support Group, Bangalore

Environment Support Group (ESG), a not for profit voluntary organization in Bangalore has worked in the area of solid waste management since 1999. ESG was a partner in the United Nations Development programme and the Indo Norwegian Environment Programme with the Government of Karnataka in a Capacity building project of the municipal solid waste workers. As part of this project ESG worked in a small ward in Bangalore and later in the entire city of Raichur, in north Karnataka.

The best way to solve the problem would be to segregate the waste at source (in homes, schools, offices, markets, hotels etc) into biodegradable, recyclable and hazardous. The biodegradable waste can be converted to compost at the home, school and office levels or it can be even done at the neighbourhood /community level. The recyclables can be given to the local recycle waste collector (raddiwala) and the hazardous waste can be disposed in a scientifically prepared land fill.

As part of the above mentioned projects we have made two docu-films in Kannada with English subtitles that clearly illustrate the need for segregation and also describes the process well. We have used these films in raising awareness among the communities we have worked and it has been received very well. Copies of the films can be obtained from our office by writing an email to esg@esgindia.org/bhargavi@esgindia.org. There are also some posters and power point presentations that help raise awareness that can be downloaded from our website and used effectively.

ESG has also worked on Hazardous waste collection, segregation, management and disposal in a project called SACODI. The details of this project are available on our website. As part of this project ESG has made some posters that can be used for raising awareness. They can also be downloaded from our website.

More recently we have been fighting a case of careless disposal of Bio medical waste by Apollo hospital in Bangalore. Much of the information related to this is also on the website. All of the above can be accessed at www.esgindia.org. In case you need more information do feel free to contact us by email.

At the home, school and office level we at ESG and in our homes practice a very simple technique to convert our biodegradable waste to compost. This can be practiced by everyone very easily and the manure obtained can be used for our small home gardens even if in small balcony gardens/potted plants. Enclosed below is the simple method.

COMPOSTING AT HOME: BBC (Bricks, Bagasse, Compost) Method A Non-messy composting method!

Requirements:

- An old container (plastic is preferred). Can be the likes of an old bucket.
- Few pieces of red bricks
- Bagasse (sugarcane residue)
- Compost

Method for making the compost pit:

- Make holes at various points including the bottom of the container. This is to ensure that water or moisture has space to escape.
(In case of a Plastic container the best way to make holes is to heat an old spoon/rod and pierce it through the plastic. While doing this ensure that your nose is covered as the fumes emerging out of burning plastic is dangerous)
- Once this is done, place the bricks, broken into smaller pieces in the container. This will be the first layer inside container. After placing the bricks sprinkle some water on the bricks, ensuring that it is fairly moist.
- The second layer is made up of the Bagasse. Place this layer on top of the bricks. It need not be done very precisely. Just round it up on the bricks. Once this is done sprinkle some more water wetting the bagas.
- The third and final layer is made up of compost. Just a fistful. You can borrow compost from a gardener or just buy it of from a nursery. It is inexpensive. After putting a fistful of compost, sprinkle some more water.
- After these three layers are fit into the container, your compost pit is ready for use
- Place it in your balcony or window sill. Sunlight and rain is good.
- Everyday you can feed it with vegetable, fruit peels.
- Water the container once in every few days to ensure there is moisture, especially in summer.

Harvesting the compost:

- The first harvest will be ready in 40 days. The compost will be black in colour.
- Take the top few layers off and place them on newspaper. This layer has to be placed back into the bucket again. Take the bottom layers (compost) and place it on another newspaper and let it dry in the sun.
- Once the compost is dry, use it on your plants. Remember that this compost is very strong and hence needs to be mixed with soil.
- Smile while you realize you have reduced garbage and helped plants grow faster.

Advantages:

- No stink
- No worms so no fear of extreme weather
- Easy to make and doesn't occupy too much space

Dis-advantages:

- Composts only vegetable and fruit peels. Doesn't compost leftover food
-

Murali Kochukrishnan, Action for Food Production (AFPRO), Bhubaneswar

Any solid waste management projects should be a practical, affordable, adoptable and a sustainable one at the community level and also the willingness of the community to be a part of the proposed system. The approaches and system may vary from place to place based on the Socio- Economic status of the community. Waste management depends up on the bio-degradable and non bio- degradable wastes. Villagers by themselves can initially segregate the wastes while disposing it in to two as biodegradable and non bio-degradable wastes. Further, the bio- degradable wastes can be utilized at the house hold level for composting or a group based methodology where the availability of the dung is not a dearth in the villages as quoted. Simple methodologies of composting in pits/vermin- composting or even cement rings can be placed one above the other with wire-mesh holes on the sides of the rings with temporary bottom sealing between the rings can be provided. These rings can be easily moved from one place to the other for continuous utilization for composting methodologies in spite of building permanent structures for composting. The composted material will act as good organic manure. A dedicative team needs to be formed with in the village with appropriate remuneration to over see and clear the debris. The non bio-degradable wastes will surely pose a problem in the village. It needs to be either recycled/may be collected and sold out to the rag pickers/Kabadiwala. The wastes which are neither recycled nor sold can be utilized to the land fill sites in the villages for land leveling measures. The concept of NREGA convergence in to the Total sanitation Campaign can also be though of with appropriate IEC activities. The generated compost manure will surely enhance the productivity and may reduce the intake of chemical fertilizers.

Asit Nema, Foundation for Greentech Environmental Systems, New Delhi

I consider Home Composting as an "Individual Environmental Responsibility", because it's the most appropriate, effective and simple solution. I consider Home Composting as a humble way to give back to the Mother Earth and reduce our carbon foot-print. We have been promoting this 'Earth Friendly Green Hobby' for last five years in and around Delhi. Unfortunately very few people – not even the die-hard environmentalists are motivated to embrace it. So far we have only about 500 converts in the entire city! Actually those who are preaching source segregation are also doing it for the sake of workshops and conferences, and not practicing themselves!

But for those who may be motivated, I have put a whole lot of information on our website www.green-ensys.org as well as posted a detailed analysis of the sector on my blog <http://indiahomecompost.blogspot.com>. Please visit these sites and help spread this practice in your respective towns and cities. If you have any queries, I will be most happy to respond and help your group get started in your respective places.

Venkatesh P., Bangalore Medical College, Bangalore

I would like to extend the reflection upon the reason of the fact that local communities have left caring for the solid waste and liquid waste disposal. To this effect, I would like to say that the previous methods used by the communities in disposal of the wastes in their villages suited the context of that time. Though those methods do find in place and in fact I support initiatives to reinvigorate those techniques, they have to undergo some amount of tempering to suit the present day context. Of course with definite involvement and complete participation of the people as it should be started taking into consideration of the local people's concerns. There are many such pre-existing methods that are less known or not known to many technical minds in the country. To that effect they have been able to meet the levels of disposal of wastes. So thinkers and activists should work to resuscitate the age old methods which have stood the test of time as well as in deciphering other such methods. One such example is the solid waste management of the human night soil through ECOSAN Concept promoted by the WASH Institute, took its birth nowhere else than in India at Thiruvananthapuram palaces wherein the excreta was disposed of in sanitary way vis-a-vis converting it into compost which would serve as a fertilizer for the field to rejuvenate and sustain the soil fertility. The same has been extended and put in use with effort to change the mindset through the panchayat and people to be used by the NGO named SCOPE of Tiruchy, Tamil Nadu.

Arunabha Majumder, Jadavpur University, Kolkata

Solid waste management is considered to be one of the important components of environmental sanitation. Solid waste management has been included in Total Sanitation Campaign programme undertaken in rural areas of the country. The per capita solid waste generation in villages is low compared to cities and towns and it ranges between 100 and 200 gms per day. Around 60% solid waste is organic (garbage); 15% is inorganic recyclables and rest 25 % is inorganic non-recyclables. The moisture content is higher in solid waste and caloric value is in lower range (800 to 900 Kcal/kg).

Organic wastes need to be converted to compost (soil conditioner) through Windrow process or Vermicomposting. The unit could be operated manually by engaging unemployed youth. The compost could be sold to the farmers. A simple calculation shows that a village having a population of 1000 may generate 200 kg solid waste (@200gms/cap/day) and out of which 120 kg is organic.

The organic waste after conversion through Windrow process may generate 22 MT of compost per year. The compost can fetch Rs 44000/-per annum through sale (@Rs2000/ per MT). The organic compost will have 660 kg of NPK (@3%). Source segregation of solid waste is necessary for running compost unit. Source segregation will help in separating Inorganic recyclables in the tune of 15%. The quantum of inorganic recyclables will be around 11 MT per annum. This may fetch Rs 22000/- per annum through sale(@Rs 2/-per kg). This process will generate employment. SHGs could be formed to manufacture home-decorative items from recyclable waste items. The primary house to house collection may also generate employment. Pedal tri-cycles may be used for primary collection. Subscriptions can be collected from the villagers for the services.

In West Bengal, solid waste management system has been introduced under TSC program in a few Gram Panchayats through a participatory approach. The Sanitation Task Force is extending technical support to the GPs.

Kalyan Paul, Pan Himalayan Grassroots Development Foundation, Ranikhet, Uttarakhand

I would be glad to hear from members about the OWC Systems and in case there are any sites in Uttarakhand or Himachal Pradesh, please do let us know.

Anand Ghodke, CCDU Government of Maharashtra, Mumbai

I worked with the Government of Maharashtra for 5 years in TSC. Most of you will agree with me - there is no dearth of technologies, but it is the management and of course operation and maintenance of the systems created at community level. A large number of piloting, re-piloting and experiments are going under TSC across the country. There are some good examples which have clicked for sometime and elapsed over a period of time.

States like Maharashtra had undertaken the measures to tackle these issues almost a decade ago. This has mainly been through the State Reward Scheme - *Sant Gadge Baba Gram Swacchhata Abhiyan*. Even though this has been a high profile programme, it could influence many of the villages and villagers so far. One can see such initiatives; but consistency remains a problem. But some of the examples under the award scheme addresses all the issues raised like livelihood, management, increased productivity and the awareness regarding the 3 Rs. The State of Himachal has also initiated the State reward programs for Gram Panchayats - *Maharishi Valmiki Sampurn Swacchhata Puraskar*. The GPs are assessed for their outstanding work in a competitive manner for doing outstanding work in the Sanitation Sector including Solid and Liquid Waste Management. Even the Vellore model in Tamil Nadu can be a good example to learn from.

But I feel the time has come for the Government to take some key decisions in this regard - complete ban on plastic, taxation for handling the waste and that too through privatization making large investments in the sector. As per the TSC guidelines the TSC project offers a cost provision of 10 % of the total project cost and the State Governments are not clear on how to use this amount.

Also one of the key reason for failure is lack of Coordination, Communication and Convergence (3 Cs) amongst the various departments - e.g. TSC talk of vermi-compost, recycling and reuse, etc which were also highlighted by the Agriculture Department, Watershed Development Program, and income generation activities under IRDP/TRYSSEM/SGSY for recycling of plastic and waste paper; NREGA funds can effectively be used to undertake soak pit construction, digging work for drains, waste water collection ponds, etc.

Till the time the Government thinks seriously about this; we will keep on piloting with no concrete results. The Nirmal Gram Puraskar awarded villages are supposed to have systems for solid waste management. The situation in these GPs across the country tells the story. Unfortunately the efforts under this component has been limited and scattered.

Gaurav Aggarwal, Indian School of Business, Aligarh

I would appreciate if someone can provide options for disposal of inorganic waste in a way that it does not harm the environment. Land fills, although they do away with the waste, but there is a

long term impact on the environment. Also, have the organic waste disposal machines considered to be deployed on a village level or an area level or are they restricted to only the industry etc?

[R. K. Srinivasan](#), Centre for Science and Environment, New Delhi

In Indian conditions the inorganic load in the solid waste is high. The solid waste which is not separated contains high levels of silt, sand and grit, I would like to know if the incinerators will also handle the silt load as well?

[Sacchidananda Mukherjee](#), National Institute of Public Finance and Policy (NIPFP), New Delhi

I would like to share my experience of working across six villages in Erode district, Tamil Nadu (during my doctoral research work) on livestock waste management issues.

My basic objective was to capture/understand the factors which influence farmers' willingness to adopt Best Management Practices (BMPs) for livestock waste management. The aim of the whole exercise was to understand the factors influencing farmers' willingness to protect groundwater from nonpoint sources of pollution through voluntary adoption of BMPs in agriculture, livestock waste management and sewage and sanitation related activities. I took groundwater nitrate concentration as an indicator of nonpoint source pollution and I estimated the nitrogen load of the Lower Bhavani River Basin, Tamil Nadu (Mukherjee, 2008). The results show that livestock waste contributes - 44 per cent, human waste - 5 per cent, fertilisers - 37 per cent and others (symbiotic and non-symbiotic nitrogen fixation, nitrogen deposition through precipitation) - 14 per cent in total nitrogen load of the basin (the basin is located in Coimbatore and Erode district of Tamil Nadu). It is to be mentioned that unlike developed countries, in India livestock waste acts as nonpoint source pollution and pollutes local (groundwater nitrate pollution) and global environment (methane emission from livestock storage - methane is one of the Green House Gases). Proper management of livestock waste could provide a private good (biogas), a local public good (safe groundwater) and global public good (less emissions of Green House Gases).

Problems and Prospects of Livestock Waste Management

On an average 13 per cent of the sample households (sample size: 395) have biogas plant and it varies from 3 per cent to 49 per cent across study villages. An effective household level biogas plant could digest 20-30 per cent of the livestock waste (cattle waste) generated by an average herd size of 4-5 cattle. It is to be mentioned that the production from the biogas plant will be enough to meet the demand for a family with average family size of 4-5 member to meet the need for cooking fuel and supplementary uses like running water pump for irrigation. The odourless liquid sludge that comes out from the biogas plant contains enriched nitrogen and it could meet need for nitrogenous fertiliser of the family. The sludge is odourless and does not attract flies and it could be dried in open place and stored easily.

The remaining 70-80 per cent of the livestock waste which is not required for household biogas plant is stored in open place. As a result, the livestock waste heap (which is a visible pollution) attracts flies and other vectors and spread bad odour and diseases. Since the storage is done in open place without lining and cover, it leaches nitrate in groundwater (through runoff from storage) and emits methane. As a result the very purpose of the biogas plant gets diluted, and farmers leave with little nitrogen in manure for farmland application. Therefore, family biogas plant cannot be the only solution for safe management and disposal of livestock waste. We need for other solutions for safe management of livestock waste. It is to be mentioned that for a household (having average 4-5 member) does not need a larger biogas plant which could digest

a substantial part of the livestock waste of the family. Therefore, until and unless there is some mechanism for trading of biogas among villagers or with power plants, there is no incentives for individual households to invest in construction of a larger biogas plant. The alternative could be a community level biogas plant with membership of villagers and the plant could run on commercial basis with active participation of stakeholders. The community biogas plant could consume larger amount of livestock waste and it could also supply biogas to those who don't have cattle (or membership). The community biogas plant could also supply biogas to nearby urban consumers and/or local water supply agencies for running their water pumps (water pumps can be operated in biogas).

My study shows that apart from the economic incentives, there are several other factors which influence farmers' willingness to adopt biogas plant - those are socio-economic, institutional, geographical and environmental in nature. The herd size and land holding size are two major factors, apart from government incentives, availability of credit, groundwater level, access to commercial fuels (like LPG), environmental awareness, social network, access to agricultural information/consultation sources, knowledge of BMPs, availability of family based labour (as reflected by work force participation rate of a household) etc.

Apart from biogas plant, bio-composting of livestock waste could also consume the remaining part of livestock waste. The adoption of bio-composting either at the household level or community level could meet the needs for nitrogenous fertilisers of the farmers.

Reference: Mukherjee S. (2008). *Economics of Agricultural Nonpoint Source Water Pollution: A Case Study of Groundwater Nitrate Pollution in the Lower Bhavani River Basin, Tamil Nadu*. Unpublished Ph.D. Thesis, Madras School of Economics, University of Madras, Chennai, Tamilnadu.

[Gaurang Mishra](#), Directorate of Economics and Statistics, Port Blair (response 2)

[S. Mukherjee](#)'s point is furtherance of my point of view. The main problem in Gobar gas (re-christened Biogas) is the sustainability and to sustain the farmer's interest for long. In Kanpur I have seen many plants closed due to the lack of interest in long run. Secondly there should be alternatives to the biogas at the time when gas production becomes less or minuscule. Sometime the temperature or the incubation period is less or several other reasons gas is not adequately available at the time of need. That time the traditional methods come handy like dry gobar cakes, dry wood or kerosene stove or LPG gas etc as per the affordability.

Regarding the other part of livestock waste as was discussed earlier, I would say that traditionally the other livestock waste was stored at the places away from the habitation or at the edge of the village where all the household waste is used to dump, usually the place is near the fields and at the time of onset of monsoon that waste heap is taken and dropped in the field using the bullock cart. During ploughing and rains all that get mixed in soil. The pollution occurs in those places where due to the congestion waste is kept near to the human habitations/hubs. And that is the scene in most of places which were very recently called villages and now they have acquired a new look of semi urban or a KASBA. In such places the land is highly commercialized priced possession therefore waste is kept at whatever piece of land is available even in nearby streets of houses, ignoring the health hazards in front of grabbing of land.

Panchayat may play a major role. Panchayati Raj Institutions have to play their role more prominently. They can impose tax on disposal of waste on unwarranted places on those households. The amount can be decided in the gramsabha meetings. But the elected members of gramsabha should be willing to do so. Our great scientist community can play a significant role in

addressing this aspect. They can influence the gram sabhas. MS Swaminathan Research Foundation with the help of rural development department can train the functionaries of PRIs.

In my view, instead of spending money in publishing various advertisements regarding the success achieved in newspapers the concerned department can sponsor organizations/researchers for training the PRIs (read communities) on sanitation and preservation, conservation, etc aspects. Organization like MS Swaminathan, IITs, IIMs (famous for NIF-innovative foundation of Prof Anil Gupta), Dr Vandana Siva, etc can play a lead role in this regard.

Krupa, Sahjeevan, Bhuj

For safe and sustainable disposal of solid waste management system examples are available at Gujarat. These systems have been provided by Excel industries. They have developed OWM technology for organic waste at the Bhavnagar municipality vegetable market. They have also established a solid waste management technology at Ahmedabad. These options can provide good examples at a small scale or a cluster of village level. This model has been linked with the local governance in that the village level panchayats are directly linked with the local farmers of the area, and are assisting them with agricultural needs by facilitating the need for manure produced from these plants. This has also solved the problem of waste disposal at the village level in addition to providing manure for farmers.

Many thanks to all who contributed to this query!

If you have further information to share on this topic, please send it to Solution Exchange for the Water Community in India at se-wes@solutionexchange-un.net.in with the subject heading "Re: [se-watr] Query: Safe and Sustainable Disposal of Solid Waste at Village Levels - Experiences; Examples. Additional Reply."

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