

National Environmental Engineering Research
Institute, (NEERI) India



in Association with
Earth Engineering Centre, Columbia University, USA



2nd INTERNATIONAL BRAINSTORMING WORKSHOP ON SHORT AND LONG TERM SOLUTIONS FOR MUNICIPAL SOLID WASTE MANAGEMENT PROBLEM IN INDIAN CITIES

**Organized under the CSIR's mission of Wealth from Waste by the
Council of Scientific and Industrial Research-National
Environmental Engineering Research Institute (CSIR-NEERI) in
association with Earth Engineering Centre, Columbia University,
New York**

**21-22 February 2013, The Lalit Hotel, New Delhi
Barakhamba Avenue, Connaught Place
New Delhi - 110 001, India**

**OUTCOME OF
WORKSHOP**

Outcome of 2nd International Brainstorming Workshop on “Short and Long-Term Solutions for Municipal Solid Waste Management Problem in Indian Cities”

WTERT-India’s (Waste to Energy Research and Technology Council) 2nd International Brainstorming Workshop on “Short and Long-Term Solutions for Municipal Solid Waste Management Problem in Indian Cities” was held at New Delhi, India on 21st and 22nd February, 2013. This workshop was organized under the CSIR’s mission of Wealth from Waste by WTERT-India, which is collaboration between the Council of Scientific and Industrial Research-National Environmental Engineering Research Institute (CSIR-NEERI), and the Earth Engineering Centre (EEC), Columbia University, New York, USA. Other supporting collaborating organizations were the Ministry of Environment and Forests (MoEF) and Ministry of Urban Development (MoUD). The sponsors of the workshop were M/S Hitachi Zosen INOVA, Hyderabad, GIZ, New Delhi; M/S Ramky Enviro Engineers Ltd., Hyderabad; GIZ New Delhi, and Housing and Urban Development Corporation (HUDCO), New Delhi.

The main objective of this workshop was to discuss the existing waste management system in India and compare the findings with management practices followed elsewhere in the world. This workshop was attended by about 200 delegates from fields like Research and Development, Scientists, budding researchers, service providers and entrepreneurs. The participants and delegates were from different parts of India and the world - USA, Canada, Spain, Japan, Germany and Switzerland. The workshop was divided into different sessions’ viz., inauguration and various technical and plenary sessions on the different themes. Invited lectures on different themes are highlighted in **Figure 1**.



Figure 1: Detailed Themes of Workshop

Inauguration Ceremony

Dr. Rakesh Kumar, Chief Scientist (CSIR-NEERI) and Head, NEERI, Mumbai Zonal Laboratory (MuZL), **Dr. Sukumar Devotta**, Former Director, NEERI and Chairman, SEAC, Maharashtra, **Dr. Dieter Mutz**, Director, GIZ New Delhi, **Prof. Patrick Hettiaratchi**, University of Calgary, Canada and **Dr. Sunil Kumar**, Senior Scientist, CSIR-NEERI, were present for the inauguration session. The inauguration ceremony was moderated by **Dr. Sunil Kumar**. This is shown in **Figure 2**.



Figure 2: Inauguration Session

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The workshop was inaugurated by **Dr. Rakesh Kumar (Figure 3)**. He welcomed all the delegates and participants. He defined the motto and importance of this conference. He briefed the delegates and participant about the biggest challenge faced by India in processing and proper treatment of Municipal Solid Wastes. He also discussed various aspects of waste management in India, especially disposal problems, technological options for their treatment, funding issues mainly for small cities, amendment of MSW rules and opportunities in terms green jobs and economic research to estimate actual cost to manage the MSW for all over India. With this, he openly welcomed all the panellists and wished all members success.



Figure 3: Dr. Rakesh Kumar delivering his Welcome Address and Introductory Speech

Thereafter, distinguished speaker **Dr. Sukumar Devotta (Figure 4)** shared case studies of MSW management in developed nations and challenges faced by developing nations to implement the same. He also briefed the audience about opportunities in terms of research and development to overcome the challenges for SWM in developing nations. His major concern was the authentication of data. He gave an example of two esteemed organisations that had carried out the assessment of MSW from the same locality, but there were significant variation in their results. He raised his concern about whose data is to be considered as authentic and whose result is to be followed for development of technologies by engineers. **Dr. S. Devotta** thereby laid down the vision for WTERT-India to act as knowledge centre and aid in the dissipation of research and data across India and South-East Asia. He concluded his talk by sharing his view regarding evaluating the drawbacks and failure of technologies in India in terms of management and treatment of MSW.



Figure 4: Dr. Sukumar Devotta delivering Distinguished Speech

Then, Guest of Honour, **Dr. Dieter Mutz**, (Figure 5), shared his experience about the management practices in India and in its implementation. He pointed out economic and recycling potential of MSW. He compared the recycling process of MSW in India with those from Europe and Germany, and concluded that there is tremendous scope in India for future research and development in municipal solid waste management. He also showed his concern about E-waste and its future challenges.



Figure 5: Dr. Dieter Mutz delivering Speech as a Guest of Honour

Thereafter, **Prof. Patrick Hettiaratchi** (Figure 6) shared his views on MSW management in Canada and Sri Lanka. He expressed his views on the understanding of an

appropriate technology for a particular locality and implementing the same with proper scientific management. He highlighted that if this problem is solved, one could utilise wastes as resources. He concluded that many models and techniques are there to solve the problem of MSW universally but different localities or countries have different problems, and therefore have different solutions.



Figure 6: Prof. Patrick Hettiaratchi delivering the Guest of Honour speech

Finally, the inaugural session was concluded by the Vote of thanks conveyed by **Dr. Sunil Kumar (Figure 7)**.



Figure 7: Dr. Sunil Kumar Proposing Vote of Thanks

Panel-I: Municipal Corporation and Solid Waste Management

This first panel was chaired by **Mr. K. U. Mistry** and moderated by Mr. Ranjith Annepu. Speakers of this panel are summarized in **Figure 8**.

Panel-I Municipal Corporation and Solid Waste Management Chairperson - K.U.Mistry, Chairman, Gujarat Pollution Control Board



Figure 8: Details of Panel I

Dr. R. M. Dubey briefed about the challenges faced by the Assam Government in terms of management of MSW. He highlighted the necessity of in-situ and ex-situ treatment processes. **Mr. P. Patil** expressed his views on population explosion, rapid urbanization and infiltration as the major grievances of SWM in urban areas like Mumbai. **Mr.V.K. Chourasia** highlighted the various initiatives of the Central Government to manage MSW. **Dr. Vivek Agrawal** briefed about the importance of Public Private Partnership (PPP) in SWM. He also discussed the various models followed by different state government to achieve MSW management through PPP basis. **Mr. P. Prasada Rao** highlighted that one should concentrate going beyond Government policies, legislations, initiatives and infrastructure, the support of community – community action and citizen engagement is a vital for implementation of sustainable waste management programmes.



Figure 9: Members of Panel I

Academic Research and Paper Presentation

This session was chaired by **Prof. A. D. Sawant**. The speakers of this panel are summarized in **Figure 10**.

Academic Research and Paper Presentation Chairperson: Prof. A. D. Sawant, Former Pro Vice Chancellor, Mumbai University



Figure 10: Details of Academic Research and Paper Presentation

Prof. A. D. Sawant discussed SWM using the PPP model. According to him, private sector has better expertise, technology, and capital to manage challenges of MSW. Among papers; **Prof S. Sudalai** presented about the role of social media in spreading awareness on waste management issues and opportunities. Thereafter **Ms. Rozita Singh** highlighted case studies

from New Delhi in regards with the decentralized method for treatment of MSW. **Dr. (Mrs.) Poonam Ahluwalia** presented her work on methodological framework to assess environmental impacts of various waste management options. **Dr. T. Vijayan** talked about “Ecopots” to treat waste in house. **Dr. Vinod K. Garg** presented his research work on treatment of sludge through Vermicomposting with cow dung and weeds. **Mr. Devendra Goyal** spoke about City development integrated and self financed municipal SWM model for India. **Prof. Shyamala Mani** talked about Private Public People’s Partnerships (PPPP) and briefed about the PPP model executed so far across India. **Mr. Anurag Gupta** and **Ms. Sanjali Jain** presented a case study of Gasification as a treatment option. The multiple levels of sharing of knowledge within the participants and speakers of India and also from other countries, led to the emergence of a set of recommendations.



Figure 11: Members of Academic Research and Paper Presentation

Panel II: Scientific and Technical Issues in Solid Waste Industry

This panel was chaired by **Er. Thomas Vogler**. The names of the different speakers are summarised in **Figure 12**.

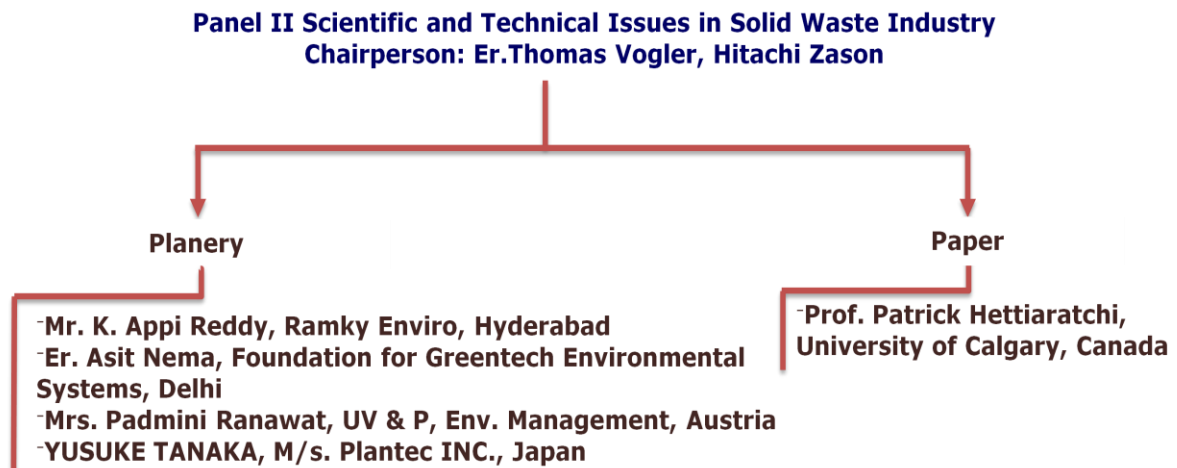


Figure 12: Details of Panel II

Prof. Patrick Hettiaratchi presented his work which dealt with how different technologies had been adopted by the Canadian Government to solve many challenges of MSW management. He presented this as a sustainable model for the world. **Mr. K. Appi Reddy** highlighted on practical and technical issues of MSW combustion boilers. Thereafter, **Er. Asit Nema** delivered his talk about value addition product from MSW. **Mrs. Padmini Ranawat** delivered her talk on Scientific and Technical Issues for India’s SWM Industry. Last plenary lecture was delivered by **Mr. Yusuke Tanaka** on New Generation Incinerator - Vertical Combustor.



Figure 13: Members of Panel II

The second day started with the Live Webinar of **Prof. Nickolas Themelis (Figure 14)**, who spoke about Sustainable Waste Management for India and the role of Global WTERC Council. He highlighted different recycling technologies to manage and make profit out of management of recyclables. Other technologies that were touched upon by him were composting, anaerobic digestion, biogas plant for organic waste, and mass-burn waste to energy technologies. This would be very useful for developing countries like India. He showed some land-filling case studies and also highlighted role of WTERC across the World. He compared the quantity of MSW with respect to GDP of different countries.



Figure 14: Prof Nickolas Themelis (Live webinar)

Panel-III Regulatory, Policy and Financing Issues

This panel was chaired by **Dr. Sukumar Devotta**. Names of different speakers are summarized in **Figure 15**.

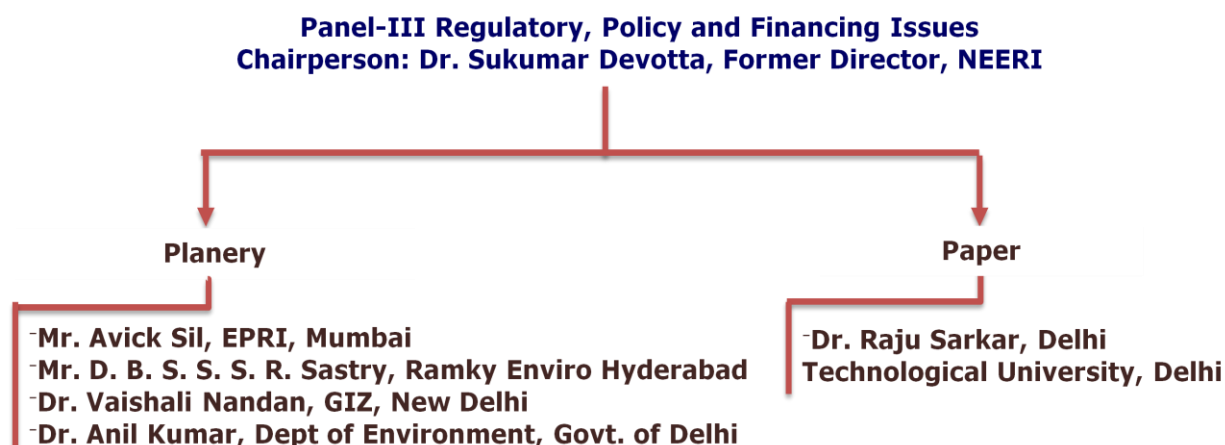


Figure 15: Details of Panel III

The first plenary lecture was delivered by **Mr. Avick Sil**, who focused on a concept of ‘zero waste’ for the municipal sector. He highlighted the social and economic benefits of zero waste in the MSW sector. He also briefed about the scope of research and development in this sector. Then **Dr. Raju Sarkar** presented his work on the utilization and management of pond ash. Thereafter **Mr. D. B. S. S. R. Sastry** highlighted the policy and financing issues of MSW. Then, the plenary lecture was delivered by **Dr. Vaishali Nandan**, who mainly focused her talk on Regulatory, Planning and Financing issues of Urban Waste Management. In the end of this panel, **Dr. Anil Kumar** briefed about the different technologies, and he recommended that according to the situation, technologies needed to be adopted and managed for MSW. He also highlighted overcoming social, economical and environmental issues of MSW. He highlighted that next generation research should be focused on these aspects.



Figure 16: Members of Panel III

Panel IV: Academic Research on Solid Waste Management

This panel was chaired by **Prof. Somnath Mukherjee**. The names of different members are summarized in **Figure 17**.



Figure 17: Details of Panel IV

The first plenary lecture was delivered by **Mr. K. S. Rao**, Hitachi Zosen, Hyderabad. He mainly spoke about the exaggerations on WTE emissions, cleared some of the doubts around WTE and explained about Hitachi Zosen’s new technology to recover energy from calorific

value waste. Then **Dr. G. Poyyamoli** presented his research work on Eco-technologies for MSW management in coastal areas. This was mainly presented in a research framework. Thereafter, **Mr. Ranjith Annepu** highlighted that research is very important to help decision makers. He concluded his talk with a concern about the quality of human resources in this sector in India and the need for increasing research based policy decisions. The last plenary lecture was delivered by **Prof. Patrick Hettiaratchi**, who talked about different technologies of MSW management in Indian conditions and also recommended that life cycle assessment, health impacts, GHG emission, social impacts and quantitative assessment as a holistic part of research and development for MSW management.



Figure 18: Members of Panel IV

Panel V: Public Participation and Inclusive Waste Management

This panel was chaired by **Dr. Vijay Kulkarni**. The different members in this panel are summarized in **Figure 19**.

Panel V Public Participation and Inclusive Waste Management
Chairperson: Dr. Vijay Kulkarni, VP, Shapoorji Pallonji & Co. Ltd.



Figure 19: Details of Speaker of Panel V

The first plenary was delivered by **Ms. Pujarini Sen**, who spoke about the different issues facing rag-pickers and their integration into the formal sector. Thereafter **Mr. Federico Demaria** delivered his speech about inclusive waste management and waste pickers’ and waste pickers organizations’ perspective on the same. The last plenary lecture was an online lecture by **Dr. Martin Brunner (Figure 21)** on fairy tales in waste management and facts about Waste-to-Energy. He presented various case studies of WTE plants across the world.



Figure 20: Members of Panel V

Summary of Technical Panel Discussions

The summary of the technical panels is given in **Table 1**.

Table 1: Summary of Technical panel

Name of the Panel	Outcome
Municipal Corporation and Solid Waste Management	<ul style="list-style-type: none"> • Incentives must be provided to rag-pickers, and their health aspect must be considered while planning MSW management • It was observed by the panel that most of the projects are planned for 25 years which is very uncertain with respect to the economic viability and guarantee of raw materials. Therefore, one should follow measures like: <ul style="list-style-type: none"> — Assurance of supply of the quantity and quality of raw material to processing plant for the project period — Social acceptance — Leachate control • Recently there is generation of a new kind of MSW, which is household hazardous waste. Government need to formulate some strategies regarding the same in order to achieve parity in treatment of traditional MSW. • One also needs to develop proper tariff policy especially for sale of power generated from treatment of MSW. This tariff plan should be universally accepted across all states in India. If this happen, one can easily formulate the strategy for tipping and processing fees for MSW. This tariff policy must be taken on priority basis • There are areas in many cities where segregation is difficult. In such cases in-situ treatment of waste should be encouraged. Decentralized treatment process should be adopted to manage MSW
Academic Research and Paper Presentation	<ul style="list-style-type: none"> • Social media may change the people’s mindset towards the management of MSW • Incineration is one of the good options for management of MSW • Outcome of the all the academic research should be implemented in practical approach. Thus from laboratory scale one should concentrate on pilot scale studies • In-situ and ex-situ management of MSW can be followed according to the locality • Actions that must be implemented: Per head optimization of waste; important figures and findings must be documented and a knowledge centre must be created MSW 2000 rules and labour rules must be revised
Scientific and	<ul style="list-style-type: none"> • Source segregation is necessary and strategies must be formulated

<p>Technical Issues in Solid Waste Industry</p>	<p>toward its implementation</p> <ul style="list-style-type: none"> • Different countries have different technologies for MSW management, but Indian condition is different from others. So any technology which is adopted in India, must be modified as per Indian condition for its optimum functioning • There is an urgent need of research and development in this sector, especially in following areas: Biogas (small scale and large scale); landfills of low-cost for smaller cities, recycle and reuse benchmarking, combustion technology adaptation based on Indian MSW feedstock etc.
<p>Regulatory, Policy and Financing Issues</p>	<ul style="list-style-type: none"> • Due to land scarcities, one should focus on zero waste concept along with decentralized treatment scheme • Management of dry waste should be taken as one of the major priorities • RDF can be good option for treatment of dry waste • Public places like Delhi metro station can be a good place to aware the common people about the management of MSW • There should be establishment of legal links as to reform by-laws and phenomenon of ownership which create competition and hence generate responsible commitment.
<p>Academic Research on Solid Waste Management</p>	<ul style="list-style-type: none"> • Technologies must be implemented according to the situation and needs • WTE can only be implemented only after proper assessment of waste and their characteristics • One must carry out research in risk and failure analysis for WTE • Different background person needs to come together to solve MSW management • Composting can be adopted at smaller level (10-20 tons/day), but for larger generation (6000-8000 tonnes/day), one could opt for incineration, RDF, bioreactor landfill and WTE.
<p>Public Participation and Inclusive Waste Management</p>	<ul style="list-style-type: none"> • There is a need to redefine and document technologies applicable for smaller cities, large villages; whereas large urban metros must address through technologies option of waste to energy, volume reduction and less land intensive options • Universities, entrepreneurs, informal sectors (rag pickers, ‘kabbadiwala’ etc.), formal sectors need to work together in local level • Roles and responsibilities of different organizations like rag pickers must be formulated in policy framework

Panel VI: A Participants-Driven Panel Discussion and Concluding Remarks

The two-day International workshop concluded with panel discussions about the problems and solutions of MSW management in Indian cities and the future opportunities. This panel was chaired by **Dr. Vijay Kulkarni**, moderated by **Dr. Rakesh Kumar**. The panellists were **Mr. D.B.S.S.R. Sastry, Er. Thomas Vogler, Prof. Shyamala Mani, Mrs. Padmini Ranawat, and Mr. Ranjith Annepu**. The discussion was on **regulatory reforms**, as selected by audience.

The multiple levels of sharing of knowledge within India and also from other countries, the set of recommendations emerged. Though some of the issues could not be led to consensus, however, the need to move ahead and move decisively and distinctly was clearly spelt out.

- Roles and responsibilities of common people need to be defined in regulatory, especially for source segregation
- The MSW Management and Handling Rules needs to be reformed. One should concentrate on collection and transportation issues
- Incentives can be included in the regulatory policy to encourage the in-formal and formal sector to manage the solid waste level locally
- Private companies should be attracted towards management of MSW through lucrative policies
- One must concentrate on bridging the gap between research and policy makers and also with research universities, industry and formal-informal sector along with ULB
- Only technology can't solve the problem because there are some others issues are there. These are Uncertainty of feedstock in terms of delivery of its quantity and quality; Limitation of the processing machines ex. Requires a waste of particular range of calorific value, dry waste etc; Environment and social concerns
- There are some financial issues must be tackled
 - Stagnant compost price
 - Reasonable insight of tariff
 - Tipping fees need to be paid in time
 - Subjective evaluation of performance will not be carried out to impose unreasonable penalties
 - To attract the Indian waste sector for private investment

- Decentralized management systems needed, but Single rule of decentralized management system cannot be implemented to across the India because various kind of living. Relaxation should be given to local regulatory board
- Universities, students, industry, policy makers, etc. need to start the segregation at source at their work places, households or at the time of their daily work
- Industries believe that nothing wrong in the rules, ULB needs to transparent the system to check the maintenance of rule and regulations
- Certain percentage of electricity used in industries must come from ‘waste to energy’ plant as to make the industry economic viable



Figure 22: Members of Participants-Driven Panel Discussion

Future Opportunities

- Public awareness can be conducted by WTERT-India with the help of local government bodies. This could be carried out at individual society level, households, villages etc.
- Source segregation must be made mandatory as without it, downstream processes fails. A knowledge based driven awareness campaign should be initiated by Government. WTERT-India could formulate the strategy and lay down the framework for the same

- There should be establishment of legal links as to reform by-laws and phenomenon of ownership which create competition and hence generate responsible commitment. Apart from that as the Municipal Staff mixes the waste at primary level, sensitization and awareness camps must to establish to educate the masses for the source segregation
- Policy and guidelines should be reviewed from time to time. These should be at par with the international standards. WTERT could provide knowledge based support for this activity
- Documentation of project needs to be made public, WTERT website could be the ideal location for maintaining these data and reports
- Before landfill or incineration processing source reduction, size reduction etc need to be decreased.
- All technology supplier company need to do the audit of their treatment process for MSW and report can be published by WTERT-India. Also, WTERT-India could assist in identifying experts for auditing. An universal level auditing procedure and structure need to be formulated in near future.