



Regional Approach- Municipal Solid Waste Management

By Dr. Amiya Kumar Sahu

President-National Solid Waste Association of India

Regional Approach-Municipal Solid Waste Management

Dr. Amiya Kumar Sahu

Editor' Note: This paper has been targeted for a broad audience. The level of scientific detail provided is therefore not as high as would be normally be required in technical paper subject to peer review by environment industry professionals.

Municipal Solid waste (MSW) management is a major concern for highly urbanized society due to growing population, unplanned development and lack of land. It has been witnessed that individual small or big cities are unable to manage their waste processing and disposal. It is also observed that some of their issues cannot be dealt by small municipalities in absence of trained manpower and adequate financial sources. Regional MSW management programs have received considerable attention due to its high likelihood of success. This paper addresses the relevant issues of regional municipal solid waste management, especially local acts and regionalization as the viable option for MSW management.

Disposal Practices in India

Management of Municipal Solid Wastes (MSW) continues to remain one of the most neglected areas of urban development in India. The 23 metro cities in India generates about 30,000 tones of such wastes per day while about 50,000 tones are generated daily from the Class I cities. Piles of garbage and wastes of all kinds littered everywhere have become common sight in our urban life.

Indian Municipalities have overall responsibility for Municipal Solid waste Management. However most of them are unable provide proper system to tackle the current situation. Magnitude and



One of the open disposal site in India

density of urban population in India is increasing rapidly and consequently the Municipal agencies spend about 5-25% of their budget on MSWM. Despite of such heavy expenditure, the present level of service in many urban areas is so low that there is a threat to the public health in particular and the environmental quality in general.

Most of the MSW generated in Indian cities and towns is being disposed of in unsanitary landfills or open dumps. Only seven cities and towns in India have established sanitary landfill till end of 2006:

1. *Surat*
2. *Pune*
3. *Ahmadabad urban development authority*
4. *Puttur*
5. *Karwar*
6. *Navi Mumbai*
7. *Bangalore*

The Municipal Solid Waste (Management and Handling) Rule 2000

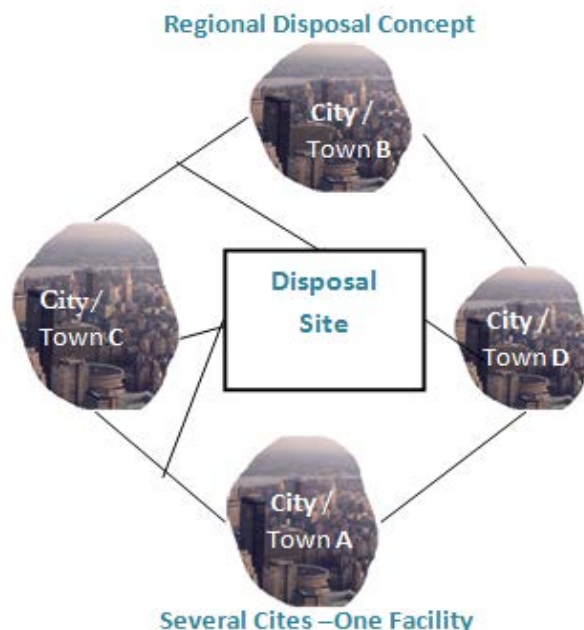
This rule was notified by the Ministry of Environment and Forest, Govt. of India [vide No.S.O.908 (B) dated the 25th September 2000]. The objective of these Rules was to make every municipal authority responsible for the implementation of the various provisions of the Rules within its territorial area and also to develop an effective infrastructure for collection, storage, segregation, transportation, processing and disposal of Municipal Solid Wastes

- According to this rules following are the mandatory requirement for Disposal of waste.
- The waste should be disposed of in engineered landfills and never in open or unsanitary dumps.
- Sanitary landfills for municipal solid waste are essential for the disposal of waste and unused residue from processing plant or other facilities when they cannot be further processed or recycled.
- This rule directs that landfill site should meet the specification given in the schedule of the rule like site selection, facility at site and specification for land filling etc.
- The landfill site should be large enough for the disposal of waste for 20 to 35 years.

Setting up and operating a sanitary landfill is a complex and expensive exercise .Creating small facilities is most often not practical or viable. Typically, for a sanitary landfill to be economically viable needs to have a minimum capacity of 250 to 300 tons per day Furthermore, municipalities cannot afford the expenses of technical experts to of technical inputs, development of facilities and finally maintenance for long term. The cost-effective and viable solution lies in adopting a regional approach that enables two or more municipalities to derive the benefit of economy of scale by coming together not only to get benefit of size as well as.

The Regional Landfill Concept

As per the conventional approach to waste treatment, Regionalization refers to the bundling the waste disposal needs of several towns or cities and tackling the problem they share by creating one regional facility.



The region could encompass a large metropolitan area that includes several contiguous municipalities. Alternatively, a cluster of small towns could share a common disposal facility

Need for Regionalization

Small cities / towns requiring landfills sites are facing severe problem in identification of land and in many cases possession is also becoming very difficult. Creating small facilities; for all small Municipal Body – cities and towns below 300,000 population is not viable in short as well as long time period.

- a. This is on account of
 - Disproportionate financial investment needed for the facility; they also do not have enough resources to operate and maintain a landfill.
 - High rate of labour requirement per Tonne of waste
 - No adequate land for the landfill development operations and maintenance; Use of large portion of land for disposal of waste is not possible for small Municipal Bodies in relation to provision of other services.
 - Not in my backyard situation; A landfill will need to be constructed near to city/town which again leads to public objection.
- c. More importantly, does not show a private agency willingness towards small landfill development due to financial viability and poor health of municipal finances.
- d. Regionalization minimizes the scope of public objections, facilitates ease of disposal as this site can be constructed at a distance from city/town.
- e. The regionalized landfill construction can be managed professionally in a cost effective manner.
- f. The burden of cost of onetime items on participating Municipal Bodies will be shared and the total tipping fees to be paid will be only to the extent of waste sent to the landfill.
- g. The site can be awarded to Private Operator who will be willing to handle a large landfill site.

Financial benefit of regional disposal

- Reduction in the fixed costs (for example, lining, equipment, human resources land and overhead) per unit of waste because of the greater amount of waste and the allocation of costs among several municipal bodies
- Cost saving because of sharing of overhead and maintenance cost among participating municipality bodies.
- Sharing of professional management
- Improved bargaining power to buy better equipment and system at lower costs.

Technical benefits of regionalization

- The municipality has greater access to technical resources and professional expertise.
- It can use large and sophisticated equipment (for example, Compactors)

- Large landfills allow waste to be stacked to greater heights –over 30 meters, compared to the common practices of 3 to 5 meter. Greater height also corresponds to greater depth of landfilling which implies a sustainable increase in available air space and, hence waste disposal capacity per acre of land which leads to lower capital cost per ton of waste

A regional facility can be located at a considerable distance from the municipalities, which helps overcome constraints on land availability.

Additional transport costs can be substantially offset by the cost saving in disposal and treatment.



Regional disposal facilities of Oneida and Herkimer Counties New York (USA)

- A large landfill facility allows for proper planning and development of the site, with provision of an adequate greenbelt and other amenities that makes the facility less offensive to the surrounding population. Over a period of time this improvement would help public opposition to location of landfill facilities

Environmental and social benefit

- Safeguarding the public health

The health risks associated with illegal dumping are significant. Areas used for open dumping may be easily accessible to people, especially children, who are vulnerable to the physical (protruding nails or sharp edges) and chemical (harmful fluids or dust) hazards posed by wastes. Rodents, insects, and other vermin attracted to open dump sites may also pose health risks. Dump sites with scrap tires provide an ideal breeding ground for mosquitoes, which can multiply 100 times faster than normal in the warm stagnant water standing in scrap tire causing several illnesses.

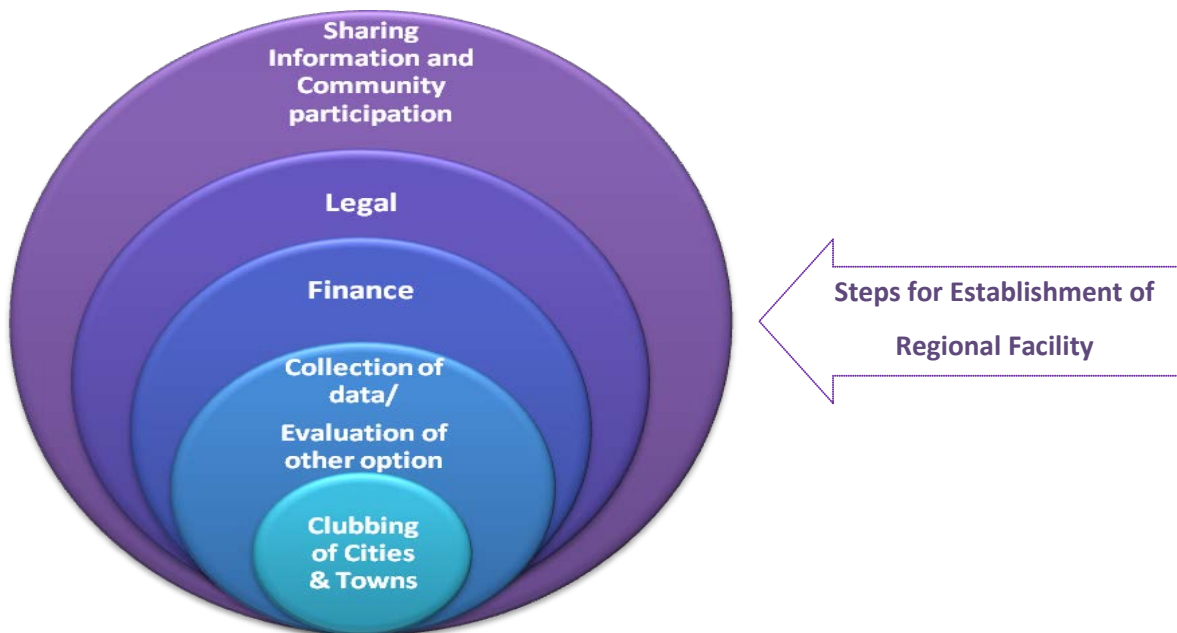
- Reduction in Environmental pollution

Runoff from open dump sites containing chemicals may contaminate wells and surface water used as sources of drinking water which will be reduced in sanitary landfill. Open dumping can also impact proper drainage of runoff, making areas more susceptible to flooding when wastes block ravines, creeks, culverts, and drainage basins.

Reduce the potential pollution contamination of water resources from leachate emissions

Reduce the dust generated from on-site vehicle movements, and placement of waste and materials and reduce emission of greenhouse gases.

Establishment of Regional Facility



Institutional Aspect of a Regional Facility

A regional facility entails some kind planning of a sound Institutional arrangement that enables the coming together of the partnering Municipalities

The participating municipalities should establish a regional management organization. The regional management organization serves two key purposes

- It serves as the formal management structure for regional projects.
- It implements the planned project, providing the necessary authority for financing, operating, and monitoring the SWM activities.
- The different types of regional management structures are currently in used. The type of structure chosen depends on such factors as available financing, applicable laws, and existing government bodies or regional organization.
 - i) Intermunicipal Agreements
 - ii) Authorities, Trusts, and Special Districts
 - iii) Nonprofit Public corporation
 - iv) Regional council

- v) Private sector participation

Attributes of the regional approach

- It is constituted specifically to provide a particular service (namely, solid waste processing and disposal)
- It is governed by a board of directors, a council, authority or some similar executive oversight body, unique to the organization
- It is usually not dependent on taxes for funding, but raises funds through service charges (or tipping fees) paid by its customers—the partnering local bodies.
- It may or may not involve the participation of private sector service provider
- It often requires special legislation and ordinances for its establishment.

Example of Regional Disposal Facility

Regional landfills are being used not only in developed countries such as the United States, the United Kingdom, Germany, Sweden, and Poland, but also in developing countries such as Argentina, Brazil, Mexico, Palestine, and Egypt. In India, the approach is being adopted in the states of Gujarat, West Bengal, and Andhra Pradesh; others, such as Tamil Nadu, Kerala, and Maharashtra are also considering adopting this approach.

National

West Bengal

The Government of West Bengal constituted a Solid Waste Management Mission in the form of a registered society named as West Bengal Solid Waste Management Mission. (WBSWMM) To promote, facilitate and advise on scientifically-sound and technologically proven solid waste management by the municipal bodies

The Asansol urban area, consisting of the Asansol Municipal Corporation (AMC), Durgapur Municipal Corporation (DMC), and the municipalities of Raniganj, Jamuria and Kulti is one of the most rapidly urbanizing centers of West Bengal. Selected as a mission city under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), the issue of managing municipal solid wastes was a prime concern in the area. Under the nodal role of Asansol Durgapur Development

Authority (ADDA) a project was conceived with the help of USFIRD and IDFC to develop a regional engineered land fill facility. Public Private Partnership was formed for implementation of the project.

Maharashtra

Municipal Council of Navghar Manickpur, Vasai, Virar and Nala Sopara come together and constitute a corporation and private service provider was involved on the BOT terms

Gujarat: Regional landfill facility at AUDA

Ahmadabad urban development Authority clubbed together 12 municipalities situated around the city of Ahmadabad, Chandkheda, Kali, Ranip, Chandlodiya, Ghatlodiya, Memnagar, Jodhpur, Vejalpur, Sarkhej, Thaltej, Bodakdev and Vastrapur and created a common regional facility for integrated treatment and disposal of waste.

Kerala: six regional Engineered landfill (ELF) are proposed for the 14 districts and one regional engineered landfill facility has been initiated

International

New Zealand: Canterbury Regional Landfill In the Canterbury region six Councils have come together to develop a modern, high standard waste disposal facility, instead for each local authority working within its own boundaries and formed the joint venture with Private waste companies.

Chile: In the area of Capital (Santiago), 16 municipalities joined to form an informal association for the purpose of waste disposal, and engage a private company to construct and operate one sanitary landfill. All municipalities signed the concession agreement.

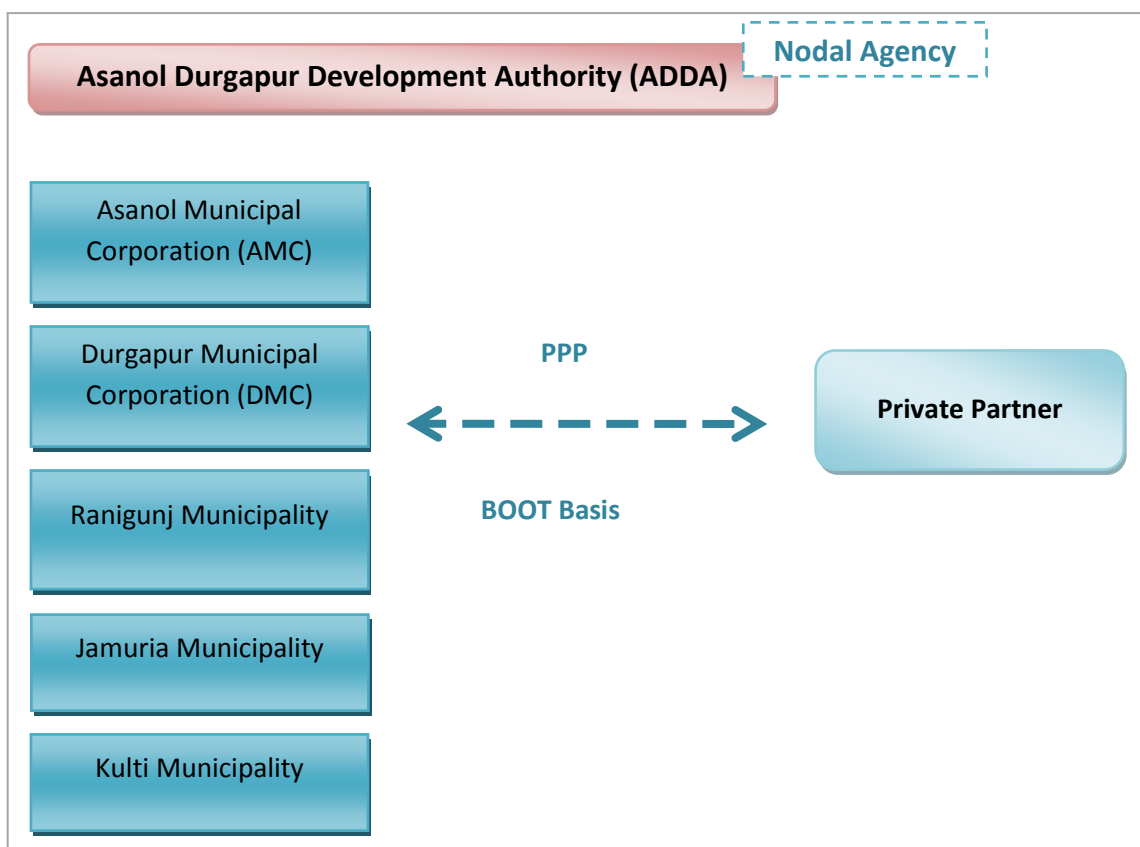
Spokane, United state: The Spokane Regional Solid Waste System (System) was created by Inter-local Agreement between Spokane County and the City of Spokane All the ten existing regional cities and towns, as well as Fairchild Air Force Base, subsequently joined the System by executing inter-local agreements with the City and County of Spokane. The system operates as a department of the City of Spokane's government, and manages solid waste facilities and contracts for the benefit of all citizens residing in Spokane County.

England: Counties (usually incorporating atleast one city, several towns and numerous rural districts) are responsible for arranging and monitoring waste disposal, and invite bids from private companies for waste disposal facilities, several communities may use one landfill and several landfill sites may be used by each of the larger counties waste from one county may be land filled in a neighboring county.

Success Story

ASANSOL West Bengal-India

The Asansol urban area, consisting of the Asansol Municipal Corporation (AMC), Durgapur Municipal Corporation (DMC), and the municipalities of Ranigunj, Jamuria and Kulti is one of the most rapidly urbanizing centres of West Bengal. Selected as a mission city under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), the issue of managing municipal solid wastes was a prime concern in the area. Under the nodal role of Asansol Durgapur Development Authority (ADDA), a project was conceived with the help of USFIRD and IDFC to develop a regional engineered land fill facility. Considering that the waste generated in the region is about 700 tons per day, it was decided that, three processing plants would be set up. The first, at Durgapur, to cater to Durgapur town. The second, at Asansol, to meet the needs of AMC and Kulti, and the third at Mangalpur for Jamuria and Ranigunj. Since a fair amount of land was available with ADDA at Mangalpur, it was decided that the landfill facility would be built here. Adding to this was the fact that the land available was actually an open-cast mine pit, that has been abandoned. Since the land is degraded and cannot be put to any other use due to its depth, it was found suitable to form a land fill. Public Private Partnership model was used to implement this project.



The project has three components.

Collection and transportation of solid waste: 30% of the amount required for this process is being contributed by the ULBs themselves. Various equipment has been bought by the ULBs. These include

bins, tri-cycle vans, dumpers, dumper placers etc. The ULBs have distributed 2 coloured bins to each household.

Processing of solid waste: The ULBs will deposit the MSW collected by them to their designated processing plants. These plants are equipped with technology to segregate waste into dry and wet, as well as bio-degradable and non-bio degradable. The plants would produce compost, fuel blocks, plastic pellets, sand/bricks, which it would market.

Landfill:

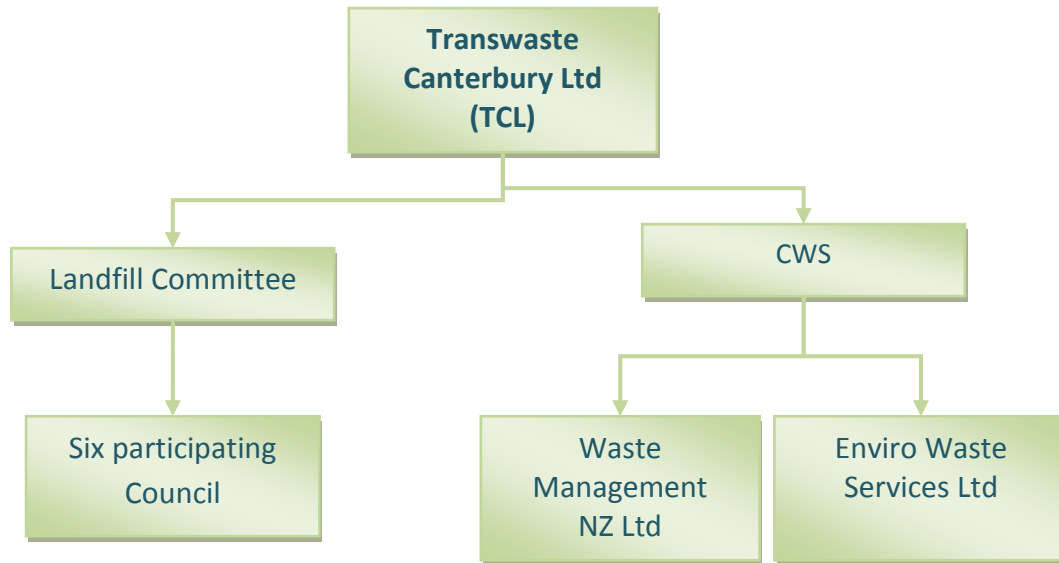
The MSW rules are very specific regarding the structure of the landfill. Any landfill has to be lined with a specified quality of clay, geo textile and HDPE liner. A system of leachate collection has to be in place. Once the landfill is full, an arrangement for capping is to be made. Since the processing is thorough, it is expected that the land fillable waste would produce very little leachate and methane and other gases. Arrangements for disposal of both are being made.

The process of selection of a private partner was on the basis of efficiency of waste processing, scientific management of landfill, and other such parameters. Gujrat Enviro Protection Infrastructure Ltd and Hanjer Biotech Ltd were selected. The bid was at Rs. 85 per ton of Municipal Solid waste provided. The private partner would be responsible for transporting the residual waste to the landfill. It is expected that about 25% of the waste collected would have to be land filled. The MOU has been signed on 23.12.2008 and land handed over to them.

The concession period is for 25 years and the private partner will operate on a Built Own Operate Transfer (BOOT) basis. The ULBs have signed an agreement amongst themselves and with ADDA (nodal Agency) to assure the supply of 350 tons per day of waste to the processing facilities. The Municipal Solid waste management project of AUA is unique in that it is the first engineered landfill facility in the state. The ULBs have also started collecting user charges ranging from Rs 5 to Rs 25 per month per household and from Rs 25 to Rs 50 in commercial areas. Larger units like hotels, shopping complexes etc are being charged up to Rs 4000 a month thus the project is a self-sustaining venture.

The Canterbury Landfill Project New Zealand

Six Councils joined together to develop one modern, high standard waste disposal facility to accommodate most of Canterbury's solid waste. Waste companies were invited to regional waste disposal solution which would meet the Councils' and community's objectives. Two firms Waste Management NZ Ltd and Enviro waste Services Ltd, participated in a joint venture with the Councils. The two companies subsequently agreed between themselves to set up a new joint venture company (Canterbury Waste Services Limited - CWS) to participate in the joint venture with the Councils. The MOU between the new joint venture company, Transwaste Canterbury Ltd (TCL) and the Councils was provided. Also, half of the shares in the company were owned by the six participating local authorities, and half by CWS (Canterbury Waste Services).



TCL has selected, consented, built and now owns the Kate Valley Landfill. It is responsible for the collection and transport of residual waste from all transfer stations that supply waste directly to the landfill. TCL sets the gate charges at the landfill

Each participating Council, as transfer station owners (and any other suppliers of waste to the landfill), must ensure the waste going to landfill meets TCL's waste acceptance criteria, and that waste is loaded in an appropriate way to meet safety and efficiency requirements.

Success of Joint Venture Canterbury Landfill Project:

- A successful joint approach by (originally) six (now five) territorial Councils to establish and operate a major facility for waste disposal for a large part of the Canterbury region, in ways which optimize the achievement of Council and community objectives.
- A successful public – private joint venture which achieves fundamental commercial objectives without compromising Council and community requirements, including fair pricing in a regional monopoly environment.
- A robust process in the establishment of the Kate Valley Landfill which preserves options for increased diversion from landfill, and for an alternative method of waste disposal should one become available which at least equals the Kate Valley facility in both economic and environmental protection terms.
- The establishment of a high quality long term waste disposal facility which meets Council and community expectations and world best practice standards of service and environmental security.
- It is also evident that the financial performance of the company is satisfactory, and that it will earn its required rate of return and provide the desired dividend levels to its shareholders within a reasonable period following commencement.
- The necessary increase in gate charges has been absorbed by the community without any significant protest or effect.

- There have been no significant consent compliance issues, environmental incidents or operational problems.

Challenges of Regionalization

Despite all advantages that regionalization of landfill brings, many challenges need to be addressed. The main challenge occurs when two or more municipalities come together with different goals. Although neighboring municipalities shares many common SWM needs and concern, disparities in population, geography, industrial base, or other characteristic may make it difficult for them to agree on specific regional projects

Municipalities considering regionalization should recognize that costs and benefits of regional projects, although shared, will not necessarily be identical for all communities. Municipal officials might need to consider the trade offs of sharing common facilities.

Transport of waste across jurisdiction could also be a source of conflicts. Regionalization sometimes requires that waste be transported over long distance and through neighboring areas and communities. The road leading to a regional solid waste facility might see an increase in traffic. The source of conflicts is related to the concerns over the resulting congestion, pollution road way wear and tear.

Future Perspective on Regional Approach

- Use of GIS: GIS has the potential to become a useful tool to help identify regional wastes disposal sites.
- Need for scientific and techno commercial assessment of the site specific needs leading to regional facilities creation.
- Small remote area still need to resolve their issues, therefore development of cost effective solutions for small urban/semi urban areas need to be researched.



Dr Amiya Kumar Sahu
President, NSWAI

Member - IISWM 2013
Steering Committee

Dr. Amiya Kumar Sahu ,is the founder and President of National Solid Waste Association of India (NSWAI) (website: www.nswai.com) established in 1996 in Mumbai. He holds a PhD degree from USA in Environmental Sciences and M.E in Solid Waste Management from IHE (Delft), Netherlands. After commencing his career as a Sr. Scientific Officer in Air Pollution Prevention Cell, Mumbai Municipal Corporation between 1976-1983 as In- charge of Air Surveillance Project in the city of Mumbai, he joined Associated Industrial Consultants, Mumbai as Project Engineer till 1985. Dr Sahu was working as Technical Team leader (World Bank) for the Sectoral Studies of Municipal Waste in Bangladesh. And was also consultant to Inter-agency (UNEP, IAEA, WHO) in air pollution projects. He was instrumental to draft MSW Rules, 2000 in India. He even promotes introduction of the subject on solid waste in higher studies and research activities in India and believes in the principle of 3-E that is Ethics-Environment-Economics.