

Sustainable Municipal Solid Waste Management

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Objectives:

1. To understand the concept of sustainable development
2. To study about sustainable municipal solid waste management
3. To gain knowledge about the criteria involved in sustainable municipal solid waste management

1.0 Introduction

According to UNEP, sustainable integrated solid waste management is defined as selection and application of suitable techniques, technologies and management strategies for achieving waste management goals. While framing sustainable waste management strategy, multi aspects such as socio-economic, cultural, legislative, technical, institutional and environmental aspects are considered. Sustainable MSWM (municipal solid waste management) establishes link between the stakeholders involved at each level and different aspects of MSWM strategies. It offers far reaching inter- disciplinary agenda to deal with the problems related to sustainable MSWM, especially in developing countries with poor solid waste management services. The sustainable approach takes into account almost every possible aspect of MSWM such as, generation of waste, its segregation at the source of generation, its collection and transport, recycling and resource recovery, existing waste disposal methods and its up-gradation along with communities' participation.

2.0 Sustainable Municipal Solid Waste Management- Outlook

A viable and organized approach is needed in every element of the sustainable waste management system. For its accomplishment, the technical, legal, managerial, socio- economic and financial outlook is considered. The prominent concerns in each element of the sustainable waste management system are to be identified and considered for the implementation. The most environmental crucial concern arising due to municipal solid waste is the buildup of indiscriminate and uncontrolled waste and its improper handling and disposal. These problems need to be addressed by identifying its causes, which are mentioned below.

- Increased household trash and commercial waste
- Lacking of segregation practice at the source itself
- Lack of collection and transportation facilities for collection of waste and its disposal

- Inefficient and insufficient capacity of the disposal system and unsuitable means employed for the disposal of waste.

The above mentioned problems are widely prevalent in most of the developing countries and hence require remediation and restoration for prevailing sustainability. Disposing the commingled waste without prior segregation and treatment incurs huge expense in terms of loss of resources such as recyclables and reusable, transportation and disposal cost. Also, it creates a great impact on the environment by polluting air, soil and water. The health hazard too impacts the economy in turn. The economic loss will create lack of resources and finance required for the sustainable waste management system and hence the cycle will go on until some major remedial steps are adopted to prevent degradation of the environment and socio-economic condition of the people.

The prime step for the success of integrated sustainable waste management system is problem identification at each level. The analysis should take into account the technological as well as performance aspect along with other features including environmental, social, economic, institutional, legal and political aspects. The important issues to be considered are mentioned below.

- The implementation of the management and its factors such as collection, which covers rate of generation; area cover; facilities and their capacities; transportation which considers type of facilities and capacity, frequency of the trips, distance between transfer stations and their route; and its proper functioning along with processing systems like efficiency of the performance and the capacity are included in the technological and performance aspect

- The important environmental aspects to be considered consist of rate of the collection and disposal of municipal solid waste from the locality; separation of infectious, toxic and hazardous waste from the municipal solid waste stream; frequency and the occurrence of the waste related diseases; guidelines for waste recycling, reduction and reuse; and environmental awareness among the people.

- The financial and economic features consider funding source (taxes, municipal budget, user charges and basis etc.); proficiency in the factors of the budget for overall waste stream; expense recovery through taxes and levy; and general efficiency in the utilization of finance.

- The socio cultural feature considers the concern of the stakeholders involved in the municipal solid waste management, their performance in association with the municipal body; the framework for the participation in different activities at different level including grass root level; and the input by the women and the social organization.

- Institutional aspect considers the sharing of the responsibilities within the framework of the management. The whole waste stream including the involvement of private agencies, NGO, community based organization should be included in the management such that performance related problem if any could be easily sorted out and resolved. Supervision of the waste stream having enough technical expertise which play important role in effective build up of the system.

- Legislative aspects are important for the planning of powers, budgeting and functioning of the system. The legislative framework because of its executive powers can enforce the rules to facilitate the achievement of the laid objectives. In case of any problems arising in policy and legal operation should be sorted out at local level immediately.

3.0 Approaches to sustainable municipal solid waste management

According to the present status of municipal solid waste management, a strategic approach is required in every step of waste management. After taking into account the various factors, two approaches or strategy has been formulated.

3.1 Upstream strategy

This approach considers basic set of rules such as reduction of waste generation, segregation at the point of generation, encourages recycling practice and promotes solid waste composting techniques. The principle of cleaner production adopted under upstream strategy directs the production and supply of environment friendly products and services by the industries and manufacturing units. This will certainly lead to waste reduction at the manufacturing end itself rather than at the end of consumption. Application of cleaner production idea would successfully be able to reduce the waste at the source of production itself (industries and manufacturing units), which happens to be greater contributor of municipal solid waste generation.

3.2 Downstream strategy

This method applies to those countries which critically require an improvement in their existing municipal solid waste management system. Here, the concept of cleaner production recommends segregation of mixed waste before transportation and dumping. The advantages of the segregation process of waste include:

- Reduce the quantity of waste during final disposal.
- Eliminate negative effect on the environment
- Operating cost is minimized
- Land area required for the disposal of waste is ultimately reduced
- Valuables can be recovered from the waste which would result in effective utilization and conservation of the resources.

The major problems arising from open dumping like exudation of landfill gas and leachate generation apart from odour, aesthetic and dust problems need to be emphasized more. The main reasons which give rise to such conditions are identified as uncollected waste and disposal of waste in open dumps which cause immediate human health and environmental hazard. In order to achieve 100% waste collection, it is important to restore the supervisory capability in addition to financial and legal participation along with sufficient technological infrastructure.

4.0 Addressing Existing MSWM Problems

The disposal of municipal solid waste in open dumps in an unscientific way is main problem of solid waste management. The other related problems include poor designing, lacking compaction, top cover and insufficient monitoring systems for the leachate and landfill gas. The sustainable approach in most of the developing countries would be to put down existing

waste management practice and constructing engineered sanitary landfill for effective solid waste disposal. The existing landfill should be upgraded in accordance with the environment standard. Developing landfill bioreactors could enhance the degradation of waste in short time period by improving biological process.

5.0 Critical characteristics for sustainable MSWM

5.1 Management outlook

Management aspect is very important and should go in parallel to the technical planning. Most of the developing countries suffer from lack of work efficiency and constricted resource allotment for technical aspect. This is due to politically induced appointments which lead to non-attendance at work place. The management sector therefore should be strengthened by considering following aspects.

- A viable and implementation plans with the strategy for improving environmental quality for the management of municipal solid waste at regional level would help in proper management.
- The 'Polluter pays principle' should be applied to every waste generator including different government, non- government agencies, commercial and private sectors.
- Environmental management strategy viz. product stewardship, the concept of cleaner production and specifications given to the manufacturers for the packaging materials should be applied in order to reduce waste generation at manufacturer's and consumer's end. It will also help in resource recovery resulting in resource conservation.
- Development of organized information system that can be serviceable, comparable and updated to keep record of solid waste aspect and for the continuous supervision.
- A long term plan for sustainable waste management invariably includes the identification of suitable waste disposal site within each state/ region.
- For the regulation and monitoring of the solid waste management, responsible government agencies should be appointed to supervise the local government as well as private firms.
- Participation of private sectors, NGOs and Community based organizations should be encouraged for providing managerial support.

5.2 Technical outlook

The transfer of technologies to the developing countries from the developed countries requires thorough acclimatization of the technique to the regional and local level. A well planned strategies for the implementation of the sustainable waste management need to be employed on technical aspect. The following aspects need to be stressed.

- There has to be facility of enclosed structures for the primary collection of municipal waste and colour coded bins for storing community waste. The colour coded bins and enclosed structures placed at the kerbside help in easier collection of waste and its transportation to the

disposal site. The number of waste storage facilities and the waste collection vehicles depend on the density of the population residing in particular locality.

- The waste from the community storage units should be transported on regular basis before it overfills. It can be done using compactor trucks to improve the task force. Outdated vehicles should be taken out and people depositing domestic and institutional waste in the collection units should be encouraged.
- There has to be fixed time schedule for the collection of the waste, about which people should be well aware of.
- There should be facility of transfer stations at appropriate distance from the residential area, wherever needed. The cities with the population of more than 500,000 should be equipped with transfer station facility with weighbridges at both processing as well as disposal sites.
- An integrated waste management approach should be adopted by the communities residing adjacent by sharing common facilities such as centralized solid waste treatment system and disposal facilities.
- Research and development should be encouraged to sustain changes in waste generation and management scenario.
- On the basis of the accessibility of land area and funds, the existing dumping sites should be transformed into sanitary landfills. In case it is not economically feasible, the open unsanitary dumpsite should be closed to prevent invasion by the scavengers and open burning. Sanitary landfills should be constructed in an environment friendly manner with the facilities of leachate treatment and landfill gas control system.
- Intrusion and mixing of hospital and industrial waste into the municipal solid waste should be checked in order to avoid infection and health hazard. For the, separate solid waste management system should be constructed for hospitals, health care units and industries.
- Community participation should be encouraged and awareness should be spread in every community through information, education and communication.

5.3 Financial outlook

Mobilization and budgeting of the resources is important for the waste management aspect. The financial aspect governs the technical and management aspect of the sustainable waste management system. Allotment of sufficient budget is imperative for the collection and final disposal of the municipal solid waste. Sometimes in spite of sufficient share of budget allocated for the municipality, the waste processing system suffers due to financial crisis which is because of overstaffing. There has to be fine coordination and transparency among the staff members regarding the finance distribution for waste handling, operation and maintenance cost. Imposing charges for the collection of waste and its disposal should depend upon the rate of waste generation and economic condition of the area.

The private sector should be encouraged to invest for the management of waste while considering the set up of centres for waste recycling. Providing subsidies, soft loans and tax

exemption for equipments, machineries, spare parts etc. will encourage private sectors and organizations.

5.4 Legislative outlook

A well organized framework is required and legislation with effective implementation play major role for sustainability. The following aspects need to be considered.

- A suitable standard for disposal facilities including effluent/ emission standard need to be set up for the discharge of the pollution. These standards may be based on either WHO norms or national pollution control standards.
- All the waste disposal units should be declared as pollution source and should be imposed to strictly maintain their discharge standards in accordance to the established standards.
- Law and regulations should be set up for the mechanisms involving resource recovery, recycling of waste and waste reduction.
- Taxation for solid waste management should be in compliance with the existing situation and higher taxes should be imposed for those good having excessive packaging or those which generate high volume of waste.
- For mass transportation workstations, a suitable solid waste management system should be regulated.
- A well-organized solid waste management regulation including guideline for the implementation of waste collection, its transport and final disposal has been set up but its effective enforcement is absent. So, it is important to regulate different categories of waste such that they do not co mingle and mix with the waste stream of municipal solid waste.
- Every waste processing and disposal facilities with perimeter of at least 500 meters should be marked buffer zone for no development.

5.5 Supportive outlook

The mobilization of the supportive aspect requires working in parallel with technological system, financial resources, management and legislation for sustainable waste management system. The following aspects should be considered.

- The involvement of private agencies should be encouraged for the collection, hauling and disposal of waste. It should be done for short term as well as long term contract as their involvement will increase the efficiency of the system. To fulfill this goal, the contractors should be endowed with concession.
- The concept of sustainable solid waste management should be introduced in the public academic program, workshops, and trainings and in school curriculum.
- Training and education programs should be initiated to foster administrative and technological capacity building at local and regional level.

- The waste assortment, segregation and recycling of the waste should be emphasized at the source of the generation by employing organized and feasible strategy.

The projects related to research and development should be promoted in the academic and research institutions for appropriate sustainable technology to cop up with the bottlenecks of the existing sustainable waste management system.

6.0 Summary

To summarize, in this module we have familiarized about

- The concept of sustainable development in municipal solid waste management
Upstream and downstream approach
- Critical characteristics involved in sustainable municipal solid waste management

you can view video on Sustainable Municipal Solid Waste Management

References

- Municipal solid waste management in Asia, Asian Regional Research Programme on Environmental Technology, 2004

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YOUTUBE- LINK

Topic-Sustainable Municipal Solid Waste Management

<https://www.youtube.com/watch?v=Op0CaL112FQ>