INDEX

'RESEARCH JOURNEY' International Multidisciplinary E- Research Journal | ISSN : 2348-7143
Impact Factor - (SJIF)-6.261(2017), (CIF) -3.452(2015), (GIF) -0.676 (2013) | Vol. 5, Issue 2
UGC Approved Journal- Sr. No. 40705 | April-May-June 2018

Waste Management -A Case Study of Nashik City (Maharashtra)

Chintaman Nigale[1], Dr. Suresh Shelar[2], Sudhakar Borase[3]

1. Dept. of Geography, Arts, Comm. And Sci. college Nandgoan Nashik Maharashtra Email Id- chintamannigale2010@gmail.com Mobile No.09822080859
2. PG Dept. & Research centre of Geography, G.E.T.s' Arts, Comm. & Sci. College, Nagaon, Dhule. Maharashtra Email Id- *dr.skshelar@rediffmail.com* Mob. No. – 9421901826
3. Dept. of Geography, RNC Arts, JDB Comm. & NSC Sci. College Nashik Road, Maharashtra Email Id- borasesudha@gmail.com Mob. No. - 8485896360

Abstract **:**

Hazardous wastes are considered highly toxic and therefore disposal of such wastes needs proper attention so as to reduce possible environmental hazards. Industrial growth has resulted in generation of huge volume of hazardous wastes in the country. Invent oxidation of hazardous wastes generating units in the country is not yet completed. Scientific disposal of hazardous wastes has become a major environmental issue in India. Waste generation is one of the key problems of the modern world due to the vast volumes and variety requiring different management strategies. The desired direction of the waste management is towards sustainable strategies. One should not forget about the waste once it is picked from their home. But should realize the crucial and vital question such as its disposition and management. The waste management implies collection, transport, processing or disposal, managing and monitoring of waste materials. India being the 7th largest country in terms of area and 2nd largest in terms of population and Maharashtra being the 2nd largest state in terms of population in India Nasik city located in the northwest of Maharashtra State in India which has been referred to as the "Wine Capital of India" is located in western Ghats on the western edge of the Deccan Peninsular on the banks of the River Godavari. According to the census of India, 2011, Nasik had a population of 1486973 with a total area of 259 sq.km. This makes it the 4th largest urban area in Maharashtra in terms of Population and the 3rd most industrialized city in Maharashtra after Mumbai and Pune. The Nasik Municipal Corporation is collecting 400-550 Tons MSW per day. According to DPR for SWM, 2012 the average waste generation is only 238 gm/capita per day. This situation is either due to collection inefficiencies or due to high proportion of agriculture/horticulture farming, which helps in utilization of green waste for composting. With better collection and transportation measures, the collection efficiency should increase.

Keywords: Waste materials, SWM, MSW, DPR, Disposal

Introduction:

Every citizen should be made aware of the duty to keep neighborhoods and city clean. Creation of awareness is the first step to bring an attitudinal change among people. Most of the people are ignorant about the various ways in which waste can be stored, transported and safely disposed and also about their ill effects to health and environment. Therefore it is necessary, to create awareness among the people about the entire process of Municipal Solid Waste Management system i.e. from generation to safe disposal. Waste comprises of 3 different categories wet waste (vegetable peels, food waste etc), dry (paper, plastic, metal etc) waste and toxic waste (batteries, CFLs etc). Source segregation of waste into different categories and its effective collection system

80%, and female literacy was 66% The Nashik Urban Agglomeration had a population of 1,152,326 and thus it was the fourth largest urban area of Maharashtra State after Mumbai, Pune and Nagpur.

Database And Research Methodology:

The present work is based on both primary and secondary source of data. To improve the MSWM systems in the cities the following seven directives were given:

1. Prohibit littering on the streets by ensuring storage of waste at source in two bins; one for biodegradable waste and another for recyclable material.
2. Primary collection of (segregated) biodegradable and non-biodegradable waste from the doorstep, (including slums and squatter areas) at pre-informed timings on a day-to-day basis containerized using tri-cycle /hand carts/pick up vans.
3. Street sweeping covering all the residential and commercial areas on all the days of the year irrespective of Sundays and public holidays.
4. Abolition of open waste storage depots and provision of covered containers or closed body waste storage depots.
5. Transportation of waste in covered vehicles on a day to day basis.
6. Treatment of biodegradable waste using composting or waste to energy technologies meeting the standards laid down.

Types of waste:

Agricultural wastewater treatment relates to the treatment of wastewaters produced in the course of agricultural activities. Agriculture is a highly intensified industry in many parts of the world, producing a range of wastewaters requiring a variety of treatment technologies and management practices.

Biodegradable waste is a type of waste which can be broken down, in a reasonable amount of time, into its base compounds by micro-organisms and other living things, regardless of what those compounds may be. Biodegradable waste can be commonly found in municipal solid waste (sometimes called biodegradable municipal waste, or BMW) as green waste, food waste, paper waste, and biodegradable plastics. Other biodegradable wastes include human waste, manure, sewage, and slaughterhouse waste.

Chemical wastes are usually segregated on-site into appropriate waste carboys, and disposed by a specialist contractor in order to meet safety, health, and legislative requirements.

Waste organic solvents are separated into chlorinated and non-chlorinated solvent waste. Chlorinated solvent waste is usually incinerated at high temperature to minimize the formation of dioxins Non-chlorinated solvent waste can be burned for energy recovery. Innocuous aqueous waste (such as solutions of sodium chloride) may be poured down the sink; aqueous waste containing toxic compounds are collected separately. Waste elemental mercury, spent acids and bases may be collected separately for recycling.

Food Waste. The regulations require that main sources of food waste should use a dedicated bin for their food waste and not mix it with other types of waste. They also require that a brown bin collection service is used so that the waste is brought to a composting facility or other approved recycling centre. Alternatively, the food waste can be brought directly to the recycling facility or

is the key to success in MSWM system, and the role of common man as a responsible citizen is very crucial in implementing effective and efficient system.

Objective:

This document describes the current status, relevant planning figures and the future steps for improvement of MSWM in Nashik. It therefore forms a planning document for sustainable Municipal Solid Waste Management in Nashik with special reference to 3R strategy –Reduce, Reuse, Recycle. It also aims at informing the public about current and future services, its environment and health benefits as well as the costs it incurs. This document also describes rules and regulations pertaining to MSW and fines for non compliance. This document is therefore part of NMCs communication strategy for SWM.

Actually the main target groups are General Public, School Children, Corporators & Municipal Corporation Workers

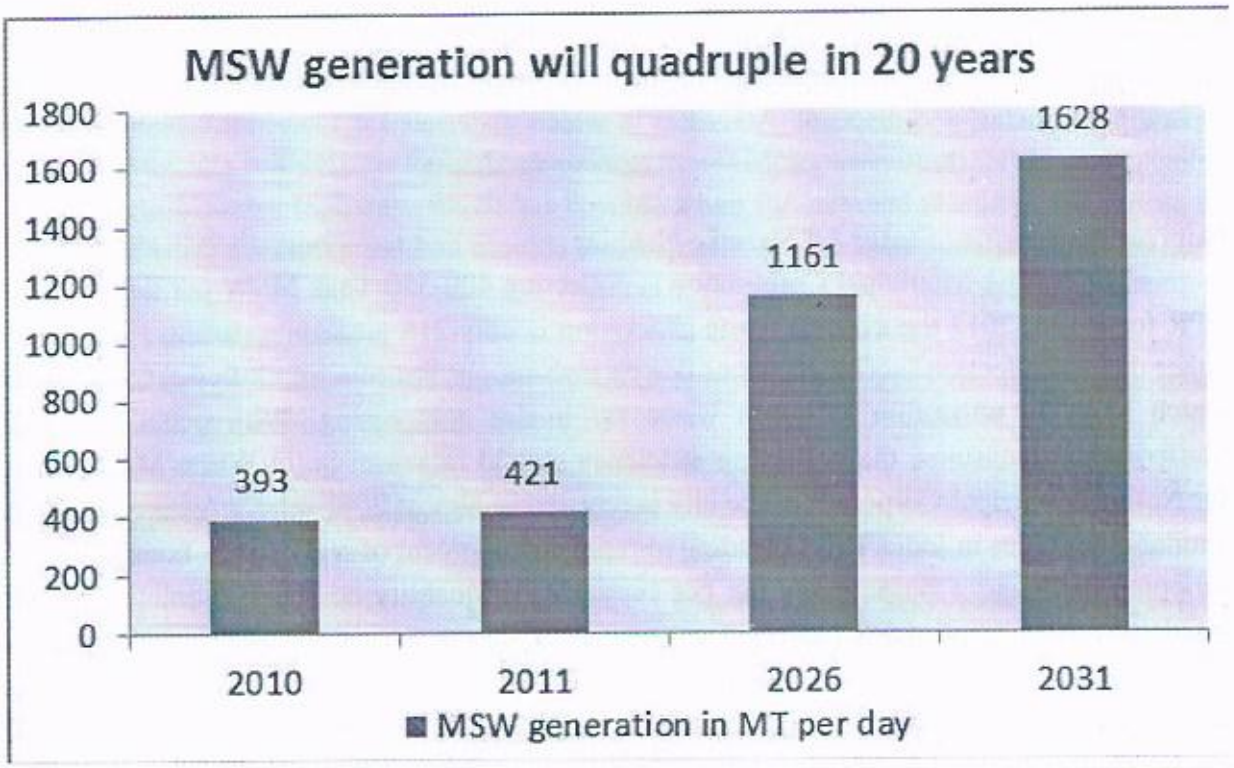
Following aspects:

- Importance of Source Segregation
- Why is it necessary to give the waste to Safai karamacharis?
- Do not Litter: Keep your neighborhood and your city clean
- Health impacts of unhygienic environment
- Solid Waste Management Process- from generation to safe disposal
- Role of Citizen's active participation in improving SWM system
- Fines and Penalties for non- compliance with legal provisions

Study Area:

Nashik is the 4th largest city of Maharashtra and 19th largest city of India. Nashik is the 4th fastest developing city of India and 11th fastest growing city of the world (Ref. TOI Publication Mid 2011). Nashik is the wine capital of India, the best quality of wines is exported all around the world from Nashik. This city is major pilgrimage centre of India. This city has ranked 20th in population. The city has proved to be the best living city in Maharashtra. Nashik is located in the northwest of Maharashtra, 171 km from Mumbai and 210 km from Pune. Nashik is the administrative headquarters of Nashik district and Nashik Division. Nashik, which has been referred to as the "Wine Capital of India", or as India's Napa Valley, is located in the Western Ghats, on the western edge of the Deccan peninsula on the banks of the Godavari. In addition to supplying the name to the famed Nassak Diamond, the city is known for its picturesque surroundings and pleasant climate. Nashik is one of the world's holiest Hindu cities. It is also known as the pilgrimage capital of India. Kumbh Mela is held here once in 12 years along with Ujjain, Allahabad and Haridwar in India. Lord Rama along with Lakshmana and Sita spent 4 months of his exile at Tapovan near Nashik. The city came under the rule of Mughal in 16th century and was renamed Gulshanabad. It is also noted for its participation in freedom struggle. Freedom fighters like Veer Savarkar and Anant Kanhere were born in Nashik. Nashik is located on 20° 0' Northern latitude and 73° 78' East longitude. Nashik is located in northern Maharashtra at 600m (1968 ft) from the mean sea level. The river Godavari originates from Trimbakeshwar (24 km from Nashik) and flows through various parts of the city. The river forms the northern boundary of the city in some areas and then flows through the old residential settlement in the city. According to the Census of India, 2011, Nashik had a population of 14, 86,973. Males constitute 54% of the population and females 46%. Nashik had an average literacy rate of 74%, higher than the national average of 64%; male literacy was

Existing projected waste generation, Nashik, 2010 – 2031



Source: DPR for SWM, 2007

Collection Establishments:

NMC abolished the waste bins system and introduced door to door collection of waste through "ghanta gadis" from 1996 (vehicles with bells). Each of the 108 wards has at least one ghanta gadi, which are covered tipper trolleys. A total of 120 ghanta gadis are on contract, including one driver and two helpers per vehicle. The two helpers in each ghanta gadi receive waste from householders, deposit it in the vehicle, and sort recyclable material which is then disposed off through the recycling chain. However since last year and half the existing no. of ghanta gadis are unable to serve entire city daily, Therefore a particular house in a ward is served every alternate day.

Currently,

NMC collects garbage from households, hotels & restaurants and commercial establishments, with the number of residential households being by far the largest

No. of establishments covered by door to door service

Sr. No.		Total No.
1	Households	297890
2	Hotels and Restaurants	1806
3	Commercial	300
	Total	299996

Source: MNC

Street sweeping:

The Health Department of NMC employs 1993 sweepers to sweep 1869 km of roads each day in two shifts (morning 7 – 10 am and evening 4 – 8 pm). Sweeping includes cleaning of roads,

can be treated by the business themselves by installing a composting unit.

The municipal solid waste industry has four components: recycling, composting, land filling, and waste-to-energy via incineration. The primary steps are generation, collection, sorting and separation, transfer, and disposal. Activities in which materials are identified as no longer being of value and are either thrown out or gathered together for disposal.

Current And Future Status Of Swm In Nashik:

The Nashik Municipal Corporation is collecting 400-550 Tons MSW per day. According to DPR for SWM, 2012 the average waste generation is only 218 gm/capita per day. This situation is either due to collection inefficiencies or due to high proportion of agriculture/horticulture farming, which helps in utilization of green waste for in-situ composting. With better collection and transportation measures, the collection efficiency should increase. Solid Waste Management Plan for Nashik Municipal Corporation The city is registering almost 20% extra growth rate compared to similar other cities in India.This is leading to rapid development of real estates, housing, complexes, shopping malls etc. Consequently the per capita MSW quantity has been estimated to reach 400 gm/day by 2011 as per DPR (2007). The population growth rate of the city during the last decade has been 63.98%. This type of growth rate may be witnessed in the current decade also. Keeping above factors in view the projected quantity of MSW is 750 TPD by the year 2015 and 1628 TPD by the year 2031.

Generation of Municipal Solid Waste (projections):

YEAR	MS MT/day	Quantity MT/Year	Remnants@15% MT for sanitary Land Fill
2006	300	109500	16425
2011	421	153665	23050
2021	827	301855	45278
2031	1628	594220	89133
Total		7520095	1128015

Volume in SLF at compaction density 0.8=140018m

Source: DPR for SWM, 2007

Generation and collection of Solid waste management

Current:

The total quantity of waste generated by 1.375 million populations in 2006 was around 300 metric tons (MT) per day, translating to a per capita waste generation of 218 gms per day, and is estimated to be 421 MT in 2011. 15 Currently, NMC officials estimate that per capita solid waste generation is over 300 gms per day. A detailed analysis of ward-wise generations shows that Wards 1, 57, 59 and 95 have the highest generation of 10 – 15 MT/day, followed by Wards 17, 23, 40, 44, 46, 48, 62, 66, 71, 2, 73, 76 and 78, with 5 – 10 MT/day, while the rest of the 107 wards generate less than 5 MT/day.

Future projections:

Per capita waste generation is projected to reach 400 gms per day by 2031, and the total to rise to 1161 and MT in 2026 and 1628 MT in 2031, at a CAGR of 8.7

road sides, vegetable markets, public places, garden sides and other open spaces of the city. There is also a special NMC unit to sweep and clean river sites alongside the river Godavari and its tributaries.

Plastic processing:

Recyclers sell collected plastics to processors at Malegaon about 120 km away from Nashik on the Agra-Mumbai highway, which has become a hub for recycled plastic in the region. Different types of plastics are converted into moulds and dispatched to users or manufacturing units..

Transport and Processing:

NMC uses full-size and mini-trucks as well as tractor trailers to transport solid waste collected by Ghanta Gadis to the waste disposal sites

Details of Solid Waste Transportation Vehicles

Sr. No.	Types of Vehicles	Total No.	Capacity (T)	Tons/month
1	Lorries/Trucks	4	3	360
2	Mini Lorries/Trucks	3	1	90
3	Tracer Trailers	18	3	1620
4	Tipper Trucks	124	3	10890

Source: NMC

Composition of waste:

The recent analysis of solid waste components collected within NMC area reveals that 37.8% are easily compostable (short-term biodegradable) materials, 19.50% are hard lignitic materials and long term biodegradables while 16.20% are an assortment of textiles, plastic, rubber etc (DPR on SWM, NMC). The last two components having 35.70% content in the MSW have become a major cause of concern these materials are negative contributors to processing plant efficiency and rapidly exhaust the land available for landfills.

Processing:

The Municipal Solid Waste (MSW) facility established at Pathardi about 15 km south of the city towards Mumbai has a variety of processing units to treat different types of MSW.

1. Pre-sorting Unit:

It is electromechanical segregation system for incoming non segregated MSW with the capacity of 500 TPD and it comprises of two lines with all necessary requirements and materials. After mechanical segregation compostable material will go to windrow composting, material with calorific value goes to RDF plant and inert will be further
processed at Inert Processing plant. Solid Waste Management Plan for Nashik Municipal Corporation.

2. Aerobic Composting Unit:

Composting is done through windrow composting method and sheds have been constructed for windrows. Today out of total MSW 3 to 5 % is converted into compost. The compost has already become popular amongst the farmers within 100 km radius of Nashik. By maintaining the

price line of Rs2000/MT Ex-factory level for loose form and Rs. 2450/- for packed form with necessary backup support, entire quantity of compost will be saleable in this belt.

3. Leachate treatment plant:

This facility treats 0.4 MLD of leachate (or 10 TPD of organic wastes) coming out from solid waste dumps and the sanitary landfill site. Proper arrangements for the collection and transportation of leachate have been made. Leachate is primarily generated in monsoon season and during other periods the same plant is utilized to generate bio gas from organic waste. The 40 KW power thus generated is used to operate pumps at the MSWM facility.

4. Refuse Derived Fuel (RDF) Plant:

The high calorific energy containing materials present in MSW are to be handled separately from the stage of receiving at the tipping floor onwards. RDF plant with capacity of 150 TPD is installed for generation of fuel pellets from high calorific value materials. Woody materials, paper products, textiles, jute etc forms the main constituents of RDF which is a valuable source of alternate energy. The technology for RDF primarily focuses on refinement of MSW through material re-combinations, segregation, drying, size reduction, blending and homogenization. This material is further refined for separation of sand, dust, metals, glass etc before grinding or shredding. The shredded material is obtained as fluff which is further processed into pellets, briquettes or bailing. NMC is exploring the possibilities for marketing of fuel pellets and nearby industries have shown their interest for fuel pellets.

5. Animal Carcass Incinerator:

Dead animal carcass incinerator with the capacity of 250Kg per hour is installed for the incineration of dead animals such as dogs, cattle's etc. Solid Waste Management Plan for Nashik Municipal Corporation

6. Sanitary Landfill:

The solid waste that is not suitable for any processing is transported to the sanitary landfill site. For this purpose, a sanitary landfill in an area of 2 hector has been developed. All the necessary aspects of scientific land filling were considered during creation of sanitary landfill. Proper arrangement for leachate is also provided and this is connected to the leachate treatment plant for further processing. Solid Waste Management Plan for Nashik Municipal Corporation

Complaint Redressal System:

NMC has appointed six Divisional Sanitary Inspectors (DSI) and below them there are Sanitary Inspectors (SI). Most of the complaints are addressed by DSI and SI at division level. A 24 hrs toll free numbers 145 is operational for receiving complaints. All the complaints will be addressed within 72 hours. In addition citizens can file their complaints in written either to divisional office or to NMC headquarters. 6. Current Activities to reduce/recycle/reuse/ of MSW Waste Streams in Nashik:

1. **Glass, paper, metal:** A substantial amount is collected by Ghantagadi workers and informal rag pickers and this is further handed over to scrap merchants in the city.

2. Organic Waste: Organic waste is segregated at the processing facility through the mechanical segregation process and it is then converted to compost through aerobic composting. Most of the organic waste is converted in compost and sold to farmers. Waste from permanent and temporary vegetable markets is collected and transported to the composting plant and reused as organic manure.

3. Construction Debris: NMC has identified sites for dumping the construction debris. This

waste stream is currently not entering the MSW stream. The responsibility for disposing the construction debris is with the waste generators and not with the Corporation.

4. Street Sweeping/ Drain Cleaning: This material is collected by the safai karamcharis and transported to the Ghanta Gadis in the respective wards.

Further need for improvement: Source Segregation of Municipal Solid Waste:

Source segregation of waste is a statutory requirement as per the MSW (M&H) Rules, 2000. As mixed wet and dry waste loses value and makes it very difficult to handle the waste or tosegregate it further. There is a thus need to segregate waste at source into wet and dry fractions. Wet can be defined as vegetable peels, food waste, garden waste, etc. Dry can be defined as metal, paper, wood, cloth, etc. Segregated waste is easier to handle by the waste collectors. Treatment of segregated waste is less energy intensive, reduces the burden to the environment, improves quality of compost and increases the production of compost and recyclables.

Other Waste Streams in Nashik:

Hazardous Waste

Hazardous waste is waste that poses substantial or potential threats to public health or the environment and which is ignitable reactive, corrosive and toxic. In the industrial sector, the major generators of hazardous waste are the metal, chemical, paper, pesticide, dye, refining, and rubber goods industries. Household waste that can be categorized as hazardous waste include old batteries, shoe polish, paint tins, old medicines, and medicine bottles.

Bio-medical Waste:

'Bio-medical waste' means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological. It means any solid or liquid waste which may present a threat of infection to humans, including non-liquid tissue, body parts, blood, blood products, and body fluids from humans and other primates; laboratory and veterinary wastes which contain human disease-causing agents; and discarded sharps. This is currently being handled by M/s SMS Water Grace BMW Pvt. Limited in Nashik. However, the nursing homes and dispensaries are still to be addressed for separate handling of bio-medical waste.

Analysis:

Analysis of city waste carried out recently, reveals 37.8% easily compostable (short-term biodegradable) materials, 19.50% hard lignite and long term biodegradables and 16.20% textiles, plastic, rubber etc. These last two components having 35.70% content in the MSW have become a major cause of concern. These materials are a negative contributor to the processing plant efficiency and rapidly exhaust available land for landfilling. Mounting heaps of high volumes of – low density waste is a common scene around each compost plant. This has necessitated re-thinking of the integrated technological approach to solve MSW disposal problem towards a total solution in a sustainable manner. Looking to the recent trend of changing waste characteristics, increasing quantities of combustible materials and infrastructural bottlenecks, it became essential to upgrade overall MSW collection, storage, transportation and processing through integrated technological facility at Khat Prakalp site. This plant came into operation in 2000. However, this plant was small and could not deal with the entire 350 TPD waste reaching the plant and a backlog of 2.50 lakh MT waste was generated, which was piled put in two heaps close to the plant. Under JNNURM, NMC

sought more funds and upgraded the plant to a capacity of 500 to 600 TPD. The plan is that by the time backlog is cleared; fresh arrivals will reach this level of plant capacity.

Nashik is an important part of "Mumbai-Pune-Nashik Gold Triangle" development plan. For this business the city has to gear up for growth, expansion, socio-economical and business developments. Keeping the above facts in view overall integrated solid waste management facility was created .Nashik is the only city in Maharashtra which has taken lead towards scientific management of MSW in abidance of MSW rules 2000. With the upgradation of entire SWM system, this facility could act as a lime-light training and development Centre for the State of Maharashtra.NMC has given contract of collection and transportation of solid waste of the 6 divisions of the city to two contractors. Contract of collection and transportation includes door to door collection of solid waste through Ghanta Gadi and transportation to Municipal Solid Waste Treatment Facility. Solid waste is collected from 2.9 lakh households of 108 wards of the city through 124 Ghanta Gadi's and ownership of the Ghanta Gadi's is with NMC.

Conclsion & Recommendations:

Citizens will need to segregate waste in three forms mainly wet, dry and toxic waste in separate bins in their households. The segregated waste collected thus has to be handed over to the Ghanta Gadi's. Store your waste at your home, if not able to give waste on a particular day. Every citizen should be made aware of the duty to keep neighborhoods and city clean. Creation of awareness is the first step to bring an attitudinal change among people. Most of the people are ignorant about the various ways in which waste can be stored, transported and safely disposed and also about their ill effects to health and environment. Therefore it is necessary, to create awareness among the people about the entire process of Municipal Solid Waste Management system i.e. from generation to safe disposal.Producing waste is a natural consequence of the world we live in. It becomes clear that we need to deal with our waste when you consider the vast quantities that we produce. Thinking about what we throw away every day helps us to understand the relationship between the use by the consumer/producer and the impact waste has on the environment.

There are many facets to the management of waste.

Concepts: An agreed set of models were created to help waste management programmes in different countries.

Hierarchy: This pyramid structure places the different waste disposal options in order of preference.

Disposal: Different types of waste are disposed of in different ways. Landfills and incineration are the two most popular ways to get rid of unwanted products. Increasingly, however, composting and prevention methods, such as designing products with less material in them, are being used.

Recycling: As disposal of waste becomes ever more difficult, recycling is encouraged. Biological reprocessing has also become a popular method of dealing with waste material.

Prevention: Creating less waste is better than having to dispose of it - and cheaper. Using less, throwing away less and being conscious of your environment are the major factors in dealing with waste regulation problems.

Education: One of the ways to make sure that waste is better controlled is to inform people of the choices available to them to dispose of their waste materials.

Government policies: Governments have passed much of the responsibility of dealing with waste management onto local authorities, with National Waste Management Strategies to back them up.

The Ministry of Urban Development, Government of India, is nodal Ministry in charge of various aspects of Urban Development including Municipal Solid Waste Management in the Country and also provides technical and financial assistance to the States.

References & Sources:

1. Commission on Global Governance, 1995: Our Global Neighborhood, Handbook of Solid Waste Management: George Tchobanoglous, Frank Kreith
2. Nashik Municipal Corporation Official Website
3. www.wikipidea.com
4. Improving Municipal Solid Waste Management in India: A Sourcebook for Policy Makers and Practitioners
5. Performance Audit of Management of Waste in India: Report of the Comptroller and Auditor General of India for the year ended March 2007.