International Journal of Humanities and Social Science Research
ISSN: 2455-2070; Impact Factor: RJIF 5.22
www.socialsciencejournal.in
Volume 3; Issue 6; June 2017; Page No. 49-53

A critical analysis of solid waste management in Faridabad city

[1] Kokila Yadav, [2] Dr. ML Bansal
[1] Research Scholar, Department of Geography, Kurukshetra University, Kurukshetra, Haryana, India
[2] Associate Professor, (Civil) Coae & TC cshau-Hisar, Haryana, India

Abstract
Municipal Solid Waste (MSW) is generated in Faridabad city in Haryana, India, due to its rapid economic growth, increasing population and change in living standards of city. This paper analyses critically existing municipal solid waste management in study area. At present, the total solid waste generated in Faridabad Municipality is around 622 tons/day, but the waste collected by the Municipality is about 470 tons/day, which means almost 152 tons/day of the solid waste remains uncollected. Presently, there are three dumping sites which are temporary in nature. Recently, three NGOs named Ramki (NIT), Vishal Protection Force (Old Faridabad) and International Academy (Balllabhgarh) have been awarded the work of door-to-door collection by MCF. After collecting the waste from the houses, these NGOs transfer it to the nearest collecting points. There are at present 342 collection points in the city provided with community bins, open bins, dumper bins, etc. Capacity of Compost Plant situated at Bandhwari village (Gurgaon road) is 1000MTP. It includes 600MTP for Faridabad and 400MTP for Gurgaon. Presently, 20OMTP is used for making compost, fuel pallets and RDF. The wastes are being dumped in the open without any treatment. Salvage of materials with recycling potential and value by rag-pickers takes place primarily at the collection points and partly at the landfill sites. Collection and dumping of domestic and municipal wastes is a serious problem in Faridabad city because of its impact on environment and public health. This leads to the pollution of ground and surface water because of leaching. Polluted water flowing from waste disposal sites caused serious pollution of water supply. The open burning of waste caused air pollution, illness, reduction in visibility and making disposal sites dangerously unstable. The gases produced by burning cause different respiratory diseases. Aerosols and dust spread fungi and pathogens from uncollected and decomposing waste.

Keywords: municipal solid waste (MSW), new industrial township (NIT), national capital region (NCR), tone per day (TPD), municipal solid waste management (MSWM), RDF (refuse derived fuel)

Introduction

The 'Municipal Solid Waste' includes commercial and residential wastes generated in municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes" (MoEF., 2000). Solid waste is a material which can't be used beneficially without its suitable processing. It is an unwanted material left from the different processes and sometimes it may also be in usable form. One of the obvious consequences of rapid urbanization is the growing generation of solid wastes, and many civic authorities face unprecedented problems for their rapid collection and proper disposal. The sudden outburst of population in urban areas, due to shifting from rural area in search of job and modern facilities had resulted in a substantial increase in the generation of solid waste and challenged the old waste management system. Everyone try to dispose of the waste material at the earliest whenever an opportunity is available. This practice usually ends up as illegal dumps on streets, open spaces, water bodies and waste land. Solid wastes management includes all administrative, financial, legal, planning, and engineering functions (Ramachandra and Varghese, 2003) [7]. The management of solid waste is one of the challenges facing most of the urban area in the world (Zerbock and Candidate, 2003) [13].

The quantity and nature of the waste generated vary with the activities and with the level of technological development in a country. "The issue of waste is not only because of the increasing quantities but also largely because of an inadequate management system (Tinmaz and Demir. 2005) [12]. The environmentally sound management of solid wastes issue had received the attention of international and national policy making bodies and citizens (Subramanian, 2005) [11]. The improvement of solid waste management is one of the greatest challenges faced by the Indian Government. The government and the local municipal authorities have taken many initiatives towards the improvement of the current situation (The Expert Committee, 2000). The municipal agencies spend 5-25% of their budget on SWM, which is Rs. 75-250 per capita per year. The waste quantities are estimated to increase from 46 million tons in 2001 to 65 million tons in 2010 (Kumar and Gaikwad, 2004) [3]. NEERI has conducted extensive studies on quantum of waste generation in various cities. Studies have revealed that quantum of waste generation varies between 0.2-0.4 kg/capita/day in the urban centers and it goes up to 0.5 kg/capita/day in metropolitan cities. Poor SWM related problems have resulted in serious environmental and social complications (Moore *et al*., 2003) [5]. The problem of managing solid waste is caused by poor waste collection, storage and disposal leading to subsequent pollution and environmental degradation (Ramachandra and Shruthi, 2007) [10]. Due to lack of building control, formal settlements experience housing extensions which result in the destruction of planning standards (Kassim and Ali, 2006) [2].

Solid waste is mainly generated from the houses, commercial and industrial areas and hospitals etc. Due to rising income and influence of western life style, the consumption of products that have shorter life spans results in higher volumes of plastic, paper, glass, rags, food items, vegetables and parts of dead animals, radio-active materials, broken and unusable plastic goods. Now-a day dumping such a large quantity of solid waste is not possible

because of the very high cost of land which is required for dumping. Moreover, land at the outskirt of the metro cities is required for residential and other purposes. Normal compositing also requires a long time and hence requires a lot of space. Therefore, we need some latest techniques which are faster and can handle easily large amount of solid wastes in an efficient manner. Artificial composting is one of such technique which can be utilized to solve the current problem of solid waste in big cities.

Objectives

This paper aims to critically examine and evaluate existing municipal solid waste management in Faridabad city.

Study Area

Faridabad is identified as one of the Delhi Metropolitan Area (DMA)/ National Capital Region cities and accordingly it has strong linkages with Delhi. NH 2 from Delhi-Mathura passes through the length of the city and is the central axis of the city of Faridabad**.** Faridabad is situated on the Delhi-Mathura NH-2 at a distance of 32 km from Delhi, at 28° 25' 16" N latitude and 77° 18' 28" E longitude. The present geographical area of Faridabad is 207.88 sq. km. The rapid urbanization, increasing commercial and industrial activities and changing life styles in Faridabad are leading to a steady increase in the generation of solid waste. MCF is responsible for the collection, transportation and disposal of all solid waste generated in the city, except the untreated bio-medical waste and hazardous industrial waste, which is taken care of by the respective generators. MCF organizes the collection and transportation of the waste through a team of its own conservancy workers and a fleet of vehicles and dumper-placers. The waste collected is disposed at various dumping yards without any treatment. Population in Faridabad city is estimated to be about 16.62 lakh in 2011. The NCR regional plan for 2021 has projected the population of Faridabad as 25 lakhs. The Faridabad Municipal Corporation consists of Old Faridabad, Ballabgarh and New Industrial Township (NIT) (City Development Plan 2006).

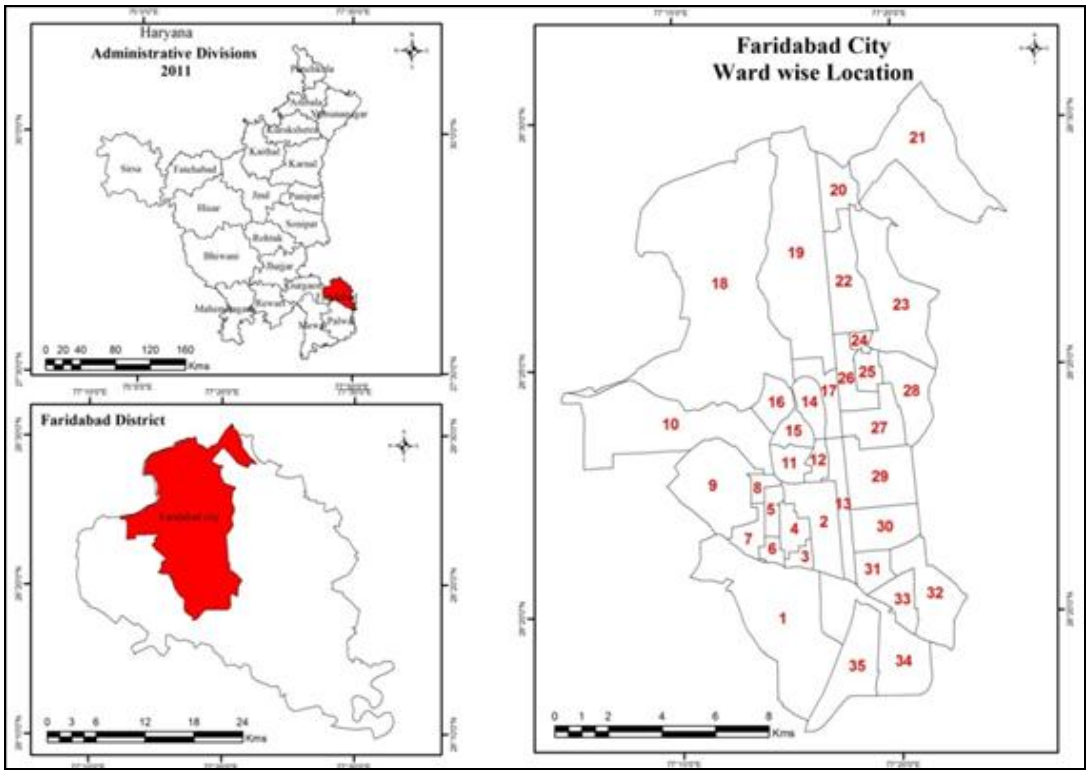

Fig 1: Location map of study area

Solid waste of Faridabad city is increasing rapidly due to industrial growth and location in NCR (National Capital Region). The population, urbanization, higher per capita income, standard of living, and changing lifestyle is also contributing to increased solid waste. Strict rules and regulations related to solid waste disposal may bring good change in solid waste characteristics and its management. Rapid urbanization, increasing commercial and industrial activities and changing life styles in Faridabad are leading to a steady increase in the generation of solid waste. MCF is responsible for the collection, transportation and disposal of all solid waste generated in the city, except the untreated bio-medical waste and hazardous industrial waste, which is taken care of by the respective generators. MCF organizes the collection and transportation of the waste through a team of its own conservancy workers and a fleet of vehicles and dumper-placers. The waste collected is disposed at various dumping yards without any treatment.

Data and Methodology

City population data was collected from the provisional population tables, census of India, 2011. The total municipal solid waste generation and ward wise solid waste was estimated. City Development Plan has provided insight to study solid waste management in Faridabad city. The solid waste management system of the metro cities such as Mumbai, Delhi, Kolkatta and Chennai was also examined. The secondary literature review proved to be an important asset in the absence of access to information available with the Municipal Corporations Faridabad. The major source of information was the City Development Plans (2006-2012) developed for sourcing funds under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) program. Primary survey includes Collection Point Survey, dumping site / Landfill site Survey and transfer station survey for a fair idea of the different types of waste being generated in the city. Municipal solid waste samples were carried out in

June and September, 2011 a period covering pre and post-monsoon. Separate two sets of samples were collected from 18 selected sites for characterization of municipal solid waste.

Result and Discussion

Table No. 1 shows that Mumbai has the highest proportion of waste generation of 5335 ton per day with 0.436 per capita (kg/ day), followed by Delhi (4000 ton per day with 0.475 per capita (kg/ day), Kolkata (3692 ton per day with 0.347 per capita (kg/ day), Chennai (3124 ton per day with 0.657 per capita (kg/ day), and Bangalore (2000 TPD with 0.484 per capita (kg/ day). On the other hand, Coimbatore has the least share of generation of municipal waste (250 ton per day with 0.429 per capita (kg/ day), followed by Visakhapatnam (300 ton per day with 0.399 per capita (kg/ day), Patna ((330 ton per day with 0.360 per capita (kg/ day), Cochin (347 ton per day with 0.518 per capita (kg/ day, Indore (350 ton per day with 0.320 per capita (kg/ day, Madurai (370 ton per day with 0.393 per capita (kg/ day), Varodara and Ludhiana (400 ton per day with 0.388/0.384 per capita (kg/ day), and Varanasi (412 ton per day with 0.400 per capita (kg/ day). Likewise, there is a wide variation in the generation of municipal waste. Chennai has highest per capita solid waste generation 0.657 (kg/ day).

Table 1: Status of Municipal Solid Waste Generation in Some Metro Cities

Sr. No.	Metro City	Population in the Municipal Corporation	Municipal Solid Waste Generation (tons / day)	Per Capita Solid Waste Generation (kg/ day)
1.	Mumbai	12288519	5355	0.436
2.	Delhi	8419084	4000	0.475
3.	Kolkata	10643211	3692	0.347
4.	Chennai	4572976	3124	0.657
5.	Bangalore	4130288	2000	0.484
6.	Ahmadabad	2876710	1683	0.585
7.	Hyderabad	4098734	1566	0.382
8.	Kanpur	1874409	1200	0.640
9.	Lucknow	1619115	1010	0.624
10.	Surat	1498817	900	0.600
11.	Pune	2244196	700	0.312
12.	Jaipur	1458483	580	0.398
13.	Bhopal	1062771	546	0.514
14.	Nagpur	1624752	443	0.273
15.	Varanasi	1030853	412	0.400
16.	Ludhiana	1042740	400	0.384
17.	Varodara	1031346	400	0.388
18.	Madurai	940989	370	0.393
19.	Indore	1091674	350	0.320
20.	Cochin	670009	347	0.518
21.	Patna	917243	330	0.360
22.	Visakhapatnam	752037	300	0.399
23.	Coimbatore	816321	250	0.429
	Total /Average	66885287	30058	0.449

***Source*:** CPCB, 2000, Status of Solid Waste Management in Metro Cities.

Table 2 shows that in Faridabad, total solid waste generated was 82 MT per day with per capita generation about 250 grams per capita per day in 1981. Presently, total quantity of solid waste generated is 622 MT per day with per capita generation about 400 grams per capita per day. There is wide variation in the quantity of generation. The quantity of waste generation increased with the population growth. There is positive relationship between population and solid waste generation. Recently, MCF has engaged three NGOs namely Ramki (NIT), Vishal Protection Force (Old Faridabad) and International Academy (Balllabhgarh) for door-to-door collection and transfer it to nearest collecting points.

Table 2: Population and Solid Waste Generation

Sr. No.	Year	Population in Lacs	Population In Lacs (including 10% floating population)	Per Capita Waste Generated (g/day)	MSW Quantity Generation MT/day	MSW Quantity Generation (including 10% floating population) MT/day	MSW Quantity Generation MT/Year	MSW Quantity Generation (including 10% floating population) MT/Year
1.	1981	3.30	3.63	250	82	90	30112	32940
2.	1991	6.25	6.87	250	156	171	57031	62586
3.	2001	10.54	11.60	400	422	464	154452	169824
4.	2011	14.14	15.55	400	565	622	206790	248800

Municipal solid waste generation MTP was calculated with the help of following formula:-

Population × Per Capita Waste Generated (g/day) = MSW Quantity generation MT/day,

For Example: 15.55 Lacs × 400 (g/day) = 622.0 MT/day

There were 342 collection points in the city provided with community bins, open bins, dumper bins and the like. In all, 180 dustbins of MCF were located at specific collection points. For the purposes of primary collection, MCF has equipped its staff with 810 wheel barrows and 80 handcarts. The average spacing between the dustbins against the available road length is 1867 meters and the average area coverage per collection point is 0.40sq.km. The total staff of the conservancy department of MCF was 1212 against a sanctioned 1415 members. However, MCF has employed 750 conservancy workers on a daily wages basis. Thus on

an average each conservancy worker is responsible for sweeping 621 meters of road length. Waste transportation and disposal was carried out on all days. Waste collected from various locations in the city was transported either to the transfer station or directly to the dumping yard. MCF uses its own conservancy vehicles. There was two JCBs of 3 Metric Tons (MT) capacity each to assist in secondary collection activities. The JCBs was reported to be making at least five trips per vehicle per day **(**City Development Plan, Municipal Corporation of Faridabad, 2002-2012).

Table 3 shows that 58 percent residential area waste, 11 percent commercial establishment waste, 8 percent vegetable and fish market waste, 6.50 percent garden and public places waste, 2.50 percent institutional waste and 14 percent street sweeping waste substance are present in MSW in Faridabad city. Residential waste generation quantity is unusually higher (58 percent) in Faridabad city.

Table 4 shows the characterization of MSW of MCF that includes 9.53 percent paper material, 16.53 percent of plastic, small quantities of metal (.46%) and glass (1.30%) and dust/ash and soil (33.65 percent). Organic matter consists of 46.78 percent and is the largest constituent.

Table 3: Source Wise Waste Generation in Faridabad City

Sr. No.	Sources	Percent	Quantity MT
1.	Residential area	58.00	360.76
2.	Commercial establishments	11.00	68.42
3.	Vegetable and Fish markets	8.00	49.76
4.	Gardens and Public places	6.50	40.43
5.	Institutional areas	2.50	15.55
6.	Street Sweeping	14.00	87.08
	Total	100.00	622.00

***Source*:** Solid Waste Management Work- Municipal Corporation Faridabad, 2010

Table 4: Average Composition of Waste in Faridabad City, 2011

Sr. No.	Major Component	Unit	Obtained value in sample (Percentage on wet weight basis)	
			Range	Average Value
1.	Paper	%	2.03 –20.36	9.53
2.	Plastic	%	4.63 – 25.65	16.53
3.	Metal	%	ND – 3.80	0.46
4.	Glass	%	ND – 3.86	1.30
5.	Organic/Biodegrad-able Waste	%	31.30 – 71.96	46.78
6.	Dust/ Ash and Soil	%	8.32 – 40.02	25.63

***Source*:** Field Sample Survey, 2011.

Sweeping of the roads and streets carried out daily by *Safai Karamcharies* in all MCF authorized area. Waste collected by sweeping and designated surface drains (up to 2 ft.) width is lifted and transported daily at designated dumping sites. The garbage transported to dumping sites is leveled by JCB machine and disinfectants are sprayed on it daily by sanitation department and covered by fresh earth by engineering department.

Table 5: List of Equipment and Vehicle in Faridabad City

Sr. No.	Particulars	Number/ Qty
1.	240 Ltr LLDPE Bins	500
2.	Littre Bin – 60 Ltr capacity with MS Frame	600
3.	4.5 Cum capacity M.s. Container	70
4.	1100 Ltr capacity Moble Bin	500
5.	Tri – cycle Rickshaw with 6 nos LLDPE Bin	1164
6.	140 Ltr capacity wheal Barrous	574
7.	3000 Ltr capacity water tanker with pressure jetting system	3
8.	Tripper Truck 6 cum capacity	5
9.	Refuse Collector Truck	16
10.	Dumper Placer Truck	18
11.	Haulage Truck of 16 cum capacity	9
12.	Animal Catcher Van	3
13.	JCB 3DX Exvator - Loader	7
14.	JCB 430Z Articulated front and Loader	2

***Source*:** Solid Waste Management Work- Municipal Corporation Faridabad, 2010

Table 6: Roads, Drains and Collection Points of Garbage in Faridabad City

Sr. No.	Roads, Drains and Collection Points	
1.	Total length of roads and streets	1156 Kilometers
2.	Total length of drains	907.84 Kilometers
3.	Total number of collection Points	342

***Source*:** Sanitation Department, Municipal Corporation Faridabad, 20

As per existing road length, drains and 342 collections points of garbage which are situated in existing regular areas of municipal corporation, Faridabad the requirement of sanitation staff as per norm and report of XEN. JNNURM shows that MCF is grossly under staffed (Table7).

Table 7: Sanitation Staff Position of Municipal Corporation Faridabad

Sr. No.	Name of the Post	Sanction in Budget	Existing	Vacant	Requirement of Sanitation Staff as per norm and report of XEN. JNNURM
1.	Medical Officer of Health	1	1	-	-
2.	Senior Sanitary Inspector	7	4 +1 =5	3	15
3.	Sanitary Inspector	5	3	2	30
4.	Asst. Sanitary inspector	25	20	5	60
5.	Safai Daroga	62	50	12	120
6.	Safai Karamcharies	1316	1069 + 570 (Daily Wages) = 1639	247	4571

***Source*:** Sanitation Department, Municipal Corporation Faridabad, 2010

Waste disposal is the most important aspect of solid waste management. Table shows that only land dumping was used for disposal of municipal waste in 1971. There was no other technique for waste disposal. Afterward in 1991 about 90 percent of the municipal solid waste was disposed in low lying area outside the cities which had no provision of leachate, collection and treatment. Approximately 9 percent municipal solid waste was used for composting (Table 8).

Table 8: Waste Disposal Trends in India

Sr. No.	Waste Disposal Method	1971 (40cities)	1991 (23 cities)
1.	Land Dumping	Almost all	89.8%
2.	Composting	-	8.6%
3.	Others (Pelletisation, Vermi - composting	-	1.6%

***Source*:** CPCB, 1999

At present, different type of solid waste require advance techniques and equipments related with collection, storage and disposal. Earlier, there were no use of modern technique and equipments for collection, storage and disposal. This led to serious problems for management of MSW in Faridabad city. Proper management of solid waste is necessary for any city, for that, advance technology and equipments should invent and use. In the recent time, land is not available for dumping of solid waste. Cost of land increased day by day. Hence selection of suitable land becomes a challenge for the urban local bodies. There were five dumping sites in the city in 2001 out of which only three are in operation presently. Nangla enclave and Bhakri village sites are not in operation now. Following are the dumping sites of MCF;

- Kheri Road Basalwa dairy site, Old Faridabad
- BLB near Ucchagaon
- Near Badarpur Border behind Samshan Ghat
- Nagla Enclave, NIT
- Revenue estate near Bhakari village

Compost plant is situated at Bandhwari village (Gurgaon road). Capacity of compost plant is 1000MTP. It includes 600MTP for Faridabad and 400MTP for Gurgaon. However, only 20OMTP municipal solid waste is used for making compost; fuel pallets and RDF (refuse derived fuel) at present. It will be sufficient for next thirty years for Faridabad and Gurgaon. About two-thirds (470TPD) of the total solid waste of 622 TDP generated in MCF is reported to be collected out of which 270 TPD is transported to landfill sites and 200 TPD for composting. Rest of the 152 TPD remains uncollected which also reflect the very serious problem of solid waste management of Faridabad city.

Conclusion

There are many problem related with solid waste management. Individual house problem is that if both husband and wife are working and children are schools going, they have to keep their waste basket in the open courtyard for collection by collector (cart person) to avoid smell nuisance in the kitchen and house. It is observed that the stray monkey, dogs and other stray animals heave waste basket before it is collected by the cart man. Secondly, if the individual household put the waste in community dustbin then cows, dogs and pigs (stray animals) litter the solid waste on the road and around the community dustbin causing foul smell and unhygienic problem. Therefore, quick and proper solid waste management facility is essential.

Municipal solid waste is being dumped in the open without any proper treatment. Presently, there is no organized door-to-door collection system. Salvage of materials with recycling potential and value by rag-pickers takes place primarily at the collection points and partly at the landfill sites. The city has failed to handle MSW in a scientific and systematic way.

There are mostly four types of solid waste i.e. biodegradable, non- biodegradable, Repair and construction materials and useless material. Biodegradable waste should be used for making compost and other products which are useful and fortunately MCF is about 200 TPD for composting. Construction waste should be used for lean concrete and land filling in low lying area. Recyclable material should be recycled in a proper manner so that they become more usefully. Left out material should be allowed incineration. Rag pickers should be banned and the segregation must be done by the MCF in order to increase the income from the recyclable waste. Separation and shredding of solid waste should be done carefully preferably at the primary source.

References

1. Government of India Manual on Municipal Solid Waste Management, the Ministry of Urban Development. 2000; 1(2):789.
2. Kassim SM, Mansoor A. Solid Waste Collection by the Private Sector: Households' Perspective — Findings from a Study in Dar e Salaam City, Tanzania, Habitat International. 2006; 30(4):769-780.
3. Kumar S, Gaikwad SA, Shekdar AV, Kshirsagar PS, Singh RN. Estimation Method for National Methane Emission from Solid Waste Landfills, Atmospheric Environment. 2004; 38:3481-3487.
4. Ministry of Environment and Forest Notification on Municipal Solid Waste (Management and Handling) Rules, India, 2000, 3.
5. Moore MP. Gould, Keary BS. Global Urbanization and Impact on Health, International Journal of Hygiene and Environmental Health. 2003; 206(4-5):269-278.
6. Municipal Corporation of Faridabad, Jawaharlal Nehru National Urban Renewal Mission, City Development Plan, 2006-2012, 58-62.
7. NEERI Strategy Paper on Solid Waste Management in India, 1996, 1-7.
8. Ramachandra TV. Management of Municipal Solid Waste, TERI Press, The Energy and Resource Institute, Darbari Seth Block, IHC Complex, Lodhi Road, New Delhi, 2006, 16-18.
9. Ramachandra TV, Varghese SK. Exploring possibilities of achieving sustainability in solid waste management, Indian Journal of Environmental Health. 2003; 45(4):255-264.
10. Ramachandra TV, Shruthi B. Environmental Audit of Municipal Solid Waste Management. International Journal of Environmental Technology and Management. 2007; 7(4):369-391.
11. Subramanian K. Solid Waste Management Issues in Indian cities, The Hindu, 23rd February, Chennai. 2005.
12. Tinmaz E, Demir I. Research on Solid Waste Management Systems to Improve Existing Situation in Corlu Town of Turkey, Science Direct, 2005.
13. Zerbock O, Candidate MS. Urban solid waste management waste reductions in developing nations' school of forest resources an environment science, Master's International Program, Michigan Technological University, Working, 2003.