

**BRIEF COMMUNICATION****ASSESSMENT OF THE LANDFILL SITUATION OF ADDIS ABABA CITY ADMINISTRATION****Yohannis Fitaw\*, MD, MPH, Berhanu Zenebre\*, BA, MPH****ABSTRACT**

*The management of waste in cities has become an increasingly difficult task for municipalities to keep and maintain the cleanliness of the environment. The management of solid waste in the urban areas is becoming even more difficult as the population and city size increases with time. The objective of this study was to assess the Addis Ababa City landfill system with respect to the standard requirement for a landfill.*

*This qualitative study was conducted during March 2001 at the Addis Ababa landfill site found at the southwestern end of Addis Ababa commonly called 'Repi'. The methods employed were comparing the site with a standard checklist, observation of the landfill site and in-depth interview with concerned bodies and review of available records. The survey showed that the landfill system of the Addis Ababa City does not have earthen layering after daily operations, ground water monitoring, and leach out collection and treatment facilities. The site was very unsightly, odorous, accessed by human and animal scavengers. There were residential houses very near to the site. The existing situation favors the adverse health effects of the site on the near by dwellers and dwellers of Addis Ababa at large and the environmental pollution of the city. In conclusion, the existing landfill of Addis Ababa city lacked most of the standard requirement of a landfill. Proper landfill management should be initiated. [Ethiop J Health Sci 2003; 13(2):125-130]*

**INTRODUCTION**

Health is a function of various factors one of which is environmental and personal hygiene (1). In developing countries, there is lack of safe and adequate facilities for disposal of waste and control of vectors (2).

There is a need for improvement in the existing human environment and provision of better working condition to secure the human health and well-being (3).

\*Department of Community Health, Gondar College of Medical Sciences, P.O. Box 196, Gondar, Ethiopia

It is estimated that the potential health gain from the efforts to tackle environment total to nearly 80 million Disability Adjusted Life Years (DALYs) a year in developing countries (4). Some counties have National Waste Strategy that ensures waste which is recovered or disposed without endangering human health and without using process or method, which could harm the environment (5).

One of the key challenges in environmental health is disposal of solid waste. The management of solid waste in cities has become an increasingly difficult task for municipalities to keep and maintain the cleanliness of the city environment (6). The disposal of solid refuse arising from domestic activities is a universal problem where many countries meet difficulty in dealing with the waste (7). Solid wastes come in a variety of types and classes (8). There are different methods of disposing solid waste like open dump, hog feeding, incineration, grinding, compaction, reduction, and composting and sanitary landfill (6).

Sanitary landfills require a land depression or excavated trench in to which garbage and refuse is dumped and then cover with soil. This method serves to reclaim wastelands is one of the commonly acceptable refuse disposal and treatment methods (9,10). Sanitary landfill is a controlled method of refuse disposal in which refuse is dumped in accordance with a preconceived plan, compacted and covered during and at the end of each day (6).

One of the important considerations in site selection is accessibility. A disposal area should be located near major highways in order to facilitate use of the existing roads and lessen the hauling time to the site. The direction of operation of sanitary landfill should be with the prevailing wind to avoid blowing of litters towards resident area (11).

Inefficient urban waste disposal can give rise to breeding places for flies, mosquitoes

and rodents with an increased risk of epidemic of diseases. Unsightliness and bad odour due to mainly hydrogen sulphide, one of the by-product gases, are commonly encountered. The other problem is human and animal scavenging (12,13).

Other potential harmful effect of a mal-designed and inadequately cared landfill is its contribution to air pollution. The cause of the air pollution could be the smokes resulting from hot ashes disposed in the area or intentional fire released on the waste by scavengers. The other contributors to the pollution are hydrogen sulphide and methane, commonly called marsh gases, which are generated from the decomposition in landfills (6).

Uncontrolled methane emission from the landfill sites besides its contribution in air pollution, is also incriminated as one of the green house gases which has role in global warming. The methane gas, produced when anaerobic methane producing bacteria are active, can be harvested and can be used as source of energy. This condition may be reached in 6 months to 5 years depending on the landfill. Methane gas monitoring and control must be included in the planning, design & operation of a sanitary landfill (6).

Land area for sanitary landfill should provide for 20-40 years period. Since the population in an area will not usually remain constant, it is essential that population projections and development be taken in to account (9). In order to attain proper site development and ensure proper utilization of the land area, it is necessary to have sufficient proper equipment and well-trained personnel at all time at the sites. Records should be kept including type and amount of solid waste. At least annually, the evaluation should be made of the weights of refuse received and volume of refuse in place as a check on compaction and rate at which the site is being used (6). Specific standards should be in place to follow when closing the landfill and setting up a program of

monitoring and maintenance during the post closure period (14). Improperly planned and maintained landfill sites are potential source of epidemics and environmental pollution. The objective of this survey was to assess the Addis Ababa landfill system with respect to the standard requirement for a landfill.

## MATERIALS AND METHODS

This qualitative study was conducted in March 2001 at the Addis Ababa landfill site found at 'Repi' in the Southwestern end of the city. Data was collected by the investigators of the study. The principal method employed is comparing the site against a standard checklist for a landfill site. In-depth interview with solid waste management team leader of the Addis Ababa City Administration Health bureau Environmental Health Department, the supervisor of the landfill, staffs who work in the landfill using semi-structured questionnaire was done. Available records were reviewed.

## RESULTS

The Addis Ababa solid waste disposal site is located in the outskirts of the city along the Jimma road at a place called "Repi". The place has been in use since 1964. The landfill area has access to the main road. The road taking from the main highway to the landfill site is an all weather road and it is about 2.5 kilometers from the main roads. The waste collecting trucks can easily access the landfill site.

The total area of the landfill is 10 hectares although it was legally considered to be 25 hectares. At the start of the landfill, the area was considered to be reasonably farther from residential area. But in recent years people began to dwell in near by areas. Residential houses are built within a distance of 50 meters from the landfill site. The area

is freely and easily accessed by human and animal scavengers for there is no fence, which can possibly limit access to the landfill. Because of the access by human scavengers especially during operation of the equipment's, accidents are evident.

Solid wastes are collected from all over the city by 86 waste collecting trucks. A total of about 112 loads of solid wastes are received each day. After the waste has been dumped, two dozers do spreading of waste. After the waste is spread by the dozers, there is compaction, excavation and damping processes. At the end of each working day, soil layering is not applied.

The wastes that are received to the landfill sites are not separated on the basis of their biodegradability. There is no means of controlling disposal of hazardous waste. As the area is freely accessed, illegal dumping is common. For dead animals received at the site, there is no incineration.

Smoke was observed in different sites on the landfill area. The human scavengers are seen igniting fire on the wastes. These human scavengers select edible items and reusable materials and take it back to the town. Most of the human scavengers make their living on scavenging and selling the materials retrieved from the disposal area.

The landfill area has bad odour and flies are commonly seen, rodents and other vectors are found on the site. Animal scavengers seen in the area are dogs, donkeys, and birds like raven. The human and animal scavengers are seen eating disposed foods.

The landfill has no leach away of collection and treatment facilities. Currently there is no underground water monitoring system being employed and it is not possible to judge the extent of ground water contamination.

The methane gas that is emitted from the landfill site was not controlled. From the 10 years survey done from 1988-98 to see the methane emission from the Addis Ababa

landfill site, it was found to be 53.43 GgCH<sub>4</sub>. The year-to-year methane emissions showed some variations. This yearly variation of methane emissions was shown to relate with the variation of the amount of municipal solid wastes. The Addis Ababa City landfills methane emission accounts for about 18.0 % of the total country emissions per year (15).

Blowing litters especially plastics are observed in the area. The blowing litters easily access the near by houses. The area is a very potential site for fire hazard but there

is not fire protection and control mechanism in use currently. The operators while in operation have uniforms and gloves but they do not have facemasks or goggles. The interviewed operators complained that because of incomplete protection, they usually contaminate them selves with blood soaked wastes. The site is daily supervised by the sanitarian placed as a responsible authority over the landfill area by the Addis Ababa City Administration Health Bureau.

Table 1. Net Annual Methane Emitted from Landfill For Addis Ababa City, for each year 1989-1998

| YEAR | A   | B                                       | C                                 | D                                     | E                                   | F                                    |
|------|---|---|-----------------------------------|---------------------------------------|-------------------------------------|--------------------------------------|
|      | Released (Country specified) Methane Generation Rate Per Unit | Gross Annual Methane Generation (GgCh4) | Released Methane Per Year (GgCh4) | Net Annual Methane Generation (GgCh4) | One Minus Methane Oxidation (GgCh4) | Net Annual Methane Emissions (GgCh4) |
|      |   |   |                                   | D=(BxC)                               | 1-0                                 | F= (DxE)                             |
| 1989 | 0.6   | 5.38                                    | 0                                 | 5.38                                  | 1                                   | 5.38                                 |
| 1990 | 0.6   | 5.37                                    | 0                                 | 5.37                                  | 1                                   | 5.37                                 |
| 1991 | 0.6   | 4.00                                    | 0                                 | 4.00                                  | 1                                   | 4.00                                 |
| 1992 | 0.6   | 3.84                                    | 0                                 | 3.84                                  | 1                                   | 3.84                                 |
| 1993 | 0.6   | 4.26                                    | 0                                 | 4.26                                  | 1                                   | 4.26                                 |
| 1994 | 0.6   | 4.65                                    | 0                                 | 4.65                                  | 1                                   | 4.65                                 |
| 1995 | 0.6   | 4.41                                    | 0                                 | 4.41                                  | 1                                   | 4.41                                 |
| 1996 | 0.6   | 6.27                                    | 0                                 | 6.27                                  | 1                                   | 6.27                                 |
| 1997 | 0.6   | 6.02                                    | 0                                 | 6.02                                  | 1                                   | 6.02                                 |
| 1998 | 0.6   | 7.23                                    | 0                                 | 7.23                                  | 1                                   | 7.23                                 |
|      |   |   |                                   |                                       | Total                               | 53.43                                |

**Source:** Addis Ababa City Administration Health Bureau, Environmental Health Department.

## DISCUSSION

There are minimum standard performance requirement any landfill is expected to fulfil. The currently operating landfill system of Addis Ababa lacks many of these basic requirements. The landfill site is located near residential places. Initially when the site was established, it was reasonably farther from dwelling areas. For unclear reason residential houses are built near the site. Blowing litters and dirt (dust) are easily carried away to the near by residential houses. This will directly affects the health of the near by dwellers by causing upper and lower respiratory tract infections and allergic diseases. The bad odour of the area also affects the near by dwellers with adverse health effects and poor aesthetic value (12).

One of the requirements for the landfills is its accessibility to the main road (11). The waste collecting cars can easily access the site. Since the road is all weather road, it can serve in the dry and rainy season without hampering the activity of the landfill. As human and animal scavengers freely access the landfill, it has a direct health impact. The scavengers eat disposed food, which can possibly be contaminated and rotten. The scavenging animals are possible sources of infections to human (13). Restricting access of the landfill must be initiated as public health measure and also to prevent illegal dumping.

Residential areas are located away from the direction of wind blow. Due to the nearness of the residential area, the blowing litters can affect them. Further building of residential house should be restricted and those houses, which are located very near to the landfill, should be given place elsewhere.

The other defective area of the landfill is with respect to cover material. Daily operations must include covering disposed solid waste with at least 15 cms of earthen material at the end of each operating day using techniques appropriate for the control

vectors, flies, odours, blowing litters and scavenging (7). The breeding of vectors like flies, vermin and rodents have direct bearing of disease causing organisms, as they are potential transmitters of diseases. The scavenging animals can also be involved in the transmission of diseases to human (12).

As hot ashes and combustible materials get disposed at site, this can start fire. Fire preventing and controlling mechanisms need to be built. The fire that could arise at any time in the landfill site can easily spread to near by residential houses. Such accidents can claim the lives of many people and could cause a devastating material damage. Soil can be used to extinguish fire, but providing fire-fighting equipment will be necessary in bigger fire events. Open burning of wastes should be strictly forbidden, and the scavengers should be discouraged from igniting fire on the waste (6).

The landfill area has no run on or run off control system. In times of heavy rain, wastes can be carried away to rivers and this can pollute water bodies and wet lands. It is mandatory to design and built a run on and run off control system (11).

The other potential danger posed by the existing landfill is ground water pollution. This ground water pollution usually results from the leach out produced from the landfill. A leach out collection facility and ground water monitoring system should be instituted (11). Once the ground water is polluted, lots of people can be directly affected,

The emitted gasses from the landfill area especially methane is not regularly checked and controlled. Methane is one of the gases incriminated in contributing to green house effect. If the methane emission is excess, it can contribute its share in global warming. Methane can be harvested and used in energy generation. This energy generation has economic importance and environmental protecting effect. Methane gas is explosive at concentrations of 5-15% (6). Uncontrolled

methane emission can contribute to the fire hazard that already exists in the site.

Operators should be appropriately trained to run a landfill. Personnel qualification and development should be considered. Since the operators are dealing with potentially hazardous wastes, they should be provided with adequate protective devices. Even though the operators did not complain about the noise, they should be offered ear-protecting devices. The reason they did not complain could be due to adaptability to the noise.

Since there are no standby equipment in emergency situations, the mini workshop which is already established has to be functional. In case of breaking down, maintenance of the equipment can be quickly and easily carried out in the workshop. The site has been in use for the past 38 years.

In conclusion, the landfill system lacks most of the requirements a standard landfill should fulfill. In the strict sense, the landfill is difficult to call it a landfill system. It is just a controlled "open dump".

Therefore, It is appropriate to work on the closure and post closure plan of the site. It is necessary to build a run on and run off control system of water. Other possible site of landfill should be identified and all the preliminary study should commence. Further study to see the extent of leachate produced from the site and its possible impact is recommended.

#### ACKNOWLEDGEMENTS

We acknowledge Dr. Abara Kumie, Addis Ababa City Administration Health Bureau Environmental Health Department, Solid waste management team members, Ato Fikru Tessema, Solid waste management team leader, Ato Yitayew Mangahsa and all staffs who work in the landfill for their support and hospitality.

#### REFERENCES

1. Kerr C. Community and Sanitation, 1991:1.
2. World Health Organization. Intersectoral Action For Collaboration, 1986, Geneva.
3. World Health Organization. Conquering Suffering Enriching Humanity. The World Health Report, 1997, Geneva.
4. Ghai O, Gupta P. Essential Preventive Medicine, 2000:72.
5. William P. Waste treatment and disposal. 1998:5,183-195,245.
6. Salvato A. Environmental engineering and sanitation. 3<sup>rd</sup> edition, 1982.
7. Hobson W. The theory and Practice of Public Health, 5<sup>th</sup> edition, 1979: 142-143.
8. Moeller D. Environmental Health, 1997:172.
9. Green W, Ottoson J. Community Health, 7<sup>th</sup> edition, 1994:445-446.
10. Rosenau M. Preventive medicine and Public Health, 10<sup>th</sup> edition, 1973: 1161.
11. Region 14 Health Bureau. Terms of reference for solid waste preliminary report. Louis Berger International Inc, East Orange WJ, WJ, 1998.
12. Holland W, Detels R, G. Oxford Text Book of Public Health, 2<sup>nd</sup> edition, 1991: 147.
13. Hopkins E, Bingley W, Scucker G. The Practice of Sanitation, 4<sup>th</sup> edition, 1973: 1161.
14. Royal Netherlands embassy of Ethiopia, Solid waste management in Addis Ababa, Proceedings of workshop, Addis Ababa, Ethiopia, December 1998.
15. Ehlers M. Municipal and sanitation, six editions, 1958.