Assessment of the Safety and Health Hazards in Existing Dumpsites in Kenya

Mugo K.K, Gichanga J.M, Gatebe E. and Njogu P.M.

***Abstract*—**Environmental pollution from uncontrolled solid waste disposal is of major concern and generates chemicals or pollutants that reach their surroundings, such as soil, groundwater resources, and even the ambient air, because of environmentally unacceptable disposal or failure of lining system in the dumpsites. The increasing amount of municipal solid waste (MSW) emanating from residential, commercial and industrial areas, together with changing nature of waste over time, have led to the degradation of the quality of the environment. In the interest of inter-generational equity, today's dumpsites should not leave a negative environmental legacy for future generations to address. Furthermore, for as long as dumpsites remain part of our waste management strategy, best practice measures must be adopted to ensure that they are managed acceptably. The study focused on three dumpsites in Kenya; the Nakuru dumpsite in Nakuru county, the Nyeri dumpsite in Nyeri county and the Ngong' dumpsite in Nairobi county. The approach was to conceptualize the problem of solid waste disposal problem in Kenya within the mainstream environmental discourse. The study used interviews and observation, focus group discussions and participatory rural appraisal.

***Keywords*—**Environment; Health; Waste.

I. Introduction

THE accelerated growth of urban population, increasing economic activities and lack of training in modern solid waste management practices in the developing countries complicate efforts to improve this service sector. Although the urban residents of the developing countries produce less solid waste per capita than the high-income countries, the capacity of the cities to collect, process or reuse and dispose solid waste is limited [1].

The processes of storage, collection, transport, treatment and disposal of wastes all have the potential of environment risk [2]. Major advances in the development of new materials and chemicals have increased the diversity and complexity of the waste streams. Consequently, wastes are taking on a new economic importance, not only in terms of revenues generated by the waste treatment and disposal industry, but also because wastes may have a residual value as a secondary raw material which can be recovered or reused.

In solid waste management, environmental and health risks can be minimized by making waste technologies more contained, reducing contaminant emissions, changing working methods, use of protective clothing, and keeping the public and residents a safe distance away from operations. For example, risk of respiratory infection or allergic response to organic dust can be greatly reduced if transfer stations, composting and recycling process systems are enclosed or ventilated and if workers wear respiratory masks [3].

A study carried out in the USA on increased coronary disease events showed that solid waste workers had two times more risk than the country's general laborers. Because of inadequate understanding of the magnitude of the problem and poor financial resources, the risks are still largely unmanaged in most developing countries [5,6].

People living and working in the vicinity of solid waste processing and disposal facilities are also exposed to environmental health and accident risks. These risks relate to the emissions from the solid wastes, the pollution control measures used to manage these emissions, and the overall safety of the facility [5]. As with occupational risks, these risks are being substantially managed in high-income countries, but are still largely unmanaged in most developing countries.

Pollution control costs money and adherence to safe design standards requires a commitment to construction and operation supervision. External financial assistance is needed to support poor countries in their environmental efforts, even though solid waste projects have proven to be more time-consuming to prepare and implement than most urban infrastructure improvements. Solid waste management is an important part of the urban infrastructure that ensures the protection of environment and human health [7].

Falora et al acknowledged that key environmental problems facing human settlements in both urban and rural areas are mainly tied to urbanization [8]. These include among others poor solid waste management, lack of sound legal framework to govern environmental management and failure to enforce existing environmental status by relevant public agencies and lack of community participation in environmental management.

Fobil et al pointed out that poorly dumped and uncontrolled waste degrades urban environment, discourages efforts to keep streets and open spaces in clean and attractive conditions leading to reduced aesthetic appearance and bad smells [8]. Uncontrolled waste often ends up in drains leading to blockage of drainage channels resulting to floods and unsanitary conditions.

Since the mid-1980s municipal solid waste and the environmental consequences associated with its management have received a great deal of attention in industrialized

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countries [9]. Research into the environmental effects of waste management practices has shown that the 'preferred' option(s) for waste management depends upon a number of site specific factors, including: characteristics of the waste, efficiency of the waste collection and processing systems required by different waste management practices, availability and proximity of markets for recovered materials, end use of the materials, recovered from the waste stream, emission standards to which waste management facilities are designed and operated, cost effectiveness of the environmental, protection obtained by different waste management practices and the social preferences of the community [10].

The decomposition of waste into constituent chemicals is a common source of local environmental pollution. This problem is especially acute in developing nations with very few existing dumpsites meeting acceptable environmental standards [11]. As land becomes scarce, human settlements encroach upon dumpsites space, and governments in some cases encourage new development directly on top of recently closed dumpsites.

In Kenya, the environmental management and co-ordination act, of 1999 provides a legal and institutional framework for the management of the environmental related matters, it is the framework law of environment which was enacted on the 14th of January 1999 and its implementation commenced in January 2002. County governments are charged with the responsibility of collecting and disposing of wastes within their areas of jurisdiction. The waste management issue in Kenya is as a result of many interconnected factors. Inadequate infrastructural waste management facilities such as treatment and disposal infrastructure, unreliable and irregular waste collection patterns lead to littering and physical accumulation of solid waste. The absence of modern waste management facilities such as sanitary landfills has left open dumping as the only means of disposal for solid waste. Lack of garbage segregation at the source worsens the situation. This poses great risks to human health while reducing recycling potentials to generate by-products. Solid waste has become a public irritant due to emission of foul smell and presence of scavengers and rodents. It damages the aesthetic value of the affected areas and reducing properties value.

County governments have a role in the set-up and operation of waste management systems. Most urban authorities in both industrialized and developing countries receive their powers and obligations from a central government authority, with allocation of powers and responsibilities to protect the rights of the citizens, to provide services, and to serve the common good [12].

II. STUDY AREA

The Nyeri, Ngong' and Nakuru dumpsites situated in the Nyeri, Nairobi and Nakuru county respectively were selected for the study. The Nyeri dumpsite serves the town of Nyeri and its located three kilometers from the town centre. The Ngong'dumpsite serves part of Nairobi, the capital city of Kenya although it still gets some waste from the nearby Kiambu and Kajiado counties. The Nakuru dumpsite serves Nakuru town and its environs.

III. METHODOLOY

The study implemented a case study research design. Data for this study was collected from a wide variety of sources to present a description of the phenomenon or the experience from the perspectives of the respondents. Instruments used included a questionnaire guide, an interview guide and a field observation guide. The questionnaire contained both close ended and open ended questions in order to solicit information. Risk assessment included investigation of the relative effectiveness of different control measures in reducing exposure to safe levels.

IV. RESULTS AND DISCUSSIONS

In all three dumpsites studied waste was found indiscriminately dumped on the ground surface, without any compaction effort and all the waste piles had undergone some degree of heavy burning as a result of no soil cover, the long dry season, and random fires. Field observation revealed that waste disposal was not confined to any one location. The sites survey indicated that accessibility problems during the rainy season had necessitated the need for alternate illegal disposal areas. Disposal sites were not being covered and there was no proper control of contaminated leachate.

Workers wore no protective gear not even gloves and face masks. Waste pickers in sites were not being managed. To complicate the exposure risk to workers and pickers, their personal hygiene was often inadequate. Washing facilities were not typically provided for use at the work place for clean up before going home (often by public transportation). In addition there was inadequate education on hygiene and health relations among the workers. Majority had no post primary education (Figure 2) and a significant number were illiterate with no formal education.

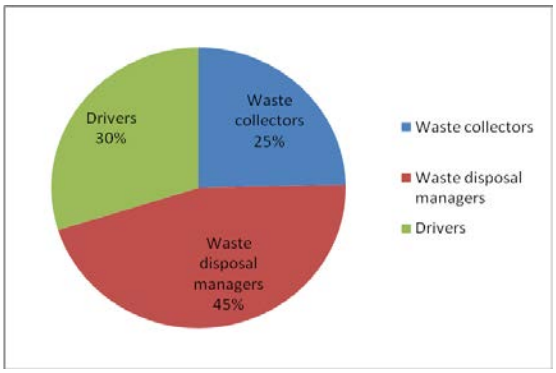

Fig. 1 Knowledge of waste handlers' on use of protective and preventive equipment (PPE)

Dumpsite waste pickers in all three dumpsites revealed that 55% did not use soap to wash their hands; 63% did not use soap to wash their feet; and more than 39% did not change their clothing daily. About 7% regularly waited more than a week between baths and changing clothes. In waste picking,

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women reported preparing meals immediately after returning home from waste picking, without washing.

Respondents indicated that the health issues of concern varied by activity. Noise related hearing loss, hand arm vibration, manual handling and exposure to airborne were identified as major issues by several operators. One respondent was concerned about age-related impacts on musculoskeletal fitness, the development of age-related arthritis and age related deterioration in hearing / vision in employees with an average age of about 50 and about 10 years employment in the industry.

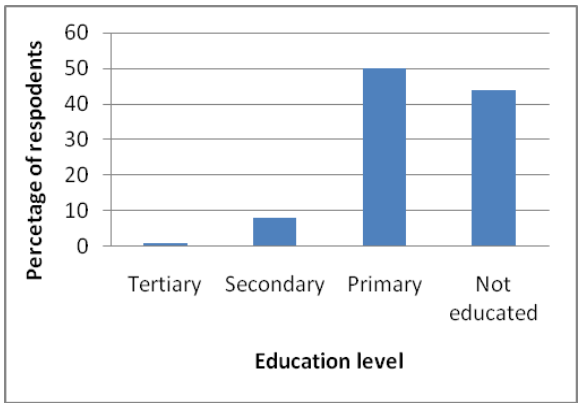

Fig. 2. Education level of waste handlers.

Exposure to skin contaminants in workshops and carcinogens, sensitisers and other toxic substances in hazardous waste were identified as issues by individual respondents. Safety and health issues were even complicated by acknowledgement of lack of knowledge on PPE by waste handlers (Figure 1).

91% of nearby residents and 54% of those living far from dumpsite thought their health was affected by the location of dumpsite. They also use the stream for washing clothes and bathing their children. These activities expose these residents to wastes particularly hazardous wastes which can lead to various diseases through chemical exposure. Household residents, especially those who are closer to the dumpsite were not happy about the location of the dumpsite in their community. They complained that the dumpsite is too close to their residencies causing them a lot of sicknesses. Furthermore, they argued that their surroundings were smelly and filthy and some of the wastes from the dumpsite get scattered near their houses causing pollution in the environment. All the respondents indicated that no measures are taken up to make sure that the community, at large, is protected from the dumpsite. Lack of protection from dumpsite related effects was worst because of low knowledge on pollution. Majority of residents who lived either close by or further away from the dumpsites indicated they knew nothing about pollution. A small percentage of them indicated that pollution causes sickness. Therefore, the residents suggested that among many other options, the dumpsite should be relocated as an interim measure.

None of the questionnaire respondents indicated that work related stress was of concern, despite its importance in the wider workforce. The information provided by respondents about shift working and the requirement to undertake repetitive tasks suggested that factors associated with increased risks of stress such as repetitive tasks, changing shift patterns and limited or no control on work speed may be an issue at a minority of dumpsites.

V. Conclusions

Exposure to waste handling sites is likely to give rise to significantly increased risks of chronic respiratory illness. It is likely that exposure to dust and bioaerosol in substantial proportion at composting sites exceeded the thresholds for the development of chronic (and disabling) respiratory illness. Small quantities of biological material are present in most wastes, giving rise to a potential for exposure to bioaerosol. Storage of organic-rich wastes, including untreated MSW, greatly increases the potential for bioaerosol emissions.

Occasional exposure to significant infection risks or hazardous substances such as asbestos may occur wherever workers are in close contact with wastes on picking lines or during cleaning and maintenance operations involving untreated or partially treated wastes causing most risk. Provided workers use appropriate PPE and there are well established procedures in place to handle high risk incidents, the risk to worker health should be small.

It is difficult to develop alternative technology for total elimination of hazardous wastes generation. In developing countries, the thrust on economic development is often given priority to production costs than the best available technology that minimize wastes generation. The cost of treatment and disposal of such wastes becomes a liability on the society.

In spite of the environmental and health knowledge available, development of proper waste handling techniques has not taken place at the desired pace. As in other sectors of development where private ventures are entering in a big way, waste management, treatment and disposal programmes offer a good scope for private entrepreneurs to benefit with this sector of development. This will not only enable a facility provider to sustain his industry with profit but also the society will be benefited from these developmental activities in terms of getting cleaner environment and employment.

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