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Introductory Chapter: Overview of Household Hazardous Waste Management in the African Context

Daniel Mmereki, Baizhan Li, Liu Hong and
Andrew Baldwin

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<http://dx.doi.org/10.5772/66307>

1. Introduction

Today, the management of household hazardous waste (HHW) is continuing to be a hot topic throughout the world due to the hazards or risks posed into the environment and public health. Scientific research has confirmed that in the recent decades, rapid global urbanization and increases in living standards, buying power and easier access to products that are convenient but not always safe have led to changes in the HHW characteristics [1]. It has been observed that people are, therefore, exposed to a greater amount of diversified hazardous materials and/or potentially hazardous materials, such as phthalates [2], antibacterial agents [3] and monosodium glutamate [4]. Improper management of HHW poses unpredictable negative impacts at the source of generation, at the waste collection points, during transportation and after disposal in landfills and/or incineration sites, with significant negative impacts to the environment and public health [5–7]. Other harmful effects of HHW include air pollution, which may be caused by the release of mercury, lead, cadmium and nickel into the atmosphere from burning batteries [1]. In most of the African countries, inadequacies of the policy frameworks include lack of capacity and governance [8]; fewer resources available to deal with environmental health issues arising, limited expertise and knowledge on HHW management technologies, inappropriate HHW classification and characterization and municipalities have not created their own HHW database. On the other hand, developed countries have dedicated substantial economic resources to regulate the production, treatment and disposal of HHW [9].

In the African context, the management of household hazardous waste (HHW) is becoming a major cause of concern in the twenty-first century. Currently, there is no segregation of household hazardous wastes and a consistent policy framework specifically dealing with

HHW regulation and a significant proportion of these waste are generated from residential daily life. However, there are uncertainties in the generation of household hazardous waste due to a lack of a consistent and efficient waste management system. As innovative processes such as phytoremediation, recycling and reuse are still nascent and/or nonexistent, most of the waste generated is indiscriminately disposed of or through conventional landfilling. This introductory chapter gives an overview of household hazardous waste disposal in African countries and provides recommendations for due adjustments and improvement of the current situation.

2. Materials and methods

The introductory chapter applied the survey of relevant published literature and electronic sources of information, news articles, reports and issues by international organizations such as the World Bank, the World Health Organization (WHO), the African Union (AU), the South African Development Community (SADC), the Economic Community of West African States (ECOWAS) and knowledgeable and well-informed individuals to provide an overview of HHW management in the African continent.

3. Overview of HHW in the African context

3.1. Sources of HHW

Household hazardous wastes are produced from residential daily life. This is related to lifestyle and public convenience in using products categorized as household hazardous waste. These include home cleaning products such as drain openers and all-purpose cleaners, medicines and personal cares, home maintenance and batteries, automotive maintenance, amusement and educational products.

3.2. Definition and HHW classification

Household hazardous waste (HHW) has been defined as “hazardous waste entering the municipal solid waste stream, representing a variety of waste types classified together based on the possession of hazardous properties (e.g., flammability, corrosivity, reactivity, caustic and toxicity)” [10, 11]. It has been shown that HHW cannot only include such products as batteries, pharmaceuticals, discarded light bulbs and mercury thermometers but also used motor oil, pesticides and solvent and paint residues in used bottles and cans (also known as “packaging and containers,” PC) [11]. It has, however, been noted that there is no universally defined classification of HHW, even within a country; different regulatory frameworks classify HHW differently [12]. Different classes of waste are governed by different regulations and are subject to different forms of treatment [1]. Furthermore, the definition of HHW may change over time in any given country.

3.3. HHW generation and composition

In developing countries in the African region, it is difficult to compare the quantities of HHW produced because of the differences in the way they are defined due to inappropriate policy frameworks. In most cases, however, these countries have no national databases on HHW production.

3.4. Collection and disposal

Generally, most people in the African countries mix all the components of household wastes, including household hazardous waste. Efforts to manage and process hazardous waste also focus on industrial hazardous waste processing without covering all the aspects of HHW. Domestic hazardous do not receive adequate attention. Researchers have shown that there have been no continuing efforts which are done to process household hazardous waste.

In most African countries, landfilling is the most common means of HHW disposal because it is the least expensive option and has low technical operating requirements, although sub-quantities of HHWs are incinerated and recycled in some countries. Moreover, landfilling may consist of open dumps or burying the wastes in unlined, excavated pits, or dumped in open spaces or water bodies. The wastes dumped in water bodies are likely to contaminate groundwater and surface water sources. Although most of the countries have ratified the Basel Convention, there has been a relatively lower interest and progress to minimize the generation of HHW. If the efforts to reduce HHW cannot be implemented, then significant environmental health impacts are realized. Fewer government programs encourage the recycling of consumer products such as batteries and electrical and electronic equipment, ending up in landfills. Although some of the HHWs such as solvents can be reused in other capacities like combining with other fuels and use in industrial burners, these wastes are disposed of in landfills. However, solvents with toxic properties are best destroyed by incineration. There is lack of data and information of quantities of HHWs dispersed throughout the region and no one knows what is disposed of, what was disposed of some decades ago and how it was disposed of. Safe methods of treatment and disposal are therefore required.

In much of the African continent, waste disposal facilities are unregulated or uncontrolled. Although no figures have been provided in countries like Botswana, it has been observed that a significant proportion of HHW disposal occurs with inadequate control or treatment [8]. It is a common practice to dispose of HHW wastes in unregulated landfills, conventional landfilling.

Furthermore, landfilling is likely to continue to be the primary means of HHW waste disposal. It has been observed that the construction of high-technology landfills with multiple synthetic liners, extensive monitoring devices and gas collection systems may be beyond the resources of many developing countries, particularly in the African context. The implementation of low-technology and low-cost approaches can increase the capacity and safety of landfills. Such approaches and techniques might include the separation of HHW from nonhazardous waste to reduce the amount of HHW going into landfills and installing leachate collection systems to reduce off-site migration of contamination. Another method of HHW disposal is incinera-

tion [13]. Although incineration is regarded as the safe and effective method for destroying hazardous wastes, in most of the African countries, incineration operates under less stringent regulations; countries have not enacted stricter regulations to minimize emissions of dioxins. Many of the incinerators installed in most of the African countries to treat HHWs are operating without adequate emission controls.

3.5. Comparison among countries

In the African context, a comparison of HHW production between countries is problematic, because of varying definitions or nonexistent of definition on what constitute household hazardous wastes. Also, the registration of wastes is not complete in some countries. This also makes the tracking of waste generation in these countries difficult because of lack of definition of HHW. This makes it difficult to devise methods and tools to update HHW data and trends, sources and fate of HHW as well as serious threats to the natural environment and public health.

3.6. Environmental health impacts

Meanwhile, the problem of HHW in some African countries is magnified by the importation of HHW from developed countries. These countries are unable to treat or dispose of the waste efficiently due to potentially higher treatment cost and remediation measures for environmental health impacts arising. For instance, workers' safety and health is relatively low in African countries receiving these wastes; not adequately trained to handle and manage HHW or does not have access to adequate protective equipment (PE).

3.7. Regulatory framework

There is no consistent and established approach to HHW regulation and standardized operational procedure on the characteristics and properties of waste, including the quantities of HHW generated, composition, content, and sources and fate of HHW. Most of HHW is currently codisposed with municipal solid waste. Due to inadequacies in policy frameworks in most of the African countries, some undefined proportion of HHW is shipped legally or illegally to African countries such as Nigeria, Ghana and Somalia from developed countries. These African countries accept HHW even though they lack administrative and technical resources to deal with them. In some countries such as Somalia, with inadequate policy framework or with no clear national government, waste trafficking from developed countries is becoming problematic.

3.8. HHW management

African countries lack technical and operational norms; so the household hazardous waste management system in society is individually interpreted as their habits. It can be concluded that there are no standardized operational norms about the management of household hazardous waste. Although most countries in the African continent have acquired more industrial growth and rapid economic growth, environmental health concerns related to HHW

have not attracted increased attention from both the private and public sector agencies. In addition, there is a relatively lower advocacy and attention on environmental health issues from the public sector, the press and national advocacy groups. Furthermore, public programs that deal with the impacts of HHW on public health and the environment are rudimentary.

3.9. Recommendations

To improve HHW management efficiency in developing countries in the African region, it is critical to implement efficient and well-functioning approaches, including the circular economy; encompassing waste prevention and minimization, recycling and reuse over disposal. Overall, African countries are especially in need of home-made and low-cost technologies for HHW management. The following recommendations are offered for guiding HHW management activities:

- Provision of technical norms, training and financial resources if possible to enhance the development of HHW management programs in African countries. Countries such as South Africa with mature recycling programs should share their experience so that mistakes are not repetitive. The information transfer could include state-of-the-art waste management technologies, technical expertise and experiences in administrative and organizational capacity and governance to make adjustments and updates on HHW management methods and practices.
- HHW management decisions should be based on the best available technological know-how. Environmental health threats should be prioritized.
- Due to limited economic resources, African countries may have to take an incremental approach in managing HHW.
- An effective management of HHW needs concerted efforts on integrated and multidisciplinary approaches, including involving all the stakeholders—the public, regulators, academia and nongovernmental organizations. The public is an important stakeholder and their participation in waste management issues is critical to ensure societal acceptance.
- Governmental departments should inform the public about the potential risks of HHW and also encourage residents to separate compostable and recyclable material at the source in the residential households of African cities.
- Optimization of HHW disposal programs, carrying out research on HHW management, to review and implement monitoring methods and tracking of several HHW substances. (e.g., batteries and insecticides) from manufacturing sources to household disposal.

4. Conclusion

This introductory chapter discusses household hazardous waste management in African countries. There are key challenges to manage HHW among the African countries, including codisposal with other household wastes, inadequacies in policy frameworks, inadequacies of

municipalities to create their own databases on HHW, inadequate technical expertise and knowledge on waste management technologies, lack of cooperation of all the stakeholders, inadequate institutional capacity and poor record keeping on how much HHW is generated, where it is going and how much is disposed of. One of the key challenges to HHW management is the lack of capacity building and awareness. Therefore, concerted efforts are needed to involve all the stakeholders and the development of consistent legislation to prevent the environmental health impacts of HHW and reduction of waste. Furthermore, there is an urgent need for farsightedness of the decision makers to develop and implement integrated policy strategies to stimulate societies to manage HHW in a more sustainable manner.

Author details

Daniel Mmereki^{1,2*}, Baizhan Li^{1,2,3}, Liu Hong^{1,2,3} and Andrew Baldwin^{1,2,3}

*Address all correspondence to: dani.mmereki2@gmail.com

1 International Research Centre of Low Carbon and Green Building, Chongqing University, Chongqing, China

2 Key Laboratory of Eco-Environment of Three Gorges Region of Ministry of Education, Chongqing University, Chongqing, China

3 Faculty of Urban Construction and Environmental Engineering, Chongqing University, Chongqing, China

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