



**UNIVERSITI PUTRA MALAYSIA**

***MUNICIPAL SOLID WASTE MANAGEMENT AND HEALTH RISK  
IMPLICATION IN ZANZIBAR***

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**MUNICIPAL SOLID WASTE MANAGEMENT AND HEALTH RISK  
IMPLICATION IN ZANZIBAR**

**By**

**BIUBWA FAKI ALLY**

**Thesis submitted to the School of Graduate Studies, Universiti Putra Malaysia,  
in fulfillment of the requirements for the Degree of Master of Science**

**September 2015**

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## DEDICATION

This thesis work is dedicated to my sweet husband and my lovely daughters Zuvena and Yasmin for their passion and giving me opportunity to pursue the master program in Malaysia.



Abstract of the thesis presented to the Senate of the Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

## **MUNICIPAL SOLID WASTE MANAGEMENT AND HEALTH RISK IMPLICATION IN ZANZIBAR**

By

**BIUBWA FAKI ALLY**

**September 2015**

**Chairperson : Sharifah Norkhadijah Syed Ismail, PhD**  
**Faculty : Medicine and Health Sciences**

Solid waste is a visible concern in Zanzibar. One of the fundamental problems facing Zanzibar communities is the lack of formal system for solid waste management and is more apparent in informal settlements. It is estimated that, more than 50% of the diseases that affects people of Zanzibar are related to unsanitary environments which highly associated with poor waste management practices. The study aimed at assessing the current municipal waste practices and associated health risks in the municipality. Necessary data was obtained through interview administered questionnaire on one to one basis with a total of 200 households systematically selected from their residential areas. Similarly, photograph, documentation, field and direct observation were considered to add value of information. The results revealed that, more than half of respondents (66.5%) have access to collection services in their residence and 33.5% don't have any collection services. All residents in Zone A (N = 50) receive collection services followed by Zone B (N = 41) while residents in Zone C (13%) and Zone D (8%) don't have adequate collection services. Within the household, open containers such as plastic buckets (55%) and plastic sucks (32.5%) are usually used for the storage of waste and majority of respondents don't practice waste sorting in their homes (92%). The method of disposal is mainly communal collection containers (36.5%) including metal skips and slabs, through door to door collection service (25%) and indiscriminately disposal in open piles (29%). Burning or burying is common practices in the residential areas without access to collection services. There is low level of awareness about specific health and environmental problems associated with poor collection and disposal. Analysis revealed that there is significant relationship between household practices and reported health symptoms. The prevalence of respiratory illness, skin rashes, under 5 children diarrhea and malaria observed was higher in Zone C which is nearby the dumping site compared to other zones (A, B, and D). Reported health symptoms were more noticed to children aged 5-15 years particularly respiratory symptoms than other age category. The results depicted statistically significant relationship only between reported health symptoms and practices implying that improper waste management practices

increase public health risks in terms of disease occurrence such as respiratory symptoms, diarrhea and other sanitation borne illness. Therefore, institutional capacity should be strengthened by moving it from centralized to decentralized approach. Also involvement of all stakeholders (government agencies, public, private and informal sectors; NGOs and CBOs) in system design from planning of MSWM issues to operations should be considered a synergy for effective and sustainable MSWM system in the Municipality.

Key words: municipal solid waste management, practices, health risks, Zanzibar.



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**AMALAN DAN CABARAN PENGURUSAN SISA PEPEJAL DAN  
IMPLIKASI RISIKO KESIHATAN DI MAJLIS PERBANDARAN  
ZANZIBAR**

Oleh

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Sisa pepejal merupakan aspek yang diberikan perhatian yang ketara di Zanzibar. Salah satu masalah fundamental yang dihadapi oleh komuniti Zanzibar ialah kekurangan sistem yang formal bagi pengurusan sisa pepejal dan yang lebih ketara di kawasan penempatan tidak formal. Dianggarkan, lebih 50% penyakit yang dihadapi rakyat Zanzibar berkaitan dengan persekitaran tidak bersih yang sangat berkaitan dengan amalan pengurusan sisa yang lemah. Kajian ini dijalankan bertujuan untuk menilai amalan sisa majlis perbandaran terkini dan risiko kesihatan berkaitan di kawasan perbandaran. Data yang diperlukan diperoleh melalui temu bual yang mengandungi soalan berdasarkan temu bual secara basis satu dengan satu dengan jumlah 200 isi rumah yang dipilih secara sistematik dari kawasan perumahan. Di samping itu, fotograf, dokumentasi, pemerhatian lapangan dan langsung diambil kira bagi menambah nilai pada maklumat. Hasil kajian menunjukkan bahawa, lebih daripada separuh responden (66.5%) mempunyai akses pada perkhidmatan pengutipan pepejal di kawasan perumahan mereka, manakala 33.5% tidak mempunyai sebarang perkhidmatan pengutipan pepejal. Semua penduduk di Zon A (N = 50) menerima perkhidmatan pengutipan, diikuti oleh Zon B (N = 41), manakala penduduk di Zon C (13%) dan Zon D (80%) tidak menerima perkhidmatan pengutipan yang mencukupi. Dalam kalangan isi rumah, bekas terbuka, seperti baldi plastik (55%) dan penyedut plastik (32.5%) biasanya digunakan bagi penyimpanan sisa dan majoriti responden tidak mengamalkan penyisihan sisa di rumah mereka (92%). Kaedah penyisihan kebanyakannya merupakan bekas pengutipan komunal (36.5%), termasuk skip besi dan slab, melalui perkhidmatan pengutipan pintu ke pintu (25%) dan tidak terkecuali pelupusan dalam bentuk timbunan terbuka (29%). Pembakaran atau penanaman merupakan amalan biasa di kawasan perumahan tanpa akses pada perkhidmatan pengutipan. Terdapat kesedaran yang rendah tentang kesihatan yang spesifik dan masalah persekitaran yang berkaitan dengan pelupusan dan pengutipan yang lemah. Analisis menunjukkan bahawa terdapat hubungan yang signifikan antara amalan isi rumah dan simptom kesihatan yang dilaporkan.

Prevalen penyakit respiratori, ruam kulit, diare, kanak-kanak bawah 5 tahun dan malaria yang dikesan adalah lebih tinggi di Zon C yang berhampiran dengan tempat pembuangan sisa berbanding dengan zon-zon yang lain ( A, B, dan D ). Simptom kesihatan yang dilaporkan lebih ketara dalam kalangan kanak-kanak berumur 5-15 tahun, terutamanya simptom respiratori berbanding dengan kategori umur yang lain. Hasil kajian menunjukkan terdapatnya hubungan yang signifikan secara statistik hanya antara simptom kesihatan yang dilaporkan dan amalan yang memberi implikasi bahawa amalan pengurusan sisa yang tidak sempurna meningkatkan risiko kesihatan umum dari segi kekerapan penyakit, seperti simptom respiratori, diare dan penyakit bawaan sanitari yang lain. Oleh itu, kapasiti sesebuah institusi perlulah dikukuhkan dengan cara pendekatan berpusat ke tidak berpusat. Penglibatan semua pihak berwajib (agensi kerajaan, orang awam, swasta, sektor tidak formal, agensi bukan kerajaan dan organisasi berasaskan komuniti) dalam reka bentuk sistem daripada perancangan isu pengurusan sisa pepejal hinggalah ke peringkat operasi boleh dianggap sebagai sinergi kepada pengurusan sisa pepejal yang efektif dan mampan dalam perbandaran.

Kata kunci: pengurusan sisa pepejal, amalan, risiko kesihatan, Zanzibar.



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I certify that a Thesis Examination Committee has met on 29 September 2015 to conduct the final examination of Biubwa Faki Ally on her thesis entitled "Municipal Solid Waste Management and Health Risk Implication in Zanzibar" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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Member of  
Supervisory  
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## LIST OF ABBREVIATIONS

CBOs	Community –Based Organizations
CI	Confidence Interval
EGSSAA	Environmental Guidelines for Small-Scale Activities in Africa
GDP	Gross Domestic Product
HIJRA	Humanitarian Initiative Just Relief Aid
IGES	Institute for Global Environmental Strategies
ISWM	Integrated Solid Waste Management
MSWM	Municipal Solid Waste Management
NGOs	Non-Government Organizations
OR	Odds Ratios
SEZM	State of Environment of Zanzibar Municipality
SMOLE	Sustainable Management of Land and Environment in Zanzibar
SPSS	Statistical Package for Social Sciences
TPHC	Tanzania Population and Housing Census
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UN-HABITAT	United Nations Human Settlements Program
WHO	World Health Organization
ZEP	Zanzibar Environment Policy
ZHDR	Zanzibar Human Development Report
ZMC	Zanzibar Municipal Council
ZSDP	Zanzibar Sanitation and Drainage Program
ZUSP	Zanzibar Urban Services Project

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

This chapter provides an overview of the subject researched the background of the research, problem statement, justification of doing the research, research objectives, research questions, significance of the study and scope of the study.

### 1.2 Background of the study

The production of municipal solid waste is an inevitable consequence of human activity, and its management directly impacts the health of the people and environment surrounding it (Vergara & Tchobanoglous, 2012). The process of Municipal Solid Waste Management (MSWM) encompasses all the function of direct waste generation, storage, collection, source separation, processing, transport, treatment, recovery and disposal (Ramachandra & Bachamanda, 2006; Agamuthu, 2011). These processes have to be carried out within existing legal, social, economic efficient and environmental guidelines which are very important for the protection of public health and aesthetic and environmental reasons (Jafari, Hatam & Saed 2010; Pattnaik & Reddy, 2010; Guerrero, Maas & Hogland, 2013).

To achieve these goals, effective and sustainable municipal solid waste management systems must be embraced by local authorities with appropriate organizational capacity and cooperation between numerous stakeholders in the public and private sectors actors (Schubeler, 1996; Henry, R, Zhao. Y., Dong. J, 2006). However, management of MSW is most challenging compared with other types of wastes such as agriculture, mining and industrial wastes particularly in the developing world (Wang, 2011). The management in most cities of developing countries is highly unsatisfactory (Schubeler, 1996).

Municipal solid waste management is a continually growing problem at global, regional and local levels although the problem appears to be different in different countries (Ramachandra & Bachamanda, 2006). With rising urbanization, population expansion, economic growth and change in lifestyle and food habits, the amount of municipal solid waste has been rapidly increasing in developing countries and its composition is also changing (Dokhikah, 2012; Vergara & Tchobanoglous 2012; Jafari, Hatam & Saed, 2010). Giusti (2009) and Agamuthu (2011) indicate the daily global MSW generation is estimated to be more than  $2 \times 10^9$  tons.

However, due to inadequate resource and inefficient infrastructures, not all of the waste generated get collected and transported to the final dumpsites (Prakiti, 2006). Most municipalities lack the efficient collection techniques which are evidenced by increasing dumpsites and abandoned waste and deposit in the city streets and open places in the residential areas (United Nations Environment Program (UNEP), 2005; Sandra Contreau, 2006; Ohaka, A., Ozor, P & Ohaka, C, 2013). The piling up of uncollected waste then becomes a breeding ground for pathogens leading to communicable diseases such as cholera, diarrhoea and malaria (Ifeoma *et al*, 2011; Vuai, 2010). Achankeng (2003) revealed that the prevalence of such disease can be related to the polluted condition caused by the waste being left around.

In addition, unhealthy disposal of solid waste remains the prevalent method used by many communities in the developing countries where waste is disposed of randomly at uncontrolled open dumps, water bodies, wetlands and surface drains (Mangizvo, 2010; Odufuwa, 2012; Ogunrinola, 2012; Agwu, 2012; Ohaka *et al*, 2013).

Proper management of municipal solid waste can reduce or eliminate adverse human health and environmental impacts, while supporting economic development and improved quality of life. Despite this fact, many challenges militated against sound urban effective waste management system. The major issues and challenges that contribute to inefficient waste management system in developing countries includes lack of organization and planning in waste management and financial restrictions (Al-Khatib I., Arafat H., Basheer T., Shawahneh H., Salahat A., Eid J., Ali W, 2007; Ogwueleka, 2009; Zaini Sakawi, 2011; Jafari, Hatam & Saed, 2010; OkotOkumu, 2012; Dhokhikah & Trihadiningrum, 2012). Waste management is poorly financed because it is not a prioritized activity in all urban councils whose funds for the operation of the urban councils are mainly from external sources (over 50 %) like the central government and donors in the form of grants (Okot-Okum, 2012; Wang, 2011).

Other important aspects compounding the problem are inadequate policy, lack of legislations and control systems (Maseva, 2005; Fauziah, 2013; Khatib, 2011; Ogawa, 2005 ); inadequate technology (Odufuwa *et al*, 2012); low recycling rate (Agamuthu, 2011); weak institutional structure (Banga, 2011; Reagassa, 2011); low public awareness and poor attitude towards waste management (Pokhrel, 2005; Premakumara, 2011; Agwu, 2012; Ohaka *et al*, 2013; Fauziah, 2013).

Poor waste handling practices and inadequate provision of facilities in cities of developing countries results in indiscriminate disposal and unsanitary environments that pose a threat to the human health and the environment (Achankeng, 2003; Pokhrel, 2005; Ifeoma 2011; Uwakwe, 2013). This unhygienic condition creates health problems by attracting disease vectors like flies, mosquitoes and rodents which in turn spread the infectious diseases such as malaria, respiratory tract infection, diarrhea, typhoid, dysentery, and cholera (Boadi, 2005; Abul, 2011; Vuai, 2010, Odufuwa, 2012; Ogunrinola, 2012; Ohaka

*et al.*, 2013) and also reduce the aesthetic quality of the city. Improper solid waste management leads to economic loss (Abduli, M., Hossein.T., Ariandokht. A, 2013; Jafari, Hatam & Saed, 2010; Ogunrinola, 2012) and is one of the main cause of environmental pollution including ground water (Ahmed & Quader, 2011; Sankoh, F., Xiangbin.Y & Quangyen. T, 2013) and green-house gases (GHG) emission which is a critical climate change problem (Ohakwe, 2011, Khatib.I, 2011; Vergara, 2012) and becomes the topic of major environmental concern today.

In addition, inefficient management options results in the loss of considerable amounts of materials and substances that can be beneficially reused, recycled or recovered. Therefore, planning for and implementing a comprehensive program for waste collection, transport and disposal along with activities to prevent or recycle waste can eliminate the aforementioned problems.

As part of the developing countries and East Africa in particular, Zanzibar experiences difficulties in waste management. According to the 2012 Tanzania Population and Housing Census, the Zanzibar population is 1,303,569 at the annual growth rate of 2.8%. With population growth due to rural- urban migration and being economic centre, the generation of wastes in the Zanzibar Municipality has increased (Gauff, 2005; State of Environment of Zanzibar Municipality (SEZM), 2005). Currently, the production of the municipal waste is estimated to be approximately 300 tons/day (Zanzibar Municipal Council (ZMC), 2013).

However, due to resource crunch, the municipal has capacity to collect and dispose of only 60 tons/day (SEZM, 2005; ZMC, 2013). Zanzibar Municipal Council (ZMC) is a local government established in 1995. This authority under Drainage, Sewerage, and Solid Waste division is the sole responsible body for waste management in Zanzibar and urban municipality in particular but faces many challenges in terms of human and material resources to effectively manage waste problem.

### **1.3 Problem Statement**

Solid Waste is a visible concern in Zanzibar. One of the fundamental problems facing Zanzibar communities is the lack of formal system for solid waste management and is more apparent in informal settlements (SEZM, 2005; Zanzibar Urban Service Project (ZUSP), 2010). Although the Zanzibar Municipal Council (ZMC) engages in collection of municipal solid waste, this service is still inadequate; a significant proportion of the population does not have access to collection services (Zanzibar Sanitation and Drainage Program (ZSDP), 2005; Sustainable Management of Land and Environment (SMOLE), 2011). Thus, residents opt to dump waste on available spaces throughout the suburbs - resulting unsightly piles of waste and wind-blown litter everywhere. These piles of waste are scattered around residential areas and present health risks, causes bad odors and surface water channels and drains to be blocked (ZUSP, 2010).

The municipal solid waste collected is transported to central dumping site without any form of treatment prior final disposal. The current municipal solid waste management system under the local authority in the municipality does not facilitate any treatment strategy at least to reduce the waste quantity or related health and environmental problems.

Besides, there are numerous informal dumping sites throughout the country side and urban areas which are potential for considerable health hazards to the nearby residents. Health problems associated with mosquitoes, flies, rodents, bad odor and generally nuisance along with waste scavengers can be further aggravated from this indiscriminate dumping.

A broader body of literature has deemed indicated the significant relationship between improper solid waste management practices and public health risks as well as the impact to the natural environment. It is estimated that, more than 50% of the diseases that affect residents in Zanzibar are related to water and sanitation where the unsanitary environments is highly associated with poor waste management practices (Zanzibar Environment Policy, 2013). If the condition is left unchecked, it will impose social and economic costs to the government.

Moreover, waste utilization that would raise economic benefit is not priority of the sector and hence large amount of resource materials are constantly lost. In light of this, MSWM remains a challenge to the municipal authority due to its public health and environmental concerns and aesthetically consideration. Therefore there is immense pressure to improve the municipal solid waste management practices in Zanzibar Municipality. This could be attained by providing a general view of the existing system to understand the situation, the potential health risks and suggesting the possible measures for the future development in a sustainable way.

At present, there are very limited studies focusing on municipal solid waste management practices in Zanzibar with particular emphasis on environmental impact rather than its detrimental effects to human health. In addition, there is lack of basic epidemiologic data on the health impact of prevailing waste management practices. Therefore, there is a need to address the municipal solid waste management issues and associated problems which may pose health risks to the Zanzibar communities.

#### **1.4 Objectives of the study**

The main objective of the study is to assess the current municipal solid waste management practices and associated health risks in Zanzibar Municipality.

The research aimed at achieving the following specific objectives;

To determine the existing households practices, knowledge, awareness, and concerns on MSWM in Zanzibar municipality.

1. To examine health symptoms reported in Zanzibar municipality
2. To investigate the relationship between reported health symptoms and other studied variables such as knowledge and disposal practices.
3. To identify the problems and challenges on MSWM which the Zanzibar municipality is facing.

#### **1.5 Research questions**

From the above objectives, the following are research questions developed:

1. What are the existing MSWM practices of the households' and to what extent the households knowledgeable, aware and concern of the MSW in the municipality?
2. What are the common health symptoms reported in Zanzibar municipality?
3. Is there relationship between reported health symptoms and other studied variables such as knowledge and disposal practices?
4. What are the main problems and challenges faced by the municipal solid waste management system?

#### **1.6 Scope of the study**

The study focused on the municipal solid waste which generation trend is constantly increases with the population in the municipality and therefore put bearable pressure to the local government for its management. It also presents a valuable resource if the appropriate management options are applied and hence mount economic benefit. Geographically, the study is confined to Zanzibar municipality only which is the nation capital and economic center where many people resides and increase waste production which adds the waste management problem as faced by many other growing cities in other countries and Africa in particular.



The scope of the study focus on collection and disposal practices with health implication in residential areas. This is because due to population increase in these areas, production of domestic waste also increases which forms the main constituent of MSW accounting for 74% of the total MSW stream. The study focused on these important elements for better understanding of the situation and evaluates the existing capacity of the management system on their operation.

In addition collection and proper disposal are very important steps to maintain public health and therefore their improvement can effect a significant development of overall waste management system. This would form the basis for changes in policy and motivating government to raise their interest in waste management sector.

### **1.7 Significance of Findings**

For efficient delivery of the management system, municipal authority should strengthen control and monitoring processes, improve services and practices, and gear social dimension while compounded with support by stakeholder's participation. Therefore the outcome of this study is a comprehensive report that presents the vital findings on MSWM in Zanzibar municipality which is the capital city of Zanzibar. These data can be used as baseline assessment to motivate and drive the responsible authority to adopt safe management options to protect public health risks and reduce burden on national budget. Findings will enlighten Ministry of Health on the extent that the public health issues might be contributed to waste management problems.

The study also contributes to the literature gaps about MSWM in Zanzibar and health. Findings would be very helpful to the decision makers on MSWM in the development of efficient policy approaches and measure to be taken towards improvement of existing MSWM and promote sustainable system in the country.

Study also enhance further researches regarding MSW to be conducted in Zanzibar such as studies on waste characteristics; behavioral perspective and comparative analysis studies on landfill effects which always form the basis of future development plans. For instance, study on disposal sites will add knowledge to the understanding of the effects of uncontrolled sites and therefore sparks the improvement of landfill sites in order to prevent public health and environmental deterioration.

Since there is no overall policy regarding waste management and there are very few laws and regulations, this study will provide a base for a policy formulation and its directives. People were very positive with 3Rs initiative and therefore the study will guide in deciding alternatives management programs and plans on waste management hierarchy.

## 1.8 Thesis organization

This thesis has been organized into 5 chapters. Chapter 1 contains general introduction about the study portraying the background of the study, problem statement, justification, objectives, research questions, hypothesis, its scope and the whole work organization. Chapter 2 is a literature review comprising of relevant topics to waste management subject matter such as elements of MSWM, public health and environment impacts from municipal waste, aspects of MSWM such as political, social and technical. Chapter 3 provides detailed methodological approaches used to undertake the study. Chapter 4 presents the findings obtained from the field data and their discussion. Chapter 5 summarizes the key findings, give the general conclusion and recommendations of the study.



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