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Environmental Health in Zanzibar

A Case Study on Domestic Solid Waste Management in the Urban West (North Zone)

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Master Thesis

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Abstract

Background: The environment has a great impact on people's health as well as on their life expectancy. Inadequate waste management is a major cause of environmental problems, especially critical in urban areas in developing countries. Increasing population density and generation of waste per capita cause acute challenges for municipal solid waste management (MSWM). For sustainable solid waste management (SWM), a multitude of influencing factors need to be considered in the planning and implementation of waste management as described in the *Integrated Sustainable Waste Management* (ISWM) model by UN-Habitat, 2010. The cooperation of different stakeholders and the adoption of locally feasible solutions are essential. This study addresses the domestic solid waste management and associated environment and health challenges in the most deprived zone of Zanzibar Town in order to identify suitable measures for behavioural as well as structural interventions.

Method: A multi-method case study was conducted to explore domestic solid waste management and related environment and health risks. Extensive field research was conducted in the North Zone of the Urban West from January to March 2015. A Knowledge, Attitude and Practice (KAP) survey was conducted in form of quantitative interviews (n=384) to investigate the SWM service provision, infrastructure and practices as well as associated environment and health challenges at community level. The provision of information and educational measures was also dealt with in the questionnaire. Observations and field notes were documented to complement and illustrate the survey results. A qualitative expert interview with the Head of the Social Service Department of the Zanzibar Municipal Council (ZMC) was furthermore included in the data collection to take into consideration the government perspective at municipal level. The application of multiple methods allowed triangulation for comparison and validation of results.

Results: Serious environmental health concerns related to domestic solid waste management were evident throughout all areas studied. A variety of environmental health risks related to the improper disposal of domestic waste were recorded during the field research. Results are presented according to their topical relevance, combining findings from the different methodologies. Several topics re-emerged in each of the methods applied, allowing major issues to be identified with regard to SWM infrastructure, domestic SWM practices, the impact on environment and health, media use, information and education as well as financial resources for domestic SMW. The community's knowledge, attitude and practices were found to be diverse, which together with an insufficient SWM infrastructure and lacking alternatives furthered the occurrence of environmental health threats. Lacking cooperation between the ZMC and the urban communities was recognised as a major cause of poor SWM in urban Zanzibar.

Conclusion: The study's results have illustrated the necessity of an integrated approach to SWM in Zanzibar. Physical elements as well as governance features need to be incorporated for sustainable service provision. The active involvement of different stakeholders is critical to comprehend the interrelated influencing factors and to enable the sustainable planning and implementation of solid waste management. The diversity found within the research area further highlighted the importance of cooperation with and empowerment of the respective community (Shehia) to establish and strengthen existing initiatives appropriate for the area. To enable immediate and sustainable change, viable interventions for short-term implementation at the local level need to be designed. Low-tech solutions were found to be most feasible for the provision of domestic SWM in urban Zanzibar.

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Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
CBO	Community-based Organisation
ENT	Ear, Nose and Throat
e-waste	Electronic waste
GDP	Gross Domestic Product
GNI	Gross National Income
GVG	Glitters Volunteer Group
HDI	Human Development Index
HIV	Human Immunodeficiency Virus
IPT	Intermitted Preventive Treatment
IRS	Indoor Residual Spraying
ISusWM	Integrated Sustainable Waste Management
ITN	Insecticide Treated Nets
ITV	Independent Television Limited
KAP	Knowledge, Attitude and Practices
LDC	Least Developed Country
LLIN	Long-lasting Insecticidal Nets
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
NGO	Non-governmental Organisation
NLUP	National Land Use Plan
PHC	Population and Housing Census
PPP	Public-private Partnership
RGoZ	Revolutionary Government of Zanzibar
SW	Solid Waste
SWM	Solid Waste Management
TBC	Tanzania Broadcasting Corporation
TSh	Tanzanian Shilling
UNEP	United Nations Environmental Programme
UNDP	United Nations Development Programme
UN-Habitat	United Nations Human Settlements Programme
USD	US Dollar
UTI	Urinary Tract Infections
WHO	World Health Organisation
ZBC	Zanzibar Broadcasting Corporation
ZIFA	Zanzibar Institute of Financial Administration
ZMC	Zanzibar Municipal Council
kcal	kilocalories
kg	kilogramme
m^3	cubic metre
wt	weight

1 INTRODUCTION

1.1 Environment and Health

The relationship between the environment and human health is highly complex, as our environment comprises different physical, biological, chemical, geographical, social and cultural as well as economic characteristics. Therefore, most diseases cannot be associated with only one type of exposure, but with several environment-related risk factors (Corvalan, Kjellström, & Smith, 1999).

1.1.1 The Global Perspective

There are great health inequalities between and within countries, resulting in substantial differences in morbidity and mortality amongst populations. The environment in which people live, grow and work highly influences their health as well as life expectancy (Marmot, 2005). Thus environmental pollution poses one of the major health threats and greatest global challenges of our time.

Globally, it is estimated that 23% of deaths and 24% of the disease burden can be ascribed to environmental influences. Among children between the ages of 0-14, death related to environmental factors is even higher (36%). There are great regional variations, which can be explained by substantial differences in environmental conditions as well as the availability of health care. The highest absolute burden of disease related to environmental conditions is found in lower respiratory infections as well as diarrhoea and malaria, which pose great risks to populations especially in developing countries. With regard to the global environmental burden the amount of healthy life years lost per capita is 15-times greater in developing than in developed countries. The biggest difference can be observed with regard to infectious diseases, where the per capita environmental burden is up to 120-150 times higher in developing countries (Prüss-Üstün & Corvalan, 2006).

1.1.2 Challenges in Developing Countries

Developing countries face a higher disease burden related to environmental hazards. Widespread poverty, the lack of technology, equipment and environmental legislation further contribute to the precarious environmental conditions (Prüss-Üstün & Corvalan, 2006; Briggs, 2003). There is a particularly rapid growth of urban populations in the developing parts of the world, which increases health hazards as the required infrastructure, transport and sewerage systems cannot be expanded at the same pace (WHO/UNEP, 2008).

A high proportion of economically weak populations are affected by poor sanitation facilities, insufficient waste management and consequent contamination of water sources leading to an increased rate of infectious diseases such as diarrhoea, cholera and other waterborne diseases. The indoor use of solid fuels

for heating and cooking further increases the risk of respiratory diseases (Prüss-Üstün & Corvalan, 2006). As these environmental factors and their health consequences impact directly on economic productivity at individual as well as at national level, environmental hazards contribute to maintaining the inequity of the most vulnerable populations, where the highest priority is the daily struggle for basic needs. Therefore it is crucial to link health and environmental interventions with improvements in quality of life and well-being (WHO/UNEP, 2008).

1.1.3 Relevance of Solid Waste Management for Environment and Health

Insufficient solid waste management (SWM) is a major cause of environmental problems, especially critical in urban areas in developing countries. Increasing population density and generation of waste per capita in combination with a lack of waste disposal facilities in domestic areas cause acute challenges for municipal solid waste management (MSWM), resulting in low collection rates (UNEP, 2005).

Waste accumulation in domestic areas poses a health threat to the general population. It promotes the spreading of germs as it attracts disease vectors such as insects, vermin, snakes and other animals. Serious viral, bacterial and parasitic diseases are the consequence (Harvey, Baghri, & Reed, 2002). Uncollected waste can cause blockage of drains, resulting in stagnant water, which provides a breeding place for mosquitos and leads to contamination of water sources used for consumption by the population. The situation is especially critical when poor sanitary conditions result in human excreta being mixed with municipal solid waste increasing the risk of infection when handling the waste (Coffey & Coad, 2010; Spies, 2010; UNEP, 2005).

There are great regional variations in the amount and composition of waste that needs to be disposed of. In most developing countries the waste includes a high amount of organic components, which attracts flies, rats and other rodents. Especially in hot climatic conditions where waste decomposes more quickly, the occurrence of highly unpleasant odours makes a higher rate of collection necessary (Coffey & Coad, 2010). Tropical weather conditions can increase the amount of leachate through the degradation of waste materials, causing contamination of soil and groundwater. The burning of waste can reduce hygienic concerns, but instead causes air pollution through toxic substances (Spies, 2010).

1.2 Solid Waste Management in Developing Countries

1.2.1 Definition of Municipal Solid Waste

Municipal solid waste (MSW) comprises all unwanted waste materials from domestic, commercial and industrial facilities, public institutions, parks and markets as well as street sweepings. Consequently, the waste is a mixture of very different materials including hazardous waste that needs to be dealt with (UN-HABITAT, 2010; Vuai, 2010). MSW includes food and yard waste, plastic, wood, paper, metal, glass, textiles, diapers as well as household hazardous waste.

Depending on its physical composition municipal solid waste has variable characteristics, such as the moisture content (% wet or dry/wt), density (kg/m^3), calorific value (kcal/kg) as well as chemical composition. It also varies according to the regional living standard, lifestyle and natural resources. The main difference between developing and industrialised countries is the proportion of organic waste components, which is considerably higher in the less developed countries (UNEP, 2005).

1.2.2 Municipal Solid Waste Management in Developing Countries

Municipal solid waste management refers to the organisation of the whole waste cycle, from its generation, domestic storage, collection and processing of the waste materials up to the point of final disposal (Vuai, 2010). The major duty of municipal solid waste management is the prevention of negative health effects, especially for low-income populations. Other functions include the maintenance of the environment as well as the promotion of economic productivity and creation of employment. For the successful execution of service, solid waste management needs to be adapted to local conditions and implemented by the respective municipality together with the communities in order to be sustainable (Schüberle, Wehrle, & Christen, 1996).

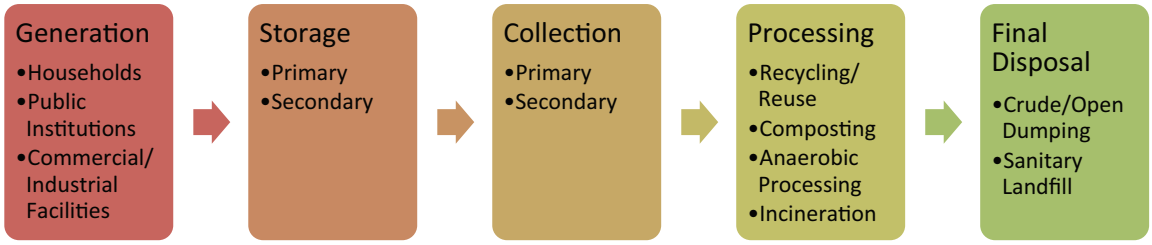


Figure 1 Municipal Solid Waste Management - From Generation to Final Disposal *(created by author)*

Source/Generation

Sources of municipal solid waste are households, commercial and similar establishments. The generation of waste is determined by local habits and preferences, social, economic as well as geographic factors. Waste prevention at source presents an essential element of the solid waste management hierarchy *(see chapter 1.2.3)* as it reduces the amount of waste in need of collection and disposal. It comprises the reduction of

waste quantity and toxicity and furthermore includes the reuse of materials at the source of generation. Strategies for waste reduction include the redesign of packaging, the promotion of awareness and responsibility among producers and consumers as well as the local extraction, separation and recovery of materials from the municipal waste stream, including small-scale composting (UNEP, 2005).

Storage

In the course of the waste management process, waste is first stored at household level in small domestic containers and then transferred and stored intermediately in large containers provided at community level. The required storage volume depends on the population serviced, waste generation per capita as well as frequency of collection. Capacity, usability and hygiene standards have to be considered for the selection of suitable storage facilities (Coffey & Coad, 2010; Harvey, Baghri, & Reed, 2002).

Collection

Solid waste collection refers to the removal of accumulated waste from the source of generation and many SWM systems in developing countries include measures of primary and secondary collection. Primary collection describes the collection of waste at household level and transportation to a transfer station or collection point by small vehicles, such as wheelbarrows, hand or animal carts. Measures for primary collection include door-to-door, block and kerbside collection. Larger, motorised vehicles are used for secondary collection and solid waste is taken to the final disposal site in large quantities. Secondary collection is usually the responsibility of the municipal council, but is nevertheless determined by the primary collection systems as well as availability and effectiveness of equipment at community level. Community-based primary waste collection from households is feasible where population density is high, with low waste generation per capita of mainly high-density waste. The frequency of collection is determined by climatic conditions, higher temperatures requiring a more frequent collection. The frequency, structure and quality of SWM service however are, in the end, dependent on the financial resources available for waste management (Schüberle, Wehrle, & Christen, 1996; UNEP, 2005).

Particularly in low-income countries, such as Zanzibar, the application of community-based primary collection can lower the costs and improve service delivery through the use of equipment that is locally available and appropriate for the management of municipal solid waste (Schüberle, Wehrle, & Christen, 1996).

Processing

Measures for the processing of solid waste are applied to reduce costs for transport and final disposal as well as to minimise waste related environment and health risks. Depending on the waste characteristics, availability of resources and the environmental conditions different treatments may be implemented, such as the incineration, anaerobic and aerobic processing of waste materials. Composting (aerobic processing) is regarded as waste treatment and as a form of recycling as it reduces pollution at the stage of final

disposal and can furthermore be recovered as a resource in form of compost (Coffey & Coad, 2010; UNEP, 2005).

Recycling/Reuse

Recycling involves the separation, extraction and recovery of waste components, which are then returned to the value chain for further use. The recovery of materials however requires technical solutions and suitable waste needs to be dependently available in sufficient quantity (Coffey & Coad, 2010). The reuse of waste materials that have been refurbished is another form of recycling as it prolongs products' usability.

Recycling is applied not only for the purpose of environment and health benefits but additionally helps to recover valuable resources and reduce costs for final disposal (UN-HABITAT, 2010). Financial benefits are the main drivers for recycling practices in developing countries, encouraging informal waste workers to separate recyclable materials from the waste stream to be sold for further treatment. Hereby environmental pollution is less important and might even be caused during the extraction of waste materials. (Coffey & Coad, 2010).

Composting (Aerobic Processing)

Composting turns biodegradable materials into soil conditioner. Aerobic bacteria digest organic waste, reducing the amount of waste and consequent pollution associated with crude final disposal. Aerobic processing of organic solid waste occurs when there is sufficient oxygen, moisture and appropriate temperature conditions. Materials suitable for composting are fruit and vegetable waste, agricultural waste such as crop residues, yard waste such as grass and leaves as well as animal manure and human excreta. Other materials such as wood, bone or paper although compostable can slow down and therefore hinder the process (Coffey & Coad, 2010).

Anaerobic Processing

Anaerobic processing of organic waste is undertaken in an oxygen-free environment. Microbial populations are used for the degradation of organic material and production of biogas and other compounds.
There are two major advantages of anaerobic processing. Co-digestion with other substrates enables the successful degradation of low nutrient organic wastes, while at the same time biogas is produced at a relatively low cost. The anaerobic digestion is determined by several factors including the composition, quality and microbial characteristics of substrates and environmental influences such as temperature and pH value (Khalid, Arshad, & Anju, 2011).

Incineration/Energy Recovery

Incineration describes the controlled burning of waste with minimisation of air pollution. The solid waste volume can be reduced significantly through combustion at high temperatures. The residues neither decompose nor attract rodents, flies and vermin but may contain heavy metals and toxic components that

can cause pollution of nearby water sources. Incineration of certain waste materials furthermore enables energy recovery. The adequate operation of an incineration plant is very costly and requires high environmental standards (Coffey & Coad, 2010).

Incineration is less suitable in developing countries where waste has high organic, moist components and therefore little energy value (calorific value). Waste with high proportion of wet organic matter makes incineration difficult, if waste is not consequently separated at source. Improper incineration due to unsuitability of waste composition causes problems in the operation of the plant and a subsequent rise in hazardous air pollution. Another more feasible method of energy recovery from solid waste is the utilisation of landfill gas from sanitary landfills (Coffey & Coad, 2010).

Final Disposal

Final disposal describes the process of waste being dumped in its ultimate destination. Two major options are applied for final disposal. Crude or open dumping is most commonly used in developing countries, which is the disposal of solid waste on natural land without any further treatment resulting in severe detrimental environmental consequences with regard to soil, water and air pollution. Another method for final disposal of solid waste is sanitary landfilling. This involves controlled preparation, operation as well as continual restoration of the site. Thus, environmental pollution can be minimised by the means of effective treatment and disposal of waste (Khalid, Arshad, & Anju, 2011).

As an island, Zanzibar faces many challenges associated with the final treatment and disposal of solid waste management, including the lack of suitable sites and financial resources for the establishment of sanitary landfills to prevent the widespread environmental degradation by waste. Consequently, crude dumping is practised. Waste separation and recycling are effective measures for the reduction of waste materials being dumped in landfills (UNEP, 2005; McDougall, White, Franke, & Hindle, 2001; Vancini, 2000).

1.2.3 Integrated Sustainable Waste Management

Integrated Sustainable Waste Management (ISusWM) framework as presented in UN-HABITAT's *"Solid Waste Management in the World's Cities (2010)"* refers to the interdependency of the various aspects and dimensions involved in the SWM process. The ISusWM model is based on the three physical elements, public health, environmental protection and resource management as well as the three governance features inclusivity, financial sustainability, sound institutions and proactive policies, which are explained in the following (UN-HABITAT, 2010).

Physical System Elements

Public Health (Collection)

Inefficient waste management has direct consequences on our natural environment, human health and length of life. Thus, the safe collection and subsequent reduction of solid waste being randomly dumped or burned in domestic areas is important to maintain healthy conditions and reduce environment and waste associated diseases, such as diarrhoea and respiratory diseases.

Environmental Protection (Treatment and Disposal)

The handling and final disposal of solid waste has to be controlled for the environmental protection of land, air and water. The implementation of sound waste treatment and introduction of sanitary disposal is an essential part of sustainable SWM.

Resource Management (Valorisation of Recyclables and Organic Material)

The prevention as well as reuse, recovery and recycling of waste presents another crucial element for the sustainable management of waste. The quantity of waste in need of collection and disposal and associated costs as well as environment and health effects are reduced through the valorisation of recyclable and organic waste components.

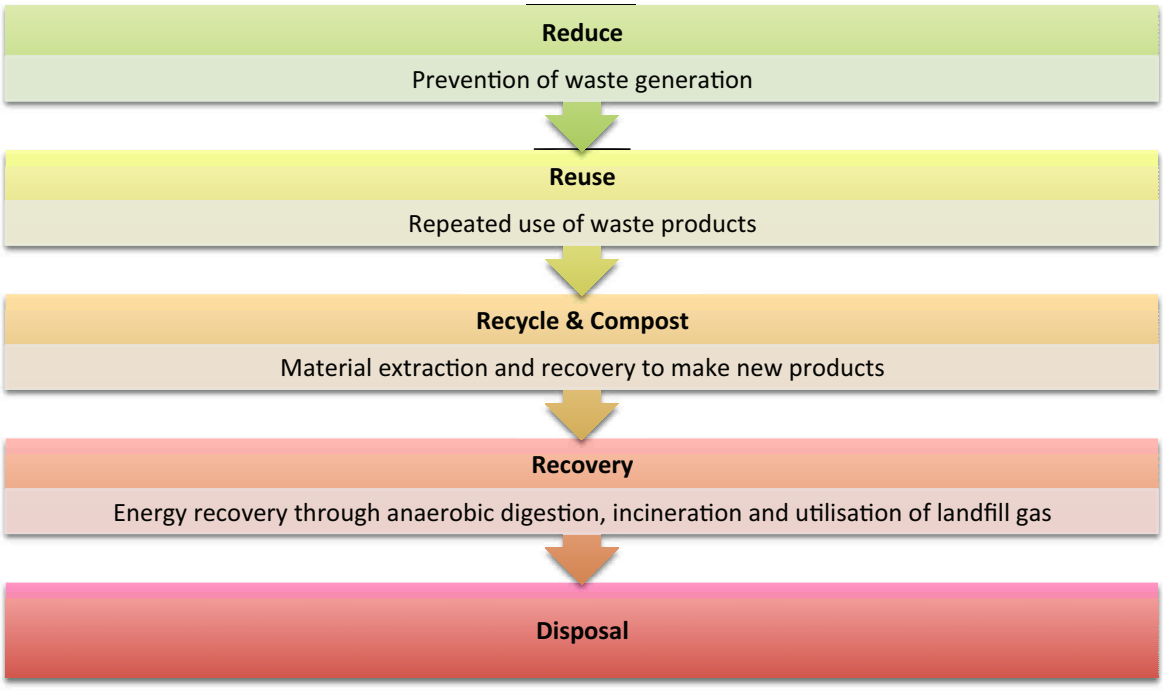


Figure 2 Waste Hierarchy *(adapted from UN-HABITAT, Solid Waste Management in the World's Cities (2010))*

Governance Features

Inclusivity

For solid waste management to be sustainable, all stakeholders need to be involved in the planning and implementation of changes. Although the municipal government is responsible for the management of urban SWM, it is unable to provide sustainable measures without the inclusion of other interest groups.

The major stakeholder-groups are:

1. Users: Households and public institutions.

2. Providers: Local authority, Community-based Organisation (CBOs) and Non-government Organisations (NGOs), the private formal and informal waste sector.

3. External Agents: National and local government, donor agencies.

Financial Sustainability

Solid waste management is one of the most vital urban services and represents a substantial proportion of the permanent budget requirements of a city. Despite the relatively high costs, service delivery is often insufficient with low collection coverage and poor standards of disposal. The introduction of revenue collection as well as the mobilisation of investments is crucial to address the increasing quantity of waste and establish a reliable solid waste management system. Most system users are generally willing to contribute to service delivery at domestic level if adequate service is provided for locally appropriate prices. Nevertheless, a significant part of the total cost remains to be covered by other resources of the municipality.

Sound Institutions and Proactive Policies

A transparent and reliable institutional framework is the basis of sustainable governance in SWM. The structural organisation of financial resources and service delivery is an essential part of sound waste management as well as community responsibility and involvement of system users. Furthermore related factors such as management, contracting, labour standards, accounting and cost recovery need to be addressed for the effective delivery of SWM (UN-HABITAT, 2010).

1.3 Research Question & Objectives

Zanzibar faces many difficulties with regard to rapid urban growth and inadequate waste management, posing great health threats to the population (H. P. Gauff Ingenieure, 2005; Zanzibar Municipal Council, 2014). Domestic waste management and the related consequences for the environment and standards of hygiene pose a continuous challenge to the citizens as well as to the local government of Zanzibar. In 2011 only 45% of the solid waste in Zanzibar Town was collected by the Zanzibar Municipal Council (ZMC), which is responsible for its collection and disposal (World Bank, 2011). The remainder is dumped on locally grown unofficial dumpsites or randomly spread, burned or buried in domestic and public areas.

Service provision by ZMC is lowest in the areas with low socio-economic status and poor populations are affected most by environmental pollution and the associated health effects (Zanzibar Municipal Council, 2014; H. P. Gauff Ingenieure, 2005). Therefore the study focuses on domestic solid waste management at household level in the least serviced zone of Zanzibar Town. According to the complexity of a sustainable domestic solid waste management system and the variety of influencing factors a multi-method case study was applied.

The aim of the research was the analysis of domestic SWM structures and practices at community level in Zanzibar Town with regard to environmental and health consequences. The findings from the research were to serve as a basis for the development of adequate educational measures concerning environmental health and SWM in the community. Furthermore structural barriers that need to be resolved to enable behaviour change were to be identified.

1.3.1 Research Question

"How can environmental education with regard to domestic solid waste management facilitate the improvement of environmental and health conditions in the communities of the Urban West (North Zone), Zanzibar? Which structural measures need to be implemented in order to enable behavioural change in the community?"

1.3.2 Objectives

The overall objective was the investigation of the current domestic solid waste management and associated challenges in the North Zone of Zanzibar Town in order to identify approaches for the implementation of behavioural and structural change towards sustainable SWM.

To answer the proposed research question, the study serves to achieve following objectives:

- To investigate current domestic solid waste management practices and determining influences in the community.
- To identify the need and potential for structural changes in solid waste management at community and government level.
- To identify environment and health risks associated with poor domestic waste management and appropriate preventive measures.
- To identify suitable means for the provision of environmental education on a broad scale to a variety of target groups.

The research aims at identifying adequate measures for the improvement of the domestic solid waste management and reduction of associated environment and health risks in the North Zone of Zanzibar Town. The current SWM system, common disposal practices as well as the role of different stakeholders for the provision of service are assessed in order to identify and address the major behavioural as well as structural challenges for the implementation of a sustainable SWM.

2 BACKGROUND

2.1 Introduction to Zanzibar and Zanzibar Town

2.1.1 Overview - Country & Population Statistics

The Zanzibar archipelago, which is part of the United Republic of Tanzania, is located about 30 kilometres off the East African coast in the Indian Ocean (Revolutionary Government of Zanzibar, 2013). It consists of the two main islands Unguja and Pemba as well as many small surrounding islets. Zanzibar Town, located on the western coast of Unguja island is the capital of Zanzibar and centre of economic activity. Zanzibar comprises a surface area of 2.654 km^2, of which 1.666 km^2 belong to the larger island Unguja and 988 km^2 to Pemba (Office of Chief Government Statistician Zanzibar, 2012; The United Republic of Tanzania. Ministry of Foreign Affairs, East Africa, Regional and International Cooperation, 2015).

Figure 3 Zanzibar - Unguja & Pemba Island

Figure 4 Zanzibar - Unguja Island/Urban West

According to the *Population and Housing Census (PHC) 2012*, Zanzibar has a population of 1.303.569 and an annual growth rate of 2,8%. The largest population of 593.678 can be found in Zanzibar Town, the Mjini Magharibi district (Unguja, Urban West), which amounts to 46% of the total population. The Urban West district itself is divided into four operational areas, which are the historic city centre of Stone Town, also called Mjini district and the Magharibi district comprising the North, South and West Zone of Zanzibar Town (The United Republic of Tanzania, 2014).

Zanzibar has a total of 250,212 households, of which 45% are in urban areas. About one third of households are female-headed. The average household size was 5,1 persons in 2014, while urban households showed a

higher average than rural households. Furthermore female-headed households (8,6) were on average double the size of male-headed households (3,6). The median age in Zanzibar is very low (18,4 years) and a total of 45% of the population is below the age of 15. Life expectancy in urban Zanzibar was 60,8 years in 2008 (Revolutionary Government of Zanzibar, 2013/d).

The climate in Zanzibar is equatorial, warm and humid with an average temperature ranging from 21°C during the cold season to about 30°C. The humidity rate ranges from 50 to 80 percent. The main rain season is from March to May. (The United Republic of Tanzania. Ministry of Foreign Affairs, East Africa, Regional and International Cooperation, 2015).

2.1.2 History and Culture

In 1964, Zanzibar and Tanganyika united to form the United Republic of Tanzania. Since then, Zanzibar, as a semi-autonomous part of the United Republic of Tanzania has established its own government with the House of Representatives as legislative assembly, an executive lead by the President of Zanzibar as well as an independent judicial system (Revolutionary Government of Zanzibar, 2010).

The first residents of Zanzibar belonged to the Bantu-speaking Hadimu and Tumbatu ethnic groups. Due to its advantageous location off the East African coast, traders from Arabia and the Persian Gulf region settled on the island in the 11th century. Later, European influence and trade increased as Zanzibar was under the control of Portugal for nearly 200 years, before, at the end of the 17th century, the Omanis obtained nominal control of the island. Zanzibar became the centre for trade of ivory and slaves in East Africa until slave trade was abolished at the end of the 19th century due to a treaty with the British. In the 1950s, Zanzibar established its own political party system and gained independence from British protectorate in 1963. It merged with the mainland Tanganyika to form the United Republic of Tanzania in 1964, after the Sultan had been forced into exile (Revolutionary Government of Zanzibar, 2013/b). Due to its history, the Zanzibari culture is a diverse mix of African, Arab, Indian and European influences. Swahili is the national language of Tanzania, commonly spoken in Zanzibar, while the official language of education and administration is English. Zanzibar is predominantly Muslim (estimated 99%) with a small number of Christians and Hindus living on the island. In addition some traditional beliefs are still found among the population (The United Republic of Tanzania. Ministry of Foreign Affairs, East Africa, Regional and International Cooperation, 2015).

2.1.3 Economy

Tanzania, including Zanzibar was ranked 152 out of 177 on the Human Development Index (HDI) in the United Nations Development Programme *(UNDP) Human Development Report, 2013*. It is still classified as one of the least developed countries (LDC) with an annual Gross National Income (GNI) of 779 USD per capita in 2015. In 2010, still 44,4% of the population in Zanzibar lived below the basic need and 13% below the food poverty line (UNDP, 2015).

The labour market in Zanzibar lacks productive employment. The economy is characterised by limited resources and at the same time high population density. The majority of the labour force is engaged in the informal sector, including low skilled jobs, such as petty trading, handcrafts and seaweed farming as well as subsistence agriculture. The illiteracy rate among the adult population in Zanzibar (15 years and above) amounts to 15,8%. Due to lacking employment perspectives in rural areas, many youths migrate to Zanzibar Town to generate some income for their families. Nevertheless, thereby the problem of under- and unemployment in the urban areas increases continuously. The demographic development poses a great challenge for the volatile labour market in Zanzibar, due to the many, often unskilled youths in search of employment (Ministry of Labour, Youth, Women and Children Development Zanzibar, 2007; The United Republic of Tanzania, 2014).

The economy depends largely on agriculture and increasingly, on tourism. Main export goods are cloves and copra, while fuel and food products such as rice, maize, oil and wheat account for the major imports to Zanzibar (Revolutionary Government of Zanzibar, 2013/c). Although the tourism sector has developed into a mainstay of Zanzibar's economy, accounting for 25% of the Gross Domestic Product (GDP), it does not sufficiently facilitate direct employment and rather provokes a highly unequal income distribution. There is a need for further linkage of the tourism sector with other aspects of economy to promote and foster its growth and revenue generation from tourism. Agriculture (49%) as well as small livestock breeding (33%) remain important for the majority of households in Zanzibar. Commercial agriculture continues to be the main occupation in Zanzibar (The United Republic of Tanzania, 2014).

2.2 Health in Zanzibar

2.2.1 Major Health Concerns

According to the *Health Information Bulletin 2008* published by the Ministry of Health and Social Welfare Zanzibar, upper respiratory tract infections were the major cause of morbidity (22,8%) in 2008, followed by pneumonia (10%). The incidence of respiratory conditions is high and varies according to seasonal change. Over-diagnosis however is estimated in up to 39% of cases (Health Management Information System Unit 2009). Clinical malaria accounted for 9,7% of morbidity in Zanzibar in 2008, statistics also including cases that had not been confirmed. The incidence of confirmed malaria cases was 1,5% in the same year. Malaria had been the leading cause of morbidity as well as mortality in Zanzibar for many years, but a considerable

reduction in malaria cases was accomplished through preventive measures such as insecticide treated nets (ITNs), long lasting insecticidal nets (LLINs), indoor residual spraying (IRS) and intermitted preventive treatment (IPT) for pregnant women. Furthermore, improved diagnostic measures and the recording of confirmed cases only, contributed to the decline of malaria-associated morbidity (Health Management Information System Unit 2009).

Diarrhoea, including dysenteries, cholera and other diarrhoeal diseases caused 8,6% of morbidity in 2008. Occurrence of diarrhoea is subject to seasonal variations with increased outbreaks during rain season. The incidence is highest among children and is a major cause of malnutrition among children under five years of age (Health Management Information System Unit 2009). Children are particularly vulnerable to environment and waste related health risks due to physiological and behavioural characteristics. Exposure in childhood furthermore influences the occurrence of disease and malfunctions in adult years (Spies, 2010).

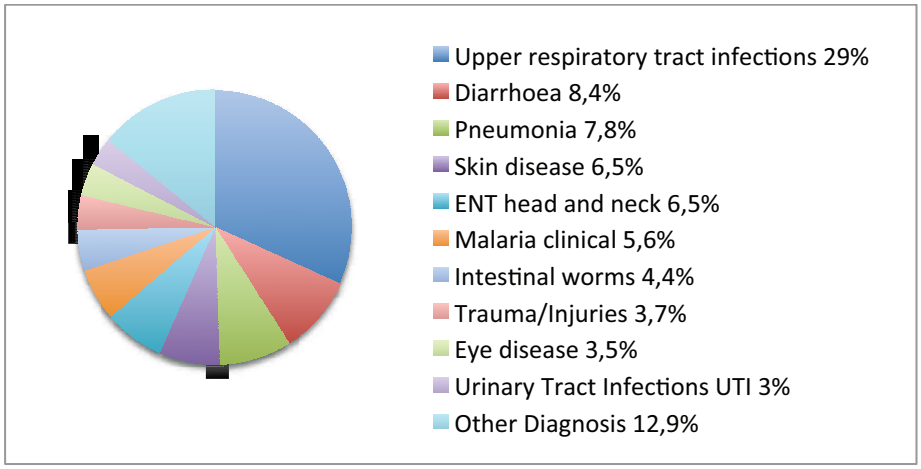


Figure 5 Reasons for Patients Attending Public Health Facilities in 2009 ***(adapted from the Revolutionary Government of Zanzibar, 2010)***

The health sector in Zanzibar struggles to improve its services due to lack of qualified human resources, supplies and well functioning equipment, caused by insufficient financial resources. Nevertheless, efforts are being made to improve the public health situation in Zanzibar through increased access to sanitary facilities in public institutions as well as at household level. The importance of an adequate sewerage and waste management infrastructure for the prevention of diseases has been recognised by the Zanzibar government, as described in *"The Zanzibar Strategy for Growth and Reduction of Poverty: 2010-2015"*. (Revolutionary Government of Zanzibar, 2010).

2.2.2 Environment and Health

Several environment-associated diseases are prevalent in Zanzibar, posing severe health risks to the population. Diseases related to insufficient environmental management disproportionately affect poor communities, living in precarious conditions with lacking access to adequate sanitation and safe water

sources. The tropical climate in Zanzibar further promotes the occurrence of certain diseases. An overview of the major environment related diseases is presented in the following.

Dengue Fever

Overview

Dengue fever is an acute flu-like illness, transmitted through infected female mosquitoes *(Aedes aegypti* and *Aedes albopictus)*. The disease is widely spread in tropical areas and influenced by the local temperature and rainfall as well as rapid unstructured urbanisation. The symptoms range from mild to incapacitating high fever, vomiting, headache with pain behind the eyes, muscle and joints pains and swollen glands or skin rash. A potentially lethal complication is severe dengue with respiratory distress, fluid accumulation, plasma leaking, severe bleeding or organ impairment, requiring intensive medical care.

Prevention

The most effective mean for the prevention of dengue is broad based vector control. Vector control entails the elimination of breeding places as well as personal protective measures. Environmental management, including the proper disposal of solid waste, the removal of artificially man-made habitats and the covering and maintenance of domestic water storage containers prevents mosquitoes from accessing egg-laying places. For personal protection, long-sleeved clothes should be worn and households should be equipped with window screens, insecticides treated mosquito nets or vaporisers. In endemic areas, the application of indoor residual spraying (IRS) is another measure for the prevention of further spreading.

Diarrhoeal Diseases

Overview

Diarrhoea is a symptom of infections, including cholera and dysenteries caused by faecal-oral transmission of bacterial, viral or parasitic organisms. Diarrhoeal diseases are closely associated with poor environmental management. The infection is related to poor sanitation and hygiene and mainly spread through water sources, contaminated by human or animal faeces as well as unhygienic handling of food. The disease can also be spread from person-to-person due to poor personal hygiene. Symptoms include the passage of liquid stools several times a day. Diarrhoea causes dehydration and malnutrition and represents a major cause of child morbidity and mortality in developing countries. The two most common aetiological pathogens causing diarrhoeal diseases in developing countries are the *Escherichia coli* and *Rotavirus*.

Cholera is a highly acute diarrhoeal infection caused by bacteria (*Vibrio cholerae*), which is transmitted through consumption of contaminated food or water. Cholera is a highly virulent disease that can lead to death within hours in cases of acute watery diarrhoea and consequent severe dehydration. Although not all people infected develop symptoms, they remain disease carriers, potentially spreading the infection.

Prevention

There are several ways of disrupting the transmission cycle of pathogens to prevent the spreading of diarrhoeal diseases. Preventive measures include access to safe water sources, improved sanitation as well as personal and food hygiene. Diarrhoea can furthermore be reduced through improved waste and animal excreta management as well as exclusive breastfeeding for the first six months after birth. A rotavirus vaccination is available and is applied in cases of increased outbreaks.

For the prevention of cholera, two oral vaccines are available, which can be applied in high-risk populations.

Helminthiasis

Overview

Soil-transmitted helminths include the roundworm (*Ascaris lumbricoides*), whipworm (*Trichuris trichiura*) and hookworms (*Necator americanus* and *Ancylostoma duodenale*). Infection is transmitted by ingestion of eggs from human faeces. This can occur when contaminated water, food or soil is ingested. Adult worms produce thousands of eggs in the intestine of the host each day, which leads to contamination of soil if sanitation is poor. As eggs, which are passed in faeces require three weeks to mature in the soil before becoming infective, there is neither direct person-to-person transmission nor infection through fresh faeces. Symptoms are related to the amount of worms harboured. Light infections usually show no symptoms. Heavier infections however can cause intestinal manifestations, including abdominal pain, diarrhoea and general malaise. Soil transmitted helminths cause nutritional impairment associated with impaired physical and cognitive development.

Hookworm larvae can additionally actively penetrate the skin and are mainly transmitted by walking barefoot on contaminated soil.

Prevention

A major strategy for the prevention of soil-transmitted helminths is periodic medical deworming treatment with albendazole and mebendazole to all at-risk populations. Morbidity is reduced through decreased worm burden. The provision of good sanitation and hygiene as well as the promotion of health education are additional interventions to reduce transmission.

Hepatitis A

Overview

The hepatitis A virus causes liver disease, transmitted through consumption of water and food contaminated with the faeces of a disease carrier or close physical contact with an infected person. It is associated with inadequate sanitation, unsafe water sources and lacking personal hygiene. High levels of infection occur where sanitary conditions and hygiene practices are poor. In developing countries, most children are infected in early years, leading to immunity in adolescents and adults. Unlike other forms of hepatitis, hepatitis A infection does not develop into a chronic liver disease. Symptoms can be mild to severe, including fever, nausea, malaise, loss of appetite, abdominal discomfort, diarrhoea, darkening of urine and jaundice, while the severity of the infection and associated mortality increases with age. Although most patients recover fully from the disease, hepatitis A can involve debilitating symptoms and can cause acute liver failure, which is in turn associated with high mortality.

Prevention

The spreading of hepatitis A can be prevented through provision of safe water sources, proper sanitary and sewage disposal systems as well as the application of good personal and food hygiene. There are several vaccines available internationally for hepatitis A, which can protect from the virus. However, no vaccine is available for children under the age of 1 year.

Leptospirosis

Overview

Leptospirosis is an infectious disease, which is transmitted by bacteria (*Leptospira*) harboured in the kidneys and genital tract of domestic and wild mammals. The disease is transmitted to humans through contact with water contaminated by infectious animal urine, entering the body through cuts of the skin or mucous membranes of the mouth, nose and eyes. The consumption of contaminated food and water can occasionally lead to infection as well. Leptospirosis occurs globally, with particularly high prevalence in tropical and sub-tropical areas. Risk of infection is especially high after very heavy rainfall and flooding. Leptospirosis presents variable symptoms, which range from mild, flu-like illness to more serious and fatal conditions. Diagnosis is often difficult due to similar characteristics to diseases such as typhoid, dengue as well as viral hepatitis.

Prevention

Leptospirosis can be minimised by preventing contact with infected animals and their urine as well as contaminated environment. Transmission can be also be prevented through protective clothing, covering up cuts and abrasions as well as thorough washing after exposure to animal urine or contaminated water and soil. Generally, potentially contaminated water should be avoided completely and strict hygienic measures need to be maintained during the handling of animals.

Lymphatic Filariasis

Overview

Lymphatic filariasis, also known as elephantiasis is a parasitic infection, transmitted through infected mosquitoes. Adult worms persist in the lymphatic system for six to eight years, producing millions of immature larvae (*Microfilariae*) that flow through the blood stream. By biting an infected host, mosquitoes ingest microfilariae, which then mature within the mosquito. In case of a mosquito bite, the matured parasite larvae enter the body through the skin and then move to the lymphatic system, where they grow into adult worms, continuing the transmission cycle. The infection with lymphatic filariasis includes chronic, acute as well as asymptomatic conditions. Most infections proceed asymptomatic without any external symptoms, still damaging the lymphatic system, kidneys as well as immune system. If the infection develops into a chronic state, it commonly leads to tissue swelling (lymphoedema) or skin and tissue thickening (elephantiasis) of limbs and scrotal swelling (hydrocele). Chronic conditions are often accompanied by acute episodes causing local inflammation of the skin, lymph nodes as well as lymphatic vessels.

Prevention

To further combat the spreading of lymphatic filariasis large-scale treatment with preventive chemotherapy can be applied. The treatment includes a single dose of the two medications albendazole and ivermectin or diethylcarbamazine citrate to the whole at-risk population. Although the treatment has limited effects on adult worms, it can effectively clear the bloodstream from microfilariae and consequently prevent the spreading of parasites to the mosquito. The transmission cycle can be interrupted if treatment is repeated annually for four to six years. Vector control, as described above *(see Prevention of Dengue)* is another mean for the prevention of lymphatic filariasis.

Malaria

Overview

Malaria is an acute, life-threatening febrile illness caused by plasmodium parasites that are transmitted through infected female mosquitoes (*Anopheles*). The malaria burden in Sub-Saharan Africa is disproportionately high, while pregnant women and children are most vulnerable to the disease. The first symptoms typically include fever, chills, headache and vomiting, which are difficult to identify as malaria. If left untreated more severe, potentially lethal symptoms, such as anaemia, respiratory distress, metabolic acidosis or even cerebral malaria can occur.

Prevention

The most effective means for the prevention of malaria is broad based vector control, as described above *(see Prevention of Dengue).* Also anti-malaria medicines can be used to prevent an infection, are however associated with various side effects.

Schistosomiasis

Overview

Schistosomiasis is an acute as well as chronic parasitic disease caused by trematode worms (blood flukes). Schistosomiasis occurs in tropical and sub-tropical areas, with the highest prevalence in Africa. Infection occurs through contact with infested water during domestic, agricultural, occupational and recreational activities, especially in poor communities with limited access to safe water sources. Children are especially at risk due to lacking hygiene and certain playing habits, such as fishing or swimming in infested water. Parasite larvae enter the body through penetration of the skin. When they have matured into adult worms, eggs are released into the blood vessels. Eggs are further spread through faeces or urine of the host, continuing the transmission cycle. Remaining eggs get trapped in body tissues leading to reactions of the immune system and progressive organ damage.

There are two forms of the disease, intestinal and urogenital schistosomiasis. Symptoms of intestinal schistosomiasis include diarrhoea, bloody stool and abdominal pain, while liver enlargement is commonly experienced in more advanced cases. The main symptom of urogenital schistosomiasis is blood in the urine (haematuria). Other complications involve fibrosis of the ureter and bladder, kidney damage or bladder cancer, which might occur at an advanced stage. Another long-term consequence can be irreversible infertility in men and women.

Prevention

The prevention of schistosomiasis includes large-scale periodic treatment of at-risk populations with praziquantel. Major target groups for treatment in endemic areas are school-aged children and adults, who are regularly exposed to infested water. In high endemic areas, entire communities require treatment for disease control. Furthermore, transmission can be prevented through access to safe water sources, improved hygiene as well as snail control.

Typhoid Fever

Overview

Typhoid fever and paratyphoid are infections of the bloodstream and intestinal tract, caused by bacteria (*Salmonella typhi* and *Salmonella paratyphi*) transmitted through the ingestion of faeces or contaminated water. Infection occurs after drinking water, contaminated by sewage or the consumption of food and drinks, previously handled by an infected person. The bacteria multiply in the host's body and move from the intestines into the bloodstream. Symptoms can vary from mild to severe conditions, including persistent fever, headache, malaise, anorexia, constipation and diarrhoea, skin rash as well as enlarged liver and spleen. Symptoms of paratyphoid are similar but with a generally milder progression. Some people carry the bacteria even after their recovery, posing a continuous risk of transmission.

Prevention

Clean water, good sanitation and hygiene are crucial for the prevention of typhoid and paratyphoid. Access to safe water sources and proper sanitation systems needs to be provided in conjunction with education concerning personal and food hygiene. Another strategy to combat typhoid and alleviate the course of disease is the application of antibiotic treatment. Although there is a vaccine available, it is not commonly applied and only provides partial protection from infection.

2.3 Solid Waste Management in Zanzibar Town

2.3.1 Waste Characteristics

The waste composition varies according to a region's living standard, lifestyle and natural resources. Waste found in urban Zanzibar is mainly composed of organic material (85,6%), as is common in developing countries (H. P. Gauff Ingenieure, 2005; UNEP, 2005).

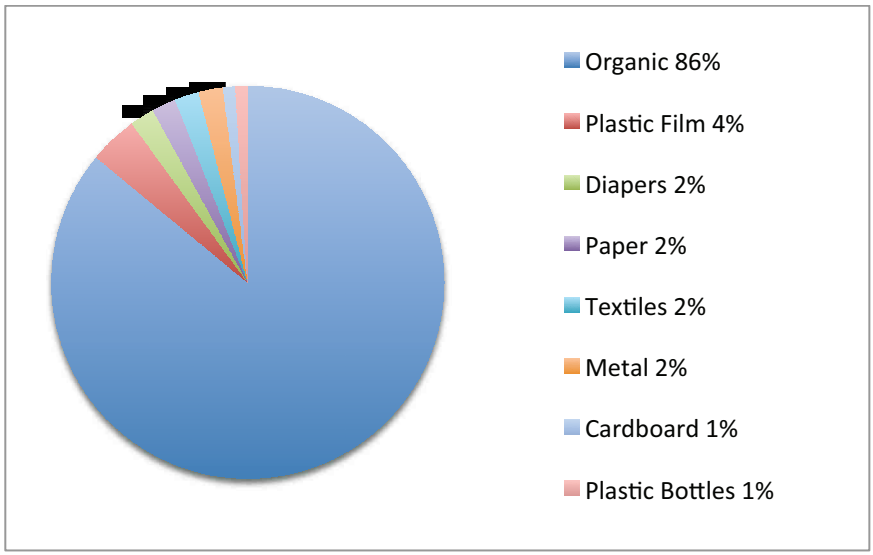


Figure 6 Domestic Solid Waste Composition Zanzibar Town *(adapted from ZMC 2005)*

Of the estimated 800m^3 of waste that is generated in Zanzibar Town per day, only 45% is collected and disposed of by the responsible municipal council. Due to the insufficient servicing, residents have adopted alternative ways of waste disposal. Many waste materials are either burned in domestic areas, dumped illegally and then eaten by animals, blown around by the wind or swept into drainages by the rain, resulting in blockages, flooding and stagnant water (Revolutionary Government of Zanzibar, 2010).

2.3.2 Stakeholders

There are a variety of individuals, organisation and groups involved in the MSWM process as service users and providers. For adequate functioning of SWM systems, jurisdiction as well as roles and responsibilities need to be clearly defined and all stakeholders involved in the design and implementation of appropriate measures (UNEP, 2005; Schüberle, Wehrle, & Christen, 1996).

Municipal Council

The municipal council, as a government authority is in charge of solid waste collection and disposal. In addition to the provision of SWM service it is responsible for the supply of an adequate public infrastructure. The municipal governments may employ private sector enterprises for the provision of SWM, nevertheless they remain in charge of the regulation and control of service provision as well as of the enforcement of laws and regulations (Schüberle, Wehrle, & Christen, 1996).

NGOs/CBOs

Non-governmental as well as community based organisations are mainly driven by developmental concerns, aiming to encourage development and improve the environment and quality of life especially for poor populations. Due to their proximity to their respective community, NGOs and CBOs play an important role in domestic SWM, functioning as a trusted mediator between the government and local community, providing organisational capacity as well as know-how at community level (Schüberle, Wehrle, & Christen, 1996; UNEP, 2005).

Informal Waste Workers

Especially in developing countries, the informal private sector plays an important role for the recovery and recycling of materials from the waste stream and can significantly reduce the material in need of final disposal. Individual workers, families or small, unregistered enterprises separate and recover certain waste materials, which are then sold for further processing. Many informal waste workers are driven by poverty and lacking employment and therefore generate their income from scavenging. The workers have to work under precarious conditions, as they are rarely equipped with any kind of protective gear and unfamiliar with the hazardous nature of waste. (Schüberle, Wehrle, & Christen, 1996; United Nations Statistic Devision, 2013).

Community/System Users

Residential households present one of the major stakeholders in solid waste management, as they are the system users. Their main priority is an effective and reliable service provision at an acceptable price rather than the sanitary disposal of solid waste, as long as the personal living environment is not polluted by waste (Schüberle, Wehrle, & Christen, 1996). Inclusion and consultation of the community concerning solid waste management services, frequency, time and method of collection as well as service cost is necessary to gain their compliance. (UNEP, 2005).

Private Sector

Private sector enterprises are involved in various stages of SWM. The private sector commonly forms public-private partnerships (PPP) with the municipal authorities offering management, organisation, human as well as technical skills for the collection, transport, treatment and disposal of waste. As the private enterprises are not responsible for public health concerns, but rather focused on profit maximisation, activities are mostly limited to the profitable functions of SWM (Schüberle, Wehrle, & Christen, 1996; UNEP, 2005).

Note: In Zanzibar Town, cooperation with the private sector had not yet been established successfully. First attempts had been made but did not result in any feasible arrangements (Rajab, 2015). Therefore, the private sector was not included in the data collection process.

2.3.3 Environmental Laws & Policies

Since the formation of the United Republic of Tanzania in 1964, environment-related issues are considered as non-union matters. Environmental management and conservation is among the issues that Zanzibar has continued to address autonomously. Therefore, mainland Tanzania and Zanzibar have differing environmental legislation and regulations (Majamba, 2005). For MSWM to be politically sustainable, precise delineation of legal requirements and local jurisdiction are required as well as clear definitions of the responsibilities of different stakeholders at community, municipal and national level (Schüberle, Wehrle, & Christen, 1996).

Framework of Environmental Law in Zanzibar

The first environmental laws and regulations were established in Zanzibar in 1996 in form of the *"Environmental Management for Sustainable Development Act No. 2, 1996"*. Some important regulations have been formulated and implemented according to the provisions of the Act No. 2 of 1996 (Revolutionary Government of Zanzibar, 2013/a):

- *Environmental Impact Assessment (Procedures) Regulations 2002*
- *Sustainable Utilization of Non-Renewable Natural Resources 2011*
- *Banning of Plastic Bags 2011*

The strict prohibition of plastic bags has significantly reduced the plastic waste in Zanzibar and presents a major step for waste reduction.

Regulations have furthermore been drafted for Integrated Coastal Zone Management (2011) and Waste Electrical and Electronics Equipment (Management and Handling 2011) among others (Revolutionary Government of Zanzibar, 2013/a).

Zanzibar Environmental Management Act 2015

In 2015, the House of Representatives of Zanzibar enacted the *Zanzibar Environmental Management Act* in order to repeal the *Environmental Management for Sustainable Development Act No.2 of 1996*. The revised provisions aim at improvements in environmental protection, conservation and management as well as at increased community compliance. The environmental law was revised to improve and reinforce the legal and institutional framework. The initial Act defined offences, but did not include any specific measure for penalisation. A stronger framework was required to facilitate the implementation of existing policies to control the substantial environmental pollution and degradation in Zanzibar. Additionally provisions concerning oil and gas exploration in Zanzibar as well as with regard to the global challenge of climate change were added to the revised Act, irrelevant however for the domestic solid waste management (The House of Representatives Zanzibar, 2015).

In *Chapter 11, Pollution prevention and waste management (p.18ff)* it is specified that every person should have the right to a clean, safe and healthy environment. Therefore any form of environmental pollution is strictly prohibited in Zanzibar. Consequently the protection and maintenance of a clean and healthy environment is a general obligation of all citizens in Zanzibar, including the reporting of environmental pollution. Substantial penalties, including fines ranging from 909 up to 13.636 Euros and/or imprisonment for up to 30 years are stipulated for the violation of the island's environmental standards. The import, collection, handling, storage, transport or disposal of any type of hazardous waste is strictly forbidden and severely punished. At community level, the respective local authorities are responsible for the sound management of solid waste and wastewater in cooperation with relevant stakeholders. Any random disposal of waste by private individuals can be punished with a fine of 45 up to 2.273 Euros and/or imprisonment for up to two years.

The Zanzibar Environmental Management Act adapts some defined principles to enable successful execution of the provisions:

> *(a) the precautionary principle;*
>
> *(b) the polluter pays principle;*
>
> *(c) the principle of ecosystem integrity;*
>
> *(d) the principle of public participation in the development of policies, plans and processes for the management of the environment*
>
> *(e) the principle of international co-operation in management of environment;*
>
> *(f) the principle of common but differentiated responsibilities. (page 6ff.)*

Environmental Policy Zanzibar

The Revolutionary Government of Zanzibar published the first "*National Environmental Policy for Zanzibar*" in 1992. Major achievements since its implementation include the introduction and operationalisation of environmental impact assessment as well as the successful removal of 360 tons of obsolete drugs and chemicals, which were sent to the UK for final disposal. Various environmental awareness programs for key stakeholders and voluntary environmental conservation groups have been initiated and first environmental issues have been integrated into the school curriculum in Zanzibar.

Zanzibar Environmental Policy 2013

In 2013 a revised version of the policy was introduced, the *"Zanzibar Environmental Policy, 2013".*
The updated environmental policy deals with emerging environmental challenges, such as environmental pollution and the destruction of water catchments and wetlands due to inadequate management of solid waste and wastewater. Furthermore, it addresses the increasing depletion of fresh water sources, degradation and pollution of land and related destruction of habitat and loss of biodiversity. Challenges concerning a sustainable energy supply in Zanzibar as well as the adverse effects of climate change and irresponsible tourism are likewise subject of the policy. The policy also highlights the importance of extended scientific research on environmental management and conservation in Zanzibar.

With regard to waste management, the policy indicates the importance of multiple stakeholder collaboration for the improvement of SWM at all levels. Implementation strategies include the promotion of adequate sanitation facilities as well as the adoption of appropriate infrastructure for waste management, including the handling, collection, reduction, reuse, recycling, treatment and disposal. Cleaner production techniques should be adopted to reduce waste at the source. Intensive community involvement and increased public-private partnerships are proposed for the improvement of SWM and environmental cleaning. The promotion of environmental standards and guidelines is addressed with regard to public awareness concerning sound SWM (Revolutionary Government of Zanzibar, 2013/a).

Environment-related Policies in Zanzibar

The Revolutionary Government of Zanzibar has furthermore established several environment-related policies, which address additional aspects with regard to solid waste management.

Water Policy 2004

This policy is concerned with issues such as sanitation and hygiene and waste disposal and related pollution and depletion of water resources as well as soil degradation. Structural improvements are proposed to establish sound sanitation and disposal systems in order to establish a safe and healthy living environment and enable the provision of drinking water at community level (Revolutionary Government of Zanzibar, 2013/a).

Education Policy 2006

This policy addresses the need for environmental education in schools with regard to management and protection of the environment, including sound handling and disposal of domestic solid waste. It is recognised that knowledge and training has to be provided for various target groups at different educational levels, including professional staff as well as students. The mainstreaming of environmental education requires strong cooperation and coordination between the government authorities responsible for education and environment (Revolutionary Government of Zanzibar, 2013/a).

National Land Use Plan (NLUP) 1995

The environmental consequences of rapid urban population growth and unplanned installation of settlements in wetland or fertile agricultural areas are discussed in the National Land Use Plan. The planning of land use is crucial for sustainable urban development with regard to adequate provision of public service infrastructure, including SWM amongst others. The involvement of district and community authorities is essential for the implementation of land use regulations (Revolutionary Government of Zanzibar, 2013/a).

Zanzibar Disaster Management Policy 2011

Disaster risk reduction and support of livelihoods are the main objectives of this policy. It is concerned with the irregular rainfall patterns and related food shortages, the degradation of land and marine ecosystems as well as the island's waste management. The waste pollution in Zanzibar causes periodic outbreaks of environment-related diseases due to heavy rainfall and consequent flooding with wastewater in domestic and other areas. (Revolutionary Government of Zanzibar, 2013/a).

National Health Policy 2011

The policy provides guidance for the development of the health sector in Zanzibar. It furthermore addresses major health risks related to environmental pollution through chemicals and hospital waste, e-waste, lacking household sanitation facilities, including contamination of water sources and air pollution. The pressures of population growth on the development of health in Zanzibar are recognised in the National Health Policy and require appropriate preventive measures (Revolutionary Government of Zanzibar, 2013/a).

Zanzibar Local Government Authority Act 2014

The Zanzibar Local Government Authority Act regulates the distribution of authority and responsibility among government representatives at different levels. It provides guidance for the establishment of local governments, defining structures, functions and duties as well as assigned powers. It was enacted in 2014 to repeal the "*Zanzibar Municipal Council Act No. 3, 1995"* as well as the *"District and Town Councils Act No.4 1995"* (The House of Representatives, 2014).

The Zanzibar Municipal Council has been appointed different functions with regard to domestic solid waste management and environmental pollution. The ZMC is responsible for controlling pollution and cleaning of roads, public places, market areas as well as waste collection points. It also deals with the maintenance of waste facilities and dumpsites. The municipal council is additionally responsible for the preparation and implementation of environmental health promotion with regard to infectious as well as non-communicable diseases. It has the power to implement by-laws regarding their mandate and is moreover responsible for the implementation of appropriate working conditions and the provision of adequate tools and equipment. It is also in charge of revenue collection within the municipality. Issues such as environmental protection, public health, climate change, the prevention and control of HIV/AIDS, population development, gender mainstreaming, the fight against corruption as well as disaster management, including the control of epidemic diseases are among the responsibilities of the ZMC as well (The House of Representatives, 2014).

As any *"local Government Authority may delegate its authority to any other lower level" (Zanzibar Local Government Authority Act 2014, p. 9, Section 12(4.a))*, the Ward Councils and subsequently the Shehia* Consultative Committees at the community level have been given the responsibility for the implementation and supervision of Zanzibar's laws, regulations, policies as well as government development programmes within their area of jurisdiction. The communal authorities have been appointed the function to provide education about legislation and to additionally sensitise the community with regard to ZMC revenue collection and fees for public services. For successful implementation of administrative structures at community level, respective authorities require comprehensive instructions and correspondent power to act.

*The Shehia is an area of jurisdiction on sub-district (community) level, controlled by a Sheha and a minimum of 10 appointed advisors. The Sheha represents the chief Government Executive at the community level, who is appointed by the Regional and District Commissioner of the respective area. The Sheha is responsible for the implementation and maintenance of law and order, policies and directives, the reconciliation of disputes in family or society with regard to cultural values, keeping records of residents' documents and permits as well as immigration to the Shehia (Tidemand, 2003).

2.4 Challenges

Zanzibar is facing many environmental challenges, which pose a great threat to the population's health, the economic as well as overall development of Zanzibar. A high proportion of the environmental problems are related to poor solid waste management, sanitary conditions and hygiene behaviour, which results in environmental pollution, contamination of water sources and environment related health threats. Due to restraints in financial resources, technical facilities and organisational capacity, the Zanzibar Municipal Council is currently unable to provide adequate waste management services in Zanzibar Town. The lack of dustbins, handcarts, garbage trucks and waste collection points leads to random dumping of waste as common practice in the Zanzibar Town area (Revolutionary Government of Zanzibar, 2010). Furthermore, the lack of environmental and health education results in low levels of awareness and cooperation in the community (Vuai, 2010; Revolutionary Government of Zanzibar, 2013).

The current SWM system provided by the ZMC is inadequate for the effective provision of SWM service. The four urban collection zones under the responsibility of the municipal council receive variable servicing. Service provision is focused on the historical Stone Town, as it is a mainly commercial area and important for the island's tourism. Collection zone C (North Zone, Urban West) however is characterised by low socio-economic status and receives the lowest level of service (H. P. Gauff Ingenieure, 2005).

Currently there is no separation of materials in the course of the waste management provided by the municipal council, resulting in crude final disposal. Additionally, the amount of electronic waste (e-waste) is increasing steadily, posing great problems to the environment (Revolutionary Government of Zanzibar, 2013). The municipal dumpsite is located in a residential area, which causes considerable public health risks in the surrounding communities. The dumpsite lacks an efficient drainage system, resulting in flooding and overflowing of domestic pit latrines, which causes epidemic outbreaks of infectious diseases, such as diarrhoea and cholera among others *(see chapter 2.2.2)* (Revolutionary Government of Zanzibar, 2010).

3 METHOD

The aim of the research was to develop an in-depth understanding of the domestic solid waste management in urban Zanzibar and its influence on environment and health. To achieve the objectives described in chapter 1.3.2, extensive information had to be gathered. The study was based on the Integrated Sustainable Waste Management framework *(see chapter 1.2.3)* introduced in UN-HABITAT's *Solid Waste Management in the World's Cities, 2010*, which addresses the different elements of solid waste management in an integrated and sustainable manner. The variety of determinants in SWM and their interrelation proscribed the scope and approach of the research. Thus, a multi-method case study was conducted and quantitative and qualitative research methods were combined to develop a comprehensive understanding of the local domestic solid waste management. The research addressed the different aspects of Integrated Sustainable Waste Management focusing on SWM at household level. Data collection included a quantitative Knowledge, Attitude and Practise (KAP)-survey to measure common characteristics in the community and to assess the current domestic SWM service. Qualitative data was collected in form of detailed observations and field notes as well as a qualitative expert interview, to explore and understand the setting, underlying context as well as different perspectives within the case study.

The importance of local conditions, requirements and solutions for the design and implementation of sustainable SWM service has repeatedly been emphasised in the literature (Palczynski, 2002; Coffey & Coad, 2010; UN-HABITAT, 2010; UNEP, 2005; Coad, 2011). Thus, this case study was imbedded into local structures and implemented in cooperation with different local stakeholders in order to gather comprehensive information specific to the conditions found in urban Zanzibar.

A case study is a very complex and time-consuming process, due to the extensive research in the field followed by the review, classification and analysis of data from different sources as well as the organisation and summary of results (Creswell, 2013). According to the explorative approach, the research methods and procedures evolved and developed throughout the study process (Creswell, Klassen, Plano Clark, & Clegg Smith, 2010). Several themes emerged within the case study. The results from the different methodologies are presented according to their topical relevance. Triangulation was used to compare and validate the research findings.

3.1 Study Area

The case study was conducted in the North Zone of the Urban West region, Unguja, Zanzibar. The total population in the town area amounts to 223.033. The North Zone (Collection zone C) is the largest of the four urban zones, serviced by the Zanzibar Municipal Council with a population of 97.439 and 17.578 households (The United Republic of Tanzania, 2014).

Figure 7 Zanzibar Urban West - ZMC Solid Waste Collection Zones *(H.P. Gauff Ingenieure, 2005)*

The area was selected, as it is a low-income area with a high unemployment rate and is the poorest part of Zanzibar Town. It is a mainly residential area with narrow streets and a low level of service concerning waste collection by the municipal council (H. P. Gauff Ingenieure, 2005; Zanzibar Municipal Council, 2014). The study area comprises 13 Shehias, which constitute the local administration at sub-district level in Zanzibar. The Shehias differ in geographical size, population, number of households, environmental conditions as well as the provision of waste management service by the ZMC and availability of community-based initiatives (Office of Chief Government Statistician Zanzibar, 2012).

The following *Table 1* provides an overview of the respective Shehias within the research area including population and household data as well as the corresponding sample size of the KAP-study.

Shehia	Population Total	Households Total (Mean Size)	Sample Size	% of Total Sample
Amani	6.156	1.119 (5,5)	24	6,37%
Chumbuni	10.925	1.852 (5,9)	40	10,53%
Karakana	8.610	1.459 (5,9)	32	8,30%
Kilimahewa - Bondeni	5.116	984 (5,2)	21	5,60%
Kilimahewa - Juu	4.714	873 (5,4)	19	4,97%
Kwamtipura	11.572	1.995 (5,8)	44	11,35%
Kwawazee	6.454	1.218 (5,3)	27	6,93%
Mkele	7.140	1.373 (5,2)	30	7,81%
Muembe Makumbi	8.354	1.466 (5,7)	32	8,34%
Muungano	5.304	1.040 (5,1)	23	5,92%
Nyerere	9.657	1.788 (5,4)	39	10,17%
Sebleni	5.102	895 (5,7)	20	5,09%
Shaurimoyo	8.335	1.515 (5,5)	33	8,62%
TOTAL	**97.439**	**17.578 (5,5)**	**384**	**100%**

Table 1 Shehias in the Urban West (North Zone) - Population and Sample
(calculations based on The United Republic of Tanzania, 2014)

3.2 Sample Characteristics

The KAP-study participants presented diverse characteristics. There was an unequal distribution of sex among survey participants (n=382), with 71,7% female and 28,3% male respondents. Most of the respondents were between the ages of 18-30 years, accounting for 40% of the survey participants. 32,6% were in the age group 31-45 years, followed by 27,4% of respondents, who were above 45 years of age. The majority, 71% of respondents (n=379) reported being married or as living together with their partner (2,9%). 10,6% had never been married, 10,3% had been divorced and another 5% of participants were widowed. Most of the respondents (58%, n=376) had received secondary education or above (3,7%). 22,9% absolved primary education while 15,4% had not received any formal schooling at all, which corresponds to the illiteracy rate indicated in the Tanzanian PHC of 2012. The lack of a steady job was highly prevalent among study participants (n=378), with 60,6% being unemployed and 20,1% self-employment. Only 7,9% of respondents reported to be government employees and 5% worked in the private sector. Another 4% were working on a voluntary basis.

The household size was very diverse, ranging from single households up to 27 persons living in one household. The mean household size was 8,23 with a Standard Deviation of 3,76. Most of the questioned households, 45,8% had a daily budget of 5.000-10.000/= TSh (equivalent 2,27-4,55 Euros). 21,2% of households however had less than 5.000/= TSh (2,27 Euros) available for daily household expenses. One quarter of households (25,1%) spent between 10.000-20.000/= TSh (4,55-9,09 Euros) per day. Only 6,6% of participating households had a daily budget over 20.000/= TSh. A positive correlation (Spearman's rho 0.321, $p<0.01$) was found between household size and daily budget.

Daily household budget categories in Euros *Assuming an exchange rate of 1 Euro = 2.200/= TSh*	
less than 5.000/= TSh	less than 2,27 Euros
5.000 - 10.000/= TSh	2,27 - 4,55 Euros
10.000 - 20.000/= TSh	4,55 - 9,09 Euros
20.000 - 30.000/= TSh	9,09 - 13,64 Euros
30.000 - 40.000/= TSh	13,64 - 18,18 Euros
40.000 - 50.000/= TSh	18,18 - 22,73 Euros
more than 50.000/= TSh	more than 22,73 Euros

Table 2 Categories for Daily Household Budget - TSh & Euros

3.3 KAP-Study

Knowledge, attitude and practice surveys seek to gather representative information concerning a specific target population and topic (WHO, 2008). KAP studies can help to identify gaps in knowledge, to understand cultural beliefs and common behavioural patterns. Structured, standardised questionnaires are used for data collection, which is mainly done through orally conducted interviews. The results give implications for action with regard to most suitable and effective activities and measures of communication strategies for the target population at hand. This information provides important indications for the design and delivery of community interventions as well as required resources and furthermore serves as a baseline for future comparison (WHO, 2008).

Prior to the implementation of the study, the respective local authorities at community level (Shehas) had to be informed about the planned research. Each Sheha was visited in person and the planned procedures were discussed. The cooperation of the Shehas, who are responsible for maintaining law and order within the community, was crucial for the success of the study, as they are highly respected among residents and have certain authority within their area of jurisdiction (Tidemand, 2003). A common response was an initial insecurity on the part of the Shehas, which after introduction to the background and motivation of the research all Shehas showed great appreciation and cooperativeness. All Shehas were very helpful in the

preparation and implementation of the community study. The local support in the field was crucial to gather comprehensive data within the different study areas.

3.3.1 Questionnaire Design

The design of the quantitative questionnaire on knowledge, attitude and practices was based on a foregone literature research on urban domestic solid waste management in developing countries and related KAP-studies conducted in comparable settings, such as the analysis of the household solid waste generation patterns and prevailing management practices in Eldoret Town, Kenya (Okalebo, Opata, & Mwasi, 2014), as well as a case study of Nigeria as an evaluation of solid waste generation, categories and disposal options in developing countries (Babayemi & Dauda, 2009) and a survey on village-level knowledge, attitudes and practices on solid waste management in the Philippines (Jamias & Tatlonghari, 2010). Different governmental and non-governmental parties provided preparatory information concerning the research topic and area. Additional information with regard to the research environment was acquired through personal field visits prior to the questionnaire design.

This survey was used to determine the level of knowledge and to understand perceptions and behaviour concerning environment, health and domestic solid waste within the community, as well as to survey the environmental conditions and waste management structures found in the different districts within the research area. The findings from the research were to serve as a basis for the development of customised educational measures concerning environmental health in the community and help to identify structural challenges that need to be resolved to enable and support behavioural change. Gathered data furthermore serves as a baseline for future assessment of change.

The KAP-study was based on a quantitative, structured questionnaire, comprising 36 mainly closed questions with numerical, categorical, multiple choice and scale answer categories. Respondents were given the opportunity to comment on the questionnaire or solid waste management in general at the end of the survey. A Swahili as well as English translation of the questionnaire can be found in the Annexe.
The following topics were covered by the KAP-survey:

- Socio-Demographic Data
- Environment
- Household Waste Management - Practice
- Household Waste Management - Knowledge
- Household Waste Management - Attitude
- Public Waste Management Services

The questionnaire as well as the informed consent form was initially formulated in English. After first revisions in cooperation with local workers as well as the professional advisor Prof. Dr. Färber from the University of Applied Sciences, Hamburg (HAW) it was translated into the national language Swahili by a

local medical doctor. Questions were further adapted in the course of the translation to correspond to the local setting of the survey.

3.3.2 Interviewer Training

The team of interviewers was composed of nine local NGO workers, of whom eight were female and one male. In order to ensure defined quality standards, such as objectivity, confidentiality as well as the professional interaction with respondents during the research implementation and data acquisition, the selected interviewers received a three-day training. The questionnaire was presented to and discussed with the interviewers. Afterwards, the participants practiced interviewing each other. The survey was then pilot-tested in a comparable community setting in Zanzibar Town and minor revisions were made according to the feedback and experiences from the field. The interviewer training itself was conducted in cooperation with the local doctor. The teaching material was again formulated in English and then translated into Swahili and is attached in the Annexe.

3.3.3 Study Sample

The sample size (n=384) was calculated with OpenEpi (Version 3) relative to the total population of 97.439 in the North Zone, Urban West, based on the *Tanzania Population and Housing Census 2012* (The United Republic of Tanzania, 2014) and corresponding to a Confidence Interval of 95%. The sample was subdivided into strata, representing the 13 administratively independent communities (Shehias) within the study area. The number of interviews conducted in each Shehia was calculated according to the population within the area. Households were selected through systematic random sampling, which is based on the selection of every *x*-th unit of the study population after selection of a random starting point (Amedeo, Golledge, & Stimson, 2009). As there is no standardised record system of households' residents, every *46*-th house was approached according to the proportion of sample size to the total study population.

To be included in the study, residents had to be the member of a household selected through the random sampling. The interviewee had to be above 18 years of age in order to qualify for participation in the survey. Participation however was voluntary. Respondents needed to be fluent in Kiswahili, while reading and writing skills were not required.

3.3.4 Data Collection

The data collection was carried out in form of face-to-face interviews in the community. Local residents of Zanzibar working in waste management were selected and trained as interviewers for this purpose. The interviewers were therefore familiar with local and cultural characteristics, which helped to gain trust and increase cooperativeness among the participants. The interviews were conducted by the use of a quantitative questionnaire, which was read out to the participants and filled in by the interviewers themselves. The high illiteracy rate among the adult population in Zanzibar (15 years and above) necessitated the use of interviews instead of self-administered questionnaires.

The interviews were conducted over the course of two months. To support a smooth and successful implementation of the study, the local Shehas assigned community representatives to accompany and guide the research team in the field, to get access to households and promote the cooperativeness of residents. They helped to introduce the background, motivation and procedures of the research study to the sampled households. Through the personal approach of community members, the willingness to participate in the interviews was very high and many study interviewees gave positive feedback and expressed their appreciation. Some households were revisited if the interview could not be conducted the first time. This personal approach of households resulted in an initial response rate of 100%.
Only two interviews were aborted at the request of the participants before reaching the end of the questionnaire and were therefore excluded from data analysis.

3.3.5 Data Analysis

The data from the quantitative questionnaires was analysed with help of the statistical software IBM SPSS statistics (Version 21). After data entry was completed, the data was cleaned and prepared for analysis. The descriptive analysis included calculation of frequency distribution, central tendency and standard deviation as well as cross tabulations. For presentation, the results were weighted with regard to their significance for the research question and summarised according to the reappearing themes. The results were presented in form of text and major findings were additionally highlighted through graphic illustration. The topically clustered KAP results were presented together with the corresponding field observations as well as findings from the qualitative expert interview for the purpose of triangulation.

3.4 Observations & Field Notes

3.4.1 Data Collection

To document the state of the environment with focus on solid waste practices, subsequent pollution as well as the diverging conditions found within each Shehia, photographs and corresponding field notes were taken. Observations were made in the course of the implementation of the KAP-survey. Additional photographs were taken during the rain season (April 2015), which followed the interview period. The visual documentation was of great importance in this context as the extent of environmental pollution through waste is extreme. A lot of health risks related to domestic solid waste management were observed and recorded in the field. Some photographs are presented in context with the other research findings. Additional observations documented during the rain season as well as detailed field notes with regard to the individual Shehias can be found in the Annexe.

The Shehas, some NGOs and community groups as well as selected community members (such as informal waste workers or scavengers) were questioned informally to acquire comprehensive information about the research topic. They were given the opportunity to comment on the current environmental health and waste situation in their areas as well as regarding long-term developments in the community.

3.4.2 Data Analysis

The photographs taken as documentation of observed environmental conditions were sorted and reviewed with regard to selected determinants including the SWM infrastructure, the state of the domestic environment including public places, roads, rivers and drainages, official and unofficial dumpsites as well as common SWM practices and extraordinary observations. The photographs and corresponding notes were clustered into themes in accordance with the findings from the KAP-study as well as the qualitative interview for comprehensive presentation of results.

3.5 Qualitative Expert Interview

3.5.1 Data Collection

After completion of the KAP-survey and field research, additional information was acquired through a qualitative expert interview with the Head of the Social Service Department of the Zanzibar Municipal Council. The department carries a multitude of responsibilities including the waste and wastewater management services within urban Zanzibar as well as public health issues related to sustainable environmental development. The expert interview mainly regarded the system and governance aspects of domestic SWM in Zanzibar. It was conducted to complement the findings from the community study. Additional elements of SWM were addressed in the qualitative interview, including:

- Services of the Zanzibar Municipal Council
- Current situation of solid waste management in Zanzibar Town
- Environmental and SWM policies
- Main challenges in SWM
- ZMC revenue collection

The interview was conducted on the basis of a qualitative interview guideline, which can be found in the Annexe. It took place in an office room provided by the Social Service Department of the ZMC.

3.5.2 Data Analysis

The interview was recorded *(approx. 65 minutes)* and subsequently transcribed with the software f5, which is designed for audio transcription. Results were summarised in form of text and relevant statements with regard to the case study were extracted from the transcript. Several themes reappeared in the course of the questioning and major challenges were identified. The qualitative interview additionally helped to evaluate the current situation concerning domestic waste management structures and processes from the municipality's perspective. The results add to the comprehensive understanding of the SWM situation in urban Zanzibar.

3.6 Ethical Considerations

Prior to the community survey, permission was granted from the Vice President's Office in Zanzibar. Furthermore the approval of the local authorities (Shehas) within the study area was sought and the Zanzibar Municipal Council informed about the research activities before implementation.

Participation in the study was voluntary after respondents were informed about the objective of the survey and confidentiality had been assured. The data was collected anonymously. All participants signed an informed consent form and were notified that they could withdraw from participation at any time. Throughout the data collection as well as processing, access to the gathered information was limited to the study team involved in interviews and data analysis.

Neither positive nor negative consequences were anticipated for the study's participants, as no physical, social, economical or psychological risks were associated with the survey protocol. The study did not include any intervention and the interviews did not request any sensitive information and were conducted in privacy. All households in the study area (North Zone, Urban West) had the same probability of being involved in the survey, while adolescents below 18 years of age were excluded from participation.

4 RESULTS

Serious environmental health concerns related to domestic solid waste management were evident throughout all areas studied. A variety of environmental health risks related to the improper disposal of domestic waste were recorded during the field research. The community's knowledge, attitude and practices were found to be diverse, which together with an insufficient SWM infrastructure and lacking alternatives furthered the occurrence of environmental health threats. In each of the methods applied during the course of the case study several topics re-emerged allowing major issues to be identified.

The results from the different research methods are presented according to their context, explanatory value, significance and quality of data source. First of all, the solid waste management infrastructure found in the study area is introduced, followed by common domestic SWM practices. Furthermore, findings regarding the environment and health conditions in the urban Shehias are summarised. Results on the use of media and preferred information sources concerning domestic SWM, environment and health are presented. At the end, findings concerning the economic and organisational aspects, such as the financial resources for domestic waste service as well as revenue collection are introduced.

- SWM Infrastructure
- Domestic SWM Practice
- Environment & Health
- Media Use & Information
- Financial Resources for Domestic SMW

4.1 Solid Waste Management Infrastructure

At the time of research (Jan-Mar 2015), the public service by the Zanzibar Municipal Council in collection zone C, Urban West, merely included the collection of solid waste at official dumpsites. A highly ambivalent solid waste management infrastructure within the research area was observed, with variations in the supply, condition, service operation and accessibility of official dumpsites. The provision of additional services, such as door-to-door collection or the cleaning and maintenance of dumpsites, drainages and public places by the ZMC was found to be missing in most of the Shehias. During field research efforts by the community to deal with the waste and related environment and health problems within their area were evident. An overview of the solid waste management infrastructure and service in the 13 Shehias, including information on community-based initiatives, is presented in the following table.

Shehia	Zones	Dump	Drain/ River	Community based organisation/Non-governmental organisations		
				Activity	Service	Name
Amani	5	1	yes	yes-active	Health Education/ Door-to-door collection (ZMC) stopped	*Amani Social Development Organisation*
Chumbuni	6	1	yes	yes-inactive	Cleaning of drains/ Health Education	*Kikundi cha Shehia Chumbuni*
Karakana	10	2	yes	yes-active	Door-to-door collection/ Cleaning of public areas	*Jumuia ya usafi na mazingira Karakana (JUMAKA)*
Kilimahewa Bondeni	3	1	yes	yes since 2015	unknown	/
Kilimahewa Juu	5	shared	yes	yes-active	Door-to-door collection Kilimahewa Juu & parts of Kwamtipura/ Health Education	*Usafi, afya na mazingira*
Kwamtipura	10		yes	no		/
Kwawazee	6	2	yes	yes-active	Door-to-door collection Kwawazee & Nyerere (ZMC)	*Zanzibar Green Environmental for Development of Society (ZAGREDS)*
Mkele	10	1	yes	yes-active	Door-to-door collection	*Usafi ningau Mkele*
Muembe Makumbi	5	1	yes	yes-inactive	Door-to-door collection/ Cleaning of public areas	*Mshkamano ndiyo nguvu yetu*
Muungano	3	1	no	no	/	/
Nyerere	6	unused	no	no	serviced by Kwawazee	/
Sebleni	4	1	no	yes-active	Door-to-door collection	*Zanzibar Community Health for Society (ZACOMESO)*
Shaurimoyo	5	1	yes	yes-inactive	Door-to-door collection/ Cleaning of dump & public areas	*Association for Shaurimoyo Sustainable Environment (ASSE)*
TOTAL	range 3-10	13	10 Shehias	7 active	Door-to-door collection: 5 Groups active/7 Shehias served	

Table 3 Overview Shehias - Solid Waste Management Infrastructure *(illustration by author)*

The research area comprised 14 official dumpsites, of which one was not serviced at the time of study (Nyerere). On average, around 1352 households were in the vicinity of an official dumpsite. Most public waste collection points were found situated close to the bigger roads at the border of the Shehias to enable collection vehicles to pass. Therefore, the dumpsites were unevenly distributed within the residential areas. Most of the KAP-survey respondents, 44,3% (n=375) stated that they live within a short (1-5 minutes) distance to the next public waste container. 21,1% lived 6-10 minutes away and 13,3% over 10 minutes away. 21,3% didn't know the distance to the next waste container.

Options for an increased provision of collection points were discussed with the municipal council and local authorities and examined in the course of the field study, but found to be unfeasible due to the lack of suitable space.

Obstructed alleyways - Karakana/Muembe Makumbi/Kwamtipura

An equal distribution and extension of serviced dumpsites in the Urban West (North Zone) was restricted by narrow and uneven streets, unplanned settlements as well as spaces prone to flooding within the domestic area. As the current ZMC service delivery is still below the targeted standard, it is assumable that the capacity to provide the servicing and maintenance of additional dumpsites is missing.

The condition of waste containers/dumpsites was regarded as good or satisfactory by 43,6% of survey respondents (n=376). 27,9% reported waste being scattered around the container. Less frequently mentioned were animals eating and spreading waste (2,4%), containers being overfilled (1,3%) and the need for repair or replacement of containers (0,8%). 3,7% of respondents indicated the lack of a solid waste container in their area and 19,9% were not able to give information concerning the container's condition.

Field observations meanwhile presented different, even more concerning results. The answers in the survey are likely to have been influenced by the social expectancy. Knowledge, perceptions and expectations were furthermore influenced by the lacking experience of an efficient SWM system. During implementation of the KAP-study, the provision of metal containers ($7m^3$) had not yet been completed in all areas of Zanzibar Town. Instead the municipal dumpsites were equipped with concrete slabs for prevention of soil contamination through waste, which was revealed by field observations as well as the expert interview. Twelve of the 13 serviced public dumps within the research area were very poorly maintained and in a devastating state. The shared dumpsite of Kilimahewa Juu and Kwamtipura was found to receive the best service by the ZMC, including regular waste collection and clearance of the site. The Sheha confirmed the daily collection of waste by the municipal council and emphasised the importance of a regular service. Other sites however presented alarming conditions as illustrated below.

Dumpsite - Kwamtipura/Kilimahewa Juu

Dumpsite - Muembe Makumbi

High accumulation of mixed waste was observed at dumpsites due to insufficient collection by the ZMC. The collection and transport to the final dump is supposed to be provided several times a week according to the urgency of disposal, is however restricted by the limited availability of trucks. Community members, ZMC staff as well as the Head of Social the Service Department repeatedly reported delays in collection due to lacking resources and required maintenance of collection vehicles. A lot of waste was found widely spread around the provided slabs, further hindering the effective collection. The failure to completely clear the dumpsites was blamed on the improper use of the dumpsites by residents. Domestic animals were attracted and feeding on the spread waste. The cumulated refuse additionally provided an ideal breeding place for rodents and other disease vectors, such as flies and mosquitoes.

Dumpsite - Chumbuni

Dumpsite - Shaurimoyo

Frequently, fires were lit on the dumpsites, either by waste scavengers as a means of recovering materials suitable for resale or by residents to reduce the occurrence of bad smells and the attraction of vermin. These fires posed a further danger to the scavengers and also to the children who were found playing on and walking over the dumpsites, often barefoot. The dumpsites were openly accessible, i.e. not fenced in in any manner.

Community groups and NGOs concerned with SWM, environment and health had been set up in twelve of the 13 surveyed Shehias. Activities ranged from door-to-door collection, cleaning and maintenance of official dumpsites, rivers, drainage systems and public areas, to health and environmental education.

At the time of study, seven Shehias were at least partly serviced with door-to-door collection by five community-based organisations offering the service. In Kwawazee and Nyerere the door-to-door collection was implemented as a joint effort with the ZMC, local authorities (Shehas) and the locally active community group. Other domestic SWM initiatives in Amani, Muembe Makumbi and Shaurimoyo had been implemented but the door-to-door collection service terminated due to lack of financial resources and equipment. In Amani, door-to-door collection as well as the ZMC revenue collection at household level was implemented in collaboration with the municipal council. NGO members reported problems in the structural organisation, stakeholder communication as well as lacking empowerment of workers as major reasons for the failure of the cooperation. The lack of any standardised structures for waste management, both within the ZMC as well as in coordination with local authorities and community groups, has so far prevented the development of an efficient and reliable system, which could be applied throughout all Shehias.

There are several ways in which waste is transported within and from the domestic areas. The most frequently mentioned means of waste transportation was the closed garbage collection truck, which was noticed by 60,1% of interviewees (n=382). The open trucks, which are also operated by ZMC, were seen by 17,1% of respondents. 38,1% furthermore reported domestic collection using wheelbarrows and 6,6% using donkey or cow carts. 12,1% of interviewees had not noticed any means of waste transportation in their area or indicated the complete lack of collection vehicles in their residential area.

The majority of respondents, 63% (n=378) rated the closed garbage truck as most suitable for collection, mainly because it keeps waste from getting spread in the environment during transportation 60,5% (n=238) and reduces the occurrence of bad smells (42%). 5,9% of interviewees, who preferred the use of closed trucks did so as it prevents the spreading of diseases. Wheelbarrows were regarded as feasible by 22,5% (n=378), mostly, by 78,8% (n=85) because it is a good and effective way to transport solid waste at community level, enabling household collection. To enable household solid waste management services, the next operating dumpsite needs to be located at a reasonable distance. Wheelbarrows were rated as suitable by 12,9% if bigger vehicles are unable to pass. The collection by open truck was favoured by 9% of interviewees (n=378), of whom (n=34) 91% had seen it in their domestic area and regarded it as a good way of collection. 5,8% saw it as the best possible alternative when closed trucks are not available. Less prominent was the use of cow or donkey carts for waste transportation, which was named as the most suitable means by only 1,6%. 9,5% did not know which collection would be best for their area.

Overall, 66,5% of respondents stated being satisfied with the public SWM service provided by the ZMC, ranging from 50% satisfaction in Mkele to 90% in Kilimahewa Bondeni (n=382), which indicates the differing level of service provided by the ZMC. The variations in satisfaction among the different Shehias are presented in *Figure 8***.** It is furthermore indicated whether door-to-door collection had been provided within

the respective Shehia, either by community groups or in cooperation with the ZMC, during the period of questioning (Jan.-Mar. 2015).

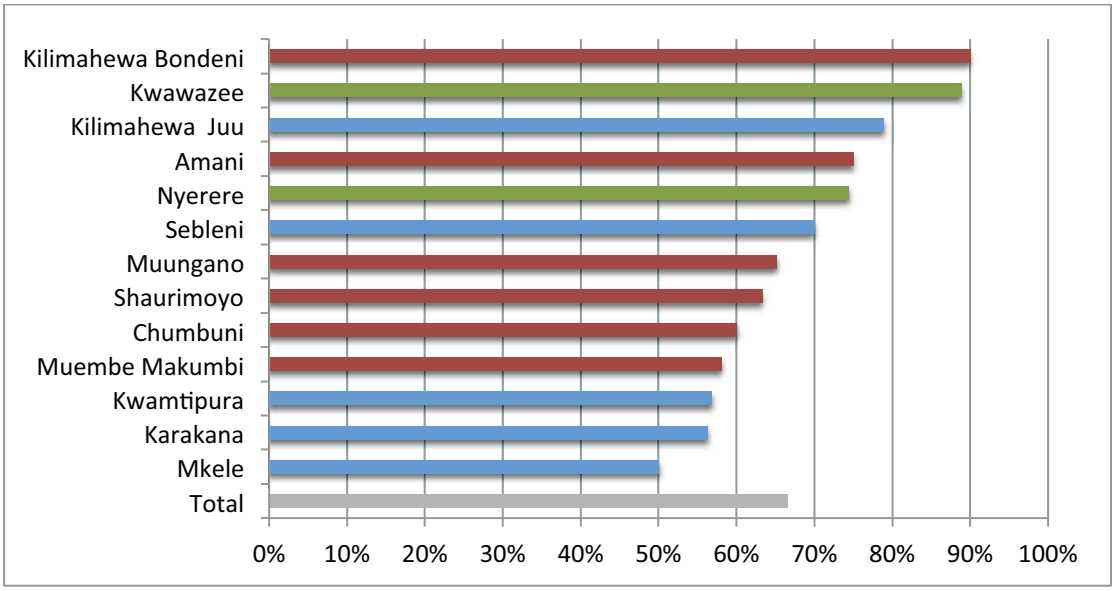


Figure 8 Satisfaction with ZMC Service Provision

Blue = Door-to-door collection provided by CBO/NGO

Green = Door-to-door collection provided by CBO/NGO in cooperation with ZMC

Red = No door-to-door collection service by CBO/NGO

The dissatisfaction of 30,9% of participants was mainly based on insufficient municipal solid waste management (54,2%, n=118), including the lack of official dumpsites, vehicles and equipment as well as delayed collection. In this regard residents additionally demanded the employment of young, qualified workers for the provision of door-to-door collection service. 10,2% indicated strong concerns about the environmental conditions and an increase of health risks, due to poor solid waste disposal. Another 7,6% were dissatisfied due to lacking provision of community education concerning SWM, environment and health. 3.4% substantiated their discontent with the missing cooperation of the ZMC with the community.

Different stakeholders were involved in the domestic solid waste management, such as community groups, NGOs and informal workers at household level as well as the ZMC, responsible for the final disposal. The importance of cooperation with different stakeholders at community level is recognised increasingly by the authorities in Zanzibar but requires further expansion (Rajab, 2015).

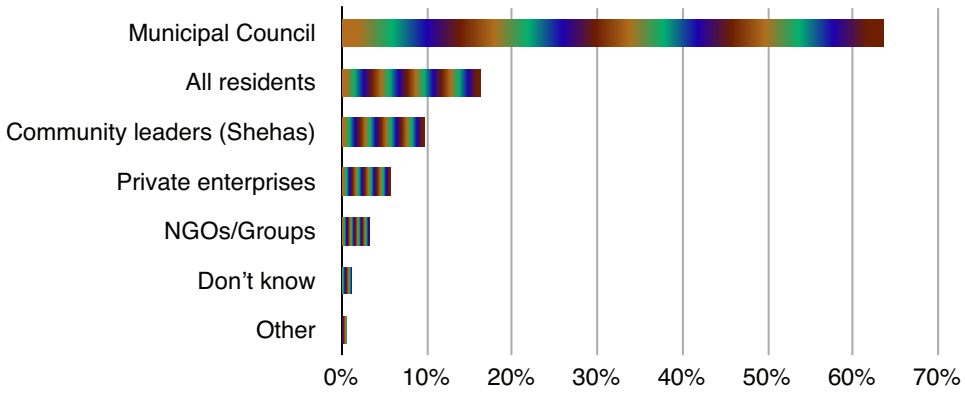


Figure 9 Opinions - Who Should be Responsible for SWM in Zanzibar Town (n=370)

The main responsibility for solid waste management in Zanzibar Town was attributed to the Zanzibar Municipal Council, by 63,5% of respondents (n=370). Community leaders, namely the Shehas were seen responsible for domestic SWM by 9,7%. Another 16,2% of interviewees indicated the responsibility of all residents. Private enterprises (5,7%) as well as NGOs and community groups (3,2%) were not so much regarded as responsible parties in SWM. Although the responsibility for the management of waste is clearly associated with governmental institutions, 55% of respondents (n=373) believed that they have an influence on the waste situation.

73,8% of respondents (n=370) mentioned that reliable disposal services by the ZMC are necessary for improvement of the waste management. The introduction and implementation of laws on waste management was also seen as an important measure by 84,2% of interviewees (n=373). Community involvement in decisions concerning public waste management services was demanded by 73,7% of respondents (n=372).

Several reasons for the lacking service by ZMC were revealed in the course of the interview with the Head of the Social Service Department. The financial resources for domestic SWM were reported as insufficient for the adequate provision of facilities, equipment and service. Further constraints regarding the deficient SWM infrastructure in the Urban West (North Zone) were associated with the lack of suitable space for additional waste collection points, severely limited vehicle access within the domestic areas as well as the restricted accessibility of some residences due to informal settlements and unplanned buildings. The expansion of cooperation with the Shehas and communities was regarded as highly important for the improvement of service.

4.2 Domestic SWM Practices

A variety of domestic solid waste management practices were observed during the study. Practices investigated comprised the storage and handling as well as disposal of household solid waste including the separation of certain waste materials. While some residents reported making use of the available SWM infrastructure and using the official dumpsites or the partly provided door-to-door collection service, highly deficient disposal practices were frequently observed during field research.

4.2.1 Storage

The vast majority of study participants, 83,5% (n= 382) stored their domestic waste outside the house. The kitchen was used for storage by 5,5% of respondents, of whom 3,4% had a closed and 2,1% an open roof. Another 8,4% reported not storing their waste at all but disposing of it more frequently. The domestic waste was mainly kept in closed containers (54,5%, n=382). The use of various closed containers was observed during field research. Residents were found to use old oil canisters or dustbins and buckets that can be closed with lids. Another 37,9% used open containers for storage, such as buckets, old canisters and containers, cardboard boxes and old rice, flour or washing powder sacks, which were most frequently seen. 3,7% did not use any container at all and 2,6% of respondents were unsure about the storage method used in their household. During field research it was repeatedly observed how domestic animals were feeding on the waste, stored in open containers outside of residences.

Storage washing powder sacks - Chumbuni

Storage old oil canister - Muungano

4.2.2 Disposal

The tropical climate in Zanzibar accelerates the decomposition of waste, occurrence of odour nuisance and consequent attraction of vermin, necessitating a frequent disposal of household waste. Most of the questioned households however, 61,4% (n=378) reported emptying their waste container only when it was

full. 36,8% disposed of their waste on a daily basis and 0,5% removed their waste whenever bad smells occurred or insects were attracted to it. The domestic waste containers attract various rodents and vermin if waste is not disposed of frequently but stored over days, increasing the risk of diseases.

In most households the responsibility for domestic waste disposal was not allocated to anyone in particular. In 52,9% of the questioned households (n=380) all household members were equally responsible for the disposal of domestic waste. 18,7% of respondents stated that the men in their household were responsible and another 12,1% reported that the women were. In 12,9% of cases, the children below the age of 15 were in charge of the domestic SW disposal.

In the course of the field survey a variety of solid waste disposal methods were found to be commonly used by residents. Besides the officially provided dumpsites, other means of disposal were observed including door-to-door collection, the burning or burying as well as random dumping of waste in public places, rivers, drainages and the sea. An overview of the residents' preferred disposal methods is given below.

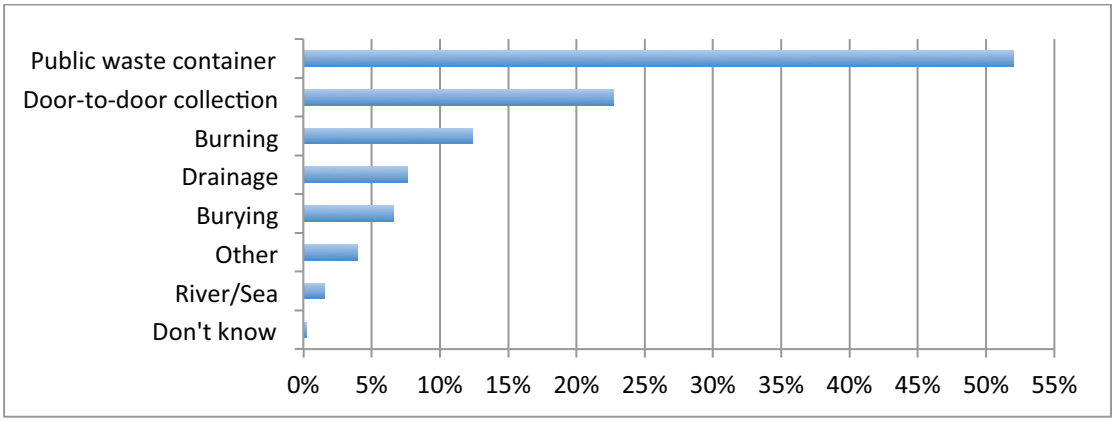


Figure 10 Domestic SWM practices - Reported Methods of Household Solid Waste Disposal (n= 379)

The majority, 57,6% of respondents (n=380) reported the general use of public waste containers or official dumpsites by ZMC, while 39,5% stated never making use of the designated waste collection points. 51,9% (n=379) of respondents named the public waste containers/dumpsites as the preferred disposal method for their household solid waste. During field research the problem of improper use of official dumpsites by residents became clear. Waste was dumped around the concrete slabs provided for the prevention of leakage and then easily spread by animals and scavengers rummaging through the waste on the extended dumping ground. The Head of the Social Service Department of ZMC identified this as a major cause for the insufficient collection of rubbish at public dumpsites, as it increases the workload for ZMC waste workers and hinders the thorough clearance of the site.

Standard container - Zanzibar Town

Official dumpsite - Chumbuni

Another frequently used disposal method was the door-to-door collection of solid waste, which 22,7% of the questioned households (n=380) used actively. 17,4% reported being serviced by informal workers or private persons, 2,6% by an NGO or community group and only 1,3% by the ZMC. Another 1,3% did not know whom they were serviced by. Residents serviced by door-to-door collection reported that the service was provided several times a week for a fee, dependent on the amount of waste collected.

NGO Door-to-door collection - Mkele

Community groups and NGOs offering door-to-door collection were interviewed as they became apparent during the course of the field survey. Some problems were repeatedly mentioned by the different community based initiatives, including those in cooperation with the ZMC. The lack of resources was reported as the major limitation to being able to implement a sustainable door-to-door collection service. Problems were reported with regard to the supply and maintenance of suitable tools and protective clothing as well as the provision of a salary or at least an allowance for waste collectors. The termination of household waste collection in some of the Shehias was associated with this scarcity of suitable working equipment as well as lacking compensation for workers. The compliance of households concerning the collection fee was generally reported as unproblematic by community-based initiatives, as the use of service was voluntary and households were free to dismiss the service and continue to dispose of their solid waste themselves. The door-to-door collection service provided in cooperation with the municipal council however was linked to the monthly revenue collection by ZMC, which led to non-compliance among residents. Unwillingness to pay the specified ZMC service fee was repeatedly reported by the community groups, hindering the successful provision of household waste collection.

Other respondents reported the use of alternative disposal methods. Crude disposal was practised by 28,2% of respondents. During field research, a lot of waste was found randomly spread within the domestic areas. Waste was dumped in different places such as public open spaces, at the roadside, in-between houses, on private property and in abandoned houses. The accumulation of randomly dumped waste in the domestic areas encourages further crude disposal by residents and thus encourages the formation of unofficial dumpsites.

Waste disposal abandoned house - Nyerere

Waste disposal random - Karakana

Overall, 7,7% of questioned households (n=379) reported using open drainages and 1,6% a nearby river or the sea to dump their waste. This behaviour is highly problematic. An immediate effect is the pollution of water and the natural environment, while the accumulated waste causes blocking of drains and natural rivers, resulting in flooding with waste and wastewater during the rain season. The waste, including faeces, is carried through the inhabited areas even to the extent of entering residences. Residents repeatedly mentioned periodical outbreaks of diarrhoeal diseases, cholera and typhoid during the rain season.

Waste disposal river - Muembe Makumbi

Waste disposal drainage - Shaurimoyo

Another frequently used disposal method was the burning of waste, practiced by 12,4% of respondents. Waste was commonly burned close to houses within domestic areas. Mixed waste was burnt, regardless of its combustibility and development of toxic smoke. Piles of waste were set on fire and then left unattended, posing a risk of the fire spreading in the surrounding environment endangering nearby residences as well as being a health hazard, with risk of injury to passing residents, especially children.

Burying of waste - Amani

Burning of waste - Kilimahewa Bondeni

6,6% of respondents reported burying their waste. Commonly observed was the use of holes within the immediate vicinity of residences. Residents, who disposed of their domestic solid waste through burying, reported using such self-dug pits until they were full, after which they were covered with soil and another hole dug for purposes of disposal. This form of open disposal of solid waste next to the houses results in a variety of environment and health hazards. The fractional decomposition of waste attracts potential disease vectors such as domestic animals, rodents and vermin. Additionally snakes are attracted into domestic areas by the presence of rodents, posing further risks to residents. The burying of waste in unprotected holes furthermore causes soil pollution. During the rain season the pits overflow, causing the spreading of waste and flooding of residences with wastewater.

Other disposal methods named by 3,9% of respondents included random dumping due to lack of waste containers and official dumpsites or the disposal of waste by children. As some respondents named more than one method, which they frequently use for waste disposal, the total amount of answers adds up to 107,9%.

The main reason for residents not using the public waste container/dumpsite by ZMC but to practise another form of solid waste disposal was the lacking provision of containers for sound SWM. 77% (n=135) did not know of any container in their residential area. Another 5,2% stated that the container was located too far away or that it was in a bad condition (1,5%). 3% did not have time to take their waste to the dumpsite. 5,9% preferred another method of disposal, such as dumping into a river, burying or burning and another 3% did not see any reason at all to use public waste containers for SW disposal.

Different challenges for the improvement of the waste situation in Zanzibar Town were identified by the KAP-survey. There seems to be a lack of knowledge and awareness concerning the interrelation of solid waste management, environment and health. Most frequently mentioned, by 41,8% of respondents (n=376), was that people do not care about the effects of poor waste management as well as that people do not know about the negative consequences of improper solid waste management (28,7%). 18,1% of respondents indicated that health is more important than SWM and needs to be improved. 13,6% felt the

same about education and 8,5% about the environment. Additional challenges were identified with regard to the current solid waste management system. 12,5% thought that lacking action of the ZMC represents the biggest problem for the improvement of the waste situation, while 10,6% of respondents identified the lack of cooperation of the ZMC with the local community as a major challenge. Moreover, 5,1% indicated that there is no incentive for residents to practice proper solid waste management.

4.2.3 Waste Separation

The separation of waste was only practiced by 3,9% of respondents (n=382). 96,1% disposed of all their waste materials together. Respondents who practiced separation of their household waste (n=15) reported different uses for the various materials found within the domestic waste. Organic waste was used as animal food by some and dumped on the dumpsite by others. Paper and carton was either used to make fire, taken to a special place, dumped or burned. Respondents likewise reported disposing of plastic and plastic bottles through dumping and burning. Others however took plastic packaging as well as bottles and resold these for recycling or re-use. Metal was sold as well by some residents for further recycling or it was dumped. Glass was mainly buried in domestic areas or taken to the dumpsite. None of the respondents separated glass for further use, treatment or selling. The major reason for separation of household waste was the expectation of a positive influence on health (73,3%, n=15). Another 20% practiced separation as it is good for the environment and 6,7% because they had seen others doing it.

Participants who did not practice any separation of SW gave two major reasons. More than half of those respondents (n=357), 51% did not know anything about the separation of waste, while 36,7% named the lack of containers for separation as a reason. 6,2% did not believe that waste separation makes any difference, while 3,6% claimed to have no time for waste separation. Others (1,4%) did not separate as the neighbours did not do it either or because of a general lack of faith in the solid waste management system.

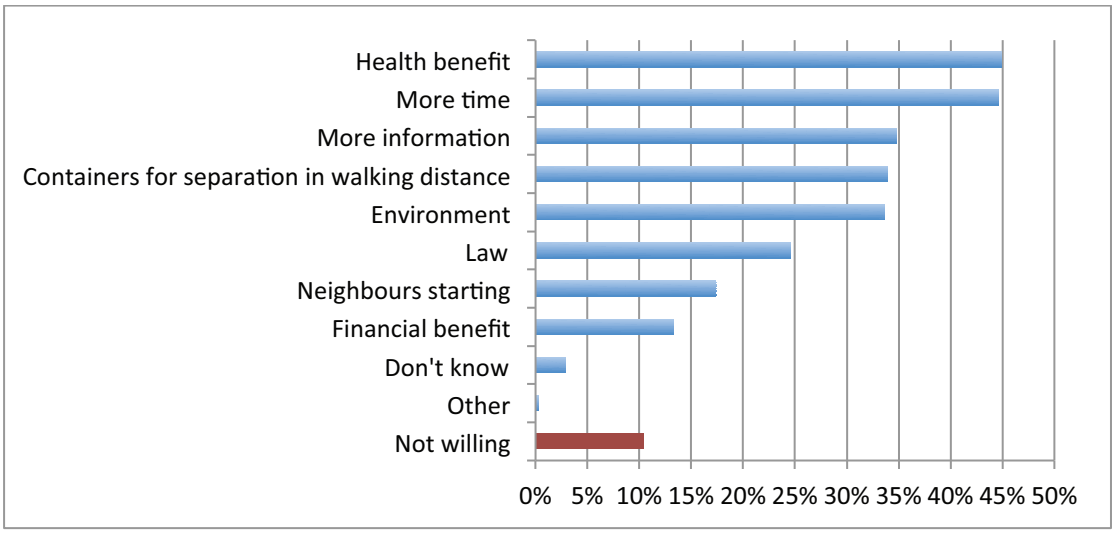


Figure 11 Conditions for Willingness to Separate Household Solid Waste (n= 345)

The KAP survey identified several aspects important for improvements in residents' SWM practices including the separation of certain waste materials. Only 10,4% of the respondents were not willing to

practice separation at all and 2,9% were unsure. 86,4% (n=345) named conditions under which they would be willing to separate their household waste. Multiple answers were possible. 44,9% of respondents (n=345), currently not practicing waste separation, would be willing to do so if it had health benefits and 33,6% if it had positive influence on the environment. 44,6% required more time resources in order to practice proper waste disposal. 34,8% would be willing if they had more information on sound domestic SWM and 17,4% if their neighbours and other community members practiced separation as well. 33,9% named the provision of containers for separation in walking distance as a condition. Also the implementation and enforcement of laws concerning the handling and separation of waste would cause 24,6% to comply. 13,3% stated being willing to separate waste materials if they had a financial benefit from doing so.

A citywide perception survey on ZMC services carried out in course of the Zanzibar Urban Service Project in 2014 has shown that there is little trust towards the service provision of ZMC in the community. Lacking communication with and limited involvement of communities increases the unwillingness to comply with the current SWM system. This was confirmed in the course of the expert interview with the Head of Social Service Department by ZMC.

During field research it was found that the Sheha as well as some residents of Chumbuni collected plastic bottles for selling. When an adequate amount of bottles had been collected, a local provider came to pick up the bottles, which were then exported in large quantities for further treatment and use. Community members were paid a certain amount per kilo of plastic bottles. The Sheha however refused to provide any further details.

Collection of plastic bottles for selling - Chumbuni

4.3 Environment & Health

Serious health concerns related to poor management of domestic solid waste were found in all of the study areas. An overview of the domestic solid waste infrastructure and practices with regard to associated environmental health risks is presented in the following table.

Domestic solid waste & environmental practices	Associated health risks
Burning of solid waste *(poor practice)*	
• Mixed waste is burned openly within the domestic areas, close to residences. • Waste includes plastic, paper, metal, chemicals, diapers, textiles and organic material.	• Respiratory problems due to air pollution from burning waste. • Risk of fire and burns.
Domestic animals feeding on waste *(poor practice/poor infrastructure)*	
• Domestic animals rummage around and feed on waste that is randomly dumped within domestic areas or spread around the official dumpsites. • The waste comprises many hazardous components, such as domestic chemicals and medical waste, faeces (diapers) as well as sharp objects.	• Domestic animals are potential disease carriers, which can accelerate the spreading of diseases related to poor sanitation and hygiene. • Spreading of diseases such as diarrhoeal diseases, leptospirosis, typhoid as well as hepatitis A.
Waste is widely spread in public places *(poor practice/poor infrastructure)*	
• Waste is widely spread in public places, either randomly within the domestic area or around the official dumpsites. • Many of the public waste containers as well as unofficial dumpsites are in immediate vicinity of schools or residences. • Waste includes plastic, paper, metal, chemicals, diapers, textile and organics, which leads to contamination of soil.	• Accumulated waste provides breeding ground for disease vectors, such as domestic animals, rodents and flies, increasing the spreading of diarrhoeal diseases, leptospirosis, typhoid fever and hepatitis A. • Accumulated waste and the presence of rodents attract potentially poisonous snakes to the domestic areas. • Walking barefoot on soil, contaminated with hookworm larvae is the primary cause of hookworm infection (helminthiasis).
Risk of waterborne diseases *(poor practice/poor infrastructure)*	
• Accumulation of wastewater at drainage outflow. • Direct contact with and fishing in wastewater.	• Wastewater accumulation in domestic areas provides breeding ground for disease vectors (mosquitoes), increasing the risk of malaria, dengue and lymphatic filariasis. • Risk of faecal-oral transmission of diarrhoeal diseases, typhoid fever, helminthiasis and hepatitis A through contact with and consumption of contaminated water and contaminated fish. • Transmission of schistosomiasis through skin contact with infested water.
Contamination of water sources *(poor practice/poor infrastructure)*	
• Contamination of water sources through pollution with diapers, chemical detergents as well as domestic medical waste. • Water is used for domestic purposes, such as cleaning, cooking and drinking.	• Contact and consumption of contaminated water can spread diseases such as diarrhoea, typhoid and hepatitis A.

Flooding with wastewater *(poor practice/poor infrastructure)*	
• Heavy rainfall during the rain season and the insufficient supply of drainages result in flooding of domestic areas with water contaminated by waste. • Flooding additionally causes overflow of pit latrines, contaminating flood water with faeces, resulting in extensive environmental pollution.	• Water contaminated with infectious waste and faeces causes spreading of diseases such as diarrhoeal diseases, leptospirosis, typhoid fever and hepatitis A. • During flooding, the occurrence of disease vectors (mosquitoes) rises, resulting in an increased risk of malaria, dengue and lymphatic filariasis. • The risk of Schistosomiasis is also increased during flooding.
Blocked drains and rivers with waste *(poor practice)*	
• The pollution of rivers and drains with waste causes blockages and flooding of domestic areas with dirt water in case of rainfall. • Waste includes mixed materials, such as plastic, paper, metal, chemicals, diapers, textile and organics.	• The accumulated waste provides breeding ground for disease vectors (flies and rodents) close to residences, increasing the risk of diarrhoeal diseases, leptospirosis, hepatitis A and typhoid. • Flooding during rain season, increases risk of additional diseases, such as helminthiasis, typhoid fever and hepatitis A as well as vector-borne diseases like malaria, dengue fever and lymphatic filariasis.
Stagnant water provides breeding place *(poor practice/poor infrastructure)*	
• Permanent stagnant water due to geographical characteristics in some domestic areas. • Pollution of wetland with certain wastes (e.g. detergents, fertilizers and sewerage) causes eutrophication.	• Stagnant water provides breeding ground for disease vectors and increases the risk of malaria, dengue fever and lymphatic filariasis. • Flies increase the risk of diarrhoeal diseases, typhoid fever and hepatitis A.

Table 4 Domestic SWM and Associated Environment and Health Risks

4.3.1 Environmental Challenges

Many environmental challenges with regard to domestic solid waste management and public health were identified in the course of the field research, as presented in the table. The majority of the KAP-survey respondents (n=365) regarded the flooding of domestic areas (54,8%) as one of the most important environmental challenges. Revisits of the research area during the rain season revealed the devastating consequences for residents. Additional photographs can be found in the Annexe.

Flooding - Chumbuni

Houses under water - Karakana

Many areas were widely flooded with water, polluted by waste and sewage from overflowing pit latrines. People were deterred from leaving their houses until the rain had stopped and the water drained off, taking up to several days or weeks. Residents reported their children missing school during the rain season due to the state of the environment. Areas prone to flooding were found abandoned during the rain season. Houses were filled with water, forcing residents to evacuate their belongings and resettle for the duration of the rain season. Residents reported vast annually recurring social, economic as well as health-related damage due to the flooding. Lack of financial resources was indicated as the predominant reason for residents to return and rebuild their houses after each flooding. Complaints were raised with regard to insufficient support by the Municipal Council to prevent the flooding of domestic areas. It has to be mentioned however, that most of the concerned residences were unauthorised settlements, built on land unsuitable for domestic purposes. Problems regarding these unplanned buildings were likewise raised during the expert interview and associated with lacking safety, unsuitability of housing as well as an inability of the ZMC to provide sufficient service for these areas.

Also the randomly scattered waste within the domestic areas (46,3%) was rated as a major environmental challenge by almost half of the respondents and rummaging animals by 25,2% (n=365). The state of the domestic environment was observed to be ambivalent with regard to the pollution by waste. High waste accumulations were found in easily accessible spaces close to rivers, drainages, wetlands as well as public open places, some of which had developed into unofficial dumpsites. Highly frequented areas and pathways were more likely to be littered with waste, as it is common practice to just drop unwanted material wherever you are. The randomly scattered waste comprised a high proportion of organic materials, which attracted domestic animals in search of food. Therefore the problem of rummaging animals was concentrated in areas with increased accumulation of waste.

Randomly spread waste - Nyerere

Hen and chick feeding on waste - Kwamtipura

Furthermore highlighted by many participants (n=365) was the problem of limited (45,2%) and unsafe (39,5%) water sources. In the course of the field research, most water sources were found highly polluted by waste. Many households were not supplied with piped water, but used the public wells and water-taps within the domestic areas. Residents were commonly found to use old cooking oil canisters for the transportation and storage of water. The water was used for different purposes, including washing, cooking

as well as drinking, without previous treatment. The limited availability of freshwater as well as the proceeding pollution of water sources is an on-going concern in Zanzibar disproportionately affecting the poor population. The importance of available clean water was recognised by the majority (63,2%) of respondents (n=372).

Polluted water sources well & river - Kwamtipura

Also the hot and dry climate was named as a main environmental challenge by many respondents (41,9%). The climatic conditions in connection with the scarcity of water raise recurring difficulties for professional farmers and residents practicing small-scale farming, especially in the dry season. Other aspects such as bad air quality due to burning of waste (15,3%) or traffic pollution (5,8%), the exploitation of natural resources (8,8%) and lack of domestic vegetation (13,4%) were not regarded as main challenges by most of the respondents.

4.3.2 Environmental Importance

Many households in urban Zanzibar are involved in and dependent on some kind of food production for private or business purposes. 37,8% of questioned households (n=381) mentioned involvement in agriculture. While 18,1% used their products for private consumption only, 19,7% made a living from it. 10% of households stated to own livestock, such as cows, goats or chicken for private purposes and another 6,3% for business. Fishery was still practiced by 11,5% of the surveyed households, with a focus on business (6,8%).

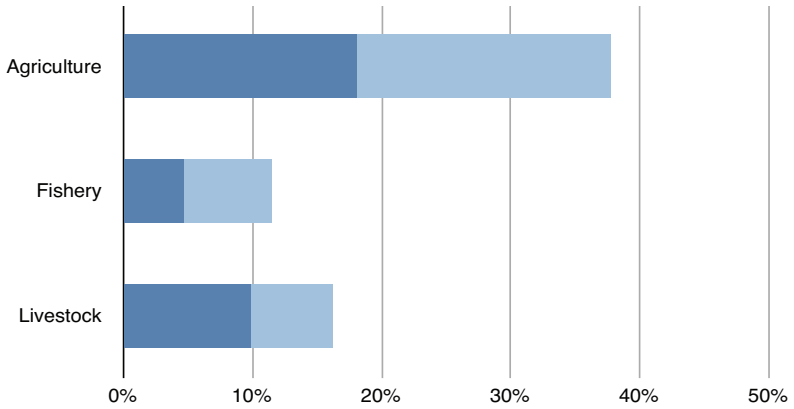


Figure 12 Household Involvement (n=381)

Being asked about the importance of different environmental aspects, clean water was most frequently mentioned, by 63,2% of respondents (n=372). Many respondents furthermore regarded healthy living conditions (53,2%), vegetation (49,7%) as well as a clean environment (39%) as important. In accordance with residents' involvement, agriculture (32,3%) was regarded as important more frequently than fishery (21,5%).

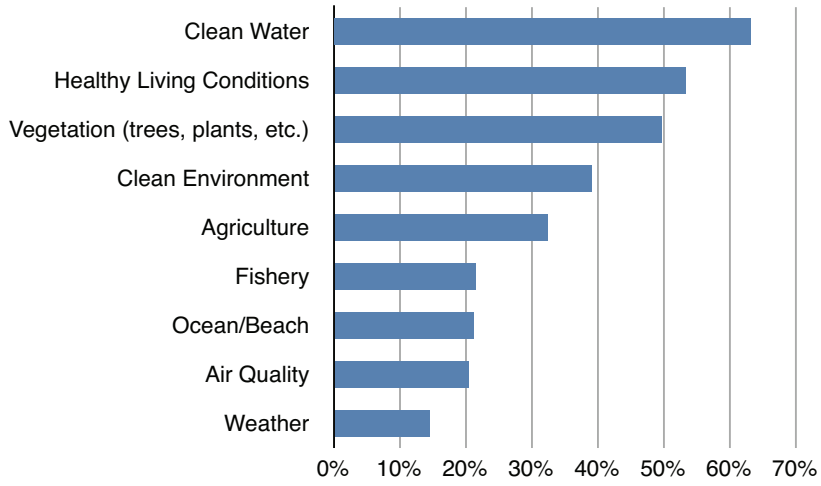


Figure 13 Importance of Environmental Aspects (n=372)

The vast majority, 84,8% of respondents (n=375) regarded the protection of the environment and its resources, including water sources, mangroves, coral reefs as well as agricultural and forest areas as important. 83,2% of the participants (n=376) recognised that changes in the environment negatively affect the community. Nevertheless, half of the respondents stated to be more concerned about problems, such as unemployment, crime and cost of living, than a waste free environment. Although 92,8% of respondents (n=376) stated playing an important role in improving and maintaining the environment in their domestic area, 56,4% of respondents (n=374) also believed to have no influence on the protection of the environment or natural resource but that the government alone is responsible for maintaining the environment. Only 36,7% of respondents (n=375) regarded the waste situation as important. Lacking awareness and concern with regard to the community's responsibility for and involvement in environmental protection among residents was justified with the difficult circumstances of life and daily struggle for basic needs.

4.3.3 Health

The majority, 50,8% of participants (n=382) reported the occurrence of some of the environment related diseases listed below in their household in the four weeks preceding the study. Most prevalent were fever (23%) and respiratory problems (22,8%), followed by malaria (16,9%) and diarrhoea (12,2%). Also eye infections (7,7%), skin diseases (6,3%) as well as worms (5,4%) were not uncommon and even 13 cases of typhoid (3,1%) and eight cholera cases (1,9%) were reported. As the incidence of diseases was self-reported, more distinctive diagnosis was disregarded and it remains unknown how many cases were clinically confirmed.

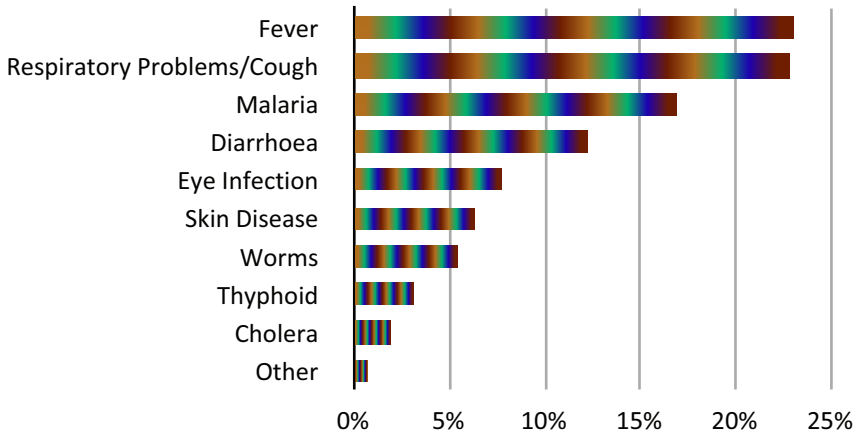


Figure 14 Environment Related Diseases in Household - Last 4 Weeks (n=382)

Many respondents, 76,4% (n=377) reported concern about diseases, such as malaria and worms, related to poor storage and disposal of waste. In accordance, 69,3% of respondents (n=378) was troubled about rats and other animals, which are attracted by the waste and contribute to the spreading of diseases. When asked directly, many respondents also expressed concern about health risks due to burning of waste 71,3% (n=377), of which 51,7% was very concerned.

Next participants were questioned about their hand washing habits, as lacking personal hygiene impacts spreading of the above-mentioned diseases. Of 380 respondents, only 69.5% washed their hands before preparing food and 10,8% did not wash their hands before eating. Even after going to the toilet, 18,7% did not wash their hands. 36,1% washed their hands after handling waste and only 7,6% after contact with animals. Although the majority of respondents claimed to use soap for hand washing, in Zanzibar soap is not generally available; hence people have to wash their hands with cold water only. The water used for hand washing may furthermore be contaminated with germs or chemicals, as many domestic water sources were found highly polluted by waste.

4.3.4 Awareness

Most of the respondents showed little awareness concerning the general interrelation of environment and health. While 55,7% of KAP-survey respondents (n=377) saw no connection between the environment and their health, only 36,6% knew about environmental influences on health. Nevertheless, the majority, 54,4% (n=375) did express concern about health consequences related to the burning of waste. Still another 38,7% stated not caring about the negative health effects.

Several problems were identified and associated with poor waste disposal by the study participants. Besides intensive odour nuisances, named by 84,2% of respondents (n=380) almost half (49,2%) recognised a connection to the breeding of disease vectors. Diarrhoeal diseases (36,3%), malaria (25,5%), respiratory problems (21,6%) as well as skin disease (13,4%) were also associated with poor waste disposal by many respondents. Concern was furthermore expressed with regard to children playing with waste (21,1%) as

well as animals eating waste (16,3%). Bad air quality was mentioned much more frequently with regard to poor waste disposal (28,7%) than water (13,4%) or soil quality (4,5%), which were associated with poor SWM by only few respondents.

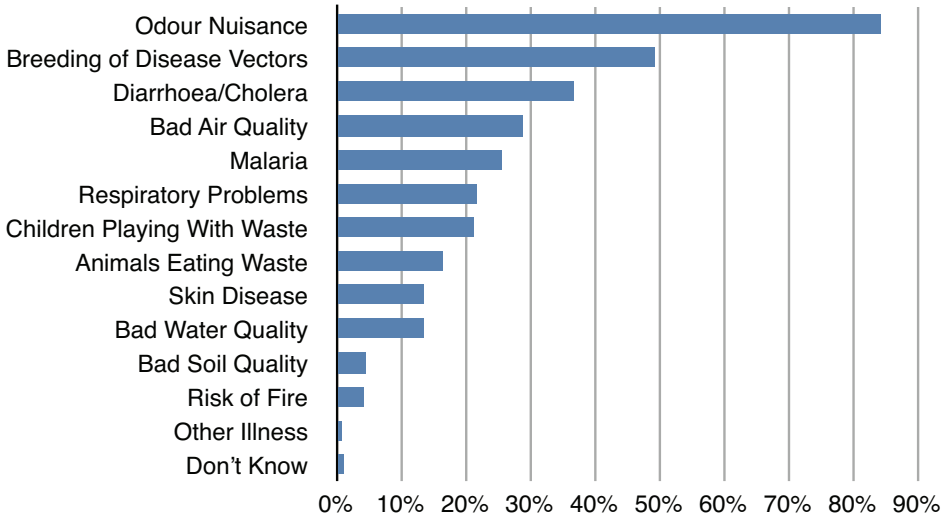


Figure 15 Problems Associated with Poor Waste Disposal (n=380)

Respondents expressed concern about several aspects of SWM. The overall waste situation in Zanzibar caused concern in 71,7% of respondents (n=378), of which 39,2% was very concerned. 67% worried about the pollution of rivers, wells and other water sources through uncontrolled dumping (n=378). Concern about flooding caused by the pollution of rivers and drains, was expressed by 68,3% of respondents (n=375). The majority however, 71,1% of respondents (n=367) believed that God will always provide necessary natural resources, whereas only 18% did not agree. Overall, ambivalent perceptions concerning the dimensions of and responsibility for the environment and health conditions were evident and reflected in residents' various disposal practices. The majority, 76% (n=372) of respondents thought that the residents of Zanzibar themselves are mainly responsible for the environment and health conditions, while 80% feel it is their responsibility to pick up waste in their community, which contradicts the devastating environmental waste pollution found in the research area.

4.4 Information & Education

Knowledge, attitudes and practices regarding solid waste management have already been discovered to be highly diverse. The following chapter therefore addresses the provision of as well as demand for information and environmental education in the community by different stakeholders, including the media. The media are recognised as an important measure for public environmental education in the *Zanzibar Environmental Policy of 2013*. The use of different media for increasing community awareness, participation and compliance with environmental policies is emphasised (Revolutionary Government of Zanzibar, 2013/a).

4.4.1 Media Use

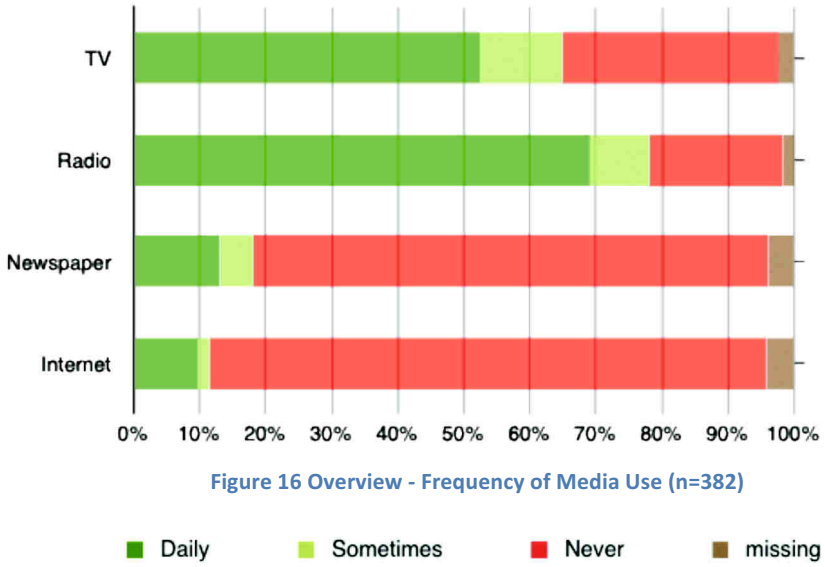


Figure 16 Overview - Frequency of Media Use (n=382)

In the course of the KAP-survey, respondents were asked about their media use. Radio was identified as the most frequently used media. 70,4% listened to the radio daily and another 9% sometimes. The majority, 52,1% (n=303) reported radio use between 6am - 12noon, 31% did not specify any preferred time. Most frequented were the stations *Zanzibar Broadcasting Corporation (ZBC) Radio (88,3%), Salaam (16,8%), Al Noor (16,8%), Imaan (14,4%)* and *Bomba FM (13,4%).*

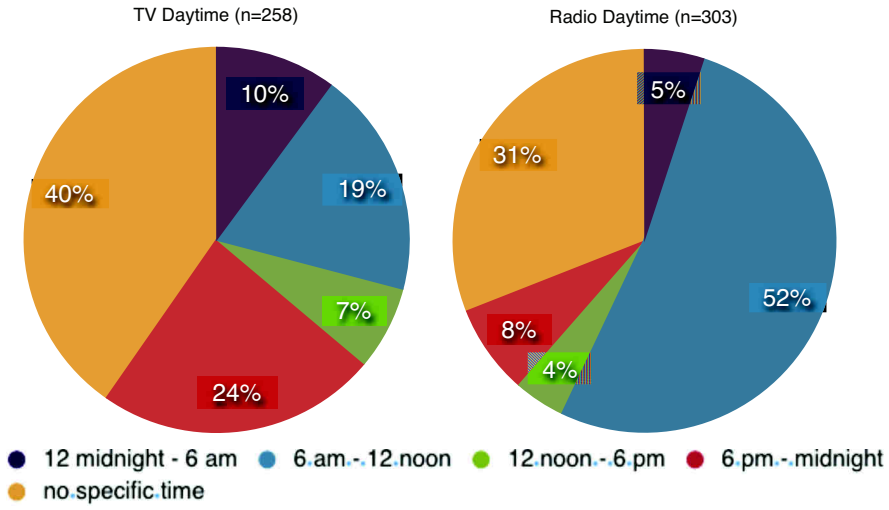


Figure 17 Time of Media Use - TV and Radio

TV was used daily by 53,6% and sometimes by 12,8% of respondents (n=382). Most of TV users (n=258) watched television in the time between 6am - 12noon (19%) or 6pm - midnight (23,6%). 40,3% did not mention any specific time. The main TV channels used were *ZBC (93,6%), Independent Television Limited (ITV) (37,5%), Tanzania Broadcasting Corporation (TBC) (32,3%), Coconut (12,5%)* and *Star TV (7,7%).*
The ten most frequently used radio and TV stations are presented in *Table 5* according to their popularity among respondents. The programmes' content is shortly introduced with public stations highlighted in red and private ones in grey.

	Media station	Programme
1	**Zanzibar Broadcasting Corporation* ZBC TV** TV users: 93,6% (n=258) Total: 62,2% (n=373)	The ZBC uses its media channels to provide information and education to the local community to encourage development. The radio as well as TV programmes aim at providing entertainment and delivering information to the people in Zanzibar. Education campaigns are integrated into the programme and address various topics, including environment, health as well as sustainable development (Zanzibar Broadcasting Corporation, 2016).
2	**ZBC Radio** Radio users: 88,3% (n=303) Total: 70,1% (n=375)	
3	**Independent Television Limited ITV** TV users: 37,5% (n=258) Total: 24,9% (n=373)	ITV broadcasts national and international news, education as well as entertainment programmes for the general population. Local health campaigns are presented to sensitise the community and mobilise support. The majority of programmes is locally produced and broadcasted in Swahili (Independent Television Limited, 2016).
4	**Tanzania Broadcasting Corporation TBC** TV users: 32,3% (n=258) Total: 21,4% (n=373)	TBC broadcasts national and international news, education as well as sports programmes for the general population of Tanzania. With its mixed programme, the channel aims to address various target groups (Tanzania Broadcasting Corporation, 2015).
5	**Al Noor Radio** Radio users: 16,8% (n=303) Total: 13,3% (n=375)	Al Noor is an Islamic oriented radio station, by an NGO in Zanzibar. It broadcasts information to encourage development and the alleviation of poverty. Radio is used as a means to empower the community, enable participation and raise awareness with regard to environment and health issues based on the principles of Islam (Music Africa, 2015).
	Salaam Radio Radio users: 16,8% (n=303) Total: 13,3% (n=375)	Saalam Radio is a radio station from Kenya, broadcasting information, news, sports and Islamic talks. Programmes include discussions on different societal issues of interest (Radio Salaam, 2015; Ashoka Changemakers, 2015).
6	**Imaan Radio** Radio users: 14,4% (n=303) Total: 11,5% (n=375)	Radio Imaan is an Islamic media broadcasted from Tanzania with the aim of facilitating social development. The programmes target at listeners from different religious, social and economic backgrounds. (The Islamic Foundation - TZ, n.d.).
7	**Bomba FM** Radio users: 13,4% (n=303) Total: 10,7% (n=375)	Bomba FM is a modern music radio station broadcasting entertainment programmes. The station is mainly targeted at youths and young adults.
8	**Coconut TV** TV users: 12,5% (n=258) Total: 8,6% (n=373)	Coconut TV broadcasts a variety of programmes, including local channels as well as international news, sports and movie channels from all over the world (Coconut Digital Television, 2013).
9	**Star TV** TV users: 7,7% (n=258) Total: 5,1% (n=373)	Star TV broadcasts entertainment as well as national and international news programmes (StarTV, 2016).

Table 5 Most Frequently Used Media Stations

* In the course of the research project, the ZBC produced several programmes with regard to SWM, environment and health. A documentary about the case study was broadcasted as well as an interactive talkshow on the topic.

Only 18,8% of participants read a gazette once or several times per week. Most frequently named were the newspapers *Nipashe Habari (55%), Zanzibar Leo (49,3%), Mwana Nchi (39,1%)*, as well as the sports news *Michezo (31,9%)* and *Mwana Sport (14,5%)*. 81,2% of respondents did not read any newspapers at all. The Internet was the least used media (12%) among respondents. Most popular were the entertainment and communication programmes *Facebook (86,4%), WhatsApp (75%), Life Style (29,6%), Google (13,6%)* and *Twitter (13,6%).* As households are usually not equipped with a computer, most Internet users get access via their smartphone.

4.4.2 Information Access

Participants were asked about previously received information concerning proper solid waste disposal, composting as well as recycling and reuse of waste materials. 37,6% (n=378) had formerly received information about waste disposal, 26,3% (n=376) about composting and 27,9% (n=376) regarding the recycling and reuse of waste materials.

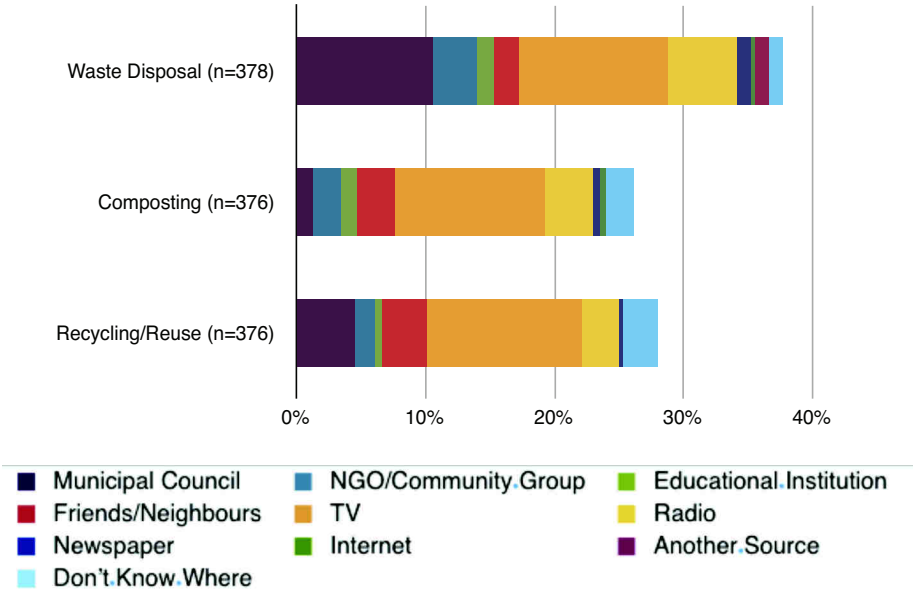


Figure 18 Information Sources - Solid Waste Disposal/Composting/Recycling and Reuse

It was found that most information had been received via TV or radio programmes. With regard to solid waste disposal practices, 31% of the respondents (n=142) had seen a TV and 14,1% listened to a radio programme. Also the ZMC (28,2%) as well as NGOs and CBOs (9,2%) played a considerable role for the provision of information to the community. Information on composting (n=99) was less frequently facilitated by the government (5,1%) or community stakeholders (8,1%) but information delivery by friends and neighbours (11%) gained more importance. Again TV (44,4%) and radio (14,1%) campaigns were frequently mentioned as the source of information. Knowledge concerning the recycling and reuse of SW materials had mainly been acquired through TV, by 42,9% of respondents (n=105). Also campaigns initiated by the ZMC (16,2%), as well as information from friends and neighbours (12,4%) and radio programmes (10,5%) had considerable influence on the provision of information. Only few respondents had received

information on the mentioned topics through educational institutions, newspapers or the Internet, as illustrated in the graph.

About half, 47,5% of respondents would like to receive further information on solid waste, composting and recycling, whereas 45,4% were not interested (n=377). A noticeable difference between respondents who had received information before and those who had not was evident concerning their request for additional information. The majority of those respondents, who had already received information, desired additional information on solid waste disposal (52,8%, n=142), composting (63,3%, n=98) as well as recycling and reuse (54,3%, n=105). Among respondents who had never received information before, the request for information was considerably lower for waste disposal (43,7%, n=231), composting (41,6%, n=274) and recycling (44,8%, n=268).

45,51% (n=178) of the survey respondents indicated TV as their preferred method of information delivery followed by practical presentation (27,53%), radio (18,54%) and written information (12,36%). 79,4% of KAP-survey respondents (n=374) agreed that public education campaigns are a suitable means for addressing the solid waste problem in Zanzibar, while 12,3% did not regard public training as a solution for the current situation. The vast majority of respondents, 93,8% (n=372) however would support the integration of environmental education in schools.

Nevertheless, analysis revealed that there was no considerable difference in solid waste management practices including separation, composting and disposal of solid waste among those respondents who had received information before and those who had not. It is questionable if the mere provision of information is sufficient to enable and induce community members to apply their knowledge and implement sustainable behaviour change.

The Head of the Social Service Department of the ZMC raised further assumptions in the course of the qualitative interview. He proposed that the poor solid waste management practices cannot only be associated with lacking knowledge about the proper handling of waste but furthermore with an insufficient comprehension of the interrelation of environmental pollution and health among residents. In addition, the sole responsibility for SWM was commonly attributed to the ZMC, resulting in lacking cooperation with the current SWM system.

4.4.3 Environmental Laws & Regulations

The majority of survey participants (n=382), 50,3% stated being unfamiliar with the laws concerning the environment or waste disposal in Zanzibar. Great variations in knowledge and awareness were found in-between the study areas, ranging from only 21,1% of respondents in Kilimahewa Juu to 75% in Sebleni, who knew about the existence of environmental laws in Zanzibar. Nevertheless, even those respondents aware of the environmental law and the consequent prohibition of random dumping exhibited poor SWM

behaviour. Crude dumping was still practised by 25,6% of informed respondents (n=153) compared to 35,1% of those who were unaware of existing regulations. None of the participants mentioned any penalty for or consequence of random dumping, which reflects the non-existent prosecution of the law at community level.

In the course of the expert interview, several challenges besides the lacking knowledge of some respondents were named as constraints for the successful implementation and prosecution of laws regarding SWM. Local habits rooted in cultural traditions prevent residents from reporting contraventions of the law committed by other community members. Additionally no authority had been appointed to oversee and implement prosecution. A lack of knowledge about the specific environmental laws and regulations even among local government officials themselves, including the Shehas was furthermore indicated as a common problem by the *State of the Environment Report 2004/2005* (Zanzibar Department of Environment 2005). The insufficient knowledge and responsibility of authorities encouraged indifference and lacking compliance of residents.

4.5 Financial Resources for SWM

The financial resources for the provision of domestic solid waste management were repeatedly addressed by a variety of stakeholders. Lacking and unstable financial resources at community as well as government level were identified as one of the major challenges for the implementation of a sustainable SWM system.

While all households are obliged to contribute a monthly fee of 3.000/= TSh (equivalent to 1,36 Euros)[*] for ZMC services including SWM, only 42,6% of KAP-survey respondents (n= 380) reported paying for waste disposal in some form. Most of those however, 70,4% (n=162) paid informal workers, private people, NGOs or community groups (15,4%) for waste disposal services. Only 8% of the contributions were made to the ZMC. 56,3% of households (n=380) did not pay for solid waste disposal at all.

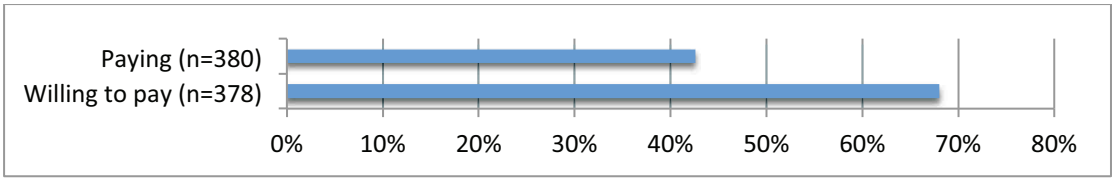


Figure 19 Payment vs. Willingness to Pay

The vast majority of participants however would be willing to pay for solid waste disposal service by the ZMC. 68% of the 378 respondents would potentially be willing to contribute financially towards public SWM, 24,9% (n=382) more than those already paying. Even 54,8% of those who did not contribute at the time of questioning (n=201) expressed some willingness to pay.

[*] Values refer to an exchange rate of 1 Euro = 2.200/= Tanzanian Shilling.

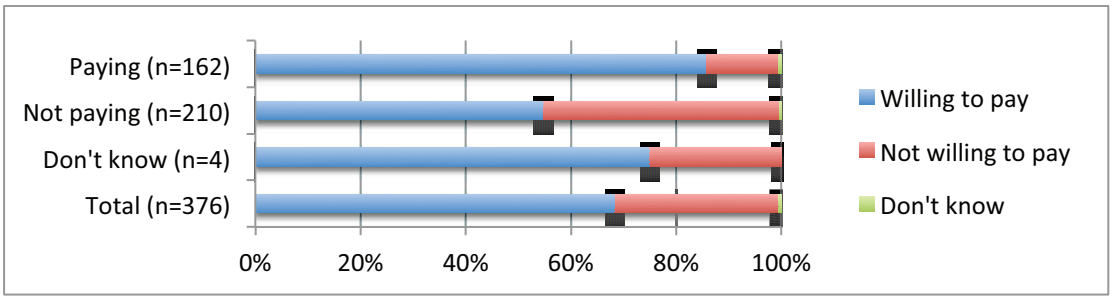


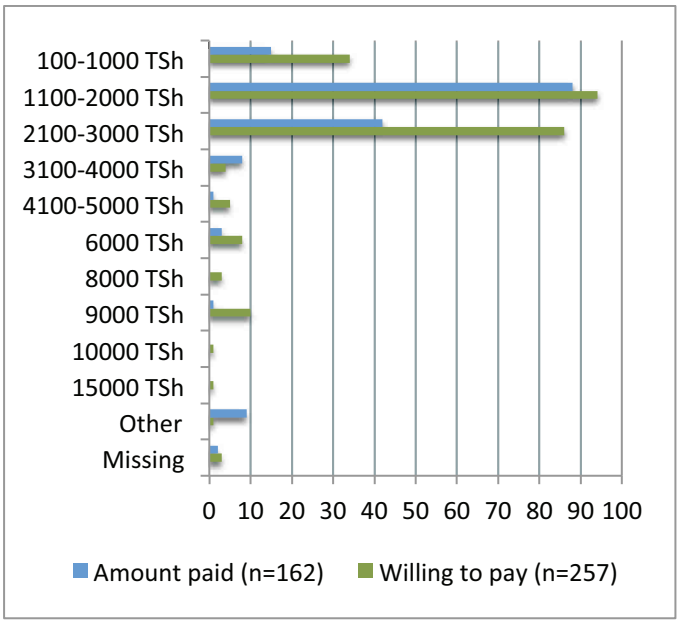
Figure 20 Willingness to Pay in Relation to Current Service Fee Contributions

Still, 31,5% (n=378) demonstrated their unwillingness to pay the municipal council for its services and 0,5% remained unsure. Also 13,6% of respondents (n=162) already paying for some kind of waste disposal service, demonstrated an unwillingness to contribute to the ZMC service fee. This indicates that some of the unwillingness to pay is due to residents' dissatisfaction with the municipal SWM. A recently conducted public survey had shown that the community has little faith in the service provision of ZMC, fostering the non-compliance (Zanzibar Municipal Council, 2014).

The most frequently mentioned reason for unwillingness to pay the ZMC service fee (73,9%) was the lack of sufficient financial resources (n=119), of which 90,6% would comply if they had adequate funds. Another 10,9% of respondents did not regard waste management as important. Other reasons for residents' refusal to pay were the lack of personal benefits from SWM service (5,9%) as well as the perceived monopolistic responsibility of the ZMC to finance waste management services (4,2%). Another 5% of respondents, unwilling to pay, reported disposing of their solid waste themselves and would therefore not require any SWM service.

Overall, 47,8% of respondents (n=113) were willing to pay if they had adequate financial resources. 18,6% demanded improvements in the SWM services and 17,7% increased transparency concerning the use of collection fees by the ZMC as a condition for their compliance with the current system. Another 6,2% would be willing to pay if all residents were likewise paying for ZMC services. Others (4,4%) did not use door-to-door collection and therefore did not feel obliged to pay for any service. 5,3% stated being generally unwilling to pay.

The amount households paid for solid waste disposal was very variable, ranging from 100 TSh up to 9.000 TSh per month. Nevertheless, most contributions (89,51%) were below 3.000/= TSh, which represents the monthly service fee of ZMC. 7,58% of the respondents stated contributing an amount higher than that. Of all respondents who declared willingness to pay a service fee (n=257), 83,27% would be willing to pay an amount up to 3.000/= TSh and 12,46% an even higher amount, with a maximum of 15.000/= TSh.



Amount TSh	Amount Euro	Paying n=162	Willing to pay n=257
100-1000	0,05-0,46	9,26%	13,23%
1100-2000	0,5-91	54,32%	36,58%
2100-3000	96-1,36	25,93%	33,46%
< ZMC fee		89,51%	83,27%
3100-4000	1,41-1,82	4,49%	1,56%
4100-5000	1,86-2,27	0,62%	1,95%
6000	2,73	1,85%	3,11%
8000	3,64	-	1,17%
9000	4,09	0,62%	3,89%
10000	4,55	-	0,39%
15000	6,82	-	0,39%
> ZMC fee		7,58%	12,46%
Other		0,62%	3,5%
Missing		1,85%	0,78%

Figure 21 Payment vs. Willingness to pay - Grouped According to Size of Contribution

The Head of the Social Service department likewise indicated the low socioeconomic status of many residents in the research area as a major reason for their unwillingness to contribute for public services. Furthermore, the community commonly perceived the municipal council as responsible and therefore refused to pay. This perception is rooted in tradition, as all public services had been provided free of charge in former times. Transparency concerning the collection and use of the public service fee was mentioned as a measure to encourage residents' compliance.

Another challenge that was mentioned in the course of the qualitative expert interview was the seasonally unstable and inadequate budget available for MSWM. Public services were generally financed by the ZMC revenue, which was acquired through the collection of service charges, some of which were paid once only, as required or on a daily, monthly, sub-annual or annual basis. While households were obligated to pay 3.000/= TSh per month, commercial establishments paid between 3.500 up to 700.000/= TSh, (1,59-318,18 Euros) according to their size and turnover. A mixed system was used for the collection of ZMC charges. While some customers received bills and required to approach the municipal council to settle their account, most households were still individually approached by ZMC staff for the collection of revenue. The proposed aim of the ZMC is the implementation of a comprehensive database, including all customers liable to pay and to introduce the use of bills throughout the municipality for improved planning and monitoring. At the beginning of each year, the ZMC acquires additional revenue through the renewal of business licences. Although more than 60% of the total ZMC revenue was used for the provision of public services including SWM, financial resources of the Social Services Department continued to be insufficient and unreliable, thus budgetary constraints remained a major cause for lacking service delivery (Rajab, 2015).

5 DISCUSSION

This work addresses domestic solid waste management and associated environment and health conditions in the Urban West (North Zone), Zanzibar. The research was conducted to gain a comprehensive understanding of domestic SWM and related environment and health risks. It aims at identifying aspects relevant for the design and implementation of an integrated sustainable domestic solid waste management in order to derive feasible interventions for the setting investigation.

The research study was conducted as part of the Master of Health Sciences at the University of Applied Sciences in Hamburg and was implemented in cooperation with the local NGO Glitters Volunteer Group (GVG) in Zanzibar, which facilitated the design and implementation of the case study research.

5.1 Discussion of Methods

The aim of the case study was to develop an in-depth understanding of the domestic solid waste management in urban Zanzibar (North Zone) and its influence on environment and health. Economically weak populations are most affected by ineffective waste management and consequent environmental and health risks. Thus, the research area was selected, as it is the poorest part of Zanzibar Town with a low-level income, high unemployment rate and low level of service concerning waste in terms of waste collection by the municipal council. The Urban West (North Zone) comprises 13 Shehias, which constitute the local administration at sub-district level in Zanzibar. Therefore, multiple cases were defined within the case study.

The extensive research approach was based upon the Integrated Sustainable Waste Management framework introduced in UN-HABITAT's *Solid Waste Management in the World's Cities, 2010,* which incorporates the multitude of interrelated elements of solid waste management in an integrated and sustainable manner. The variety of determinants for SWM and their interrelation determined the scope and approach of the research. Thus, a multi-method case study was conducted to develop a comprehensive understanding of the local domestic solid waste management in the Urban West (North Zone), Zanzibar. The different sources of information complemented each other and helped to cross-check, compare and verify results through triangulation.

The importance of local conditions, requirements and solutions for the design and implementation of sustainable SWM service has repeatedly been emphasised in the literature (Palczynski, 2002; Coffey & Coad, 2010; UN-HABITAT, 2010; UNEP, 2005; Coad, 2011). Therefore, this case study was imbedded into local structures and implemented in cooperation with different local stakeholders in order to gather comprehensive information specific to the conditions found in urban Zanzibar. Different governmental and non-governmental parties provided preparatory information concerning the research topic and area.

Additional information with regard to the research environment was acquired through personal field visits prior to the research design. Before implementation of the community survey, permission was granted from the Vice President's Office in Zanzibar and the Zanzibar Municipal Council was informed about the research activities. The respective local authorities at community level (Shehas) were visited in person to discuss the planned research. The cooperation of the Shehas was crucial for the success of the study, as they are highly respected among residents and have certain authority within their area of jurisdiction. All Shehas were very helpful in the preparation and implementation of the community study.

Data collection included a quantitative KAP-survey to measure common knowledge, attitudes and practices in the community and to assess the current domestic SWM service. The survey was conducted in form of face-to-face interviews, due to the relatively high illiteracy rate in Zanzibar. The KAP-questionnaire as well as the interviewer-training manual were prepared in cooperation with and translated into Swahili by a local doctor, who is experienced in research methodology and well acquainted with the local customs and mentality. The KAP-survey was additionally reviewed by the mentoring Professor at the University of Applied Sciences in Hamburg, Germany. A pilot-test was conducted in a comparable setting in Zanzibar Town to test the questionnaire's suitability. The effective data collection was achieved through comprehensive preparation of the study and support of the local interviewers in the field. The research team demonstrated a high degree of perseverance under difficult conditions, flexibility and dedication to the research, which was reflected in the responses of the interviewees.

The researcher was present throughout the field survey, to coordinate the study process and to approach selected households to personally introduce the purpose and procedure of the community interviews. The collaboration with the local community authorities, the Shehas, as well as the personal approach of selected households, resulted in extensive cooperativeness and a 100% response rate. Only two interviews were terminated by request of the respondents. Missing answers due to problems with understanding or unwillingness to answer occurred to a negligible extent. Participation in the survey was voluntary after respondents were informed about the objective of the study and assured confidentiality. The data was collected anonymously. All participants signed an informed consent form and where notified that they could withdraw from participation at any time. Throughout the data collection as well as processing, access to the gathered information was limited to the study team involved in interviews and data analysis. As the study did not include any intervention, there were no anticipated positive or negative consequences for the interviewees. The study participants as well as other community members were very supportive throughout the field research.

Qualitative data was collected in form of observations, field notes and a qualitative expert interview, to further explore and understand the setting, underlying context as well as different perspectives within the case study. Observations were documented in form of photographs in the course of the implementation of the KAP-survey. The Shehas, some NGOs and community groups as well as selected community members

(such as informal waste workers or scavengers) were questioned informally to acquire comprehensive information about the research topic. Additional inspections of selected sites within the study area were undertaken during the rain season (April 2015) to complement the research findings, which followed the interview period. Photographs and notes were taken to document the annually recurring devastating environment and health conditions due to the heavy rainfall. The field research was partially accompanied and documented by a camera team of the public TV station ZBC, to provide information and raise awareness in the community. The researcher and interviewers were questioned about the purpose and scope of the research while community members had the opportunity to comment on domestic SWM as well as environment and health conditions in their respective area.

The qualitative expert interview with the Head of the Social Service Department of the ZMC mainly regarded the system and governance aspects of domestic SWM in Zanzibar. It was conducted to complement the findings from the community study. The interview was conducted in English, and recorded for subsequent transcription. The interview was performed without any disturbance, as the interviewee was very cooperative and willing to provide comprehensive information. The Head of the Social Service Department later reviewed the major findings from the interview for accuracy and credibility.

A case study is a very complex and time-consuming process, due to the extensive research in the field followed by the review, classification and analysis of data from different sources as well as the organisation and summary of results (Creswell, 2013). Due to the scope of the research and rich description of the case, the study methods resemble ethnographic research. Taking an explorative approach, the research methods and procedures evolved and developed throughout the research process, which entailed the initiation, organisation and implementation of the case study. (Creswell, Klassen, Plano Clark, & Clegg Smith, 2010). Several themes emerged within the case study. The classification and integration of findings and observations from the different data sources was challenging, due to the quantity of information. The comprehensive results from the different methodologies were clustered and presented according to their topical relevance for the domestic SWM in Zanzibar. The findings are subsequently applied to the Integrated Sustainable Waste Management framework. Major problems for the implementation of an ISusWM at community level are summarised and recommendations given for suitable interventions within the setting of the case study.

The research project was conducted as a partial fulfilment of the Master of Health Sciences at the HAW. The case study however developed beyond the required scope, due to the complexity of the research topic as well as to the specific local conditions that had to be incorporated. Therefore, the researcher spent an extensive time (Aug. 2013-May 2015) in Zanzibar. She was an accepted resident in an exclusively local domestic area with very low socio-economic and was integrated into the respective community, which enabled an in-depth understanding of the local culture and living conditions. The study was initiated, planned, prepared and implemented by the researcher in cooperation with a local grass-root organisation

(GVG), which facilitated the access to various stakeholders and data sources and enabled the successful realisation of the project. The intensive collaboration enabled the design and implementation of a locally feasible, but scientifically valuable research study.

5.1.1 Validation

Different validation strategies, as presented in Creswell's *"Qualitative Inquiry and Research Design, 2013"* were employed to ensure the scientific value of the research.

Prolonged engagement and persistent observation: The extensive time and interaction in the field was one of the strengths of this case study, as it helped to the gain trust of the community and obtain an in-depth understanding of the situation with all it's facets. The field research was conducted over the course of two months after extensive preparation, including prior field visits, which allowed the collection of comprehensive information. An unscheduled follow-up was undertaken during the rain season following the KAP-survey to complement the findings and case analysis.

Rich, thick description: The research findings were documented and presented in various formats, including the rich description and illustration of field notes and observations as well as the introduction of statistics and corresponding graphs representing findings from the KAP-survey. The contextual presentation of results enables the reader to be able to relate to the findings and conditions specific to the study area.

Triangulation: The research incorporated different data sources, through the application of multiple methods and investigators. Triangulation of findings was used to validate the information and ensure scientifically valuable research.

Peer review and debriefing: The case study was conducted by a foreign researcher in Zanzibar, which made close cooperation with local stakeholders crucial. A grass-root NGO and local doctor accompanied the research process, design and implementation to ensure local feasibility. The whole research process was furthermore discussed with and reviewed by the researcher's professional advisor at the University of Applied Sciences for scientific accuracy.

Clarification of researcher bias: The researcher played a distinctive role for the development and outcome of the research project. The researcher's influence on the implementation of the research is discussed in detail in chapter *5.1.3 Possible Sources of Bias.*

Further criteria important for the evaluation of case study research, as defined by Creswell (2013) are discussed in the following.

- The study area (Collection zone C) was chosen, as it is characterised by low socio-economic status and furthermore by a low level of public services by the ZMC. The case was therefore defined by its precarious conditions concerning domestic SWM as well as related environment and health conditions. The 13 Shehias within the Urban West (North Zone) were subsequently identified as multiple cases within the case study, as they constitute autonomous areas with their own local administration. The differentiation between the various Shehias enabled the comparison of their respective community initiatives.

- The case analysis had an intrinsic merit, as it aimed at gathering specific data in the case study area. It focused on the particulars of the most deprived area within urban Zanzibar rather than seeking generalisation.

- The case study was based on the ISusWM framework, which introduces the multiple influences on SWM. Therefore different dimensions of SWM were addressed in the data collection process. In the course of the research, several themes emerged repeatedly, allowing the identification of major issues for SMW in the study area.

- The research did not aim at the transferability of results to other settings. Acutely problematical environment and health conditions caused by poor solid waste management are encountered frequently in developing countries. Valuable research has been published, which provides possible solutions for domestic SWM for a variety of conditions. As the consideration and incorporation of locally feasible interventions is consistently highlighted in literature, the case study aimed to explore the specific conditions found in a defined research area to gather information with particular relevance and derive practical implications. The study results allow assertions about the North Zone of Zanzibar Town, but incidentally refer to the overall MSWM or might be generally beneficial for low-income areas in urban Zanzibar. The findings of the research were applied to the concept of Integrated Sustainable Waste Management to summarise fundamental deficits and derive recommendations for improvement.

- The researcher captured a lot of attention due to her European background and dedicated commitment during the whole research process. Nevertheless, the researcher used her distinctive features to establish interest and gain the cooperativeness of various parties involved in the research. Successful implementation of the case study was facilitated by close involvement of the local stakeholders. The significance of the researcher's position and effect of the study is reflected in detail in the Discussion of Methods.

5.1.2 Limitations

The survey focused on primary collection of solid waste at community level as opposed to the whole SWM process. The final disposal of solid waste, including large-scale treatment and landfilling was intentionally disregarded as being beyond the scope of this research. The fact that Zanzibar is an island state was also not taken into account in the research, as it does not have any substantial influence on SWM in the domestic setting.

It is arguable that the overall SWM process has to be considered for the design and implementation of a sustainable SWM. Nevertheless, the case study comprehensively addressed the interrelated aspects of SWM at community level. The issue of inadequate final disposal through unsanitary landfilling practiced by the Municipal Council is a great challenge in need of attention and investment but exceeded the parameters and intention of this research.

Adequate sanitation is a public service, closely related to solid waste management as well as environment associated health risks. As the study focused on the domestic SWM, challenges with regard to sanitary infrastructure were only addressed incidentally and otherwise disregarded.

The private sector was not actively included in the case study, as there were no significant private stakeholders involved in the domestic SWM in the study area. The topic was however raised through the approach of informal waste workers in the course of the field survey. The Head of the Social Service Department furthermore reported the unsuccessful attempt of a public-private partnership with a steadily expanding enterprise (ZANREC), which is primarily active in rural areas. It provides collection and recycling of certain wastes. This matter was not followed-up further as it did not immediately concern the research area. Existing private stakeholders in Zanzibar including ZANREC need to be approached to negotiate collaborative networks for the benefit of all parties concerned.

Although an extensive analysis of the individual Shehias was not feasible within the scope of this research project, the diversity found amongst the Shehias highlights the importance of cooperation with and empowerment of the respective communities (Shehia) to establish and strengthen existing initiatives appropriate for the area. To enable immediate and sustainable change, viable interventions for short-term implementation at the local level need to be designed. Existing community-based initiatives need to be supported by the provision of knowledge and adequate equipment.

5.1.3 Possible Sources of Bias

During the field research, a lot of attention was drawn to the research team, due to the presence of the European female researcher and occasional attendance of a camera team of the ZBC. Participants' motivation and cooperativeness was raised by the positive perception of the extraordinary events in the community. It is unlikely that the researcher or media coverage influenced respondents' answers, as the interviews were then conducted in privacy by local interviewers and the filled-in questionnaires treated confidentially.

The team of interviewers, specifically trained to conduct the KAP-survey, were not qualified researchers, but waste workers of the non-government organisation GVG with personal background similar to the interviewees. Trust and compliance of participants was most important for an effective data collection. The use of local interviewers instead of professionals promoted the acceptance of the survey and minimised the impact of perceived social expectancy amongst the respondents. The researcher was present throughout the field survey, administering the correct implementation of interviews. Participants and other community members repeatedly thanked the interviewers and researcher for their honest concern and efforts in the urban North Zone.

The participants were unfamiliar with the concept of Knowledge, Attitude and Practise surveys, and most of them had never been part of any comparable questioning of the same extent before. Nevertheless, some respondents reported participation in the Population and Housing Census for the United Republic of Tanzania in 2012, and had thus been in a similar situation before.

The sampled households decided themselves, which household member was to attend the questioning. Respondents only had to be at least 18 years old and fluent in Swahili to qualify for participation. This procedure led to an unequal distribution in the sex of participants, with the majority of respondents being female. Added to this, the predominant presence of women in the domestic setting resulted in a disproportionately high participation of women, but enabled an outstanding response rate. In this regard, the interviewers, likewise predominantly female were able to encourage a comfortable atmosphere during the interviews. In general, the interaction of men and women is accepted and common in Zanzibar, despite the Islamic faith and did not impede the interviews. The unequal distribution of sex among survey respondents was regarded as unproblematic, since the questions focused on household practices as opposed to individual behaviour.

During the field research the problem was encountered that houses had been permanently abandoned by their residents due to flooding or other undefined reasons. These residences were disregarded in the sampling and every 46th occupied house was approached for questioning. As the domestic areas have grown without any system, there are few defined streets, which introduced a minor element of disruption

into the systematic choice of random sample. The sampling method did not meet the highest scientific standards, but was in this case most feasible in practice.

5.2 Discussion of Results

The rapid, unstructured urbanisation in Zanzibar Town and subsequent increase of waste materials posed visible challenges for the sufficient provision of domestic solid waste management. The responsibility for public services, including waste management was allocated to the Zanzibar Municipal Council, which provided different SWM services for residents, including the collection of solid waste at public dumpsites as well as kerbside and door-to-door collection in selected areas. The cleaning of public places and street sweeping were only provided in the city centre, which is the area of most commercial activities and highly frequented by tourists. Within the municipality, only 45% of solid waste was collected for final disposal, while the remaining waste was dumped randomly, burned or buried by residents, causing massive environment and health risks. The environmental pollution by solid waste was blamed on the inadequate provision of service by the ZMC and likewise by lacking compliance and poor disposal of SW in the community.

5.2.1 SWM Infrastructure

The study aimed at identifying the need and potential for changes in the solid waste management infrastructure at community and government level. Deficits were found with regard to the insufficient provision and unreliable operation of public collection points by the ZMC. An uneven distribution of infrastructure and delivery of service was found within the study area. Collection and clearance of dumpsites was theoretically provided according to the urgency of disposal, but was dependent on the limited availability of collection vehicles in practice. Additionally, the improper use of public dumpsites by residents hindered their effective maintenance, posing great environment and health risks. Different methods of secondary collection were observed during the research period, which indicates the lack of standardised procedures. Lacking transparency concerning the standards of SWM and responsibilities for the disposal of domestic solid waste at the community level further encouraged resentment and non-compliance of residents. The vast majority of KAP-survey respondents attributed the sole responsibility for SWM to the ZMC, while CBOs and NGOs were not perceived as responsible stakeholders for domestic SWM. As the ZMC was already unable to provide adequate service, there is no capacity to extend the current SWM infrastructure at municipal level.

Due to the devastating conditions, community-based initiatives have formed in various Shehias to improve solid waste related environment and health problems through the provision of door-to-door collection, cleaning and maintenance of dumpsites, rivers, drainages and public areas. The outcome however was variable. While some initiatives successfully implemented domestic SWM services, others terminated again due to lacking financial resources.

The environmental conditions within the research area were highly ambivalent. Residences were commonly built in cramped confines, with few big roads suitable for vehicles used for secondary collection. Residential areas that have expanded over time additionally presented problems concerning the accessibility of households, imposing restrictions on the extension of primary door-to-door collection service in respective areas. The varying requirements for successful service delivery indicated the need for individual solutions adjusted to the area. The importance of system users themselves as well as local service providers for the design and implementation of domestic SWM became clear.

5.2.2 Domestic SWM Practices

Another important objective of the study was the investigation of current domestic solid waste management practices and determining influences in the community. The domestic solid waste management practices found within the research area were very ambivalent. Most of questioned households disposed of their household solid waste themselves, either making use of the public dumpsites provided by the ZMC or randomly dumping, burning or burying their waste in the domestic areas. Many highly frequented, unofficially grown dumpsites were found within the study area. Very few questioned households practiced separation of waste materials. Insufficient knowledge about waste separation as well as lacking provision of containers for separate disposal were the major reasons for residents to dump all waste materials together. Many respondents however would be willing to separate if the necessary infrastructure was provided and if they had sufficient information concerning the separation of waste. Limited time was also mentioned as a restriction for sound waste disposal, which could be mitigated through the provision of an adequate infrastructure. Currently, informal waste workers play a major role for the separation and extraction of certain materials from the waste stream. Mainly plastic bottles as well as metal were collected for reselling.

Although the environmental pollution was ascribable to the residents themselves, most respondents mentioned their desire for a cleaner and healthier living environment, especially with regard to their children. The main reason for crude dumping was the complete lack of or long distance to the public collection point. Door-to-door collection was not provided throughout the research area, but service offered in selected areas only. Residents with sufficient financial resources preferred the use of household waste collection to individual disposal at the public dumpsite.

The desire for universal provision of door-to-door collection was prevalent among the majority of respondents, favouring young community members to deliver the service. The preference of services and initiatives offered by community members or a community-based organisation was noticeable and can be associated with a lack of trust towards the ZMC. Deficits in the delivery and organisation of municipal services, especially in those areas with little public attention, namely residential areas with low-socioeconomic profile nurtured this sentiment. Lacking cooperation with and insufficient inclusion of the respective community further reinforced residents' negative perception of the ZMC. Consequently, the

inclusion of system users and community-based service providers in the organisation of domestic SWM is essential for the motivation of sound disposal practices among residents.

5.2.3 Environment and Health

The environment and health risks associated with poor domestic waste management and appropriate preventive measures were to be identified in the course of the field study. The impact of domestic solid waste disposal on environmental health was apparent throughout the research area. Random dumping resulted in contamination of water sources. Hazardous environmental conditions were found with regard to water and vector-borne diseases, such as diarrhoeal diseases, cholera, malaria, dengue fever, typhoid, hepatitis A, schistosomiasis, lymphatic filariasis and helminthiasis. The random burning of solid waste within the domestic area furthered the occurrence of respiratory infections. Many respondents reported the occurrence of environment-associated diseases in their household. The community highlighted the vast increase in the incidence of diseases during the rain season and expressed their concern and desperation for support by the municipality. Poor populations were most affected by the domestic environmental health risks. Especially those living in unplanned residences, not serviced by the ZMC were confronted with increased health risks attributable to poor solid waste management. Furthermore households in the vicinity of official and unofficial dumpsites were faced with hazardous environmental conditions. Concerned residents were unable to escape their precarious living conditions due to lacking financial resources.

Although some awareness concerning the interrelation of environment and health was evident, knowledge about and possibilities for the adaptation of preventive measures at the household level were lacking. The general lack of a sound SWM infrastructure, including the storage at the household level, provision of sufficient disposal options at the community level as well as the reliable collection and final disposal of domestic SW fostered the development of environmental health risks, requiring structural intervention.

5.2.4 Information & Education

It was an important objective to identify suitable means for the provision of environmental education on a broad scale to a variety of target groups. Knowledge about the handling of domestic solid waste varied greatly among study participants. Some information concerning the disposal, recycling and reuse of domestic SW as well as composting had been received by community members via different sources. Least information had been received about composting, which would be highly feasible in Zanzibar, as the waste contains a very high fraction of organic components. TV and radio programmes, primarily broadcasted on public stations appeared to be the major source of information concerning waste disposal and related topics, followed by information provided by the Municipal Council. Community-based groups and NGOs as well as friends and neighbours also played a considerable role for knowledge distribution among residents. Research however revealed that the mere provision of information did not result in significant improvements of SW disposal practices. The lacking SWM infrastructure and recommendation of

inadequate or impracticable behaviour furthermore obstructs the successful adaptation of the acquired knowledge. Besides TV programmes, practical interventions were identified as the preferred means of information delivery among study participants. Correspondingly, the study participants regarded practical presentations at community level as well as environmental education in the school setting as an essential element for the improvement of domestic SW, environment and health conditions.

Very little knowledge concerning the environmental laws and regulations in Zanzibar was prevalent among community members as well as local authorities, which inhibited successful implementation and enforcement. Local habits rooted in cultural traditions furthermore prevented residents from reporting contraventions of the law committed by other community members. Additionally no authority had been appointed to oversee and implement prosecution. The insufficient knowledge and responsibility of authorities encouraged indifference and lacking compliance of residents.

5.2.5 Financial Resources

The financial resources for domestic solid waste management were repeatedly addressed by a variety of stakeholders. Lacking and unstable financial resources at community as well as government level were identified as one of the major challenges for the implementation of a sustainable SWM system.
The financial resources for MSWM were found to be insufficient for the provision of reliable service. The budget available for SWM was unstable due to seasonal variations in the ZMC revenue as well as the lack of a standardised system for revenue collection at community level, which impeded long-term planning.

Although many respondents reported paying for some kind of waste management, very few contributions were made to the ZMC, but NGOs and CBOs paid directly for their door-to-door collection service instead. Paid amounts however varied significantly, as some household contributed less than and others more than the set service fee of 3.000/= TSh. Major reason for unwillingness to pay was the lack of sufficient financial resources. Most households however would be willing to pay if they had the financial funds. The low socioeconomic status of many residents in the research contributed to their unwillingness to contribute for public services. Furthermore, the community commonly perceived the Municipal Council as responsible for SWM and therefore refused to pay. This perception is rooted in history, as all public services had been provided free of charge in former times. Increased transparency concerning the use of revenue and improvements in ZMC services were identified as important measures to encourage residents' compliance.

6 RECOMMENDATIONS & CONCLUSION

6.1 Integrated Sustainable Waste Management

The Integrated sustainable waste management model, presented in the introduction indicated the interdependency of the various aspects and dimensions involved in the SWM process. The ISusWM model is based on the three physical elements *public health*, *environmental protection* and *resource management* as well as the three governance features *inclusivity*, *financial sustainability*, *sound institutions* and *proactive policies*. In the course of the research study the different influences on the domestic SWM were investigated and the great importance of a comprehensive approach to SWM reinforced repeatedly. Physical as well as governance issues were therefore addressed at the community as well as government level. Recommendations, derived from the research's findings are presented with reference to the ISusWM framework.

6.1.1 Public Health (Collection)

The safe collection and subsequent reduction of solid waste being randomly dumped or burned in domestic areas is important to maintain healthy conditions and reduce environment and waste associated diseases.

Problem: The solid waste collection in the research area was lacking due to insufficient service delivery. Primary collection was offered in selected areas only, encouraging non-serviced residents or those with insufficient funds to practise crude dumping due to lack of alternatives. Secondary collection by the ZMC comprised the clearance and maintenance of the public collection points. The service was delivered unreliably with regard to frequency of collection and maintenance of the disposal sites. Most collection points were found in an alarming state. Waste was widely spread, attracting animals and rodents, causing not only environment and health threats but also hindering the effective clearance of the site. The neglect of dumpsites was caused through shortfalls in equipment and transportation vehicles. Limited financial resources hindered the maintenance and operation of collection vehicles as well as complicated replacement of spare parts.

Implications/Recommendations: To improve the domestic solid waste collection, changes at community as well as government level are required. To encourage sound disposal all residences need to be served with some kind of SWM service, either by the provision of a nearby collection point or door-to-door collection at an adequate price. As the public collection points cannot be expanded within the domestic areas due to lack of space and passageways, small-scale collection needs to be organised in order to provide equal servicing to all households. To incorporate residents' expectations and encourage cooperation, collection at household level should be initiated by community-based organisations and NGOs of the respective area. Secondary collection by the ZMC however needs to gain reliability as well to reduce the environment and health risks. Furthermore, transparent and consistent standards would set a good example for SWM and

support community compliance. Changes in the provision and organisation of SWM have to be combined with sensitisation for and education about sound solid waste disposal. In order to reduce shortfalls in service delivery, due to variations in budget, primary collection should be self-supporting and financed independently from the secondary collection provided by ZMC.

6.1.2 Environmental Protection (Treatment and Disposal)

The handling and final disposal of solid waste needs to be controlled for the environmental protection of land, air and water. The implementation of sound waste treatment and introduction of sanitary disposal is an essential part of sustainable SWM.

Problem: Although the municipality wanted to implement improvements of SWM and first plans for cooperation with the World Bank had been made, standardised procedures for the treatment, reduction and sanitary disposal of solid waste were non-existent at the time of research. Waste collected from the public collection points as well as mixed waste from other sources (e.g. hospital, commercial and industrial waste, debris) was dumped without any processing. An unsanitary landfill was used for the final disposal of waste. The site was located outside the urban centre but nevertheless close to residences. It attracted informal waste collectors, looking for valuable material among the waste heaps without any suitable equipment. Waste was burnt to extract certain materials under precarious conditions, causing environmental pollution and posing a health threat to the workers.

Great investment and expertise would be necessary to realise a reformation of final disposal standards. Therefore large-scale treatment and final disposal of solid waste at ZMC level were disregarded in the case study and possibilities at the domestic level were investigated instead.

Implications: There is a need for low-tech solutions that can be implemented locally in order to achieve immediate improvements for environment and health. The separation and treatment of discarded materials at community level would significantly reduce the waste in need of further processing and final disposal. The involvement of the informal private sector combined with environmental education would promote improved separation and disposal practices. The additional provision of adequate protective equipment would considerably decrease the health risks involved for the informal waste workers.

6.1.3 Resource Management (Valorisation of Recyclables and Organic Material)

The prevention as well as reuse, recovery and recycling of waste reduces the quantity of material in need of collection and disposal through the valorisation of recyclable and organic waste components.

Problem: The management of resources, including the reduction of waste and valorisation of materials was not implemented at the municipal level. Instead, informal waste workers played a significant role in

separating materials from the waste stream. Plastic bottles and certain metals were collected and then sold to tradesmen for export and further processing outside of Zanzibar. Households commonly reused certain materials, such as plastic bottles, textiles, oil canisters, wheat, rice and washing powder sacks, driven by the poor economic conditions. Organic components from domestic solid waste were separated by very few individual residents for composting or use as animal feed. Most of the organic material was disposed with other mixed waste materials, including plastic, metal, textile, glass, paper and carton, wood as well as diapers and household chemical waste, such as detergents. Many of the mentioned materials could be reused, recycled or used for energy recovery if they were separated. The variety of materials present diverse environment and health threats and require differing measures for sound processing and disposal. Treatments such as the recycling of materials, incineration and utilisation of landfill gas are unsuitable for the adaptation on a small-scale at community level and were not provided at municipal level. The crude handling of domestic solid waste causes massive environmental pollution, which needs to be considered for the development of an integrated sustainable waste management.

Implications: The valorisation of certain waste components requires the separation of different materials. Some means for treatment of solid waste are realisable at community level. The local separation of organic waste components would considerably reduce the amount of waste in need of collection by the ZMC. The extraction of plastic bottles and metal from the mixed waste for resale is likewise feasible for the implementation at a domestic level. Existing local activities of informal workers should be supported. For an extension of plastic and metal recycling at the community level, the inclusion of the informal private sector is crucial for a variety of reasons. Networks for the trade of valuable materials have already been generated from within the community and can be improved through increased cooperation of the different stakeholders. If separation of plastic bottles were implemented and coordinated in the different Shehias, the amount of waste could be reduced even further and processes advanced, including the collaborative acquisition and use of equipment and machines as well as the joint resale of material. Organic waste, separated at household level could be either used as animal feed or composted and later used as organic fertiliser. The high proportion of organic components can be turned into a resource through separation and treatment, while cost for secondary collection would be reduced significantly. The separate treatment of organic matter would furthermore reduce the occurrence of flies and rodents at the public collection points. Composting is practicable with limited resources, but certain conditions have to be met in order to control environment and health consequences.

6.1.4 Inclusivity

For solid waste management to be sustainable, all stakeholders need to be involved in the planning and implementation of changes. The three major stakeholder-groups are the users (households and public institutions), service providers (local authorities, CBOs and NGOs, the private formal and informal waste sector) and external agents (national and local government, donor agencies).

Problem: The service users were not involved in any organisational or operational processes of the municipal SWM. The provision of service at household level was very diverse and insufficient in most areas. Community-based initiatives had formed as a result of the lacking municipal SWM, offering door-to-door collection and cleaning of public places. The ZMC had recognised the positive impact of service provision from within the community and increased collaboration between the different stakeholders. Efforts have however produced differing results. Cooperative measures were implemented, some of which ceased again due to lacking financial resources as well as inadequate organisation and limited authority of the communal waste workers. The implementation of cooperative SWM requires the inclusion and consultation of community groups at eye level. The community workers are familiar with the respective conditions in their area and can therefore give important information for the implementation of domestic SWM measures. Many external agents have influenced the development of the current municipal SWM through different projects concerning the environment and disposal of waste. Although investments of external agents are crucial for large-scale interventions, difficulties of the ZMC to autonomously maintain acquired improvements hindered the sustainability of such projects. A lot of funds were ineffectively spent, while comprehensive consultation of community stakeholders was insufficient.

Implications: The inclusion of multiple stakeholders is crucial for the implementation of a sustainable SWM. The interest groups contribute differently to the successful management of waste. Community-based organisations and NGOs are one of the major stakeholders for the provision of primary SWM in urban Zanzibar and furthermore represent an important intermediary for the communication and cooperation with the community. The community groups facilitate service at household level under consideration of the respective environmental and socio-economic conditions. The provision of primary collection by local stakeholders should be encouraged further through support by the ZMC. Assistance is necessary with regard to financial resources, professional expertise as well as the empowerment of community workers. The assignment of responsibility and authority to community representatives is important for the implementation, control and prosecution of environmental laws and regulations. The ZMC profits through cooperation with local initiatives, as part of the SWM process is transferred to the domestic level. Collection rates and standards of disposal are improved from within the community. The improved handling of solid waste by residents furthermore facilitates the subsequent treatment and final disposal under responsibility of the ZMC. For effective SW and resource management, close collaboration and exchange between the providers of primary collection at the community and secondary collection at the municipal level is essential. External agents can contribute to the introduction of ISusWM through the provision of expert knowledge and technology as well as the mobilisation of financial resources. The inclusion of national and international stakeholders and donor organsiations aids the development and upgrading of the SWM infrastructure, including large-scale treatment and final disposal of solid waste. The inclusion of external expertise however requires adequate consideration of local conditions in order to be sustainable. The mere adaptation of highly developed SWM solution is unfeasible, as changes cannot be maintained without continuous support. External agents should focus on the provision of knowledge and capacity building

among the local authorities. Private sector enterprises are motivated by economic benefits and can likewise contribute through investment and expertise. The private sector should be included and contracted if improved service delivery is anticipated, especially for processing and recycling of materials.

Additional interest groups, such as schools, faith-related institutions community initiatives as well as the Shehas have to be included in the design and implementation of an ISusWM to encourage compliance, essential for the efficiency of domestic SWM.

6.1.5 Financial Sustainability

Solid waste management is one of the most vital urban services and represents a substantial proportion of the permanent budget requirements of a city. Despite the relatively high costs, service delivery is often insufficient with low collection coverage and poor standards of disposal. The introduction of revenue collection as well as the mobilisation of investments is essential in addressing the problem of increasing quantity of waste to establish a reliable solid waste management system.

Problem: The financial resources for SWM were insufficient for the provision of consistent service. The ZMC revenue was acquired through the monthly service fee for households and commercial institutions as well as income from other sources, such as taxes, permits, etc. Seasonal variations in the municipal budget posed challenges for the long-term planning of activities. As no standardised system had been implemented for the collection of revenue, payments were often delayed or refused by the residential service users. The manual collection of the monthly service charge from individual households is a cumbersome and highly ineffective activity, as it requires a great effort and commitment of workers, which is hardly commensurate to the revenue. The budget allocated to the social service department of the ZMC needed to cover costs for the whole SWM process, including primary as well as secondary collection. As service delivery depended on the available budget, the municipal SWM lacked reliability, resulting in a low level of confidence in the ZMC by the local community.

Implications: To improve the financial conditions and enable planning reliability, a standardised system for ZMC revenue collection needs to be implemented. All urban households should be formally registered and held responsible for contributing the obligatory service fee. First efforts had been made by the ZMC to establish payments by bill instead of receipt, but the implementation of operational structures at household level has not yet been achieved. The inclusion of community-based organisations and NGOs in revenue collection at the domestic level instead of municipal workers could encourage residents' compliance with the system. Due to precarious socio-economic conditions of some urban households, differentiation of fees according to the financial ability of the household would make such payments more viable. Residents reported various degrees of cooperativeness with regard to the amount, payable for SWM, according to their individual situation. It would be feasible to determine the amount to be paid according to the household income, number of residents or amount of waste in need of collection. Reduced

rates for the collection of separated waste materials could represent an additional incentive for the sound handling of waste at household level. Generally it is important to consult the community for successful implementation of structural changes. Comprehensive information concerning the collection and use of revenue is relevant for residents' willingness to contribute. Currently, solid waste is primarily regarded as a massive challenge in urban Zanzibar. Nevertheless, separation and valorisation of certain waste materials on a small scale can not only reduce the costs for transportation and final disposal but also turn refuse into a resource instead.

6.1.6 Sound Institutions and Proactive Policies

A transparent and reliable institutional framework is the basis of sustainable governance in SWM. In addition to the incorporation of environment and waste related laws and regulations, standards of management, contracting, labour, accounting and cost recovery need to be considered.

Problem: Although laws and regulations with regard to environment and solid waste management had already been established and corresponding policies formulated, its implementation and prosecution of non-compliance did not exist at community level. Even local government authorities, legally responsible for the maintenance of order in their area of jurisdiction, presented lacking knowledge concerning environmental regulations. Executive authorities at community level are required for the prosecution of violations. The total lack of consequences in case of random disposal and subsequent environmental pollution enabled residents to continue practicing crude dumping. Therefore, existing regulations hardly influenced the domestic handling of solid waste. Also standards of ZMC service delivery or guidelines for the domestic handling and disposal of solid waste were missing completely, while good practice was expected from the community.

Implications: For the successful implementation of SWM, reliable institutions and proactive policies are crucial. The municipal council is required to provide transparent information to the community concerning the standards of service delivery by the ZMC. Furthermore expectations towards residents' involvement in the SWM system have to be clearly defined and promoted to motivate individual compliance. The Shehas, NGOs and community-based organisations constitute important mediators for the communication with the community. The involvement of local stakeholders in the promotion of environmental laws and regulations as well as in the control and prosecution would be feasible, as they are highly respected within their community. Nevertheless, responsibilities have to be assigned clearly and authority granted to the appointed community representatives. Extensive sensitisation among residents about domestic SWM, environment and health, could generate a certain degree of social pressure with regard to random disposal of waste. Improvement in domestic handling of waste could be effected through the introduction of common standards at community level. People would be motivated to change their practices if it affected their reputation.

The integrated sustainable waste management model incorporates the various interrelated aspects, important for the successful development of SWM. Several deficits were identified with regard to the physical elements as well as governance features of the SWM system in urban Zanzibar. Considerable interventions at ZMC as well as community level are required for the implementation of effective and continuous SWM services. Previous efforts often produced only minor improvements, but give implications for alternative strategies.

Recommended Further Research

There is a need for further research with regard to the current quantities and composition of solid waste in the different collection zones within the municipality. The possibility of small-scale composting and utilisation of organic refuse as animal feed should be explored further to enable simple, affordable solutions for the processing of organic waste components at community level and consequent reduction of waste in need of final disposal. As the uncontrolled decomposition of organic waste can cause negative environment and health effects, options for safe composting need to be explored further considering the climatic and environmental conditions in Zanzibar.

6.1.7 Conclusion

The research study was motivated by the devastating environmental pollution and related health risks in urban Zanzibar, due to radically ineffective domestic SWM. The research area (Collection zone C) was chosen as it was the least serviced zone within the municipality and was characterised by a low socio-economic status. The overall objective was the investigation of the current domestic solid waste management and associated challenges as well as the identification of suitable approaches for the implementation of appropriate behavioural and structural interventions. The multitude of influencing factors, including social, cultural, economic, geographical, climatic as well as technical characteristics, required the elaborate exploration of local conditions.

In the course of the case study research, extensive data about the MSWM in Zanzibar was gathered, particularly with regard to the Urban West (North Zone). The comprehensive information about local domestic SWM allowed the evaluation of current conditions with regard to Integrated Sustainable Waste Management. The ISusWM model can be adapted to suit different circumstances, as it takes into consideration the various aspects and dimensions of SWM, regardless of the setting. The major purpose of the model is the fundamental incorporation of essential physical as well as governance features into the design and implementation of SWM. By applying the ISusWM framework to the specific setting in Zanzibar (Urban West, North Zone), the major problems with regard to the present SWM in the study area were identified and implications derived for practical optimisation of the available resources.

Recommended activities include structural and behavioural interventions at community as well as at government level. Multiple stakeholder involvement in the design and implementation of domestic SWM is

necessary to enable substantial improvement in the system as a whole. Intersectoral collaboration is critical for the successful promotion and implementation of activities with regard to environment, health, education, water, sanitation and agriculture. To address the variety of challenges with regard to domestic SWM in the research area as well as concerning the ZMC service delivery in general, joint efforts are required. In urban Zanzibar, an institutional framework for the successful provision of SWM services is lacking but is essential for harnessing effective private sector involvement, including the cooperation of informal waste workers. Behavioural change and compliance with the MSWM among residents is essential in order to establish sound environment and health conditions. Enhancement of domestic SWM infrastructure and service can facilitate improved disposal practices, however educational measures are also indispensable to provide knowledge and encourage sustainable compliance at community level. There is a need for low-tech interventions that can be adopted locally to improve the environment and health conditions by applying sound domestic solid waste management. Small-scale interventions at community level are feasible to encourage immediate improvements. Giving the community more responsibility and thus more influence in local SWM practice and for the maintenance of the environment in their respective area, would certainly encourage a higher degree of compliance on the part of the residents.

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Interviewer Training Agenda

Introduction

Dear participants,

Thank you very much for participating as interviewers in my project. During our training I will explain to you the background of my work here in Zanzibar as well as the reason for my community research. You will be taught how to conduct interviews and you will get the chance to conduct some training interviews yourself before you will go out into the community.

Personal Information

I am Isabel Wolters, 26 years old and I am a Public Health student from Germany. I came to Zanzibar in August 2013 to learn about the environment and health situation in Zanzibar. Since last year I have been working for and with the Glitters Volunteer Group (GVG). During this time I had the chance to gather a lot of new and very valuable experiences.

The research's findings will help to understand the problems in the community, to improve the current work of GVG as well as to plan future activities.

General Interview Guidelines and Introduction

When you approach a community member for an interview, you and the respondent are strangers. Therefore it is important that you build up a good relationship with the respondent from the start. The participant's first impression will influence his/her cooperation during the interview. So make sure to approach the respondent in a friendly manner and introduce yourself before the start of the interview.

Make a good impression

To make the respondent feel comfortable, begin the interview with a friendly greeting and introduce yourself and the purpose of the interview.

A good introduction could be:

"My name is _____. I am a representative of the Glitters Volunteer Group. We are a local organisation with the aim of improving the environment and living condition here in Zanzibar. We are conducting a survey about environment and health and we are interviewing community members in different areas in Zanzibar Town. Therefore I would like to ask you some questions."

Positive Approach

Do not be apologetic or negative about the interview.

Tell the participant:

- "I would like to ask you a few questions"
- "I would like to talk with you for a few moments".

Emphasize Confidentiality

If a participant is unsure about taking part in the interview or wants to know what the data is used for, explain that all information will be dealt with confidentially, that no individual names will be used and that the information from all interviews will be joined together to a report.

Do not mention or discuss other interviews or hand filled in questionnaires to any other person in front of the respondent.

Answer Respondent's Questions Honestly

Before the start of an interview, participants might ask you about the interview and how or why he/she was selected as a respondent. Answer these questions directly and honestly. However, if the participant asks you anything that is not directly related to the interview, reply politely that you will try to answer his/her question after the interview.

Tips for conducting an interview

Be neutral

When conducting community interviews, participants are likely to give answers they think you, as an interviewer would want to hear. It is important that you are neutral when asking questions as not to influence the respondent's answer. Your facial expression as well as your voice needs to be neutral so the participant does not get the feeling that he/she has given the "right" or "wrong" answer.

If the respondent gives an unclear/ambiguous answer, try to neutrally ask again using questions like:

- "Could you explain a little more?"
- "I did not understand you, would you please tell me again?"

Make clear that there is no hurry and give the respondent the required time to think about his/her response. If the respondent asks you questions in course of the interview, explain that you are interested in his/her opinion and that questions can be discussed after the interview.

Do not change the phrasing of questions

It is very important that the phrasing of questions is the same in all interviews. If a respondent did not understand or misunderstood a question you should read out the question again slowly without changing the wording. If the respondent is still unclear about the question you might rephrase it very carefully, as not to change the original meaning.

Handle hesitation of respondents carefully

There might be situation where respondents lose interest in the interview, refuse to answer questions or simply answer "I don't know". Some answers might contradict with what the respondent has said before. In these cases you need to regain the participant's interest in the interview. Point out again, that the interview is important and that it will not take much longer. It is important that a good atmosphere so the respondent feels comfortable to answer questions without being intimidated or embarrassed. If respondents give unsuitable or extensive answers, do not interrupt, but listen to the answer and then try to carefully steer back to the original question that was asked. If a participant is unwilling to give respond to a question try to solve the situation by explaining again the confidentiality of the information. If the respondent still does not want to answer, skip the question and carry on with the interview as normal. Do not give the impression that the participant is forced to give an answer if he/she does not want to reply.

Do not judge the respondent

Do not judge or valuate respondent's behavior or knowledge. Do not jump to any conclusions based on previous experiences in interviews or in general. Remember that you and the respondent might be very different and that it is important that the respondent is not influenced by your personal thoughts. You should make the respondent feel comfortable to speak to you and does not feel the need to adapt answers to please you as an interviewer.

Do not leave out any questions

You should strictly follow the protocol of the questionnaire and not leave out any questions even if you feel the answer is obvious.

Do not hurry the interview

Read out the questions slowly and clearly to make sure that the participant understands it correctly. Give the respondent time to think after you have read out a question. If respondents feel under pressure they are more likely to answer "I don't know" or choose an inaccurate response. If you get the feeling that a respondent is getting impatient and wants to rush through the questions without thinking about the answers, remind him/her that there is no hurry and that his/her opinion important.

Do not show the questionnaire to anyone not participating in an interview

Do not show the questionnaire to any person that is not participating in the interview. If anyone asks to see it, politely refuse and explain about the confidentiality of the information.

Be careful not to suggest one response over another.

When reading out the possible answers to the respondent, be sure not to emphasise an answer over another. If you need to remind the participant about the possible answers, you should read out all of the answer categories again, in order not to influence the response.

Probe for clear answers

If the respondent's answer is unclear, does not fit any of the answer categories or is contradictory to previous answers you should probe for a clear response without influencing the participants answer. In these cases you should read out the question and answer categories again to signal the respondent that his/her answer is inappropriate.

If the respondent fails to choose one of the answer categories you might ask:

- "Which answer applies to you most?"
- "Which answer do you think I should mark?"
- "You have given me these 3 answers. Let me read them again and you will tell me which best fits you. They are..."
- "I'm not sure which response I should mark. Would your answer be...(read out all the options again)?"

If the participant's response is unclear to you, you can ask the following to get a more precise answer:

- "What do you mean with that?"
- "Could you explain that please?"
- "I'm not sure if I understood you right."

Reduction of non-response

In community surveys like this, it is normal to face a certain degree of non-response of households and individuals who do not participate.

There are several reasons for non-response:

Inability to locate or access selected household.

- A senior household member refuses permission for the interview.
- Inability to locate an eligible household member for the interview.
- Respondent refuses to participate in the interview.

These cases have to be minimized as much as possible. In preparation for the community research, Shehas were informed and introduced to the study to increase cooperation among the community members. Nevertheless, return visits of households will be necessary to reduce the non-response rate, as an eligible household member might not always be present. In these cases an appointment should be scheduled for the interview.

Informed Consent

I hereby confirm that I was given satisfactory information about the interview. The interviewer informed me about the background of the study, the procedure as well as my rights as a participant. All my questions regarding the study were answered adequately. I have understood that all information I give in the course of the interview will be pooled with the data of other respondents and used for a report. All information will be handled anonymously.

I am aware of my right to withdraw my consent at any time without consequences. I hereby give my voluntary consent to take part in the interview.

Respondent's name: _____

Respondent's signature: _____ Date:_____

Researcher's name: _____

Researcher's signature: _____ Date:_____

Orodha ya mambo yatakayozungumzwa kwenye mafunzo ya wasaili

Utangulizi

Wapenzi washiriki,

Nashukuru sana kwa kukubali kwenu kushiriki kuwa wasaili katika huu mradi wangu.
Wakati wa mafunzo yetu haya nitawaelezea chanzo cha kazi zangu hapa Zanzibar vilivile sababu za utafiti wangu vijijini. Mtapata mafunzo vipi mtaendesha usaili na mtapata nafasi ya kufanya mafunzo baina yenu kabla hamjatoka kwenda kwa jamii.

Maelezo binafsi

Mimi ninaitwa Isabel Wolters, nina umri ya miaka 26 ya kuzaliwa ni mwanafunzi wa Afya ya Jamii kutoka Ujerumani. Nilifika Zanzibar mnamo mwezi wa Augosti mwaka 2013 kujifunza hali ya mambo ya afya na mazigira ya Zanzibar. Tangu mwaka jana nilikuwa nikifanya kazi na Glitters Volunteer Group (GVG). Muda huu nimepata nafasi ya kukusanya mengi mapya na yenye thamani zaidi.
Huu utafiti utanisaidia kuweza kufahamu matatizo yaliyopo vijijini kwa jamii, kuendelea nadesturi za utendaji kazi unaofanyika kwenya GVG pamoja na kupanga malengo ya baadae ya utendaji.

Kwanini huu utafiti

Zanzibar imekabiliwa na vikwazo vya mazingira na afya ikihusishwa na usimamizi wa takataka ngumu, ambayo husababishwa na kutokuwepo miundo mbivu ya upokeaji, na njia ya utupaji lakini pia usimamizi mbaya wa takataka za nyumbani ndani ya jamii, pamoja na utupaji ovyo, uchomaji moto au uzikaji wa takataka. Desturi za mazingira na hali yote kwa ujumla ni pigo kubwa juu ya maeldeleo ya Zanzibar. Miongoni mwa mambo mengine, upungufu wa mipangilio ya usimamizi wa takataka, vilevile ukosefu wa taaluma na mwamko kwa wanajamii kuhusu matokea mbaya ya kazi za mazingira inafanya raia wa visiwani kuwa katika hali kubwa ya athari za kiafya. Kuna haja kubwa ya kuinua uhamasishaji vijijini. Zaidi ya hayo ifanywe mabadiliko ya mifumo ya utendaji ili jamii iweze kufanya kazi kwa kutekeleza majukumu kuwelekea mazingira pamoja na afya zao.

Kuondoa matatizo hayo, Baraza la mji la Zanzibar, kitengo cha mazingira na sekta nyingine za Serikali zina husika katika utekelezaji wa mabadiliko ya miundo ya uthibiti wa upataji wa takataka ngumu. Wakati ukuaji wa taasisi zisizo za kiserikali (NGOs) vilevile na taasisi msingi za vijijini (CBOs) zinahamasisha jamii kujishughulisha na kujikusanya kuwa tayari kwa shughuli za mazingira (Serikali ya Mapinduzi ya Zanzibar 2013).

Hakika unafahamu pingamizi zilizopo kwenye kiwango cha jamii, ni lazima kuuliza athari zilizoonekana kutokana na hii ni kwanini tumeamua kuendesha usaili ndani ya mjini Zanzibar.

Nini utafiti

Mafunzo yatakayo endeshwa katika sehemu mbalimbali za mji wa Zanzibar. Tumechagua sehemu hizo kwa vile ne sehemu za majumbani ya watu. Sirahisi kumsaili kila mtu katika sehemu hizi, ndio maana tukachukuwa bila ya utaratibu ovyo kama ni mfamo kwa wenye nyumba.

Nani alieambiwa ashiriki

Kutokana na wenye nyumba walioteuliwa, tutatafuta mtu mwenye umvi mkubwa (mtu mzima) kwa kuwasaili mwenye umr wa miaka 18-49 ya kuzakiwa. Tuna mipango ya kuwashirikisha wenye nyumba kwenye mafunzo. Tuliomba ruhusa kuendesha usaili na ushiriki ni wakujitolea. Usaili utategemea wingi wa masuala ya kuhoji (dondoo) kwa Kiswahili na yataendeshwa na wasaili wenyeji. Maelezo yote yatakayo kusanywa wakati wa mafunzo hayo yatafanywa kuwa SIRI.
Mwishoe habari kamili zitachujwa na kuwekwa pamoja ndani ya ripoti.

Utangulizi kuhusu muongozo wa usaili

Pale unapokabiliana na mjumbe kwenye jamii kwa ajili ya usaili, wewe na yeye msailiwa wote wageni hamjuani. Hivyoni muhimuu kujenga uhusiano mzuri na msailiwa utamfanya atoemashirikiano wakati wa usaili. Unakaribiana na msailiwa katika namnaya kirafiki na unajitambulisha wewe mwenyewe kwanza kabla ya kuanza usaili.

Onyesha tabasa mzuri

Kumfanya msailiwa afarijike, anza usaili kwa kiamkizi cha kirafiki na kujieleza mwenyewe na dhumuni la usaili.
Utangulizi mzuri unaweza kuwa:
“Jina langu ni _____ . Mimi ni muwakilishi wa Glitters Volunteer Group. Sisi ni ushirika wa wenyeji ambao kusudio letu ni kuinua mazingira na hali ya Maisha hapa Zanzibar. Tunaendesha ukaguzi kuhusu mazingira na afya hivyo tunaendesha usaili kwa wanajamii katika sehemu mbali mbali za mji wa Zanzibar. Hivyo ningependelea nikuulize masuala kidodo.”

Mkabala sahihi

Usiombe radhi au kukanakusaili mueleze mshiriki:

- “Nikependa kukuuliza masuali kidogo.”
- “Nikependa kuongea na wewe kwa muda mchache.”

Tilia mkazo wa usiri

Ikiwa mshiriki hana hakika wa kushiriki mahojiano haya, au anataka kujua hayo maelezo yatatumika kwa shughuli gani, mueleze kuwa taarifa zote zitakuwa siri, kwamba hakuna jina la mtu litakalotumika na maelezo yote yaliyotolewa yatawekwa pamoja kwenye ripoti.

Usiongelee au kujadili lolote la usaili au kumpa mtu karatasi ya mtu mwengine yoyote mbele ya msailiwa.

Jibu maswali ya msailiwa kwa uadilifu

Kabla ya kuanza usaili, mshiriki anaweza kukuuliza habari za usaili, na ilikuwaje au kwa nini alichanguliwa yeye kuwa msailiwa. Jibu swali hili moja kwa moja kwa uadilifu. Ikitokezea mshiriki akauliza jambo ambalo hali husiani na usaili mjibu kwa upole kwamba suala lake utajaribu kulijibu baada ya usaili.

Bahashishi kwa ajili ya kuendesha usaili

Usiwe upande huu wala ule

Unapofanya usaili kwa jamii, washiriki watapenda kutowa majibu wanayo yafikiria, kwa vile wewe msaili utataka kusikia. Ni muhimu unatakiwa usiwe umelalia upande huu wala ule unapouliza maswali na usishawashike na majibu ya masailiwa. Hisia ya sura yako, pamoja na sauti yako isifadhaike, isewe ya kumfanya mshiriki kupatwa na mashaka kuwa yupo sawa au sio sawa katika jawabu yake.
Ikiwa msailiwa ametoa jibu ambalo halifahimiki jaribu kumuuliza tena muulize hivi:

- “Unaweza kuelezea tena kidogo?”
- “Sikuelewi unaweza kunielezea tena tafadhali.”

Muwekee wazi kwamba asifanye haraka, na mpe msailiwa muda unaohitajika kuweza kufikiria atakalo jibu. Ikiwa msailiwa atakuuliza suali katikati ya usaili, mueleze wewe unahamu ya mchango wake wa mawazo na muhimuu sana na kuhusu suala lake mtalijadili baada ya usaili.

Usibadilishe vifungu vya maneno kwenya masuali

Ni muhimuu vifungu vya maneno kwenye masuali yawe hayohayo kwenye usaili mzima. Ikiwa msailiwa hajafahamu, au amefahamu vibaya suali utamsomea suali hilo kwa utaratibu tena, bila ya kubadilisha hata neno. Ikiwa msailiwa bado hajafahamu suali unaweza ukaliomba tena kwa hadhari kubwa, bila ya kubadilisha maana yake ya awali.

Pokea mshangano kwa msailiwa kwa uangalifu

Inawezekana kukatokea hali ambayo msailiwa ikamtoa hamu ya usaili, na kukataa kujibu masuali au kirahisi akajibu “Sijui”. Na baadhi ya majibu yanabishana na aliyoyatoa mwazoni, katika hali hii unatakiwa urudishe hamu ya mshiriki kwenye usaili. Muonyeshe tena kuwa usaili huu ni muhimuu, na hautachukua muda mrefu. Ni muhimuu pawe na hali ya mazingira yenye utulivu kiasi ambacho msailiwa atajihisi yupo penye starehe ambapo atajibu masuali bila ya kukatisha katisha au tatizwa.Ikiwa msailiwa atajibu suali si vizuri au refu, usiingilie, sikiliza tu na kwa hadhari jaribu kurudia tena suali kama ulivyo muuliza. Ikiwa mshiriki hayupo tayari kutoa jibu, jaribu kuweka sawa hali hii

kwa kumueleza tena kuhusu usiri wa maelezo hayo. Ikiwa mshiriki hataki kujibu, liwache suali hilo na endelea na suali jengine endelea ns usaili kama kawaida. Usitoe dhana kama mshiriki analazimishwa kutoa jawabu ikiwa Bii/Bw hataki kujibu.

Usimhukumu msailiwa

Usimhukumu au kutathmini heshima ya msailiwa au elimu yake. Usiruke kutoa tathmini mwisho kwakuchukulia uzowefu wa usaili yaliyopita au kiujumla. Kumbuka wewe na msailiwa munaweza kuwa tafauti kabisa na ni muhimuu msailiwa asifahamu unafikira gani wewe mfanye msailiwa aone raha kuzungumza na wewe na asijihisi kutaka kutoa jibu ili kutaka kukuridisha wewe kama msaili.

Usiache suali lolote

Lazima ufuate mtiririko wa masuali kama yalivyo, usiache suali lolote hata kama utahisi jawabu lipo wazi.

Usiharakishe usaili

Soma maswali taratibu na kwa uwazi, ili uwe na uhakika mshiriki amefahamu sawa sawa. Mpe nafasi msailiwa ya kufikiri baada ya kumsomea suala. Ikiwa msailiwa atahisi yupo chini ya shindikizo, ni rahisi sana kujibu “Sijui” au atachagua jibu lisilosahihi. Ikiwa utahisi msailiwa hana utulivu anataka kuharakisha kujibu bila ya kufikiri mkumbushe Bii/Bw huna haja ya haraka mawazo yako ni muhimuu.

Usimuonyeshe maelezo ya masuala ya usaili kwa yeyote

Usioneshe masuali kwa mtu yeyote asiehusika na usaili. Ikiwa atakueleza umuonyeshe, kwa upole mkatalie na mueleze kuhusu usiri wa maelezo hayo.

Tahadhari usimpe maelekezo mtu moja mbele ya mwenzake

Pale inapomsomea majibu yanayowezekana kwa msailiwa, uwe na uhakika hufafanui jawabu kwa mwengine. Ikiwa utahitaji kumkumbusha majibu yawezekanayo utahitajika uyasome majibu yote tena, kwa ajili yakua hii isije ikatowa ushawishi wa jibu.

Kudadisi kupata jawabu lililo/wazi

Ikiwa wajabu la msailiwa halipo wazi, haliowani na lolote katika mtiririko wa jawabu au linapingana na majawabu ya liotangulia, inahitaji udadisi ili uweze kupata jawabu lililo wazi bila ya kushawishi wa jawabu kwa washiriki. Ikitokea kama hivi unahitajika usome suala na mtiririko wa majawabu tena, kwa kumzindua msailiwa kwamba Bi/Bw jawabu lako sio sahihi.

Ikiwa msailiwa ameshindwa kuchangua moja kati ya moja wapo ya jawabu katika mtiririko wa jawabu unaweze ukamuuliza:

- “Jawabu gani lililo kugusa sana?”
- “Jawabu gani unafikiria nitalitia alama?”
- “Umenipa mimi mawajabu haya 3. Subiri niyasome tena na wewe utanieleza lipi litakalo faa zaidi. Yapo…” (msomee)
- “Sina uhakika jawabu lipi litakalo faa niliwekee alama. Vile jawabu lako ni…” (soma tena yote kwa hiyari)

Ikiwa mshiriki majibu yake hayapo wazi kwako, unaweza kumuuliza haya tena ili kupata jibu lililo halisi zaidi:

- “Nini umekusudia kwa hili?”
- “Unaweza kunifafanulia haya tafadhali?”
- “Sina hakika kama nimefahamu sawasawa.”

Kupungua kwa wasio itika wito

Katika ukaguzi kwa jamii, kwa hivi, ni kawaida kukutana kwa kiwango fulani kutokana na wasio itikia wito kwa wenye nyumba na watu wasioshiriki. Kuna sababu nyingi inayofanya watu wasiitikie wito. Kutowezekana kupangwa au kuweza kufikia sehemu zilizo changuliwa.

- Mkuu wa nyumba kukataa kutowa ruhusa ya usaili.
- Kutowezekana kupangwa au kuweza kumfikia mkuu wa familia kwa usaili.
- Msailiwa kukataa kushiriki usaili.

Matokeo hayo yanatakiwa yapunguzwe kwa wingi iwezekanavyo katika matayarisho ya usaili kwa jamii. Masheha wapewe habari na wapewe maelezo ya mafunzo hayo ili kuzidisha mashirikiano baina ya wajumbe kwenye jamii. Hata hivyo matokeo ya mahudhurio kwa wenye nyumba yata shusha hesabu ya wale wasio itikia wito, na kwa wale wajumbe walio teuliwa inawezekana wasihudhurie kila siku, kwa hali hii usaili utaendesha kwa njia ya kupangiwa miadi.

Elezea ukubalifu (kiapo)

Mimi ninathibitisha kwama ninatoa maelezo ya kuridhisha kwenye usaili. Msaili amenieleza juu ya (informed) masuala yote, mafunzo, madhumuni ya mafunzo haya, kanuni pamoja na haki zangu kama mshiriki. Masuali yangu yote yaliyo husiana na mafunzo yamejibiwa vya kutosha. Nimefahamu kwamba maelezo yote niliyoyatoa kwenye usaili yatakusanywa pamoja na maelezo ya wasailiwa wengine na kutumiwa kwa ripoti. Maelezo yote yatachukuliwa bila ya kuwekwa majina.

Mimi nazitambua haki zangu za kutengua kukubali kwangu muda wowote bila ya matokeo yoyote.

Mimi kwa hiyari yangu nakubali kushiriki kwenye usaili:

Dodoso No: _____

Saini ya mshiriki: _____ Tarehe: _____

Jina la mtafiti: _____

Saina ya mtafiti: _____ Tarehe: _____

Information for Shehas and other Stakeholders

The Glitters Volunteer Group is conducting a community study on environment and health issues in Zanzibar Town. Aim of the proposed research is the analysis of domestic waste management structures and practices at community level in Zanzibar Town in regard to environmental and health consequences. The findings from the research shall serve as a basis for the development of adequate educational measures concerning environmental health in the community. Furthermore, structural challenges shall be identified that need to be resolved in order to support behaviour change and improve the health and living conditions for the residents of Zanzibar Town.

Why is the research important?

Zanzibar is facing many environmental and health challenges related to solid waste management, which are due to lacking infrastructure for the handling and processing of waste but also poor domestic waste management within the community, including random dumping, burning or burying of garbage. The environmental practices and overall situation have a great impact on Zanzibar's development. Amongst other things, the insufficient waste management structures as well as lacking knowledge and awareness in the community about the consequences of poor environmental practices pose great health risks to the island's citizens. There is a great need for raising awareness in the community. Additionally, structural changes have to be made in order to enable the community to act responsibly towards the environment as well as their personal health.

To tackle these problems, the Zanzibar Municipal Council, the Department of Environment and other governmental sectors are involved in the implementation of structural changes in solid waste management while a growing number of non- governmental organisations (NGOs) as well as community-based organisations (CBOs) facilitate community involvement and mobilisation in environmental activities (The Revolutionary Government of Zanzibar 2013). To really understand the challenges on community level it is necessary to ask those affected, which is why we decided on conducting interviews in Zanzibar Town.

How is the study going to be implemented?

The study is going to be conducted in the different Shehias of the Urban West (North Zone). We have chosen this area, as it is a domestic area with low service coverage. It is not possible to interview everyone in this area, which is why we have randomly selected a sample of 384 households. From the selected households, we seek to interview an adult household member aged 18-49. We are planning to include 384 households in the study. We will ask for permission to conduct the interview and participation is voluntary. The interviews will be based on a quantitative questionnaire in Swahili and will be undertaken by local interviewers. All information that is gathered in course of the study will be treated confidentially. At the end all data shall be pooled and summarized in a report on environment and health in Zanzibar Town.

Glitters Volunteer Group

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Maelezo kwa masheha pamoja na wahisani wengineo

Kikundi cha Glitters Volunteer Group (GVG) kinaendesha mafunzo juu ya mambo ya afya na mazingira ndani ya maji wa Zanzibar. Dhumuni la utafiti huu ni usimamizi wa uchambuzi wa takataka za majumbani, mfumo, na utendaji kazi kwa ngazi ya jamii, mjini Zanzibar, kuhusiana na matokeo ya afya na mazingira. Ripoti ya utafiti yatatumika kama msingi wa maendeleo ya kipimotosha cha elimu kuhusiana na afya ya mazingira kwa jamii.

Juu ya hayo ongezeko la vipingamizi inahitaji utanbuliwe na kusawazishara kwa ajili ya kusaidi mabadiliko ya mwenendo wa tabia na kuinua afya na hali ya maisha ya wakaazi wa mjini Zanzibar.

Domestic Waste Management, Environment and Health in Zanzibar, Urban West (North Zone)
Glitters Volunteer Group - Unguja, Zanzibar (2015)

Questionnaire

Questionnaire No.: _____ Date: _____ Time: _____ *(Kiswahili time)*

Region: _____ District: _____

Sex of respondent: □ male □ female

Hello my name is _____ and I am a member of the Glitters Volunteer Group, which is active in environmental cleaning in Zanzibar Town. We are conducting interviews on waste, environment and health in the communities of Zanzibar Town. Purpose of the questionnaire is to gather information from residents like you about the current situation, practices, challenges and opinions to improve the services for the community.
The interview takes about 20 minutes. The interview is anonymous and you don't have to state your name. All data is going to be dealt with confidentially.

Socio-demographic Data

1. **Age of respondent:**
   - ☐ below 30 years
   - ☐ between 30-45 years
   - ☐ over 45 years

2. **Marital Status:**
   - ☐ Never married
   - ☐ Married
   - ☐ Divorced
   - ☐ Widowed
   - ☐ Living together with partner
   - ☐ Other: _____ *(please specify)*

3. **Number of people living in your household:**
   - _____ Children (0-5 years old)
   - _____ Children (6-15 years old)
   - _____ Adults (16-45 years old)
   - _____ Adults (over 45 years old)

4. **Level of Education:**
   - ☐ No formal schooling
   - ☐ Primary level
   - ☐ Secondary level
   - ☐ Diploma level
   - ☐ Advanced diploma/degree level
   - ☐ Other: _____ *(please specify)*

5. **Employment:**
   - ☐ Not employed/not working
   - ☐ Government employee
   - ☐ Private entity/office
   - ☐ Self-employed
   - ☐ Voluntary work
   - ☐ Other: _____ *(please specify)*

6. **How much money does your household spend per day (average)?**
   - ☐ less than 5.000 /= Tsh
   - ☐ 5.000 – 10.000 /= Tsh
   - ☐ 10.000 – 20.000 /= Tsh
   - ☐ 20.000 – 30.000 /= Tsh
   - ☐ 30.000 – 40.000 /= Tsh
   - ☐ 40.000 – 50.000 /= Tsh
   - ☐ more than 50.000 /= Tsh
   - ☐ I don't know

7. **How many times a week do you use the following media?**

	Never	**1 time**	**2-3 times**	**4-6 times**	**Daily**	**Which ones mainly?** Stations, papers, websites
TV						**1.** **2.** **3.**
Newspaper						**1.** **2.** **3.**
Radio						**1.** **2.** **3.**
Magazines						**1.** **2.** **3.**
Internet						**1.** **2.** **3.**

8. **At what time do you mainly watch TV or listen to the radio?**

TV:
- ☐ 12 midnight – 6am
- ☐ 6am – 12 noon
- ☐ 12 noon – 6pm
- ☐ 6pm – 12 midnight
- ☐ No specific time

Radio:
- ☐ 12 midnight – 6am
- ☐ 6am – 12 noon
- ☐ 12 noon – 6pm
- ☐ 6pm – 12 midnight
- ☐ No specific time

Environment

9. **What environmental aspects are most important to you?** *(maximum 3 answers)*
   - ☐ Vegetation (trees, plants etc.)
   - ☐ Ocean/Beach
   - ☐ Fishery
   - ☐ Air quality
   - ☐ Weather
   - ☐ Agriculture
   - ☐ Clean water
   - ☐ Healthy living conditions
   - ☐ Clean environment

☐ Other: _____ *(please specify)*

10. Is anyone in your household involved in any of the following activities?
(multiple answers possible)

☐ Agriculture (farming of fruit or vegetables):
- □ personal use only
- □ business

☐ Fishery:
- □ personal use only
- □ business

☐ Breeding of livestock (cows, chicken, etc):
- □ personal use only
- □ business

☐ No

11. In your opinion, what are the main challenges concerning the environment in your community and Zanzibar? *(maximum 3 answers)*

☐ Flooding of domestic areas
☐ Hot/dry weather
☐ Unsafe water sources
☐ Limited water
☐ Animals roaming around domestic areas
☐ Waste scattered around
☐ Lack of vegetation (plants, trees) in domestic areas
☐ Bad air quality: ☐ smoke from burning waste
☐ pollution from cars
☐ Deforestation and exploitation of natural resources (e.g. mangroves, coral reef)

12. Do you think that your environment has an influence on your and your family's health?

☐ Yes: □ positive
□ negative
☐ No
☐ I don't know

If "Yes", how does the environment influence your health?

_____
_____

13. Did anyone in your household suffer from any of the following diseases in the last four weeks? *(multiple answers possible)*

☐ Malaria
☐ Diarrhoea
☐ Cholera
☐ Thyphoid
☐ Worms
☐ Skin Disease
☐ Respiratory Problems (cough)
☐ Eye Infection
☐ Fever

☐ Other: _____ *(please specify)*
☐ No
☐ I don't know

14. When do you usually wash your hands? *(multiple answers possible)*

☐ Before having food
☐ Before preparing food
☐ After going to the toilet
☐ After handling waste
☐ After contact with animals
☐ After eating
☐ Other: _____ *(please specify)*

15. Do you use soap when washing your hands?

☐ Yes, always
☐ Yes, most of the time
☐ Yes, sometimes
☐ No, never

16. Do you know about any laws concerning the environment or the disposal of waste in Zanzibar?

☐ Yes
☐ No
☐ I don't know

If "Yes", what does this law say?

_____
_____

<u>Household Waste Management - Practice</u>

17. Where do you store the waste in your household?

☐ Kitchen (open roof)
☐ Kitchen (closed roof)
☐ In another room in the house - Which room?: _____
☐ Outside the house
☐ We do not store our waste
☐ Other: _____ *(please specify)*
☐ I don't know

18. How do you store your waste in your household?

☐ In an open container
☐ In a closed container
☐ Without a container
☐ Other: _____ *(please specify)*
☐ I don't know

19. Who is responsible for the disposal of waste in your household?

☐ Child/Children (up to 15 years old)

☐ Woman/Women
☐ Man/Men
☐ Everyone
☐ Other: _____ *(please specify)*
☐ I don't know

20. How often do you dispose of your waste?

☐ Every day
☐ When the container is "full"
☐ When there is a bad smell/many flies
☐ Other: _____ *(please specify)*
☐ I don't know

21. In which way do you dispose of your household waste? Please choose the way of disposal that you use most.

☐ Burning
☐ Public waste container provided by the Municipal
☐ Informal dump site
☐ Burying
☐ Drainage
☐ River/sea
☐ Door-to-door collection – by who *(please specify):*
  ☐ Municipal workers
  ☐ Non-Governmental Organisation/Group
  ☐ Informal worker/private person
  ☐ I don't know
☐ Other: _____ *(please specify)*
☐ I don't know

22. Do you separate your household waste?

☐ No, we dispose all waste materials together
☐ Yes, we dispose of different waste materials separately

If you answered, "Yes, we dispose of different materials separately" continue with question 22 a+b
If you answered, "No, we dispose all waste materials together" continue with question 22 c+d

If "Yes, we dispose of different materials separately":

a. How do you dispose of the following materials?:

□ Food waste: _____
□ Paper/cardboard:_____
□ Plastic material: _____
□ Plastic bottles: _____
□ Metal:_____
□ Glass: _____
□ Other:_____

b. Why do you separate your waste?

☐ Because I have seen others doing it.

☐ Because it is good for my health and the health of my family.

☐ Because I think it is good for the environment.

☐ Because I get paid for certain waste materials.

☐ Because I have seen it on the news:

- ☐ TV
- ☐ Radio
- ☐ Newspaper
- ☐ Other: _____

☐ Because I use some of the materials myself *(please specify):*

Material _____ for what: _____
Material _____ for what: _____
Material _____ for what: _____
Material _____ for what: _____
Material _____ for what: _____

□ Other: _____

If "No, we dispose all waste materials together":

c. Why don't you separate your household waste?

☐ I don't know about the separation of waste.

☐ There are no containers for separate waste materials available in my area.

☐ There are containers available, but I don't have time to separate my waste.

☐ I don't think it makes a difference to separate waste.

☐ My neighbours don't separate their waste either.

☐ Other: _____

☐ I don't know

d. Under which circumstances would you be willing to separate your household waste? *(multiple answers possible):*

☐ If I knew that it is beneficial for my health and the health of my family.

☐ If I knew that it has a positive impact on the environment.

☐ If garbage containers for different waste materials were available in walking distance.

☐ If I had more time.

☐ If I had more information on how to separate waste and where to dispose of it.

☐ If other people in my area started separating their household waste.

☐ If I was paid for the separation of my household waste.

☐ If there was a law that requires households to separate different waste materials.

☐ I am not willing to separate my household waste.

☐ Other: _____

☐ I don't know

Household Waste Management - Knowledge

23. Which of the following problems do you associate with poor waste disposal?
(multiple answers possible)

☐ Odour nuisance
☐ Skin diseases
☐ Breeding of vectors (mosquitos, flies, rats, etc.)
☐ Diarrhoea and Cholera
☐ Bad air quality
☐ Bad water quality
☐ Bad soil quality
☐ Respiratory problems
☐ Malaria
☐ Other illnesses/diseases: _____ *(please specify)*
☐ Animals eating waste lying around
☐ Children playing with garbage and hazardous waste materials
☐ Risk of fire due to open burning of waste
☐ There are no problems caused by poor waste disposal
☐ Other: _____ *(please specify)*
☐ I don't know

24. Have you ever received information on proper disposal of waste?

☐ Yes – where:
- ☐ From the Municipal Council
- ☐ From a Non-Governmental Organisation/Group
- ☐ From an educational institution (school, college, university, etc)
- ☐ From friends or neighbours
- ☐ TV programme
- ☐ Radio programme
- ☐ Newspaper
- ☐ Internet
- ☐ Other: _____ *(please specify)*
- ☐ Don't know where

☐ No
☐ I don't know

25. Have you ever heard about composting of food and yard waste?

□ Yes – where:
- ☐ From the Municipal Council
- ☐ From a Non-Governmental Organisation/Group
- ☐ From an educational institution (school, college, university, etc)
- ☐ From friends or neighbours
- ☐ TV programme
- ☐ Radio programme
- ☐ Newspaper
- ☐ Internet
- ☐ Other: _____ *(please specify)*

- ☐ Don't know where

☐ No

☐ I don't know

If you answered "Yes", continue with question 25 a

If you answered "No" or "I don't know" continue with question 26

If "Yes":

a. Do you compost yourself?

☐ Yes

☐ No

☐ I don't know

26. Have you ever reused or recycled waste materials for other purposes or heard about it?

☐ Yes – where:

- ☐ From the Municipal Council
- ☐ From a Non-Governmental Organisation/Group
- ☐ From an educational institution (school, college, university, etc)
- ☐ From friends or neighbours
- ☐ TV programme
- ☐ Radio programme
- ☐ Newspaper
- ☐ Internet
- ☐ Other: _____ *(please specify)*
- ☐ Don't know where

☐ No

☐ I don't know

27. Would you like more information on how and what types of waste you can compost or recycle to reduce the amount of waste you need to dispose of?

☐ Yes

☐ No

☐ I don't know

If you answered, "Yes" continue with question 27 a

If you answered, "No" continue with question 28

If "Yes":

a. How would you like to get information?

☐ Written information (newspaper, flyer, booklet, etc)

☐ Practical presentation in form of a class or community event

☐ Via TV programme

☐ Via radio programme

☐ Other: _____ *(please specify)*

Household Waste Management – Attitude

28. How concerned are you about the following aspects of waste management?	Very concerned	Concerned	Not particularly concerned	I don't know
a. Health risks due to burning waste.				
b. Pollution of rivers, wells, and other water resources by uncontrolled dumping.				
c. Diseases (e.g. malaria,worms) related to poor storage and disposal of waste.				
d. Flooding caused by waste blocking drains and gullies.				
e. Rats and other animals attracted by waste in your area.				
f. The overall waste situation in Zanzibar Town.				

29. What do you think about the following statements? Please indicate if you agree, disagree or don't know:	Agree	Disagree	I don't know
a. Changes in the environment are having a negative effect on my community.			
b. I play an important role in improving and maintaining the environment in my community/area.			
c. Environmental education should be taught in schools.			
d. I **don't** care that burning garbage can be bad for my health and the health of others.			
e. Picking up waste in my community/area is my responsibility as a Zanzibar resident.			
f. Public education campaigns on proper waste management could help to address the waste problem in Zanzibar.			
g. Reliable disposal services by the Municipal Council are necessary for improvement of the situation.			
h. As a community member I do not have any influence on the waste situation.			
i. It is very important that the Municipal Council introduces and prosecutes laws on waste management.			
j. The community should be involved in decisions concerning public waste management services.			
k. Other personal problems (e.g. unemployment, crime, cost of living) are more important to me than a waste free community.			
l. God will always provide natural/environmental resources we need.			
m. Most environmental problems are caused by the residents of Zanzibar.			
n. Most environmental problems are caused by people from other countries			
o. It is important to protect the environment and its resources, such as water sources, mangroves, coral reefs, agricultural and forest areas.			
p. The community does not have any influence on the protection of the environment and natural resources.			
q. The government alone is responsible for maintaining the environment.			

30. In your opinion, what is the biggest challenge for improvement of the waste situation in Zanzibar Town?

☐ People don't care about the effects of poor waste management
☐ People don't know about negative effects of poor waste management
☐ Other problems in the community are **more** important and need to be solved:
  ☐ Health
  ☐ Environment
  ☐ Education
  ☐ Employment (financial resources)
  ☐ Crime
  ☐ Other: _____ *(please specify)*
☐ No adequate action is taken by the Municipal Council
☐ Lacking cooperation of Municipal Council with local community members
☐ There is no incentive for residents to practice proper waste management
☐ Other: _____ *(please specify)*

Public Waste Management Services

31. Are you satisfied with the waste management services provided by the Municipal Council?

☐ Yes
☐ No
☐ I don't know

If "No", what do you think could be done to improve the situation?

_____
_____

32. Which means of transportation for waste have you noticed in your area *(multiple answers possible)?*

☐ Garbage collection truck (closed)
☐ Open truck
☐ Wheelbarrows
☐ Donkey/cow carts
☐ Other: _____ *(please specify)*
☐ I don't know

33. Which method of collection do you consider MOST appropriate in your area/community?

☐ Garbage collection truck (closed)
  - why: _____ *(please specify)*
☐ Open truck
  - why: _____ *(please specify)*
☐ Wheelbarrows
  - why: _____ *(please specify)*
☐ Donkey carts
  - why: _____ *(please specify)*
☐ Other: _____ *(please specify)*
  - why: _____ *(please specify)*
☐ I don't know

34. Do you use public waste containers provided by the Municipal?

☐ Yes
☐ No
☐ I don't know

If you answered "Yes" continue with question 35
If you answered "No" or "I don't know" continue with question 34 a

If "No":

a. Why do you not use public waste containers?

☐ I don't know of any public waste containers in my area
☐ I don't see any reason to use the public waste containers
☐ The container is too far from my house
☐ The public container is in a bad condition (e.g. waste is scattered around, many insects, rats and animals in and around the container)
☐ I don't trust the public waste management service provided by the Municipal
☐ I don't have time to take my household waste to the waste container
☐ I prefer another way of waste disposal – how?:
_____ *(please specify)*
☐ My neighbours don't use the public waste container either
☐ Other: _____ *(please specify)*
☐ I don't know

35. How far is the next public waste container from your home?

☐ Short distance (1-5 minutes by foot) – no problem
☐ Medium distance (6-10 minutes by foot) – acceptable
☐ Long distance (over 10 minutes by foot) – too far

36. What is the condition of the waste container?

☐ Good/Satisfactory
☐ Waste scattered around the container
☐ Broken/needs to be repaired or replaced
☐ Animals eating and spreading the waste
☐ Turned over
☐ Overfilled:
  ☐ sometimes
  ☐ often
  ☐ most of the time
☐ Other: _____ *(please specify)*
☐ I don't know

37. Do you pay for waste disposal?

☐ Yes
☐ No
☐ I don't know

If you answered "Yes" continue with question 37 a+b

If you answered "No" or "I don't know" continue with question 38

If "Yes":

a. How much do you pay?

_____ /= Tsh per:

☐ Day
☐ Week
☐ Month
☐ I don't know

b. Who do you pay?

☐ Municipal
☐ Non-Governmental Organisation/Group
☐ Informal worker/private person
☐ Other: _____ *(please specify)*
☐ I don't know

38. Are you willing to pay for Municipal waste management service?

□ Yes
☐ No
☐ I don't know

If you answered "Yes" continue with question 38 a
If you answered "No" continue with question 38 b+c

If "Yes":

a. How much would you be willing to pay?

_____ /= TSh per:

☐ Day
☐ Week
☐ Month

If "No" or "I don't know":

b. Why are you not willing to pay for waste management services?

☐ I don't think that waste management is important
☐ I cannot afford to pay anything
☐ I think the Municipal Council is responsible for covering the costs of waste management
☐ I personally do not benefit from the waste management services
☐ Other people in my area do not pay either
☐ I do not trust the waste management services provided by the Municipal Council
☐ Other: _____

c. When would you be willing to pay for waste management?

☐ If the waste management services improved
☐ If I knew what the money is used for
☐ If all residents paid for waste management services
☐ If I had adequate financial resources
☐ I am not willing to pay any fee for waste management services
☐ Other: _____

39. In your opinion, who should be responsible for waste management in Zanzibar Town?

☐ Municipal Council
☐ Community leaders/representatives (Sheha)
☐ All residents
☐ Non Governmental Organisations/Groups
☐ Private enterprise
☐ I don't know
☐ Other: _____

We have now reached the end of our interview.

Do you have anything you would like to add, concerning this questionnaire or the environmental and waste situation in Zanzibar?

_____
_____
_____
_____
_____

Thank you very much for your time.

Takataka, mazingira na afya katika mji wa Zanzibar - Dodoso
Glitters Volunteer Group. Unguja, Zanzibar (2015)

DODOSO

Dodoso Namba: _____ Tarehe: _____ Wakati (wa Kiswahili):_____
Mkoa: _____ Shehia: _____
Jinsia ya msailiwa**:** ☐Mke ☐Mume *(weka alama ya vyema ✓kwenye chumba hahihi)*

Hello, mimi naitwa _____ .
Mimi ni mmoja wa wajumbe wa Glitters Volunteer Group, ambao wanajishughulisha na usafi wa mazingira katika mji wa Zanzibar. Tunaendesha usaili kuhusu takataka, mazingira na afya ndani ya jamii katika mji wa Zanzibar.
Kusudio hasa la dodoso hili ni kuunganisha taarifa kwa wakaazi/wenyeji kama wewe kuhusiana na hali halisi, ya utekelezaji wake, vikwazo na mawazo vipi tunaweza kufanya ili tuweze kutoa huduma bora kwa jamii. Usaili utakuwa siri huna haja ya kutaja jina lako, maelezo yote yatachukuliwa kuwa siri. Maelezo yote niliyoyatoa kwenye usaili yatakusanywa pamoja na maelezo ya wasailiwa wengine na kutumiwa kwa ripoti.
Usaili huu utachukua kama dakika ishirini (20).

Vielelezo vya tabia na maumbile

1. **Umri:**
   ☐Kijana (chini ya miaka 30)
   ☐Mtu wa makamo (chini ya miaka 45)
   ☐Mzee (juu ya miaka 45+)

2. **Habari za ndoa:**
   ☐Sijapata kuolewa
   ☐Nina ndoa
   ☐Nimeachika
   ☐Mjane nimefiwa na mume/mke
   ☐Ninaisha na mpenzi
   ☐Mengineyo: _____

3. **Idadi ya watu wanaoishi nyumbani:**
   _____ watoto chini ya miaka mitano (0-5)
   _____ watoto chini ya miaka kumi na tano (6-15)
   _____ watu wazima chini ya miaka arubaini na tano (16-45)
   _____ watu wazima wa miaka arubaini na tano (45+)

4. **Kiwango cha elimu:**
   ☐Hakupata elimu shuleni
   ☐Elimu ya msingi
   ☐Elimu ya sekondari
   ☐Elimu ya diploma
   ☐Elimu ya diploma ya juu/digiri
   ☐Mengineyo: _____

5. **Ajira:**
   ☐Sijapata kuajiriwa/sifanyi kazi
   ☐Muajiriwa wa serikali
   ☐Muajiriwa kampuni za watu binafsi
   ☐Nimejiajiri mwenyewe - Kazi gani?: _____
   ☐Nafanya kazi za kujitolea
   ☐Mengineyo: _____

6. **Unatumia kiasi gani cha pesa kwa matumizi ya nyumbani kwako kwa siku?**
   ☐chini ya 5.000/= Tsh
   ☐5.000-10.000/= Tsh
   ☐10.000-20.000/= Tsh
   ☐20.000-30.000/= Tsh
   ☐30.000-40.000/= Tsh
   ☐40.000-50.000/= Tsh
   ☐Zaidi ya 50.000/= Tsh
   ☐Sijui

7. **Mara ngapi kwa wiki unatumia vyombo vya habari hivi?**

	Sijawahi kabisa	**Mara 1 kwa wiki**	**Mara 2-3 kwa wiki**	**Mara 4-6 kwa wiki**	**Kila siku**	**Chombo kipi unatumia?** TV, Radio station, magazeti, makala, websites gani?
TV						**1.** **2.** **3.**
Radio						**1.** **2.** **3.**
Magazeti						**1.** **2.** **3.**
Makala						**1.** **2.** **3.**
Internet						**1.** **2.** **3.**

8. Muda gani hasa unatizama TV au kusikiliza radio?

TV:
- ☐Saa 6 usiku mpaka saa 12 asubuhi
- ☐Saa 12 asubuhi mpaka saa 6 mchana
- ☐Saa 6 mchana mpaka saa 12 jioni
- ☐Saa 12 jioni mpaka saa 6 usiku
- ☐Sina muda maalumu

Radio:
- ☐Saa 6 usiku mpaka saa 12 asubuhi
- ☐Saa 12 asubuhi mpaka saa 6 mchana
- ☐Saa 6 mchana mpaka saa 12 jioni
- ☐Saa 12 jioni mpaka saa 6 usiku
- ☐Sina muda maalumu

<u>Mazingira</u>

9. Mazingira gani ambayo unayaona ni muhimu kwako?

(Unaweza kutoa majibu zaidi ya moja)

- ☐Sehemu zenye kijani kilichosababishwa na (mimea, miti, n.k.)
- ☐Sehemu za fukwe za bahari au mito ambamo mawimbi yanaji mwaya mwaya
- ☐Sehemu ambazo samaki huvuliwa
- ☐Sehemu zenye upepo uliopoa usioleta vumbi kutishia amani
- ☐Hali ya hewa ya upepo, joto, mawingu unyevunyevu n.k.
- ☐Sehemu za kilimo
- ☐Maji safi na salama
- ☐Kuishi katika hali ya afya
- ☐Mazingira yaliyo safi
- ☐Mengineyo: _____

10. Kuna yeyote yule nyumbani kwenu anajihusisha na shughuli hizi?

(Unaweza kutoa majibu zaidi ya moja)

- ☐Ukulima wa matunda na mbogamboga:
  - ☐Matumizi binafsi
  - ☐Biashara
- ☐Uvuvi:
  - ☐Matumizi binafsi
  - ☐Biashara
- ☐Ufungaji wa wanyama (ngombe, kuku, n.k.):
  - ☐Matumizi binafsi
  - ☐Biashara
- ☐Hapana

11. **Kwa mtazamo wako, unahisi kuna changamoto gani ambazo zinahusiana na mazingira katika jamii yako na Zanzibar kwa ujumla?**
(Majibu matatu (3) yanatosha)
☐Mafuriko kwenye makaazi ya watu
☐Joto/hali ya ukame
☐Upatikanaji wa maji ya sio salama
☐Maji kidogo
☐Wanyama wanazurura ovyo kwenye makaazi ya watu
☐Kusambaa kwa takataka
☐Upungufu wa miti, mimea kwenye makaazi yetu
☐Hali ya upepo mbaya, kama upepo mkali wenye kurusha vumbi nk:
    ☐Moshi utokanao na uchomaji wa takataka
    ☐Uharibifu wa mazingira utokanao moshi wa magari
☐Uharibifu wa mazingira utokanao na ukatwaji misitu na uangamizwaji wa mali ya asili (kama miti inayoota kwenye sehemu zenye unyevu , kuvunja (mawe) matumbawe ambayo ni mazalio ya viumbe hai kama pweza, samaki, n.k.)

12. **Unafikiri mazingira yako yanakusababisha uwe na familia yenye afya?**
☐Ndio:
    ☐Hakika/sawa
    ☐Sio sawa
☐Hapana
☐Sijui

Ikiwa "Ndio" - Vipi mazingira yameupa msukumo wa afya yako?:
_____
_____
_____

13. **Jee kuna mmoja wenu yoyote aliyewahi kuumwa na aina ya maravi kama haya wiki nne zilizopita?** *(Unaweza kutoa majibu zaidi ya moja)*
☐ Malaria
☐ Kuharisha
☐ Kipindupindu
☐ Thyphoid
☐ Minyoo
☐ Marazi ya ngozi
☐ Kukohowa
☐ Marazi ya macho
☐ Homa
☐ Mengineyo: _____
☐ Hapana
☐ Sijui

14. **Wakati gani unaosha mikono yako?**
(Unaweza kutoa majibu zaidi ya moja)
☐Kabla ya kutayarisha chakula
☐Kabla ya kula chakula
☐Baada ya kula chakula
☐Baada ya kutoka chooni
☐Baada ya kushika takataka
☐Baada ya kucheza wanyama (kama paka, mbuzi, n.k.)
☐Mengineyo: _____

15. **Jee unatumia sabuni unapoosha mikono yako?**
☐Ndio:
☐Unatumia sabuni muda wote unaponawa mkono
☐Wakati wowote
☐Baadhi ya wakati
☐Hapana

16. **Unafahamu sheria zozote zile zinazohusiana na mazingira au utupaji wa takataka Zanzibar?**
☐Ndio
☐Hapana
☐Sijui

Ikiwa "Ndio" - Sharia hiyo inaeleza nini?:

_____
_____
_____

<u>Uthibiti wa takataka – Mazowea</u>

17. **Wapi unahidfadhi takataka za nyumbani kwako?**
☐Jikoni (hakuna paa)
☐Jikoni (kuna paa)
☐Chumba chengine nyumbani - Chumba gani?: _____
☐Nje ya nyumba
☐Hatudundulizi takataka zetu
☐Mengineyo: _____
☐Sijui

18. **Vipi unahifadhi takataka nyumbani kwako?**
☐Kwenye chombo kilicho wazi
☐Kwenye chombo chenye ufuniko
☐Bila ya chombo cha kuhifadhia
☐Mengineyo: _____
☐Sijui

19. Nani mdhamini wa utupaji wa takataka nyumbani kwako?

☐Mtoto/watoto *(chini ya miaka 16)*
☐Mwanamke/wanawake
☐Mwanamume/wanaumme
☐Mtu yoyote Yule
☐Mengineyo: _____
☐Sijui

20. Kwa muda gani unatupa takataka zake?

☐Kila siku
☐Chombo kinapo jaa
☐Pale panapokua na harufu mbaya/ nzi wengi
☐Mengineyo: _____
☐Sijui

21. Njia ipi unayotumia kutupa takataka zako? Tafadhali chagua njia ya utapaji takataka unayotumia.

☐Uchomaji moto
☐Unatia ndani ya chombo maalum kilichowekwa na halmashauri
☐Kuzizika/Kufukia takataka
☐Kuzitia kwenye mitaro
☐Kuzitupa kwenye mito/baharini
☐Zinakuja kuchukuliwa nyumba hadi nyumba
– Na nani?:
    ☐Wafanyakazi wa halmashauri
    ☐Vikundi siovya kiserekali
    ☐Mfanyakazi binafsi alieamua kuifanya kazi hii
    ☐Sijui
☐Mengineyo: _____
☐Sijui

22. Unazibagua takataka zako?

☐ Ndio, tunazibagua takataka nakuziweka tafauti
☐ Hapana, tunatupa takataka zote pamoja

Ikiwa jawabu "Ndio, tuunazibagua takataka nakuziweka tafauti", endelea na namba 22 a+b
Ikiwa jawabu "Hapana, tunatupa takataka zote pamoja", endelea na namba 22 c+d

Takataka, mazingira na afya katika mji wa Zanzibar - Dodoso
Glitters Volunteer Group. Unguja, Zanzibar (2015)

Ikiwa jawabu "Ndio, tuunazibagua takataka nakuziweka tafauti":

a. Tafadhali elezea njia ya utupaji/unayotumia?:

☐Takataka za chakula:

_____

☐Karatasi/Karatasi ngumu:

_____

☐Vitu za plastiki:

_____

☐Chupa za plastiki:

_____

☐Mabati/Makopo:

_____

☐Vigae:

_____

☐Mengineyo:

_____

b. Kwa nini unazibagua takataka zako?

☐Kwasababu niliona wenzangu walifanya hivyo

☐Kwasababu ni nzuri kwa afya yangu na familia yangu

☐Kwasababu nafikiri ni nzuri kwa mazingira

☐Kwasababu ninapata malipo kwa baadhi ya vitu ambavyo ni takataka

☐Kwasababu niliona kwenye matangazo ya habari:

☐TV

☐Radio

☐Magazeti

☐Mengineyo: _____

☐Kwasababu natumia baadhi ya vitu hivyo mimi menyewe: -

Tafadhali elezea kwa ufanisi:

Kitu: _____ Kama: _____

Kitu: _____ Kama: _____

Kitu: _____ Kama: _____

Kitu: _____ Kama: _____

Kitu: _____ Kama: _____

☐Mengineyo: _____

Ikiwa jawabu "Hapana, tunatupa takataka zote pamoja":

c. Kwanini huzibagui/tenganisha takataka zote?

☐ Sijui habari ya kubagua/kutenganisha takataka

☐ Hakuna chombo cha kutenganisha takataka kwenye eneo langu

☐ Chombo cha kuweka takataka kipo lakini sina wakati wa kuzibagu takataka

☐ Sifikiri kama kutaleta mabadiliko kwa kutenganisha/kubagua takataka

☐ Jirani zangu pia hawatenganishi takataka vilevile

☐ Mengineyo: _____

☐ Sijui

d. Katika hali ipi ambayo wewe kwa hiyari yako itakufanya uzibague/kutenganisha takataka zako? *(Unaweza kutoa majibu zaidi ya moja)*

☐ Ikiwa mtaelewa kuwa itakuwa na tija kwa afya yangu na familia yangu

☐ Ikiwa nitaelezwa kama itaweza kuleta manufaa kwa mazingira

☐ Ikiwa vyombo vya takataka, kwaajili ya kutia takataka za aina mbalimbali vinapatikana katika masafa mafupi

☐ Ikiwa nitapata muda zaidi

☐ Ikiwa nitapata maelezeko vipi nitazibagua na wapi nitazitupa

☐ Ikiwa watu wengi hapo tunapoishi wataanza kuzibagua takataka zao

☐ Ikiwa nitapewa malipo kwa kuzibagua takataka zangu

☐ Ikiwa kutakuwepo sheria inayotarajiwai takataka zibaguliwe kwenye vyombo tafauti

☐ Sipo tayari kuzibagua takataka zangu

☐ Mengineyo: _____

☐ Sijui

<u>Taaluma ya kuweza kudhibiti takataka za majumbani</u>

23. Matatizo gani yaliyojitokeza uliyoyahusisha kwa utupaji mbaya wa takataka?
(Unaweza kutoa majibu zaidi ya moja)

☐Harufu yenye kukera

☐Maradhi ya ngozi

☐Mazalio ya vijidudu (mbu, nzi, panya, n.k.)

☐Maradhi ya kuharisha na kipindupindu

☐Kiwango cha hewa chafu/mbaya

☐Kiwango cha maji machafu/mbaya

☐Kiwango cha udongo mbaya

☐Matatizo kwenye sehemu ya uvutaji pumzi

☐Homa ya malaria

☐Magonjwa/maradhi mengineyo, kama: _____

☐Wanyama wanakula takataka zilizosambaa

☐Watoto wanachezea takataka na vitu vya hatari vilivyotupwa

☐Athari za moto kwa ajili ya uchomaji wa moto takataka kiholela/mbaya

☐Mengineyo: _____

☐Sijui

24. Uliwahi kupata maelezo ya utupaji takataka ulio sahihi?

☐Ndio – wapi?:

☐Kutoka baraza la mji/halmashaur

☐Kutoka sehemu isiyo ya serikali/vikundi

☐Kutoka taasisi za elimu (skuli, vyuo, taasisi, n.k.)

☐Kutoka kwa marafiki au majirani

☐Kwenye vipindi vya TV

☐Kwenye vipindi vya radio

☐Magazeti

☐Kupitia mitandao ya jamii

☐Mengineyo: _____

☐ Sijui

☐Hapana

☐Sijui

25. Umewahi kusikia utengenezaji wa mbolea kwa mabaki ya chakula na uwekaji wa takataka uwarani?

☐Ndio – wapi?:

☐Kutoka baraza la mji/halmashaur

☐Kutoka sehemu isiyo ya serikali/vikundi

☐Kutoka taasisi za elimu (skuli, vyuo, taasisi, n.k.)

☐Kutoka kwa marafiki au majirani

☐Kwenye vipindi vya TV

☐Kwenye vipindi vya radio

☐Magazeti

☐Kupitia mitandao ya jamii

☐Mengineyo: _____

☐ Sijui

☐Hapana

☐Sijui

Ikiwa jawabu “Ndio” endelea na namba 25 a
Ikiwa jawabu "Hapana" au "Sijui" endelea na namba 26

Ikiwa jawabu “Ndio”:

a. Wewe binafsi unatengeneza mbolea?

☐Ndio

☐Hapana

☐Sijui

26. Umewahi kusikia au kutumia vyombo ambavyo vimetumika kwa kitu chengine na wewe ukatumia kwa kitu chengine?

☐Ndio – wapi?:
- ☐Kutoka baraza la mji/halmashaur
- ☐Kutoka sehemu isiyo ya serikali/vikundi
- ☐Kutoka taasisi za elimu (skuli, vyuo, taasisi, n.k.)
- ☐Kutoka kwa marafiki au majirani
- ☐Kwenye vipindi vya TV
- ☐Kwenye vipindi vya radio
- ☐Magazeti
- ☐Kupitia mitandao ya jamii
- ☐Mengineyo: _____
- ☐ Sijui

☐Hapana

☐Sijui

27. Je unahitaji taarifa zaidi juu ya njia gani na takataka gani ambazo unaweza kuzirejesha tena kama mbolea au kuziyayusha kutengeneza kitu chengine ili kupunguza wingi wa takataka unazo hitaji kuzitupa?

☐Ndio

☐Hapana

☐Sijui

Ikiwa jawabu “Ndio”, endelea na namba 27 a
Ikiwa jawabu "Hapana" au "Sijui", endelea na namba 28

Ikiwa jawabu “Ndio”:

a. Unataka upate taarifa hizo kwa kutumia njia gani?

☐Njia ya maandishi (magazeti, vipeperushi, vijitabu vidogo, n.k.)

☐Njia ya kuonesha maigizo ndani ya madarasa au kwenye jamii

☐Vipindi vya TV

☐Vipindi vya radio

☐Vinginevyo: _____

Usimamiaji wa takataka katika mazingira yako – Kidesturi

28. Unashiriki au unafatilia kwa kiasi gani juu ya uthibiti wa takataka? *(weka alama ya vyema ✓)*	Nafatilia sana	Nafatilia	Hayanihusu	Sijui
a. Athari za afya zitokanazo kwa kuchoma takataka.				
b. Uchafuzi wa mito, visima na vyonzo vengine vya maji kwa kutokuthibiti utupaji.				
c. Magonjwa kwa mfano (malaria, minyoo) yanasababishwa na kutokuwepo na uthibiti wa utunzaji wa takataka na utupaji wake.				
d. Mafuniko yana sababishwa kwa kuziba kwa mitaro takataka zinazo – tiwa kwa ujanja.				
e. Panya na wanyama wengine huvutika na takataka kwenye eneo lako.				
f. Mji wa Zanzibar umejaa takataka kwa ujumla.				

29. Unafikiri nini kutokana na maelezo haya? Tafadhali ashiria kama unakubali, unakataa, au huyajua. *(weka alama ya vyema ✓)*	Kubali	Kataa	Sijui
a. Mabadiliko kwenye mazingira yetu yanaleta na kule kukubaliana kwa jamii.			
b. Nina mchango mkubwa katika kukuza na kuweka mazingira bora katika jamii yangu.			
c. Elimu ya mazingira ifundishwe mashuleni.			
d. Sijali kama uchomaji wa takataka ni mbaya kwa afya yangu na wengine.			
e. Kuokota takataka katika mazingira yanayo nizunguka/maeneo ninayoishi ni wajibu wangu kama mkaazi wa Zanzibar.			
f. Kampeni za elimu kwa jamii kuhusiana na uthibiti mzuri wa takataka itasaidia kuondoa tatizo la takataka Zanzibar.			
g. Uhakika wa shughuli za utupaji wa takataka kwa Baraza la Manispaa lazima italeta hali ya unafuu.			
h. Nikiwa mwanajamii sina msukumo wowote kwenye kukabiliana na takataka.			
i. Ni muhimu sana kwa Baraza la Manispaa kuanzisha sheria za udhibiti wa takataka.			
j. Jamii inapaswa kuhusishwa na maamuzi yahusianayo na maswali ya ushughuli kiaji wa kazi za takataka.			
k. Matatizo mengine yakibinafsi (ukosefu wa jira, jirani, gharama za kuishi, n.k.) simuhimu kwangu kama kuishi kwenye jamii isiyo na takataka.			
l. Siku zote mungu atatupa mazingira halisi na rasilimali tunazozihitaji.			
m. Matatizo yote ya mazingira Zanzibar yanasababishua na wakaazi wake.			
n. Matatizo yote ya mazingira yanasababishua na watu wa nchi nyingine.			
o. Ni muhimu kuyahifadhi mazingira yetu na rasilimali zake, kama vyanzo vya maji, sehemu zenye unyevu maji hayakauki, sehemu zenye mawe kama matumbawe mazalio ya samaki, kilimo na misitu.			
p. Jamii haina msukumo wowote katika kulinda mazingira na mali ya asili.			
q. Serikali pekee ndio yenye jukumu la kutunza mazingira.			

30. **Katia ya mambo yafuatayo, ni changamoto gani kubwa katika kuimarika hali ya takataka katika mji wa Zanzibar?**

☐Watu kutojali athari za kutokuwepo uthibiti mzuri wa utupaji takataka
☐Watu kutojua athari ziletwazo na kutokuwepo uthibiti mzuri wa utupaji takataka
☐Mambo mengine kwenye jamii na muhimu sana yanahitaji kutatuliwa:
☐Afya
☐Mazingira
☐Elimu
☐Uajiri namna ya kupatia pesa
☐Uhalifu
☐Mengineyo: _____ *(Tafadhali elezea)*
☐Hamna hatua zinazofaa zinazochukuliwa na Baraza la Manispaa
☐Upungufu wa mashirikiano baina Baraza la Manispaa na wana jamii kwa ujumla
☐Hamna bahashishi/motisha kwa wenyeji wanapofanya zoezi hili utupaji taka uliosahihi
☐Mengineyo: _____ *(Tafadhali elezea)*

<u>Huduma za uthibiti takataka kwa jamii</u>

31. **Je umeridhika na huduma na uthibiti wa takataka itolewayo na Baraza la Manispaa?**

☐Ndio
☐Hapana
☐Sijui

Ikiwa "Hapana" - Unafikiria nini kitendeke ili kuimarisha hali hii?:

_____
_____

32. **Umebaini aina gani ya usafiri unaotumika kusafirishia takataka unaotumika kwenye eneo lako?** *(Unaweza kujibu zaidi moja)*

☐Gari la kuchukulia takataka (lililofungwa/funikwa)
☐Gari la wazi
☐Bero
☐Punda/n'gombe wa gari
☐Mengineyo: _____
☐Sijui

33. **Njia gani ya ukusanyaji ambao unafikiria utakua bora zaidi katika eneo lako/jamii?**

☐Gari la kuchukulia takataka lililofungwa/funikwa
- Kwanini: _____
☐Gari la wazi
- Kwanini: _____
☐Bero
- Kwanini: _____
☐Punda/n'gombe wa gari
- Kwanini: _____
☐Mengineyo: _____
- Kwanini: _____
☐Sijui

34. Unatumia kontena la jamii yaliyowekwa na Baraza la mji?

☐Ndio
☐Hapana
☐Sijui

Ikiwa jawabu "Hapana", endelea na namba 34 a
Ikiwa jawabu "Ndio" au "Sijui", endelea na namba 35

Ikiwa "Hapana":

a. Kwanini hutumii chombo cha jamii kilichowekwa kuwekea takataka?

☐Sijui kama kuna chomo cha jamii cha kuwekea takataka kwenye eneo langu
☐Sioni kama kuna haja ya kutumia chombo cha jamii cha kuwekea takataka
☐Chombo kipo mbali sana na nyumba yangu
☐Chombo hicho cha jamii kipo vibaya (kama takataka zimetawanyika, vidudu vipo vingi, panya na wanyama wamo ndani na wengine wamelizunguka chombo hicho)
☐Siamini huduma ya jamii ya uthibiti wa takataka inayotolewa na Baraza la Manispaa
☐Sina muda wakupeleka takataka zangu kwenye contena la takataka
☐ Naonelea bora kutumia njia nyengine ya utupaji takataka
– Vipi?: _____ *(Tafadhali eleza)*
☐Jirani zangu hawatumi kontena la jamii pia
☐Mengineyo: _____
☐Sijui

35. Ni umbali gani kutoka nyumbani kwako unalikuta kontena jingine la jamii la kuwekea takataka?

☐Simbali – Hamna matatizo (dakika 1-5 kwa mguu)
☐Ni masafa ya wastani ni – Inakubalika (dakika 6-10 kwa mguu)
☐Ni masafa marefu – Mbali sana (zaidi ya dakika 10 kwa mguu)
☐ Sijui

36. Chombo cha kutilia takataka lina hali gani?

☐Nzuri/linaridhisha
☐Takataka zimezagaa kuzunguka kontena
☐Limevunyika/linahitaji matengenezwa au liwekwe jengine
☐Wanyama wanakula na kusambaza takataka
☐Limefundikizwa
☐Limejazwa kupindukia mpaka
  ☐Mara chache
  ☐Mara kwa mara
  ☐Mara nyingi
☐Mengineyo: _____
☐Sijui

37. Unalipa kwa ajili ya kutupa takataka?

☐Ndio
☐Hapana
☐Sijui

Ikiwa jawabu "Ndio", endelea na namba 37 a+b
Ikiwa jawabu "Hapana" au "Sijui", endelea na namba 38

Ikiwa “Ndio”:

a. Unalipa kiasi gani?

_____ /= Tsh kwa: ☐Siku
☐Wiki
☐Mwezi
☐Sijui

b. Unamlipa nani?

☐Baraza la Manispaa
☐Sekta isiyo ya kiserikali/vikundi
☐Mfanyakazi binafsi asiye rasmi/mtu binafsi
☐Mengineyo: _____
☐Sijui

38. Upotayari kulipa Baraza la mji kwa huduma za uthibiti/ushughulikiaji wa takataka?

☐Ndio
☐Hapana
☐Sijui

Ikiwa jawabu "Ndio", endelea na namba 38 a
Ikiwa jawabu "Hapana" au "Sijui", endelea na namba 38 b+c

Ikiwa "Ndio":

a. Utakuwa tayari kulipa kiasi gani?

_____ /= Tsh kwa: ☐Siku
☐Wiki
☐Mwezi

Ikiwa “Hapana” au "Sijui":

b. Kwanini hupo tayari kwa kulipa huduma za ushughulikiaji takataka?

☐ Sifikiri ushughulikiaji wa takataka kuwa ni muhimu
☐ Sina uwezo wa kulipia chochote
☐Nafikiri Baraza la mji lina wajibu wa kugharamia shughuli zote za uthibiti wa takataka
☐Mimi binafsi sifaidiki na huduma za uthibiti wa takataka
☐Baadhi ya watu kwenye eneo langu hawalipii vilevile
☐Sina imani na huduma za uthibiti wa takataka unaotolewa na Baraza la Manispaa
☐Mengineyo: _____

c. Lini utakuwa tayari kulipia shughuli za uthibiti wa takataka?

☐Ikiwa huduma za uthibiti wa takataka utaimarika
☐Ikiwa nitajua matumizi ya pesa hizo
☐Ikiwa wakaazi wote watalipia huduma za uthibiti wa takataka
☐Ikiwa nitapata pesa nyingi za ziada
☐Sipo tayari kulipa huduma yeyote ya uthibiti wa takataka
☐Mengineyo: _____

39. **Kwa maoni/mtazamo wako, nani awe dhamana wa kushughulikia uthibiti wa takataka katika mji wa Zanzibar?**
    ☐Baraza la Manispaa
    ☐Viongozi vijijini/muakilishi (Sheha)
    ☐Wakaazi wote
    ☐Sekta isiyo ya kiserikali/vikundi
    ☐Kampuni za watu binafsi
    ☐Mengineyo: ____
    ☐Sijui

Sasa tumefika mwisho wa mahojiano yetu.

Unacho chochote cha kuongezea, kuhusiana na dodoso hili au mazingira, na takataka ndani ya Zanzibar?

____
____
____
____
____
____

Ahsante sana kwa kuniazima muda wako.

_ _

ELEZEA UKUBALIFU - Mshiriki

Mimi ninathibitisha kwama ninatoa maelezo ya kuridhisha kwenye usaili. Msaili amenieleza juu ya masuala yote, mafunzo, madhumuni ya mafunzo haya, kanuni pamoja na haki zangu kama mshiriki. Masuali yangu yote yaliyo husiana na mafunzo yamejibiwa vya kutosha. Nimefahamu kwamba maelezo yote niliyoyatoa kwenye usaili yatakusanywa pamoja na maelezo ya wasailiwa wengine na kutumiwa kwa ripoti.

Mimi kwa hiyari yangu nakubali kushiriki kwenye usaili:

Saini ya mshiriki: _____ Tarehe: _____

Jina la mtafiti: _____

Saina ya mtafiti: _____ Tarehe: _____

Interview Guideline

Mr. Rajab Salum Rajab

Head of Social Service Department ZMC

1. SERVICES OF THE ZMC

- Could you give a brief overview of the services provided by the Zanzibar Municipal Council?
- Could you describe your position and work within the ZMC?
    - What are your responsibilities?

2. CURRENT SITUATION OF SOLID WASTE MANAGEMENT IN ZANZIBAR TOWN

- In which area does the ZMC provide waste collection services?

- What types of waste does the ZMC deal with?
    - Domestic?
    - Commercial?
    - Building/Construction?
    - Hospitals?
    - Factories (chemicals)?

- Is hazardous waste separated and dealt with in a special way?

- Where is the waste dumped?
    - Any kind of separation of waste materials?
    - Are any measures planned for the future? Which measures?

- What is the frequency of collection from the collection points?
    - In Stone Town?
    - In domestic areas in Zanzibar Town?

- Is the current number of collection points in domestic areas satisfactory?
    - Are any changes planned for the future? Which changes?

- Which equipment/measure of transport is used for the waste collection?
    - Kind of vehicles?
    - Tools (like shovels)?
    - Safety equipment?

- How much staff is required for the collection of waste at the collection points? How is it organised?

3. ENVIRONMENTAL AND SOLID WASTE MANAGEMENT POLICY

- What does the ZMC policy say in regard to Solid waste management?
- How is the policy implemented in practice?
- Are violations prosecuted?
    - If yes: How?
    - If no: How could policies be implemented and prosecuted effectively?
- Are there any educational measures to raise awareness on environmental or solid waste policies and regulations?
    - Which measures are used to teach people about environmental and waste policies?

4. MAIN CHALLENGES IN SOLID WASTE MANAGEMENT

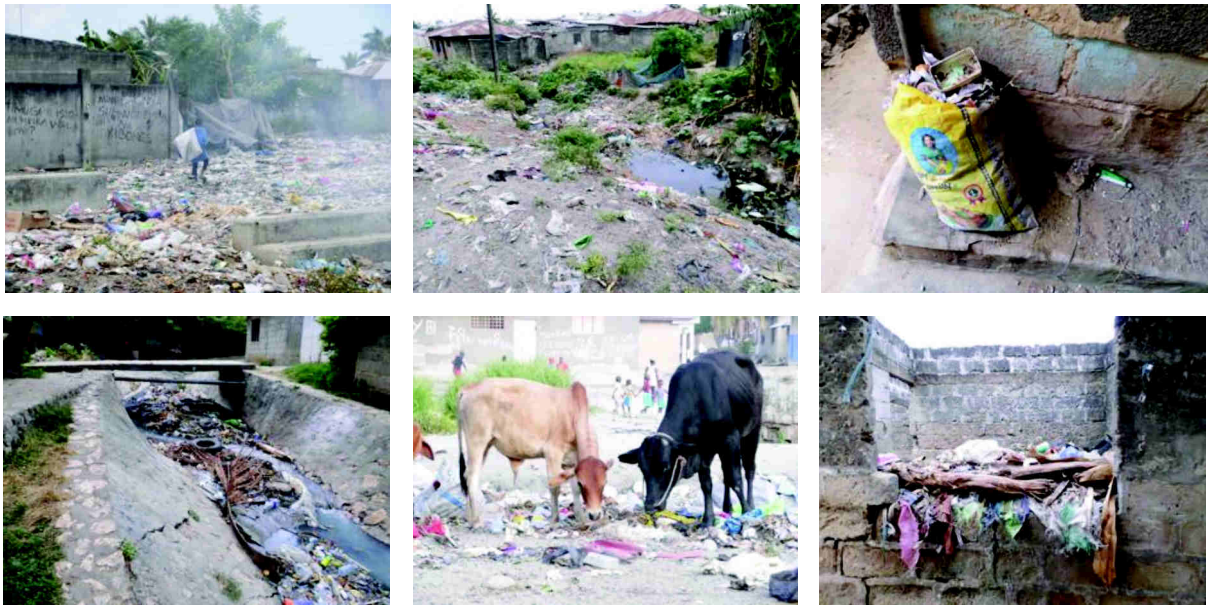
- What are the main challenges for the provision of a reliable waste collection service?
- How does the ZMC deal with theses challenges?
- In your opinion, what is needed to improve the current situation?

5. ZMC REVENUE COLLECTION

- Can you give a short overview of the Revenue Collection of the ZMC?
    - Who is responsible for revenue collection at ZMC?
    - Who is responsible for revenue collection in the community?
    - How much do private households pay per month?
    - How much do shops pay per month?
    - What is the total amount (estimate/average) collected by the ZMC per month?
    - What is the revenue used for?
    - How much % of the revenue is used for solid waste management?

Environmental Health in Zanzibar

Case Study on Domestic Solid Waste Management in the Urban West (North Zone)



Field notes by Isabel Wolters

May 2015

Background

Glitters Volunteer Group

The Glitters Volunteer Group (GVG) is a non-government organisation, located in urban Zanzibar, Tanzania. The organisation is active since 2012 and is concerned with positive community development. The NGO implements projects to generally contribute to a healthier and safer environment in Zanzibar, with a focus on waste management. Currently activities include environmental cleaning as well as health research and education.

Contact:
Project Coordinator: Isabel Wolters
Executive Secretary: Mohammed Said Ramadhan
Phone: 0773136423/0655136423
Mail: glittersvolunteer@gmail.com
Physical address: Kidongo Chekundu, Matarumbeta
P.O. Box: 1439, Zanzibar/Tanzania

The table provides an overview of the studied Shehias and respective local authorities (Shehas) including their contact information.

Shehia	Sheha	Phone	No of Interviews
Amani	Hamadi Ali Dude	0773113360	24
Chumbuni	Hassan Juma Juma	0777430233	40
Karakana	Bakari Makame Omari	0777472204/0715072204	32
Kilimahewa Bondeni	Hassan Hashir Hassan	0777452890	20
Kilimahewa Juu	Mkombe Abdallah Makame	0778395657	19
Kwamtipura	Machano Salum Khamis	0777439483	44
Kwawazee	Khalfani Salum Shomari	0777506761	27
Mkele	Khamis Khamis Mkadam	0773236079	30
Muembe Makumbi	Saleh Mohammed Juma	0777854220	31
Muungano	Suleiman Haji Haji	0773704795	23
Nyerere	Hamdu Shaka Hamdu	0777862404	39
Sebleni	Idrissa Hassan Tongoa	0773702850	20
Shaurimoyo	Mohd Mohd Salum	0777475953	33

Table 1 Overview Shehas Urban West (North Zone)

The final report is going to be sent to the Vice President's Office, the Zanzibar Municipal Council as well as the Environmental Department of Zanzibar. The research results are furthermore going to be used to apply for project funds in order to implement community initiatives to improve waste management services as well as the general environment and health conditions.

Observations and Field Notes

The Shehias within the North Zone, Urban West are very diverse in regard to their size, number of residents and houses, the physical environment as well as community structures.

The physical environment includes different aspects, such as the infrastructure within the Shehias, accessibility of houses, availability and condition of public places and open spaces, the waste situation within domestic areas as well as the condition of rivers and drainage systems, which pass through most areas. Following table indicated the number of collection points within each Shehia as well as the existence of rivers or open drainages.

Shehia	Zones	Dumpsite	River/Drain
Amani	5	1	yes
Chumbuni	6	1	yes
Karakana	10	2	yes
Kilimahewa Bondeni	3	1	yes
Kilimahewa Juu	5	shared with Kwamtipura	yes
Kwamtipura	10	1	yes
Kwawazee	6	2	yes
Mkele	10	1	yes
Muembe Makumbi	5	1	yes
Muungano	3	1	no
Nyerere	6	1-unused	no
Sebleni	4	1	no
Shaurimoyo	5	1	yes

Table 2 Shehias Infrastructure

Amani - 02.02.2015

Zones: 5 Dump: 1 Drainage: yes

Observations:

- There is one official dumpsite from the Municipal Council. Many households are far away from the dump, as it is located at the boarder of the Shehia. Especially Zone E is in need of an alternative/additional dumpsite.
- People also use abandoned private houses for the disposal of waste or it is dumped, burned and buried randomly within the domestic areas. Many residents also use the drain and river for dumping of waste. At the riverside a great heap of waste has accumulated and waste is washed into the river in case of rainfall. The water of the river has stagnated in different areas due to the waste pollution. The open drainage is not always filled with water; it serves the purpose to discharge rainwater.
- There are many narrow streets, alleyways with steps and hills within the domestic area, which make it difficult for vehicles (cars, bicycles, donkey carts or wheelbarrows) to pass some houses.
- There is a lot of stagnant wastewater in domestic areas. Wastewater (not sewerage) from households is disposed right next to the house through small pipes or holes. The stagnant water provides a breeding place for disease vectors within the domestic area. As the water is not fresh water but mixed with soap and other chemicals, it furthermore poses a threat to the environment including the soil and groundwater quality.

Comments of Community Members:

- Waste needs to be kept in a safe (good) way because during the rain season it is a risk to our health.

  "Kwa sababu taka ziwekwe vizuri wakati wa mvua hatari kwa afya zetu."

- I want the Municipal Council to bring some people to collect our waste that has a bad smell or to build a special place for dumping of waste.

  "Mimi naomba Baraza la Manispaa watuletee watu wa kuchukua taka maana zishakuwa zinaleta harufu mbaya au watupangie sehemu maalum ya kutupa taka."

- We clean our environment so it will be clean and safe to prevent different diseases transmitted by different insects, and to give education to the people about waste in order to improve our environment.

  "Tusafishe mazingira yetu ili yawe safi na kuridhisha kuepuka maradhi mbali mbali yanayo ambukizwa na aina ya wadudu, na kutoa ushauri kwa watu wasokuwa na elimu yoyote ya kuhusu takataka ili wadumishe mazingira yalio bora."

- The Municipality should employ young, strong workers and good supervisors, who should be paid a good salary so they will work well.

  "Kwa sababu Manispaa waajiri wafanyakazi vijana ambao wananguvu wafanyekazi kwa uhakika wapate wasimamizi wazuri na wawalipe mshahara mzuri kazi itafanyi kwa uzuri."

- We increase our efforts to clean the environment and to teach the community about cleanliness in our city in Zanzibar.

  "Tuzidishe bidii ya usafishaji mazingira na kuelimisha jamii katika hali ya usafi wa mji wetu wa Zanzibar."

Notes:

There is a registered NGO, which is concerned with health, HIV, environment and education.
The NGO is called *"Amani Social Development Organisation"* and is active since 2012. The NGO provides environmental education to the community, including information on proper waste disposal.

Currently the organisation does not offer any waste collection service. The group had to stop door-to-door collection due to lacking structure supplied by Municipal Council. The group had to collect the monthly fee (3.000/= TSh) in the name of the Municipal and faced the problem of people not willing or able to pay. Part of the money was forwarded to the Municipal Council.

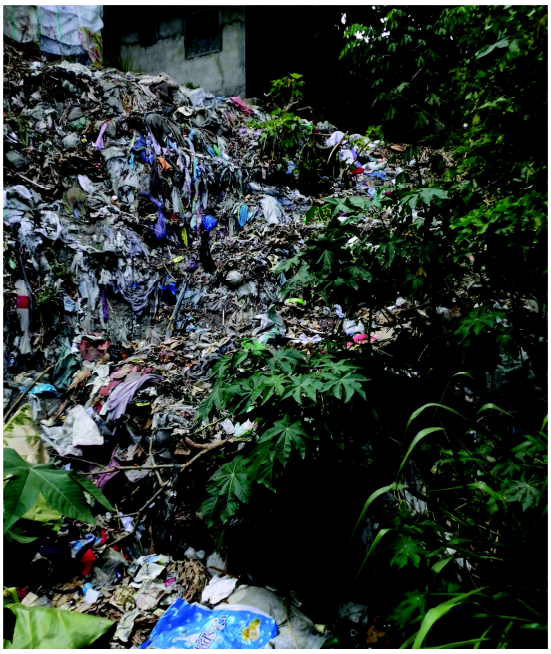
- Per house: 2.000/= Tsh for the NGO and 1.000/= Tsh to the ZMC
- Per shop: 2.000/= Tsh for the NGO and 4.000/= Tsh to the ZMC

The money from waste collection was insufficient to pay the workers adequately and provide essential tools and safety equipment.

Polluted river with self-built bridge

Old oil canisters cause soil pollution

Steps with ramp



Unofficial dumpsite

Chumbuni - 07./08./09.03.2015 (ZBC)

Zones: 6 Dump: 1 Drainage: yes

Observations:

- There is only one official dumpsite provided by the Municipal Council, which is unsatisfactory for the whole area. The waste is scattered widely around the dump and animals are rummaging around and eating the waste. Children look around the dumpsite for valuable waste materials. Some people use another dump in a different Shehia as it is closer to their homes.
- There are many unofficial places where waste is dumped randomly. People use abandoned private property (land and houses) as well as the river/drain running through the Shehia for dumping. Open spaces within the domestic area used for agriculture are also highly polluted by waste as citizens throw their waste over the fence of the separated area, where it accumulates in great heaps.
- The biggest unofficial dumpsite is a big open field at the side of the Shehia. There is a lot of waste spread widely across the area. The drainage opens out into the field, which causes stagnant water. In case of rain the complete area is flooded. There is a lot of grass and other plants growing in between the waste. Cows are grazing. People are looking through the waste for valuable materials and large areas of waste are set on fire. Children are running round and playing on the ground.
- The river/drain crosses many areas of the Shehia, which makes it necessary for residents to pass the water a lot during their daily activities. The current amount and size of bridges is unsatisfactory. All existing bridges have been built through community initiatives.
- During rain season the waste dumped into the river/drain causes flooding of domestic areas with dirt water and also waste materials are washed until the houses.

Comments of Community Members:

- In my opinion the Municipal Council should bring a container to our area. In our area waste is scattered around and causes a lot of diseases.
  "Maoni yangu Baraza la Manispaa watuletee kontena la kutilia taka katika eneo letu sehemu yetu yatupia taka mana taka zimezagaa na maradhi mengi."

- They should find us a special place for dumping waste and install a container.
  "Watutafulie pahala maalumu pakutupia taka watuwekee na kontena la kutulia taka."

- The Municipal needs to improve the services and to give us equipment to handle the waste.
  "Manispaa ituboreshee huduma kwa kutuwekea vifaa vya utendaji kazi kwa ajili ya kuwekea takataka."

- In my opinion the Municipal Council should build enough dumpsites for us to dump our waste, or to employ some special people that pass to collect our waste in order to clean our city.
  "Maoni yangu Baraza la Manispaa watuletee madampo ya kutosha ili tutie taka zetu au watuletee watu maalum wapite kutuchukulia taka wawaajili watu hao kwa ajili ya kuja tusafisha mji wetu."

- Environmental education should be provided regularly in order to understand environmental risks.
  "Itelete elimu juu ya mazingira iwe inatolewa mara kwa mara ili kujua athari ya mazingira."

Notes:

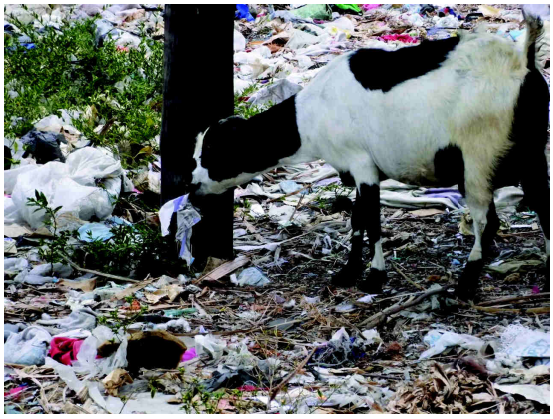
There is a group active in environmental cleaning in Chumbuni. It is called "*Kikundi cha Shehia Chumbuni*" (Group of the Shehia Chumbuni). The group currently has 21 members, but reports struggles to keep people committed, due to difficult working conditions.

The group provides cleaning of the river and drainage in the Shehia as well as other places with a high accumulation of waste. Group members work on a voluntary basis and there are no/little resources for proper tools and equipment. The Municipal Council has provided some tools in the past, but the amount is still insufficient. At the moment, the group does not provide door-to-door collection. A joint project with the Municipal Council was planned but until now no progress has been made.

Especially the older generation shows some awareness as the area had experienced a great cholera outbreak before. There have been some environmental education campaigns within the Shehia concerning waste, hygiene and important infectious diseases.

Sheha Hassan Juma Juma himself collects plastic bottles and sells them in big quantities.

Children playing on official dumpsite



Goat feeding on waste at official dumpsite

Agricultural land polluted by waste

Interview with Sheha of Chumbuni

Karakana - 11./12.03.2015 (ZBC)

Zones: 10 Dump: 2 Drainage: no/river (yes)

Observations:

- There are 2 official dumpsites provided by the Municipal. The waste is scattered widely around the dumpsites and animals are rummaging around and eating the waste. The waste is collected by the Municipal irregularly about once a month. One recently built dumping zone (concrete foundation with steps) is used as a meeting point by community members and not for waste disposal. Consequence is that people dump their waste randomly around the intended dumpsite.
- There are many unofficial places were people dump their waste. People use abandoned private property (land and houses) as well as open wells and the river running through the Shehia for dumping or the waste is dumped randomly within the domestic areas. One unofficial dumpsite is located next to a school, where waste is dumped in a hole and sometimes burned. It was also found that a lot of waste is dumped near a football ground.
- There is a river flowing through Karakana, which is highly polluted with waste. The waste causes blockages, which causes stagnant water, providing a breeding ground for flies, mosquitos and other insects. In case of rain it comes to flooding and spread of waste in domestic areas.
- There is no drainage system in Karakana. In case of rain the water flows downhill and causes flooding of domestic areas (especially in Zone 5) that are located further down. Especially during the rain season, the water rises to a very high level. Dirty water and waste enter the houses, which makes it impossible for some people to stay in there houses.
- The missing drainage system causes substantial problems during the rain season, as people cannot leave their houses in case of heavy rain or have to evacuate their houses completely. Sometimes the children cannot go to school because of the flooding.
- In Zone 5, many houses have already been abandoned by their owners because of the reoccuring flooding. Other residents of the area suffer from the situation but do not have the possibility to move to another area.
- The Municipal Council visited the area in November 2014 and the installation of a drainage system is planned in 2015. Until now the progress of the project is unknown.

Comments of community members:

- In my opinion, the Municipal Council should install a special place for dumping waste in our area and employ young workers that come to collect our waste.

  "Maoni yangu majaa mitaani yaondolewe kuwekwe sehemu maalum kutupia taka zetu. Pia tunawataka Baraza la Manispaa wawaajiri vijana waje kutuchukulia taka zetu."

- In my opinion we should implement a special program for the dumping of waste. It would be good to provide house dustbins to dump waste between (collection) days and equipment for the collection of dirty waste, for example rakes and gloves for protection against bacteria, etc..

  "Maoni yangu tufaniwe mpango maalum wa kutupia taka ikiwezekana tupatiwe house dasbin ya kutupia taka kati kati ya majuma mana kila unapopita jaa tupatie vifaa vya kukusanyia taka chafu kwa mfano tupatiwe reki ya kukusanyia taka chafu glove za kuwaa mkononi kwa kuziba tusipate bakteria, n.k.."

- We should clean our environment together to avoid the outbreak of diseases like cholera, diarrhea and vomiting.

  "Tushirikiane kusafisha mazingira ili tuepukanena maradhi ya mripuko kama kipindipindu na kuharisha na kutapika."

- People should be given education about waste and they should receive equipment. From time to time, professionals should pass to remind the community about cleanliness and waste.
  "Watu wapewe elimu kuhusu takataka na wapewe vifaa vinavyokwenda wa wakati wataalamu na wanajamii wewe wana kutana mara kwa mara kukumbushana mambo ya usafi na takataka."

- Here we do not have a drainage system so when the rain comes people have to stay in their houses. The water enters the houses.
  "Hapa petu hatuna mitaro ikinyesha mvua maji yanajaa watu wanahama ndani ya nyumba zao nyumba zinafinikwa na maji."

Notes:

There are 8 community groups within the Shehia of Karakana dealing with different issues: Adolescents, Defence and security, Elderly, Emergency, Environment, HIV, Malaria and Religion

The group active in environmental work is called *JUMAKA "Jumuia ya usafi na mazingira Karakana"* (Environmental Cleaning Group Karakana). It is active since 2004 and currently has 47 workers, 23 men and 24 women. The group started with cleaning the streets and other dirty areas within the Shehia Karakana. Since 2012 a door-to-door collection is offered in part of the Shehia. Waste is collected every day at a price of 100/= TSh. At the moment door-to-door collection service is only available in the Zones 1-4. The waste collection service is organised independently from the Municipal Council.

Residents wish for an increase of the door-to-door collection (Zones 5-10). For the provision of good service, further tools as well as safety equipment is needed.

Field visit accompanied by community members

Collapsed house due to heavy rainfall

House rendered uninhabitable by mudflow

Resident explains history of the area

Kilimahewa Bondeni - 05.02.2015

Zones: 3 Dump: 1 Drainage: yes

Observations:

- There is one official dumpsite in the Shehia. Waste is scattered around the dumpsite and therefore not all of it is collected. Animals are rummaging through the waste. The dumpsite is located right next to a football pitch. Some people use the dumpsite in Amani as it is closer to their houses.

- There are many unofficial places were people dump their waste. People use abandoned private property (land and houses) for waste disposal or it is dumped, burned or buried randomly within the domestic areas. The river/open drain running through the Shehia is also used for dumping by residents. The water of the river has stagnated in different areas due to the waste pollution.

- There are many narrow streets, alleyways with steps and hills within the domestic area, which make it difficult for vehicles (cars, bicycles, donkey carts or wheelbarrows) to reach/pass some houses.

- There is a lot of stagnant wastewater in domestic areas. Wastewater (not sewerage) from households is disposed right next to the house through small pipes or holes. The accumulated stagnant water provides a breeding place for disease vectors. As the water is not fresh water but mixed with soap and other chemicals, it furthermore poses a threat to the environment including the soil and groundwater quality.

Comments of Community Members:

- In my opinion the Municipal Council should build ways for crossing the drains.
  "Maoni yangu Baraza la Manispaa watujengee kuta za kupita maji (mitaro)."

- The Municipal Council needs to provide good service at our collection point because our children play on the dumpsites.
  "Maoni yangu Baraza la Manispaa wafanye jitihada ya kusafisha maeneo na kuchukua takataka kwenye majaa kwasababu watoto wetu wanachezea uchafu majaani."

- We want the Municipal Council to look for young workers to collect our waste. We also want the Municipal Council to bring us some equipment for work and take our waste, as we do not have a place for dumping.
  "Maoni yangu kwamba tunawataka Baraza la Manispaa watutafutie vijana ili waje kutuchukulia takataka. Pia tunawataka Baraza la Manispaa watuletee vifaa vya kufanya kazi na sisi tuchukuliwe taka zetu maana hatuna pa kuzipeleka."

- In my opinion the Municipal Council should come to clean our area and to put dumpsites, as waste is scattered around in our area and it causes diseases and is a risk for our health.
  "Maoni Yangu Baraza la Manispaa waje kutusafisha sehemu zetu chafu, na watuletee madampo ya kutilia taka maana taka zinazagaa kwenye eneo letu na kutusababishia maradhi na kutuathiri afya zetu."

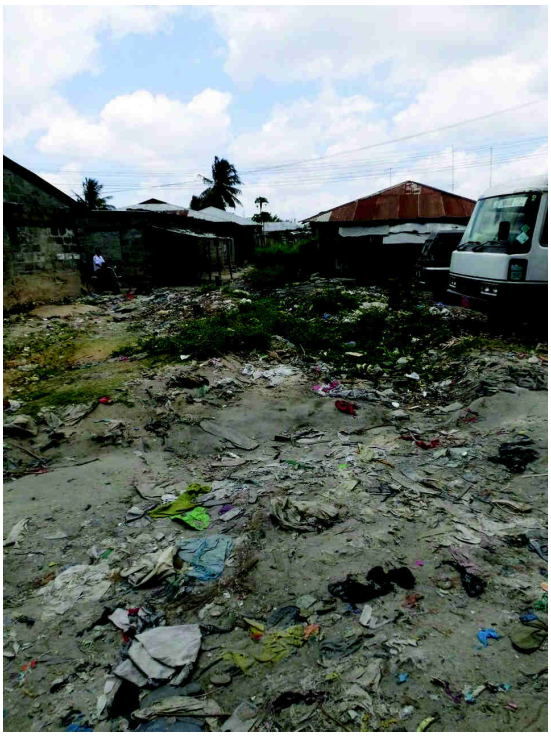
- First, the (community) groups need to take care about waste in our area.
  "Kwanza diwani awe anashuhulikia mambo ya takataka mitaani."

Notes:

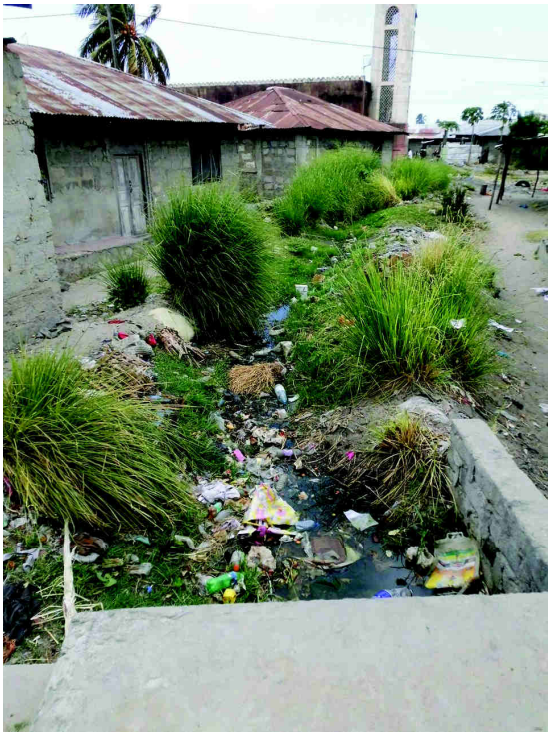
There is no NGO or group in the Shehia concerned with environmental issues. Informal workers provide door-to-door collection service. There is no fixed price for collection, but is charged according to the amount of waste.

Community members that live close to sources of stagnant water expressed concern about malaria.

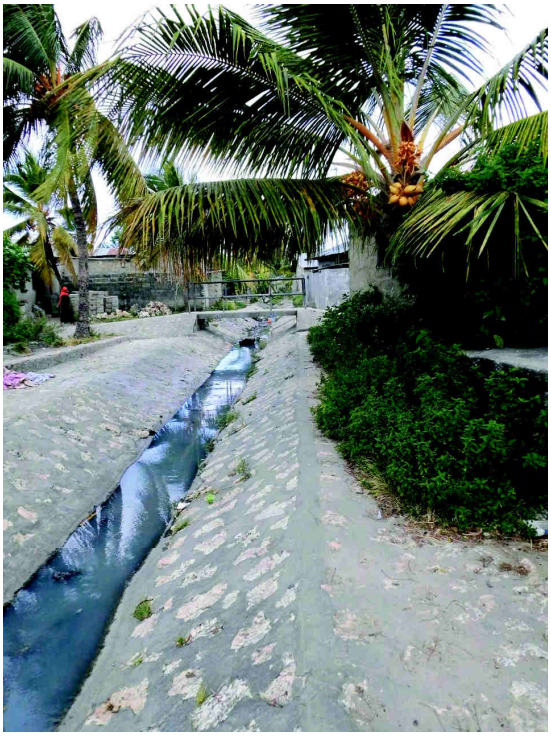
Stagnant water at domestic drainage outflow



Randomly spread waste



River polluted by waste



Newly established drainage with bridge

Kilimahewa Juu - 04.03.2015

Zones: 5 Dump: 1 (shared with Kwamtipura) Drainage: yes

Observations:

- Kilimahewa Juu has a shared dumpsite with the bordering Shehia Kwamtipura. The dump is located next to a school. The dumpsite is kept in a good state and the Municipal Council comes every day to collect the waste. Nevertheless, cows and other animals are looking through the remaining waste for food. As it is a big area, one dumpsite for two Shehias is insufficient, as some residents need to walk very long distances to dump their waste.
- There are many unofficial places where waste is dumped randomly. People use abandoned private property (land and houses) as well as the river/drain running through the Shehia for dumping. The river/drain is highly polluted by waste, which causes blockages and results in stagnant water.
- In some places, unofficial dumps have developed beside the riverbank right next to family houses. The mixed waste is accumulated in big heaps and waste materials as well as dirt water are washed down into the river during rain.
- The main roads are easy to pass even by bigger vehicles, such as small lorries, donkey or cow carts, as well as wheelbarrows. It is possible to pass most houses with some kind of transport for the purpose of waste collection.

Comments of Community Members:

- I want our adolescents to dispose waste properly, because it causes risk and outbreak of diseases, such as cholera.

  "Nawataka vijana wenzangu tutupe taka vizuri kwani zitaleta hataa na kusababisha maradhi ya mripuko mfano kipindupindu."

- In my opinion the government should install a container for storing waste in our area because the city is very dirty and people dump waste randomly in our living environment. This is my request for the government. If they care for the community they will do this to reduce the pollution of our environment.

  "Maoni yangu kwa serikali ituletee makontena kwa ajili ya kuhifadhia taka katika maeneo yetu kwani mji ni mchafu mno watu wanatupa taka ovyo katika mazingira yanayotuzuka. Huu ndio wito wangu kwa serikali hii kama inatujali wananchi wake na watufanyie hivyo ili kupunguza uchafuzi wa mazingira."

- Additional working equipment, such as wheelbarrows and education about cleaning is needed in our area.

  "Viongezwe vifaa vya kufanyia kazi kama mabero itolewe elimu mitaani kuhusu usafi."

- The Municipal and the community should cooperate.

  "Manispaa wananchi washirikiana."

- We want the Shehas to select young people who come to collect our waste.

  "Tunawataka masheha waweke vibae ili kuwachagua vijana ili waje kutubebea taka zetu."

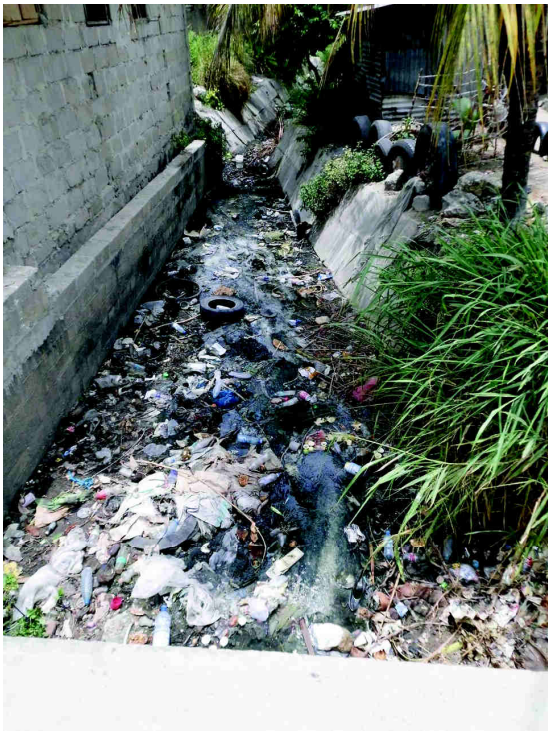
Notes:

There is a group active in environmental cleaning. The group offers door-to-door collection in the Shehias of Kilimahewa Juu and also Kwamtipura. Waste collection is charged according to the amount of waste (200-500 /= TSh).

The tools and equipment such as wheelbarrows, gloves and boots were partly financed through the group itself and partly through private contribution of workers. The amount of equipment is still insufficient to provide service on a big scale.

Burning waste next to house

River polluted by waste



Drainage polluted by waste

Unofficial dumpsite

Kwamtipura - 02./03.03.2015 (ZBC)

Zones: 10 Dump: 1 Drainage: yes

Observations:

- Kwamtipura has a shared dumpsite with the bordering Shehia Kilimahewa Juu. The dump is located next to a school. The dumpsite is kept in a good state and the Municipal Council comes every day to collect the waste. Nevertheless, cows and other animals are looking through the remaining waste for food. As it is a big area, one dumpsite for two Shehias is insufficient, as some residents need to walk very long distances to dump their waste.
- There are many unofficial places where waste is dumped randomly in domestic areas as well as public places.
- There is a river running through the Shehia, which is highly polluted by waste, which causes stagnant water, blockages and flooding within the domestic areas. The houses along the river have small drainages that discharge the dirt water directly into the river. A resident was seen washing some clothes/materials in the water, next to big heaps of accumulated waste.
- Residents living near the river, clear the waterbed from waste on their own initiative, because the blockages and flooding threatens the safety of their homes.
- In some places it is difficult to pass the water, as the amount of bridges is insufficient. Residents have to use the accumulated waste as a bridge to cross the river.
- There is a lot of stagnant wastewater in domestic areas. Wastewater (not sewerage) from households is disposed right next to the house through small pipes or holes. As there is no drainage system, the accumulated stagnant water provides breeding place for disease vectors.
- As the water is not fresh water but mixed with soap and other chemicals, it furthermore poses a threat to the environment including the soil and groundwater quality.
- There are many small and steep roads as well as steps, which makes it difficult for vehicles (cars, bicycles, donkey carts or wheelbarrows) to reach/pass some areas.

Comments of Community Members:

- The Municipal should improve the cleanliness and educate the community about the environment. And if you consider the coming rain we need to clean our environment.
  "Manispaa ijitahidi kuimarisha usafi na waelimishe jamii kuhusu mazingira. Na ukitazama mvua hizo zina kuja kwahiyo tujitahidi kufanya usafi wa mazingira mitaani kwetu."

- The Municipal should make an effort to clean in order to prevent diseases.
  "Manispaa wajitahidi kufanya usafi kwa kuepusha maradi kuzaliana."

- In my opinion all community members should work together to reduce the spreading of waste in our environment.
  "Maoni yangu tushirikiane wananchi zote ili kupunguza takataka zinazosambaa katika mazingira yetu."

- I want the Municipal Council to install a special place for the dumping of waste because we are tired of the bad smell from the drain where waste is dumped.
  "Mimi nawaomba Baraza la Manispaa watutafutie sehemu maalum ya kutupa taka kwa sababu tushachoka na harufu za mitaro inayotupwa taka."

- In my opinion we want the Municipal Council to bring some people that collect our waste.
  "Maoni yangu kwamba tunawataka Manispaa waje watuletee watu ya kutuchukulia taka yetu."

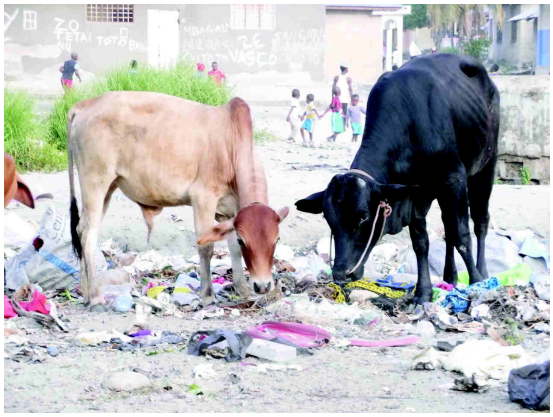
Notes:

Kwamtipura itself does not have any group that deals with environmental issues. The cleaning group of Kilimahewa Juu services the Shehia with door-to-door collection.

Resident cleaning polluted river interview by ZBC

Randomly dumped waste

Crude dumping and burning of mixed waste



Cows feeding on waste at official dumpsite

Resident washing clothes in polluted river

Obstructed alleyway

Kwawazee - 07.02.2015

Zones: 6 Dump: 2 Drainage: yes

Observations:

- There are 2 official dumpsites provided by the Municipal. The waste is scattered widely around the dumpsites and animals are rummaging around and eating the waste. The waste is collected by the Municipal irregularly.
- There are many unofficial places were people dump their waste. People use abandoned private property (land and houses) as well as an open drain for dumping or the waste is dumped randomly within the domestic areas.
- One informal dumpsite is located near a small lake where rain and wastewater accumulates. A lot of children can be seen using mosquito nets to catch fish.
- There are many narrow streets and alleyways with steps, which make it difficult for vehicles (cars, bicycles, donkey carts or wheelbarrows) to reach/pass some houses.
- There is a lot of stagnant wastewater in domestic areas. Wastewater (not sewerage) from households is disposed right next to the house through small pipes or holes. As there is no drainage system, the accumulated stagnant water provides breeding place for disease vectors.
- As the water is not fresh water but mixed with soap and other chemicals, it furthermore poses a threat to the environment including the soil and groundwater quality.

Comments of community members:

- The Municipal should improve the environmental cleaning service and should start a programme to educate the community about how to take care of the environment.

  "Baraza la Manispaa waongeze huduma za usafi katika mazingira, pia waweke vipindi vya kuelimisha watu jinsi ya kutunza mazingira."

- Cleaning service and cooperation with the Municipality of Zanzibar should be improved. The number of dumpsites and working equipment at the collection points needs to be increased and waste needs to be collected on time.

  "Uzidishwe usafi na ushirikano kwa pamoja katika Manispaa ya Zanzibar na ziongezwe nyenzo za kufanyia kazi katika madampo ya kutilia taka, na yawe mengi na taka zichukuliwe kwa wakati."

- The government workers should make an effort to implement an extensive law concerning cleanliness so every person takes care of their environment.

  "Watu wa serikali wajitahidi kuweka sheria ambazo zitakidhi kuhusiana na mambo ya usafi ili kila mmoja wetu awe ni mdau wa tunza mazingira yake."

- In my opinion the Municipal Council should employ people and educate the community, otherwise our city is going to be very dirty.

  "Maoni yangu Baraza la Manispaa wa waajiri watu la siivyo mji utazidi kuwa mchafu na waelimishe wanajamii."

- The Municipal Council should build bridges to cross the water (drain).

  "Baraza la Manispaa waje watundengeze daraja la kupitia maji (mitaro)."

Notes:

There is a community group active in environmental cleaning. The group is called "Zanzibar Green Environmental for Development of Society" (ZAGREDS), active since 2012.

The group works in cooperation with the Municipal Council and offers door-to-door collection in the Shehia Kwawazee and Nyerere. The workers pass the houses in Kwawazee everyday and twice a week in the neighbouring Shehia Nyerere. The waste is collected from households that pay the 3.000/= TSh monthly ZMC service fee. 2.000/= Tsh goes to the group and 1.000/= Tsh goes to the Municipal Council.

The pay for workers is very low and is often delayed. The Municipal Council provides tools for waste collection, but the amount and quality of equipment is insufficient, what makes it difficult for the group to provide reliable services. As the Municipal Council does not collect the waste from the dumpsites in Kwawazee on time, the group uses wheelbarrows to take the waste from the dumpsites in Kwawazee to the dump in the neighbouring Shehia Amani. From there the Municipal Council collects the waste with garbage trucks. However the schedule for collection is irregular.

Randomly spread waste

Abandoned house polluted by waste

Unofficial dumpsite

Children fishing in polluted water

Mkele - 03.02.2015

Zones: 10 Dump: 1 Drainage: yes

Observations:

- Mkele is serviced with one official dumpsite. The waste is scattered widely around the dump and animals are rummaging around and eating the waste.
- People also use abandoned private houses for the disposal of waste or it is dumped, burned and buried randomly within the domestic areas. Many residents also use the open drainage/river for dumping of waste.
- Many streets are small and uneven, but smaller vehicles, such as wheelbarrows for waste collection, can easily reach most areas. There are few plants and trees within the domestic area.
- There is a lot of stagnant wastewater in domestic areas. Wastewater (not sewerage) from households is disposed right next to the house through small pipes or holes. The accumulated stagnant water provides a breeding place for disease vectors. As the water is not fresh water but mixed with soap and other chemicals, it furthermore poses a threat to the environment including the soil and groundwater quality.
- Houses along the river/drain discharge their dirt water into the river.

Comments of Community Members:

- We need to increase our efforts to clean.

  "Tuzidishe bidii kufanya usafi."

- In my opinion the Municipal should make an effort to come and teach the community about dumping of waste.

  "Maoni yangu Manispaa wajitahidi kutupitia kuelimishe wanajamii kuhusu utupaji wa taka."

- In general the Municipal needs to collect the waste on time, if they delay for collection waste it is spread widely.

  "Kwa ujumla Manispaa wajekuchukuwa kwa muda utopangwa wasikae mpaka taka zinakuwa nyingi sana zinazagaa."

- In my opinion the Municipal Council should build a dump and should come to collect the waste on time because there is a high accumulation and spillage of waste. Animals eat the waste and there are a lot of flies that cause stomach disease and their transmission.

  "Maoni yangu wajitahidi kujenga madampo na Baraza la Manispaa wajitahidi kuja kuchukua taka mara kwa mara kwa sababu taka zinajaa sana mpaka zinatoka nje wanyama wanakuwa wanakula na nzi wingi ambao wanasababisha na maradhi ya matumbo ya kuhanisha."

- I would like the Municipal Council to bring some equipment for dumping waste, as we are tired of dumping our waste into the drainages. We also want the Municipal to look for some young workers to collect our waste.

  "Mimi naomba Baraza la Manispaa watupe vifaa vya kutilia taka maana tushachoka kutupa kwenye makaro ya maji machafu. Pia tunawataka Manispaa watutafutie vijana wanaoweza kazi ili wajo watuchukulie taka zetu."

Notes:

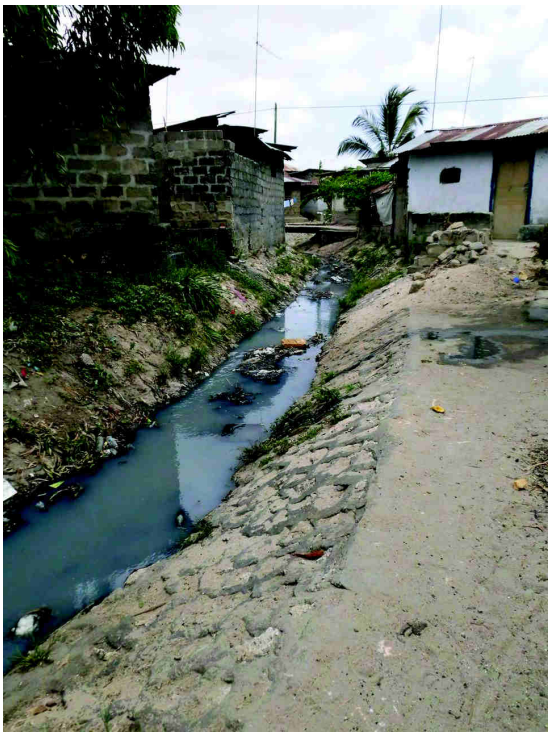
There is a group active in environmental cleaning. It is called *"Usafi ningau Mkele"*. The group is active since 2012 and currently has 11 members. The group offers door-to-door collection independently from the Municipal Council. Households are passed every 2-3 days and serviced with waste collection if they are willing and able to pay. Prices for collection are charged according to the amount of waste.

The workers are equipped with gloves, gumboots, overalls, mouth protection and tools. The household waste is collected with wheelbarrows.

Waste widely spread at official dumpsite

River polluted by mixed waste

Obstructed alleyway



Newly established drainage

Muembe Makumbi - 14./15.03.2015

Zones: 5 Dump: 1 Drainage: 1

Observations:

- There is only one official dumpsite at the boarder of the Shehia. The dumpsite is located next to a Madrasa School and the waste is scattered around. The waste is not picked up regularly by the ZMC and collection delayed up to 3 months.
- Some people use the dump in Shaurimoyo, as it is closer to their houses. In the evenings young people play football on the ground of the dump. To reach the dump in Shaurimoyo people have to cross the river, but there is no bridge in that area.
- There is a big unofficial dump in one zone (A). Zone A is separated from the rest of the Shehia by a big road.
- Children look through the waste for valuable materials without any means of protection and sometimes even without shoes.
- The boarder between Muembe Makumbi and Shaurimoyo is along a river. Because there are not enough bridges, cars, motorbikes and other vehicles cannot pass. Also the residents cannot pass safely but have to jump across or walk through the dirt water.
- The river/drain transports wastewater and also waste within the water to the ocean. The drain is polluted by a lot of waste, which causes blockages. Due to bad condition and lacking drainage in some areas, the water settles within the domestic areas. The stagnant water provides a good breeding place for flies, mosquitos and other insects.
- During the rain season the water flows downhill and causes flooding of domestic areas that are located further down. Also the blockage of drains with waste causes flooding. As a result waste swims around, which increases the risk for disease.
- There are many small and steep roads as well as stairs, which makes it difficult for vehicles (cars, bicycles, donkey carts or wheelbarrows) to reach/pass some areas. It is also difficult to reach some of the houses by foot, especially for older residents, as you have to climb a lot of stairs. The location of some houses makes door-to-door collection difficult.

Comments of Community Members:

- In my opinion the government should build a drainage in our area, as the water rises to our houses and destroys the environment.

  Maoni yangu kwa serikali itujengee huu mtaro uliopo katika eneo letu kwani unapandisha maji hadi kwenye makazi yetu yaani kwenye nyumba na kuharibu mandhari."

- In my opinion we want the Municipal to look for a special place for dumping of waste. The groups should choose young workers that come to collect our waste.

  "Maoni yangu tunawataka Manispaa watutafutie sehemu maalum pa kutupia taka. Pia wanavikundi wakae na wachague vijana wanaoweza kazi na waje kutchukulia taka zetu."

- The Municipal Council needs to collect the waste on time because if they delay, there will be problems.

  "Baraza la Manispaa lijitahidi kuchukuwa takataka kwa wakati kwa sababu wanapochelewa linakuwa tatizo."

- In my opinion I want someone to pass every house in our area to give education on waste. *"Maoni yangu nataka wapitiwe watu katika mitaa tunayoishi nyumba hadi nyumba ili kupatiwa elimu ya takataka."*

Notes:

There is a group active in environmental work. It is called *"Mshkamano ndiyo nguvu yetu".* The group is currently looking for a new secretary. There is no structured system for payment and new tools and equipment is needed. The group wants to provide door-to-door collection and clean highly polluted areas including drainages but their work is limited due to lack of resources.

The Tanzania Social Action Fund *"TASAF"*, provided the cleaning of drains (also in other Shehias). The public development programme aims at poverty reduction through engagement of local authorities and communities. Community members were grateful for the interventions, which are limited to the project period. Aim is to establish self-supporting initiatives from within the community; the outcome however is unknown at this point. Further information can be found at: http://www.tasaf.org/index.php/about-us/organization/pssn-project-description

River used as unofficial dumpsite

Eutrophic stagnant water

Burst drain during rain season

Muungano - 27.01.2015

Zones: 3 Dump: 1 Drainage: no

Observations:

- There is only one official dumpsite provided by the Municipal Council, which is insufficient for the whole area, as the dumpsite is far away from some households. The waste is scattered widely around the dumpsites and animals are rummaging around and eating the waste.
- There are many unofficial places where waste is dumped randomly in domestic areas as well as public places. A lot of waste is burned in between the houses.
- There are many narrow streets and alleyways with steps, which make it difficult for vehicles (cars, bicycles, donkey carts or wheelbarrows) to reach/pass some houses.
- There is a lot of stagnant wastewater in domestic areas. Wastewater (not sewerage) from households is disposed right next to the house through small pipes or holes. As there is no drainage system, the accumulated stagnant water provides a breeding place for disease vectors. As the water is not fresh water but mixed with soap and other chemicals, it furthermore poses a threat to the environment including the soil and groundwater quality.

Comments of community members:

- Citizens should get instructions on how to store and dump waste properly.
  " Tujitahidi wananchi tufate maelekezo tunayo pewa ya kutupa taka na kuzihifadhi."

- Dumping of waste should be prevented.
  " Maoni yangu kuwepo naulinzi kwenye utupaji wataka."

- In my opinion young people should be employed in our Shehia that come to take our waste so our city will be clean.
  "Kwa maoni yangu mimi naona waajiriwe vijana kwenye Shehia waweze kuchukua taka ili mji uwe safi."

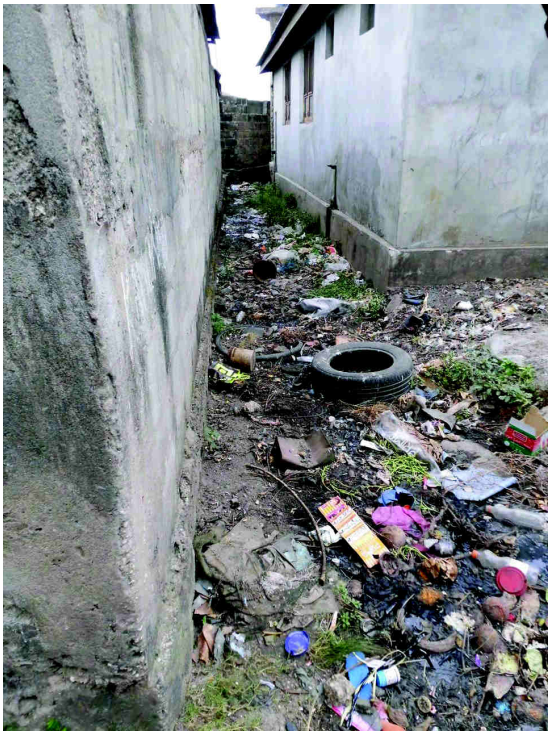
- The government and the community have a shared responsibility to maintain hygiene/cleanliness in our area.
  "Serilaki na wanajamii wawe kitu kimoja katika kudumisha usafi na mazingira katika maeneo yetu."

- In my opinion our city in Zanzibar is clean but the Municipal Council should bring enough equipment to dump waste.
  "Mimi naona mji wetu wa Zanzibar uwesafi vilevile Manispaa liwe na vifaa vya kutosha vya kuwekea takataka."

Notes:

At the moment there is no community group concerned with waste and environmental issues in Muungano. The former group had to stop their work due to lack of resources (money).

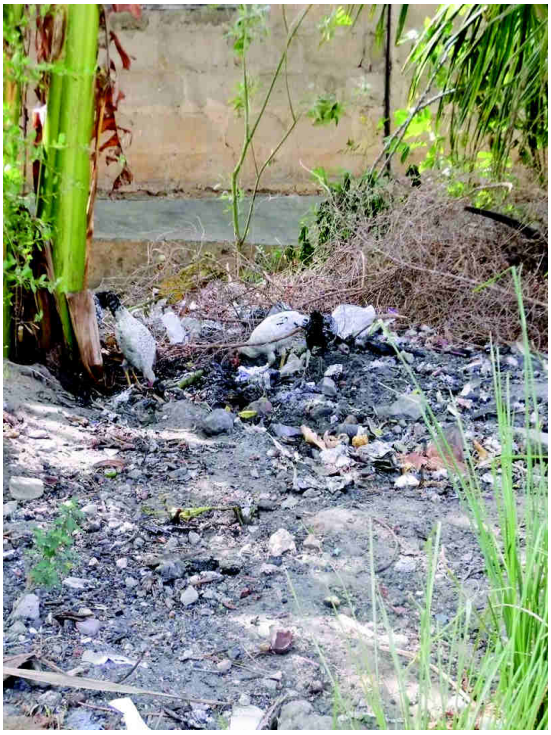
The community is generally willing to engage in waste collection and management but a small daily income is very important for families' survival. Sheha Suleiman Haji Haji recognises that the government as well as community need to be made aware about the current waste situation in city of Zanzibar. The Shehas alone cannot solve the situation but need support from Municipal. The target is to establish reliable and payable door-to-door collection in the Shehia.



Randomly dumped waste in alleyway

Stagnant water from domestic outflow

Burnt waste close to house



Chicken feeding on randomly dumped waste

Nyerere - 28./29.01.2015

Zones: 6 Dump: / (1 unused) Drainage: no

Observations:

- The Shehia of Nyerere is comprises a very big area but has no official dumpsite.
- Waste is mainly dumped in two areas with stagnant groundwater (wetland). There is a lot of waste spread widely across the area. The drainage opens out into the field, which causes stagnant water. In case of rain the complete area is flooded. There is a lot of grass and other plants growing in between the waste. Cows are grazing. The wetlands provide ideal breeding ground for mosquitos. Both grounds are close to domestic areas and which raises the risk of malaria for the community.
- People also use abandoned private houses for the disposal of waste or is dumped randomly within the domestic areas. A lot of waste is burned in between the houses. Animals (goats, chicken, cats) are rummaging through the waste, looking for food.
- There are many narrow streets, alleyways with steps and hills within the domestic area, which make it difficult for vehicles (cars, bicycles, donkey carts or wheelbarrows) to reach/pass some houses. In general the environment is very ambivalent concerning trees and plants, road quality and accessibility of houses as well as the amount of randomly scattered waste.
- There is a lot of stagnant wastewater in domestic areas. Wastewater (not sewerage) from households is disposed right next to the house through small pipes or holes. As there is no drainage system, the accumulated stagnant water provides a breeding place for disease vectors. As the water is not fresh water but mixed with soap and other chemicals, it furthermore poses a threat to the environment including the soil and groundwater quality.

Comments of Community Members:

- We pay the Municipal but they don't come to collect the waste and to look at the state of the environment, only the Sheha. We wish to cooperate with the Municipal.
  "*Manispaa tunawalipa pesa lakini taka hawaji kuchukua hawakaguwi mazingira mpaka apite Sheha. Tunaomba ushirikiano na Municipaa."*

- The Municipal Council should increase education for the community to dump waste according to the law or to store and handle waste in a better way.
  "Baraza La Manispaa wazidi kuwapa elimu wananchi wake ili kutupa taka kwa sheria au aweze kuhifadhi taka zako kwa vizuri na awe na utunzaji bora."

- In my opinion they need to improve the waste service and avoid spreading of waste around the container. They should make an effort to remove the waste every day, if it stays bad small occurs, disturbing the community. Children play with the waste instead of going to school.
  "Maoni yangu waboreshe huduma za taka zisizagae zinafurika kwenye makontena wajitahidi kila baada ya siku moja wawe wanaziondoa zikizagaa zitatoa harufu zitakera wanajamii. Watoto zitawapotezea muda watoto wasizione wakapata muda wakwenda chuoni skuli."

- In my opinion the Municipal Council should bring workers to collect our waste as the accumulated waste attracts a lot of flies.
  "Mimi naomba baraza la manispaa watuletee watu wa kubeba taka zetu maana sasa tunaona uchafu umezidi na nzi wengi wanazuliwa."

- The Municipal Council should give people education about how to dump waste and to educate them in order to avoid the transmission of local diseases, for example cholera, malaria, ebola, etc.

  "Baraza la Manispaa wawe na juhudi ya kuwapa watu elimu juu ya utupaji wa taka na kuwaelimisha ili kuepukana na maradhi ya kua mtaa mbukizo kwa mfano kipindipindu, malaria, ebola, n.k."

Notes:

There is a group working in the field of health, specialised in malaria prevention and health education.

Currently there is no group concerned with waste collection. Informal workers offer door-to-door collection service in the Shehia. Serviced households pay a fee for the waste collection, which is negotiated individually.

Randomly burnt waste

Cow feeding on waste on wetland

Well polluted by waste

Stagnant water from domestic outflow

Sebleni - 08.02.2015

Zones: 4 Dump: 1 Drainage: no

Observations:

- There is one official dumpsite provided by the Municipal. The waste is scattered around the dumpsites and animals are rummaging around and eating the waste. The waste is collected by the Municipal once a week. The frequency of collection is not sufficient which is why people set the dump on fire to reduce the amount of waste, bad smell and appearance of flies, rats and other animals.
- The dumpsite is located next to a football pitch and community meeting point.
- There are many unofficial places were people dump their waste. People use abandoned private property (land and houses) or the waste is dumped randomly within the domestic areas.
- One informal dumpsite is located near a small lake where rain and wastewater accumulates. A lot of children can be seen looking through the waste for useful materials and using mosquito nets to catch fish.

Comments of Community Members:

- In my opinion the Municipal Council should bring working equipment to our area.
  "Maoni yangu Baraza la Manispaa wajitahidi kutuleta vifaa vya kutendea kazi katika eneo letu."

- First, waste management and water service need to be improved and they (the ZMC) should bring us equipment for handling of waste and a waste container.
  "Kwanza usimamizi mzuri wa taka, huduma za maji, pia ziboreshwe watuwekee vyombo vya kuwekea takataka na watuwekee contena la taka."

- We are very thankful to the groups that pass our houses to collect our waste together with our Sheha and our programme should continue.
  "Tunashukuru sana kwa kujitokeza vikundi vinavyopita majumbani kwa kuchukua taka pamoja na sheha wetu na huumfumo uendelee. "

- We want the Municipal to pass our living areas for household waste collection and to keep the price low, as many people are poor.
  "Tunataka manispaa wapite mitaani kuchukua taka majumbani na bei ya ubebaji taka wapunguze bei wengine maskini."

- We need to take care of our city's cleanliness to eliminate diseases.
  "Tujishuhulishe na usafi wa mji ilikuondosha maradhi madogo madogo."

Notes:

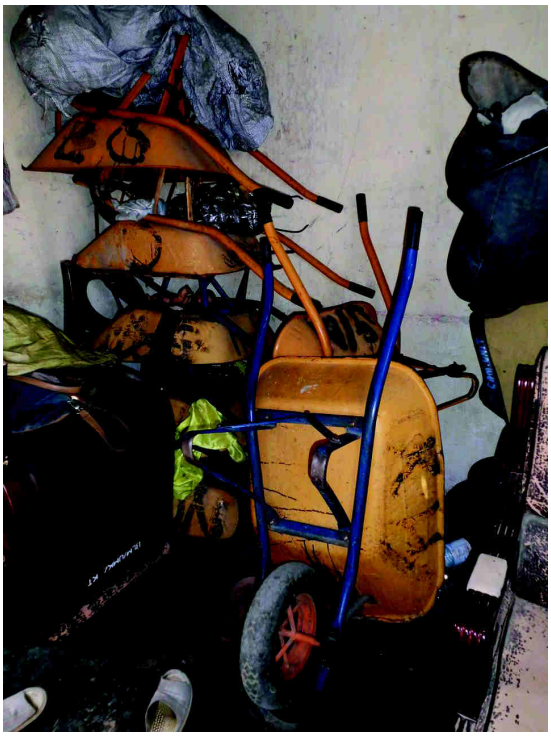
There is a community group active in environmental cleaning. The group is called "Kikundi cha afya meandeleo - Zanzibar Community Health for Society" (ZACOMESO), it is active since 2011 and has. The group offers door-to-door collection in the Shehia Sebleni independently from Municipal services. The household waste is collected 3 times a week and prices for collection are charged according to the amount of waste. Nevertheless, not all areas of the Shehia are covered by the waste collection service and some residents have difficulties the pay the fee. The group has organised some tools themselves but is in need of support to increase the amount of equipment.

Drainage outflow at unofficial dumpsite

Official dumpsite

Unofficial dumpsite

Mixed waste



Unused tools due to lacking resources of community group

Shaurimoyo - 04.02.2015

Zones: 5 Dump: 1 Drainage: yes

Observations:

- There is one official dumpsite in Shaurimoyo. It is located at the boarder of the Shehia. The waste is scattered widely around the dump and animals are rummaging around and eating the waste. Residents set parts of the accumulated mixed waste materials on fire. Due to the bad condition of the dump, the Municipal Council fails to collect and clear all waste from the dumpsite.
- The dumpsite is located near the river and residents dispose their waste very close to the riverbank. In case of rainfall the waste is washed into the water.
- Waste collection is scheduled once a week, but the ZMC collection from the dumpsite is often delayed. Sometimes the waste is not collected for weeks.
- People also use abandoned private houses for the disposal of waste or it is dumped, burned and buried randomly within the domestic areas. Many residents also use the open drainage/river for dumping, which is why it is highly polluted with waste.
- In some areas, the waste pollution causes the river water to stagnate. Stagnant water provides ideal breeding ground for flies and mosquitos and raises risk of disease in neighbouring domestic areas.
- There is a lot of stagnant water in domestic areas. Dirt water (not sewerage) from households is disposed right next to the house through small pipes or holes. The accumulated stagnant water provides a breeding place for disease vectors.
- As the water is not fresh water but mixed with soap and other chemicals, it furthermore poses a threat to the environment including the soil and groundwater quality. Houses along the river discharge their wastewater directly into the river.

Comments of Community Members:

- First, the Municipal should strengthen their service. Equipment for different environmental conditions as well as individual dustbins for every house needs to be provided. If service is good, we are willing to pay for measures to stop the problems caused by waste. We should build an oven to burn waste within the Shehia.

  "Kwanza Manispaa imarishwe kuliko ilivyo sasa, na wapatiwe vifaa vya kuzolea taka vya kila aina vya barabarani, na vya mtu binafsi kama madasbini kwa kila nyumba kumi moja moja ikiwa mambo mazuri tuko tayari kulipia harama na kazi zote za kushughulikia taka ili kumaliza tatizo la taka na tujengewe tanuri la kuchoma taka kwenye Shehia."

- In my opinion there should be a law concerning the environment and waste. It will improve the environment in our city in which we live.

  "Kwa mtazamo wangu ziwekwe sheria juu ya masuala ya mazingira na takataka kwa ujumla inaweza kuleta unafuu wa mazingira katika mji yetu tunayoishi kwa ujumla."

- In my opinion we want the Municipal Council to bring some young workers who can collect our waste. We also want the Municipal to bring us some working equipment.

  "Maoni yangu kwamba tunawataka Baraza la Manispaa watuletee vijana wanaoweza kazi waye kutuchukulia taka letu. Pia tunawataka Manispaa watuletee vifaa kufanyia kazi."

- In my opinion the Municipal Council should start a project, either with the community or the Municipal Council itself because there is a lot of waste. We also need the Municipal to supply equipment for handling of waste.

"Maoni yangu baraza la manispaa tufanyiwe mradi aidha kwa mtu au wenyewe Baraza la Manispaa maana taka zishakuwa nyingi tena zinatukera pia tunawataka Manispaa watuletee vifaa vya kutulia taka."

- My opinion, the Municipality does not maintain the collection points well, as a lot of waste accumulates over a long time.
  "Maoni yangu sehemu za kutupia takataka Manispaa hawashughulikii ipasavyo taka nyingi sana zinakaa muda mrefu."

Notes:

There is a group concerned with community health education, especially malaria.

There is a cleaning group, which is called " Association for Shaurimoyo Sustainable Environment (ASSE)" is active since 2012. The group used to offer household waste collection service and used to clear the scattered waste at the dumpsite every Sunday before collection. The group was furthermore concerned with the cleaning of drains.

Currently the group does not offer any waste collection service. The group was working in cooperation with the Municipal Council but had to stop door-to-door collection due to lacking structure supplied by Municipal Council. The workers had to deal with the problem of community members not being willing or able to pay fee. All required tools for management of waste were organised by the group itself and are ready to be used (boots, gloves, wheelbarrow). The monthly "pay" for group members was very little (ca. 3.000/= TSh per month), which is why the group could not continue its activities.

Official dumpsite

River polluted by waste

Unofficial dumpsite

Newly established dumpsite

Field observations during rain season - April 2015

Nyerere: Unserviced dump

Flooding of domestic area with dirt water

Kwamtipura: Torrent in domestic area

Waste swept away by stream

Chumbuni: Residential area widely flooded

Waste widely spread by flooding

Karakana: Field visit with community members

Child using fridge as boat

AFFIDAVIT

I hereby confirm that I am the author of the Master Thesis presented. I have written the Master Thesis as applied for previously unassisted by others, using only the sources and references stated in the text.

Date: 06.04.2016

Submitted by: Isabel Wolters