POLLUTION RISK ACCUMULATION FROM HOUSEHOLDS IN DAR-ES-SALAAM

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A thesis submitted in partial fulfilment of the requirements of Lund University
International Master’s Programme in Environmental Studies and Sustainability Science, for the degree of MASTER OF SCIENCE
May, 2011

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Abstract

Today, more than half of the world’s population lives in cities, one third of who reside in slum areas. In slum areas and other informal settlements people reside under conditions of constrained services and infrastructure- consequently many of them are exposed to a wide range of health risks. The aim of this thesis was to assess the factors that pose health risks to the urban dwellers in the slum areas of Dar-es-Salaam. To achieve this aim the thesis focused on the assessment of conditions of the urban living environment that if not managed can pose a health risk to the urban dwellers. The urban environment factors that were assessed include housing water supply, solid waste, drainage, road access and waste water sewage. Mnazi Mmoja and Midizini sub wards of Dar-es-Salaam were used as case study areas. The data was collected with the aid of semi structured interviews, focus group discussions, observations and literature review. The diseases that were found to be predominant in Mnazi Mmoja and Midizini sub wards are malaria, cholera, diarrhoeal and typhoid. The factors that present health risk in the case study areas were found to be: use of unsafe water because of limited access to safe water supply, pilling up of solid waste due to inadequate waste handling and collection, poor housing condition including overcrowding, indoor smoke from cooking and filthy external surrounding, stagnant water on storm drains due to waste accumulation leading to blockage, narrow and inaccessible part during emergency services. These factors were driven mainly due to absence of proper urban planning that leads to proliferation of informal settlements following rapid urban population growth, but unmatched and slow expansion of infrastructure and housing. It is important for the government to take measures in planning and advocating the upgrading of these informal settlements through more participatory approach by including residents of these settlements.

Key words: urban health risk; diseases; slum dwellers; urban planning; urban environment; urban growth; water supply; sewage and waste-water; solid waste; drainage
Acknowledgement

Appreciation is one way of recognizing the value or significance of the received assistance and contribution. In the process of producing this thesis, a number of people and relevant offices, have been helpful and cooperative to enable this achievement. In fact it is not possible to mention everyone who contributed for this particular research study but kindly few are mentioned below

First and in a special way, I would like to thank my Main Supervisor, Dr. Nicodemus Mandere, for his superb contribution through having consultation and support up to the end of this dissertation. The Head of Department Dr Stefan my lecturers in LUMES for their critics, directives and help, when I was carrying out the research.

I wouldn’t forget my parents, Mr Hozefa Gulamabbas and Mrs Salma Hozefa and my sisters Farida, Sakina and Tasneem for their great love and support they have been giving me since I started this long academic journey up to this level. I would also like to thank my girlfriend Helena for supporting me in every step throughout this thesis work.

I also thank in advance the staff members of Manzese Local Authority office, Manzese clinic personals and Doctor in charge and Municipals and city council officers. Without their support in helping to acquire the findings for this study, achieving results would be very difficult. Finally, I acknowledge the key informant Mr Ally for his help in arranging and introducing me to persons to be interviewed in the case study area.

Nothing at all could be done in the way planned, if God didn’t take care of every single step in this academic journey till today as I wind up this thesis. May, all mighty have mercy be upon all.
Table of contents

1. Introduction ................................................................................................................................. 6
2. Aim and objectives ...................................................................................................................... 7
3. Theoretical framework for urban health risk ................................................................................. 8
   3.1. Urban growth ......................................................................................................................... 8
   3.2. Urban planning ...................................................................................................................... 9
   3.3. The Urban Environment ....................................................................................................... 10
       3.3.1. Housing .......................................................................................................................... 10
       3.3.2. Water ............................................................................................................................ 11
       3.3.3. Sewage and waste water .............................................................................................. 12
       3.3.4. Solid waste ................................................................................................................... 12
       3.3.5. Accessibility ................................................................................................................ 13
4. Study area description .................................................................................................................. 13
   4.1. Dar-es-salaam city ................................................................................................................. 13
5. Methods and materials ............................................................................................................... 16
   5.1. Preliminary field investigations ........................................................................................... 16
   5.2. Primary data collection ........................................................................................................ 17
       5.2.1. Interviews ....................................................................................................................... 17
       5.2.2. Field observation ........................................................................................................... 20
       5.3.3. Focus group discussions ............................................................................................... 20
       5.3.4. Literature review .......................................................................................................... 21
6. Results ......................................................................................................................................... 21
   6.1. Common diseases experienced in Mnazi Mmoja and Midizini Sub-wards ......................... 21
   6.2. Water Source condition in Mnazi Mmoja and Midizini sub-wards ..................................... 22
   6.3. Sewage and waste-water situation in Mnazi Mmoja and Midizini sub-wards .................... 24
   6.4. Water drainage condition in Mnazi Mmoja and Midizini sub-wards ................................. 25
   6.5. Solid waste collection system in Mnazi Mmoja and Midizini sub-wards ......................... 27
   6.6. Road access system in Mnazi Mmoja and Midizini sub-wards .......................................... 28
       ............................................................................................................................................. 29
   6.7. Housing condition in Mnazi mmoja and Midizini area ....................................................... 29
7. Discussion .................................................................................................................................... 31
7.1. What role do these factors play in disease proliferation and prevalence? ........................................ 32
7.2. What does the study findings implications for policy? ................................................................. 35
8. Conclusion .................................................................................................................................. 38
9. References .................................................................................................................................... 38
9. Appendix ...................................................................................................................................... 47
1. Introduction

More than half of the world's population lives in areas that are categorized as urban areas (United Nations Population Division 2001). In developing countries, with increasing urbanisation process a significant and growing proportion lives in or around metropolitan areas (UN 2002). Most of them live in the city outskirts, where they depend to some extent on natural resources such as land for food, water and fuel, and space for living (Addo 2010). The urban fringe comprises the habitat of diverse populations, including lower income individuals who are mostly exposed to negative externalities of both rural and urban systems (Johnson 2001). These externalities comprise of; health risk, life and physical dangers associated with the living or working in unsuitable sites, lack of access to clean water and basic sanitation and poor housing conditions. Environmental changes also affect the livelihood strategies of these communities by decreasing or increasing their access to different types of capital (UNEP 2005)

Many of sub-Saharan cities are undergoing increased rates of urbanization with uncontrolled changes in land and building uses, increasing densities and intensifying spatial size which if not effectively managed could result into hazards or even disasters (WB 2005). For example, lack of access to clean drinking water can expose the urban dwellers to epidemics such as cholera (WHO 2009). The situation can be worsened if for instance floods occur leading to widespread contamination of water sources particularly in those areas with low sanitation (UN 2011). In such circumstances, if appropriate control measures are not implemented, the disease risk can intensify leading to disaster epidemics.

Urbanization in Tanzania has been on a rapid increase in the last two decades (Stage and McGranahan 2010). The rapid urbanization has led to profound expansion of among others the four major urban centres - Dar es Salaam, Mwanza, Mbeya and Arusha (MPEE 2006). Dar es Salaam comprises about 10 % of the total national population (4.1 million people) and about 40 % of the national urban population (NBS 2002). Because of absence of adequate urban planning measures, 40 to 80 % of the urban population reside in unplanned parts of the cities that lack most of the essential municipal services such as sanitation, waste management system, water
supply systems, and road systems (Lerise et al. 2003). Additionally Lerise et al. (2003) have indicated that these parts of the city are highly populated with record high population densities.

Urbanisation process in Tanzania is characterised by unguided spatial expansion and settlement densification. This unguided development has led to spread of informal settlements, worsening of social services (e.g. environmental care, health care services, foster care and residential care) and public utilities (e.g. housing, electricity, water and sewage and sanitation) increasing urban poverty and lack of security of tenure (Lerise et al. 2004). Many urban areas in Tanzania thus have poor drainage systems, poor sanitation, and lack access roads, poor housing condition and deteriorating environmental qualities. Consequently, people residing in these urban areas are exposed to a wide range of risks (Lerise et al. 2004). It is therefore, important that the exact sources of risk factors are understood to aid the policy intervention to control and prevent the occurrence of disasters. It is in this context that this thesis research is conducted.

2. Aim and objectives

The aim of this thesis research is to assess the health risks that can affect people living in an urban environment, analyse the factors that contribute to the health risks and discuss possible measures/interventions that can be adopted to address the problem. To achieve this aim, the following research questions are addressed:

1. What kind of health risks are households in urban areas exposed to?

2. What are the strategies used by the urban households living in these informal settlement to avoid health risk accumulation

The outcome of this study will bring to the fore the health risks to which people are exposed to, their causes and recommended interventions to reduce impact. This information can serve as a good basis from which the government can design and implement policies to increase preparedness to prevent or adapt to various urban health risks- consequently, provide a good living and working environment for all groups of urban dwellers.
3. Theoretical framework for urban health risk

Urban health refers to the study of the health of urban population (Galea et al. 2009). According to Galea et al. (2009) the urban health can focus on the health of the whole urban population or a segment of the population. Urban growth, urban planning and urban environment in general (Khan et al. 2010) are important factors that can affect the health status of the urban population in a particular urban region. For instance, a rapid urban growth in absence of proper planning can result in adverse impacts on the urban environment (housing, landscape, sanitation, water supply, air and other infrastructure) (Rosan et al. 2000).

3.1. Urban growth

Urban growth is a rapid process in most parts of the world (Boulle et al. 1997). However, the rate of urbanization varies from region to region and between various cities in a country. The rapid urbanization is drawing large population from rural areas to cities (Cincotta et al. 2003) and this trend is expected to continue into the future (Quarantelli 2003) which in turn will accelerate rural urban migration.

The rural urban migration is often economically driven as people strive to move to areas where they can secure jobs and get access to basic infrastructure (schools, health clinics, workplaces and communication networks) (Keeble 1969). Most cities in the developing world are growing rapidly leading to high population densities as well as expansion into the city’s outskirts (Cohen, 2006). The crossroads and market towns rapidly convert into urban centres (Cincotta et al. 2003).

Thus despite that formally all big cities were situated in developed countries (Vitousek et al. 1997) nowadays most of the large cities (10 m inhabitants) are located in the developing world (Michel et al. 2009). Thus the rate of urban growth in most developing countries is fast and rising steadily (Cohen 2004; UN 2007; Michel et al. 2009). The rapid urbanization in the developing countries has been experienced particularly from the 1950s – in which period the urban population in developing countries has grown to 2 billion from approximately 300 million (Chrispeels et al. 2003).
The rate at which the urban infrastructure is developed and expanded in most developing countries is much slower than the rate of the urban population growth (World Bank 2009). Thus the urban population in most of the developing countries far outweigh the available basic facilities such as roads, water supply, sewage facilities, education and healthcare facilities among others (Rigg et al. 2008). Consequently, employment opportunities reduce, conflict due to competition for the limited resources, as well as depletion of city budgets are among the impacts that can arise (Cincotta et al. 2003). Additionally, constrained infrastructure can lead to various adverse human health problems (Pierre et al. 2006). According to Mavalankar et al. (2009) absence of sufficient infrastructure lowers the quality of services and can increase vulnerability of individual and the community to various health risks.

3.2. Urban planning

Urban planning according to Kotchtitzky et al. (2006) is a multidisciplinary field that would involve many experts for successful implementation. Urban planning is often conducted in order to enhance the wellbeing of the urban dwellers through a healthy environment that is clean and aesthetically suitable for living in. Urban planning is used to ensure that the community’s requirements such as housing, healthcare infrastructure, water supply, natural resource utilization, transport and garbage collection are available in sufficient levels to meet the rapidly changing urban population (Kotchtitzky et al. 2006). Because of the diversity of issues that need to be considered in the urban planning, besides the master plan, many other sectorial urban plans such as regulatory and incentive strategies, economic development plans, health programme plans and disaster preparedness plans, housing plans (Keeble 1969) are often applied.

Through urban planning, the design of the built environment will be well co-ordinated to ensure that the built infrastructure is suitably placed geographically and functionally (Mell 2008) in a manner that promotes sanitation, protection from accidents, fire hazards and access to basic public services. Through such planning the living standards rise and inequalities are minimized (Damsgaard et al. 1998). In other words, proper planning will thus facilitate access to quality services for the urban population (Galea et al. 2009) which in turn will promote a health urban
living environment. But many countries around the world particularly the developing world either lack proper urban planning policies or the existing urban plans are not implemented satisfactorily (UNHABITAT 2009a).

Consequently, informal settlements sprawl, the basic infrastructural development lags behind the rapidly increasing urban population. Thus leaves most people without access to proper housing, clean water supply, sanitation and sewage system, roads, healthcare infrastructure among many other necessary services and infrastructures – all these adversely affect the urban living environment which exposes the dwellers to various health risks.

3.3. The Urban Environment

The urban environment is constituted of a complex mix of natural elements (e.g. air, water, land, climate, flora and fauna), built environment (buildings, infrastructure and urban open spaces) and other socio-economic activities. It can thus be said that it is the interaction of the natural, built and socio-economic factors that will affect the kind of urban living environment. The kinds and state of infrastructure that is available often affects the natural environment, socio-economic activities and the health of the urban population. The most common infrastructure that have been observed to have a major impact in this regard are; housing, water supply, sanitation and sewage, solid waste and transport systems (Dempster et al. 2007). In the following sub-sections a literature review describing how these infrastructure can affect urban environment and contribute to accumulation of health risk is presented.

3.3.1. Housing

According to HREA (2011) every human being has a right to adequate housing. “Adequate housing is the housing that conforms to basic standards with regard to security of tenure, availability of services, materials, facilities, and infrastructure, affordability, habitability, accessibility, location, and cultural adequacy” (HREA 2011). The aim is to ensure that
everybody can access quality life, human dignity and promote good health (mental and physical health).

However, due to the rapid urban population growth coupled with unmatched housing and infrastructural development, a substantial percentage of urban dwellers are either homelessness or live in poor quality housing in slum areas (HREA 2011). The homeless lack access to regular and customary housing (UN-HABITAT 2000) – such people live and sleep in the open public areas (e.g. sidewalks, under bridges and public parks). According to the UNHABITAT (2010a), approximately 100 million people are homeless globally. According to UNHABITAT (2003a) one third of the urban dwellers globally live in slum areas. However, according to UN (2003) the urban population that lives in slum areas globally is estimated at 1 billion people.

Both the urban homeless and the urban slum dwellers live in abject poverty and in an environment that often lack access to basic infrastructure and services (water, sanitation, sewage, security) in addition to being overcrowded (Perlman et al. 1998). Such conditions expose the residents of these areas to diverse health risks such as water-borne disease, HIV/AIDS and respiratory (McGranahan 1997)

3.3.2. Water

Access to safe water supply is one of the basic fundamental human rights (WHO 2000). However, still a large global population (1.1 billion) have no access to safe water supply sources (WHO 2000). Safe water is often accessed from water sources such as piped water (to dwelling, plot, yard or public tap), borehole, protected spring and rain water (WHO 2007). The inadequate access to safe water can be attributed to many factors such as insufficient water management system, lack of sufficient finances and weak institutional capacity (ADB 2009).

Thus it must be acknowledged that clean water is a limited resource (ADB 2009) that is essential for a health population (UNWater 2005). Lack of access to adequate amount of safe water can adversely affect lives and livelihoods (World Vision 2007). In absence of safe water supply the urban dwellers become vulnerable to a wide-range of water-borne diseases (WHO 2002a; Gleick 2002).
3.3.3. Sewage and waste water

According to Smith (2002), many people (2.4 billion), world over have no access to right infrastructure for safe disposal of sewage and waste water. Thus in many parts of the world, particularly Africa, Latin America, Caribbean and Asia, a greater percentage of waste water and sewage are discharged to the environment without treatment (WHO 2000a). Such discharge exposes the population to a wide range of adverse health impacts through polluted drinking water, contamination of food, and contamination of bathing water. It can also create a suitable environment for various vectors such as flies and insects which in turn would lead to proliferation of vector-borne diseases (WHO 2002b).

The most vulnerable to contracting the diseases are the children, and the elderly as well as those people whose immunity has been compromised by other diseases such as HIV/AIDS (Smith 2002).

3.3.4. Solid waste

Because of the rapid increasing urban population, coupled with increase in industrialization and consumption, enormous quantities of solid wastes are generated globally (UN-HABITAT 2009b; Ichimura 2003). The large quantity of solid waste that is generated is causing many problems in waste handling in low and middle income countries (UN-HABITAT 2009b). The solid waste management is more pronounced in low-income neighbourhoods in both low-income countries and in the large cities in middle-income countries (Ichimura 2003).

Uncollected solid waste can cause harmful environmental problems by blocking drainage systems and contaminating water sources (Ichimura 2003). Poorly handled solid waste can also cause ground water pollution through leaching of chemical substances from hazardous waste in the disposal landfills (Ichimura 2003). Consequently, it can be concluded that through the aforementioned pathways, poorly handled or undisposed solid waste can cause profound health risks to the urban population (Ichimura 2003).
3.3.5. Accessibility

Easy accessibility to basic needs (water supply, energy and food), social welfare (health and education), and economic welfare (trade and industry) is essential in quality living (ILO 2003; UNEP 2009). Accessibility is therefore determined by the location of the above-referred infrastructure and services in relation to where people live (ILO 2003). Thus to enhance access for instance to basic needs, the health care facilities and schools need to be located close to the residential areas or an affordable, reliable and quality means of transport e.g. road or rail be available for easy commuting. But in many developing countries most of the above-mentioned infrastructure is limited and unreliable particularly in informal settlements and slum areas. Depending on what kinds of infrastructure that are constrained, there would be a risk of adverse health impacts – for instance lack of access to safe water supply may result in proliferation of water-borne diseases.

4. Study area description

4.1. Dar-es-salaam city

This study was conducted in Mnazi Mmoja and Midizini sub-wards of Manzese ward of Dar-es-salaam city in Tanzania. Manzese was chosen as a study area because it is one of the oldest informal settlements which has existed since 1960’s - it was assumed to have better strategies to combat health risks. Within the Manzese ward, the study was conducted in Mnazi Mmoja and Midizini sub-wards. The two sub-wards were selected because they are information-rich areas as health risk accumulation processes is a significant issue in these areas. Many studies have been conducted and documented that could also be used as a reliable sources for secondary data. These include studies by Sliuzas, (1988), Kironde (1995), Kironde and Rugaiganisa (2002), Nguluma (2003) and Sheuya (2004). Though, the later studies do not cover Manzese, they deal with pertinent issues on housing transformation informal settlements that are related in this study.
Dar-es-salaam is the Tanzania’s capital city; the city spreads along the shoreline of Indian Ocean for approximately 100 Km starting from the entry of the river Mpiji in the north to the river Mbezi to the south. It also consists of 8 offshore islands. Dar-es-Salaam’s total area is approximately 1400 Km$^2$ of which 12.5% is compactly built. The heavily compacted area accommodates over 90% of the city’s population (Kironde 1994). The geographical location of Dar-es-Salaam city is shown in Figure 1.

![Geographical location of Dar-es-Salaam city](image)

**Figure 1: Geographical location of Dar-es-Salaam city**

*Source: Dar-es- Salaam City Profile (2004)*
The Manzese ward is situated in Kinondoni municipality (Figure 2). It connects along the major Morogoro road and has six sub-wards that is, Midizini, Mnazi-Mmoja, Muungano, Kilimani, Uzuri and Mvuleni. The first two sub-wards have been chosen as study area. The population of Manzese ward is estimates at 67,000 (NBS 2002). In terms of population and area size, it is believed to be the largest squatter area in Dar-es-Salaam city.

Figure: The map of Manzese ward
Source: Ramadhani (2007)

During 1940’s Manzese was a rural settlement located in outer part of Dar-es-Salaam, however by 1957 portion of it had been incorporated inside the city area (Kironde 1995). Initially it used to be a farmland owned by an Asian origin known as Alibhai, who used it for keeping livestock in the area. Sliuzas (1998) has indicated that when the settlement of Manzese was merged into the city like other squatter areas in the city, it started as a small peri-urban village where the division and provision of land and the development process was mainly administered by
traditional tribal customs. The settlement was fully integrated within the city boundaries by 1968, and had already started developing very fast pace. At the same time the development of manufacturing industries in Ubungo area, its favourable distance from main centre of Dar-es-Salaam, and ease of access through Morogoro road connecting to the main roadway to the rest of the country contributed to the areas progress.

5. Methods and materials

The data for this thesis project was collected from both primary and secondary data sources. The secondary data include books, reports, journal, internet publications and academic articles. Several documents containing information on health risks, health policies, legislations, regularization, informal settlement and research studies were used in the whole course of research. Ardhi University Library was very useful to get most of the documents.

Both the spatial and the non-spatial data were gathered from the Ministry of Lands (MLHHS), for the study. The spatial data include: Topo-images, area boundary, ward administrative boundaries and sub-wards and blocks. The non-spatial data include the health risk survey, the regulations that are applicable to the dwellers.

5.1. Preliminary field investigations

A preliminary investigation was conducted after gathering information from various literatures, research papers and learning from various sources (local people, government clerks and academia). I had visited several informal settlements in Dar-es-Salaam to learn more and decide on which settlement would fit for conducting the field study. The criteria for selecting a particular area were, rich in information, ease of access, area where many studies were conducted before, area that is existing for longer time and ease to get respondents for interviewing. Among the informal settlements visited were, Changanyikeni, Survey area, Tandale, Makongo-Juu area and Manzese area. The investigation took about two weeks, and finally I decided to conduct the study in Manzese ward.
5.2. Primary data collection

The primary data was collected from the field studies that were conducted in Mnazi Mmoja and Midizini sub-wards of Manzese ward of Dar-es-salaam city in Tanzania. The data was collected through: interviews, focus group discussions, literature review and field observations as presented below. For this study a mixed research method was used because information from various methods would help in verification and analysing (triangulation) the condition of the built environment.

5.2.1. Interviews

In this regard semi-structured interview technique was employed to collect the field information. The sample was selected from various actors and stakeholders that were directly or indirectly worked or were affected by the urban health risks in Mnazi Mmoja and Midizini sub-wards such as dwellers, business men/women and local authority, area clinics. Semi-structured interview were used for varied reasons, the study was carefully being done to avoid researcher’s influences in opinions of the respondents. At the same time the researcher was in control of the main domain of the research. Due to the nature of health risk management in Manzese area the views and practices of the interviewees might not be lucid to the researcher and for this reason questionnaires were used to supplement the semi-structured interview method and focus group discussions. The questionnaires serve to sample opinion on various health risks and help to fill the information gap where the interviewee will not grant the interview.

The interviews conducted during the field visit covered four main areas. Firstly, to look into the type of health risks. Secondly, to look into factors contributing to the causes of health risks and thirdly to investigate into local strategies taken against factors causing health risk. Fourthly was to investigate the effectiveness of the local strategies and how can it be improved.

The respondents interviewed were selected from various levels and occupation. The interviewed respondents were from household residents, academia, central government, local authority, Ward level, Sub ward level, and ward clinic. The aim for interviewing people from various level was to acquire a clear image of the health risk situation. The household respondents were randomly
selected in both Mnazi Mmoja and Midizini area during the field visit. The respondents from academia were from Ardh University, who have previously worked on the same area and on the similar issues. Health officers and planners were interviewed at government, local authority and ward level. It was hard to reserve appointment for many governments, local authority and ward level officials since many were out for some official work. Respondents at sub ward level were mainly area ten cell unit leaders and local authority officer.

The respondents that were interviewed were 28 persons. A total of 10 households were interviewed 5 from each sub ward, 4 persons from the academia, 2 persons from the central government, 4 persons from the local government (at municipal level), 4 person at sub-ward level and 2 person from the area clinic. A summary of the respondents that were interviewed is shown in Table 1.

Table 1: Summary of interviews conducted during the field work

<table>
<thead>
<tr>
<th>Institution from which interviewed person comes from</th>
<th>Interviewed person’s position</th>
<th>Number of persons interviewed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mnazi Mmoja Sub ward</td>
<td>Households</td>
<td>10</td>
</tr>
<tr>
<td>Midizini Sub ward</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academia (Ardhi University)</td>
<td>Researcher</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Lecturer</td>
<td>2</td>
</tr>
<tr>
<td>Centrl Govt.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ministry of Health (MoH)</td>
<td>Dsm Health officer</td>
<td>1</td>
</tr>
<tr>
<td>• Ministry of Lands (MoL)</td>
<td>Plannig Officer</td>
<td>1</td>
</tr>
<tr>
<td>Local Govt.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Dsm city Council</td>
<td>Dsm Planner</td>
<td>1</td>
</tr>
<tr>
<td>• Kinondoni municipal council</td>
<td>Dsm health officer</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>KinONDONI Municipal planner</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Kinondoni Health Officer</td>
<td>1</td>
</tr>
<tr>
<td>At ward Level</td>
<td>Manzese Ward Officer</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>health Officer</td>
<td>1</td>
</tr>
<tr>
<td>At sub ward level</td>
<td>Ten Cell Unit leader</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Local Authority Officer</td>
<td>2</td>
</tr>
<tr>
<td>Area clinic</td>
<td>Medical doctor</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Medical assistant</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>28</td>
</tr>
</tbody>
</table>
5.2.1.1. Household interviews

The household survey was performed with the help of two field-assistants. Together with the household’s characteristics and the spatial data, the infrastructure condition and information on associated health risks were investigated. Semi structured interviews were used for interviewing randomly selected ten households (five from each area).

5.2.1.2. Interviews with key informants

Key informants are respondents who are well-informed and are fluent of the subject, with deep insights assist in knowing what is actually going on the field (Patton 1987). In this case the key informants were the two sub-wards (mitaa) leaders in Mnazi Mmoja and Mlandizi who had been interviewed, to get the specifics in relation to the historical development of the settlement, the administrative setting, and their responsibility in the whole process and their views on accumulation of health risks in their respective areas. Also, an interview with Ward Executive Officer (WEO) was conducted.

Discussion with respondent from Ministry of Lands, Housing and Human Settlements (MLHHS) was held to get more insights of the infrastructure condition. In addition, another discussion with Senior Town Planning and Coordination was done. Meeting with Dar es Salaam City planner was conducted to find out information on composition and administrative set-up of the city, the interconnections with the three Municipalities and the roles of the Dar es Salaam City Council on the current trend of physical development characterized by rapid urbanization. Other discussions were held in Kinondoni Municipality headquarters with the municipal health officer to collect data and information strategies implemented to prevent health risks and the on-going project on service infrastructure upgrading in the study areas. It was vital to get response from the City Council, Kinondoni Municipal and MLHHS to get the perspective of infrastructure condition at the government level. The information was used to verify with other information gathered from other informants. In order to perform semi structure interviews a set of questions (English and Swahili versions) were used to guide the interviews so as not to lose the focus of the study (see in appendix).
5.2.2. Field observation

Field observation was one of the most significant ways to collect data from the field. Observations were conducted by physically visiting the field and assessing the condition of different infrastructures (water source, road access, housing, solid waste, waste water, and drainage) and situations where major health risks are found. The observations were conducted with the aim of supplementing the information from the respondents. While conducting observations pictures were captured for further understanding of the infrastructure condition. While assessing the infrastructure condition and situations where health risks are predominant, results from observation was further used to analyse information gathered from the respondents.

5.3.3. Focus group discussions

Information was gathered from the field using the focus group discussion (FGD). Since it was possible to have a rapid assessment with semi-structured data gathering was conducted by purposively selecting a set of participants for discussing issues and concerns. Lists of key themes were drawn up to discuss the condition of the infrastructure (Kumar 1987). The focus group discussion was very effective. It created a friendly atmosphere for the respondents where it was easy to convey the information (Debus 1988). For this particular study it was important to conduct focus group discussion as it was observed that respondent in the study area responded more when in group. The main aspects discussed with the focus group were the current infrastructure condition, the health risks posed and which diseases they involve.

In order to keep the discussions on the right path and at the same time allowing respondents to talk freely and spontaneously, a discussion guide was employed to guide the sessions. Least number of items was kept in the guide to leaving enough time for in-depth discussion. In total three focus group discussions were conducted. Each focus group were having member from various levels (households, local authority and municipal level) with a total of four members in each focus group. Same guiding set of questions used in interviews were used for conducting focus group discussions. The focus group discussions were conducted in the case study area at
the local authority office and were led by myself with the help of the ward officer so as to be precise in conducting the discussion.

5.3.4. Literature review

Various literatures from previous studies and reports were used in this study as one of the research method. Reviewing the existing literature was essential for this study since there are some reports made by the municipal and the local authority that has information on built environment condition of the study area. Most of the strategies are also addressed in these reports and the measures used in enforcing them. Hence the information available in these reports was also used to verify through other research methods just to see if the available information in the literature or report is viable or not. The reports were accessed through the municipal office and local authority office and some could be accessed through government of Tanzania web page and Ardhi University. There were some studies conducted by the various international organisation and researcher previously, which were also used to study the condition of the built environment in the case study area. These were accessed through their respective offices in Dar-es-Salaam and some from their respective web pages.

6. Results

6.1. Common diseases experienced in Mnazi Mmoja and Midizini Sub-wards

The most common diseases affecting the dwellers in Mnazi Mmoja and Midizini Sub-wards according to the majority household respondents are malaria, cholera, typhoid and pneumonia. Most of the respondents emphasized that themself and their household members are frequently attacked by some of these diseases particularly malaria and typhoid. Cholera and pneumonia were common during periods of high rainfall –however, cholera was also said to be rampant during extreme drought periods. The response from a medical doctor working in one of the clinics in the area corroborated with the claim by the households that the above-mentioned diseases are the most predominant in the study areas. However, he added that ‘many of the
patients I treat in my clinic are often sick from malaria’ thusly implying that malaria is the most common disease in the area.

Studies such as MoH (2006) and KMC (2010) also indicate that malaria, typhoid and cholera are the common diseases affecting the residents of Manzese. However, according to CCHP (2008), malaria, acute respiratory infection, HIV & AIDS, pneumonia, and urinary tract infection were found to be the dominant diseases in the municipality. According to WHO (2011a) acute respiratory infection (ARI), malaria, HIV/AIDS and diarrhoeal diseases are the most common diseases affecting population in urban informal settlement in most parts of Africa.

It was observed that Mnazi mmoja and Midizini areas were generally lacking access to basic services such as clean water supply, sewage and garbage handling facilities. According to majority household respondents, absence of the fore-mentioned facilities are the main factors accelerating disease proliferation in the study areas. The respondent from the local authority, mentioned air pollution, inadequate housing, poor drainage system, poor sanitation and absence of safe water supply to majority residents as the main factors contributing to high disease prevalence in Mnazi mmoja and Midizini areas.

6.2. Water Source condition in Mnazi Mmoja and Midizini sub-wards

The majority household respondents collected water for their household activities mainly from vendors, kiosks, water streams and wells. According the respondent who was in charge of the municipal water supply, currently the municipal water supply system is available only to a very small segment of the population in Mnazi Mmoja and Midizini sub-wards. The rest have to rely on alternative water supply sources e.g. vendors, kiosks, water streams and wells. The municipal council water system is comprised of: piped water into individual household homes (covering about 6%), and public distribution point i.e. standpipe or kiosks (covering about 10%)

However the respondents emphasized that the quality of water from other alternative sources is not subjected to safety standard assessment which in turn makes the water from those sources unfit for health. For instance, it was observed that some of the wells were dug very close to
drainage channels and pit latrines - a situation that can lead to serious water contamination which in turn can result in epidemics of water-borne diseases. Though some of the respondents had indicated that, ‘they don’t use the water for drinking purpose but rather for washing and bathing only’. However it was noted that many household depend on this water source.

Water streams in the study areas are highly polluted with waste materials as can be depicted from Figure 3. One of the respondents had noted that during the rainy season these streams are full of waste water from households. Some respondents had indicated that occasionally they use water from these streams for washing purposes such as for washing cooking utensils and clothes. The same respondents were aware of the health risk of using such water –but they added that based on the circumstances they live in they have no other option than utilizing the water.

Figure 3: One of the polluted water stream but still being utilized for washing utensils

It was observed that, The Dar es Salaam Water and Sewage Corporation (DAWASCO) had provided standpipes in several areas within Mnazi Mmoja and Midizi area but these were not enough to cater for all the residents. Standpipes are authorized water kiosks with piped water – they are operated as private or community owned providing water at affordable prices to urban dwellers. According to the responses, the price of water from the standpipes is approximately 25 times less than the price of the other water vendors particularly those who deliver water on wheelbarrows.
The safe water supply problem in Tanzania does not seem to be synchronized to Mnazi Mmoja and Midizini areas only but it is rather a common problem in most urban areas in Tanzania. For instance, Kyessi (2002) and Lerise et al. (2004) found out that most informal settlements in Dar es Salaam have enormous safe water supply problems and hence leaving a majority of the population in those settlements relying on unsafe water sources.

6.3. Sewage and waste-water situation in Mnazi Mmoja and Midizini sub-wards

The responses revealed that the residents of Mnazi Mmoja and Midizini areas had no access to municipal sewage line. Thus pit latrines are the facilities used by most households in the area. Some of the pit latrines are shared by more than one household, while other are owned and utilized by individual households. Most of the pit latrines are constructed above the ground to enhance emptying when filled to capacity. One of the respondent indicated that ‘it is constructed over the ground because it is easy to clean’- here referring to emptying when full. The pit latrines are usually emptied during the rainy season through a pipe at the bottom of the pit latrine (Figure 4). The pipe is unlocked and the sewage content from the pit latrine allowed to flow freely to nearby drainage system.

Figure 4: A photo of a pit latrine showing the emptying pipe at the base

The respondents further observed that most of the pit latrines in the study areas are not well constructed since most of them are constructed with non-skilled local builders. According the
respondent from the municipal council office, there are a number of incidences of leaking pit latrines, while others collapse causing spillage of the sewage to the environment and at times injuries and deaths.

The findings from the household responses also indicated that a few households had toilets inside the house in addition to owning the pit latrines. In such cases the content from the toilets and baths that are located inside the house are emptied directly into a pit latrine that is located outside the house using a drainage pipe. The reason for locating the toilets and baths inside the house was to enhance the security of the household members particularly women and children specifically during night time usage.

The results further indicated that a few of the residents had no reliable access to pit latrines and toilets – these latter category of people were using the free-range system (would relieve themselves in the open fields. For example some would just go out in some open shaded area dig a hole on the ground – on which they excrete and cover immediately with some soil.

Due to lack of sewerage service in the case study area, it was observed that some residents had directed the waste-water channels/pipes from their bathrooms, toilets and kitchens directly into the open storm water drains. According to Mulengeki (2002) the acidic and salinity of waste results into the gabions marsh which then forms blockage. According to a response from one health officer working in the area, all the households living closer to the drainage channels are exposed to a wide range of health risks including malaria (due to stagnant water that forms pools for mosquito breeding); diarrhoeal, injuries among many other diseases that are rampant in the area.

6.4. Water drainage condition in Mnazi Mmoja and Midizini sub-wards

During the field observations, it was found that the storm water drainage systems covered only a small area along the main roads – thus most of the residential areas (about 80% as per responses) had no access to any drainage system. However, most of the existing drainage system was not functional since some sections of the system were blocked with enormous accumulation of solid waste. Surprisingly according to the respondent from the municipal council, even the newly
(opened six months before the field study) constructed storm water drainage systems are also blocked by refuse (Figure 5). The new storm water drainage system was constructed under the project ‘The Community Infrastructure Upgrading Project (CIUP)’ through this project, 2.2 km and 24.7 km trunk and road side drains have been constructed respectively.

One of the respondents stated that ‘during rainy season every walking place is filled with water, and if it is heavy rainfall then the water enters the house as well’. Since some of the households were found to be releasing the waste water and sewage from their pit latrines to the open drains during the rainy season, this situation of overflowing water on the paths and into houses would be potentially risky in terms of contraction of water-borne diseases such as diarrheal, typhoid among many other diseases that were also found common in the study areas as earlier mentioned.

Figure 5: Storm water drainage systems blockage from solid waste accumulation
6.5. Solid waste collection system in Mnazi Mmoja and Midizini sub-wards

According to the responses from the households, local authority officials and the health officials Mnazi Mmoja and Midizini area are not well covered with solid waste collection and disposal system. It is only about 25% of the households that access the municipal garbage collection system while, the remaining 75% households utilize other alternative waste collection and disposal methods. These other alternatives included burying, burning, dumping garbage in drains or open spaces—which pose adverse health implications.

However, the responses also revealed that recently (March 2011) high-income groups in Manzese ward have initiated private garbage collection system (known as contractors) which works parallel with that owned by the municipal council. But the respondents emphasized that still even with this new initiative, the garbage collection is not regular which in turn leads to large piles of uncollected garbage at the collection point and throughout the landscape. Another problem with the garbage collection is the existence of only a single garbage collection point that serves the whole area of Mnazi Mmoja. Consequently, most residents are forced to walk a very long distance to dispose their solid waste.

It was further found that a few local residents in Mnazi Mmoja have recently (December 2010) initiated a door to door waste collection system at a fee – since it is a newly initiated project its spatial coverage is small. This door to door waste collection system is aimed at reducing the rapidly increasing pile up of garbage in these settlement areas where it is perceived to cause a wide range of health risks. Besides reducing the burden of garbage in the area of operation, it has created employment opportunities, and is positively influencing people into changing their behaviour in regard to garbage handling.

Because of the above-mentioned problems with the garbage collection and disposal systems, there is enormous garbage strewn in many parts of the study areas including in storm water drains (where it causes blockage of the systems), many open spaces, along the roadside, and walk ways. Most of the garbage was already rotting and stench – potentially a health hazard. The solid waste accumulated in a storm drain and roadside is shown in Figure 6.
6.6. Road access system in Mnazi Mmoja and Midizini sub-wards

Mnazi moja and Midizini are accessible through Morogoro highway (a tarmac road) and minor roads which are rough and during rainy season mostly muddy and overflowing with runoff water. Extending from these minor roads are numerous narrow foot paths that are often dark and mucky. In some of these passages there are some on-going commercial activities such as frying chicken, washing clothes, and other minor activities resulting into multiple uses of the passages and in solid waste generation and accumulation.

Household responses revealed that these narrow foot paths, often hamper access to emergence services when needed for instance during fire outbreak, or if someone is critically ill in need of ambulance. Respondents had indicated that in such cases neighbours help in addressing the emergency situation but are often overwhelmed since they work without the right emerge combat gears. Thusly most of the emergence situations end up being catastrophic often causing enormous socio-economic losses and even mortalities in events of fire outbreaks. In many cases women feel insecure to these foot paths at night for fear of being attacked mugged or raped. It is only about 30% of the dwellers of the study areas who had access to roads. The main roads and an example of the narrow foot paths are shown in Figure 7.
The local authority officer had stated that there has been the Community Infrastructure Upgrading (CIUP) phase I in Mnazi Mmoja area which covered construction of 1.86 km of bituminous road, 14.6 km of gravel roads, 3.4 km of gravel footpaths, 24.7 km road side drains, 2 culverts and 6 footbridges. However, he further stated that the access road situation is still problem to many people in Mnazi Mmoja area and needs further investments.

Figure 7: the main access road and some of the narrow foot paths used to access the slum areas

6.7. Housing condition in Mnazi mmoja and Midizini area

The housing condition in Mnazni Mmoja and Midizini area are built in unorganised manner and poorly oriented. Some houses were very small in size in comparison to the number of occupants
living. Many houses that are constructed follow the Swahili house design. They comprise of 6 rooms linked with corridor and common toilets, bath room and kitchen in the back yard. Each room (average size 3m by 4m) is occupied by a household which comprises approximately of 4 occupants. It was found that many houses were not build with minimum required standards such that temporary materials were utilized in their construction. In case of rainfall, storm water mixed with waste-water enters these houses. In Figure 9 some of the residential houses in the study area are shown.

It was found that some houses were actually built along the slope. The storm water often hits this houses and causing damage. If the drains are block then polluted storm water remains stagnant and enters the households. It was found that many household use charcoal or wood for cooking purpose which creates heavy smoke that circulates and hence pose a risk to infection from respiratory diseases. The respondents had noted that women and children are considerably affected by the smoke. Some of the houses are built near to each other such that there is no enough space for ventilation and sunlight.

It was witnessed that some households have taken measures to avoid health risks. Many houses had netting in their windows and some where even using mosquito bed nets. However, these are often used for long time without replacement such that they become less effective. Some respondents actually believed that they were safe by just having mosquito nets even though they were not adequate.

Most of the households live in a rented house and are perceived as temporary residences by the tenants. In many cases this makes the household not to care much about their housing condition and their surrounding in general. Even the one who owns these houses often don’t care since they get their rent as there is huge demand for housing. This adds on to the accumulation of health risks.

According to a survey done by UNHABITAT (2009c) only 35% of housing structures are in compliance with existing construction standards. Housing is very important factor of infrastructure in accumulating and posing health risks to household. Studies done by Lerise et al. (2004), Kyess (2002) and Nguluma (2000) tell that housing condition have always been a significant aspects in posing health risks.
7. Discussion

For assessing the condition of the built environment the study was conducted through mixed research method which helped in verification of the information gathered from one method with the other one. The information presented in the result section is information that tally with other methods. However, some information could be gathered through one type of method only hence they have also been indicated in the result part. For assessing the condition of the built environment requires a larger area with more time so as to address more issues with large sample
size. Furthermore, there could be some level of detailed information missing as most of the time similar information was gathered using mixed research approach for verification purpose. Alternatively, if questionnaires would have been used to assess the condition the results could probably have been more feasible. However, with the available resources the study was conducted with the best plausible and effective approach and the results attained show the condition of the built environment with which analysing the result was possible.

The predominant diseases that were found in Mnazi Mmoja and Midizini sub-wards are: malaria, cholera, diarrheal and typhoid. The factors that present health risk in the study areas were found to be: use of unsafe water because of limited access to safe water supply; piling up of solid waste due to inadequate waste handling and collection; poor housing condition including overcrowding, indoor smoke from cooking and filthy external surrounding; stagnant water on storm drains due to waste accumulation leading to blockage; narrow and inaccessible parts during emergence services. With these findings two question arise: 1) what role do these factors play in disease proliferation and prevalence?; and 2) what does these study findings imply for policy? The discussion section will focus mainly in answering these two questions.

7.1. What role do these factors play in disease proliferation and prevalence?

Majority residents in the study areas use of unsafe water because of limited access to safe water supply sources. This finding is not surprising since access to safe water supply has been identified as a major problem affecting most urban residents in many developing countries around the world (WB 2006; UNHABITAT 2009d; WHO 2011). The limited access to safe water has been attributed to increasing water demand due to rapid urban population growth that overstretches the existing urban water supply infrastructure (UN 2010). According to WHO (2011) use of unsafe water can lead to increased prevalence of infectious water-borne diseases such as cholera, typhoid and dysentery. For example due to consumption of unsafe water cholera outbreaks were experience in Zimbabwe and Haiti during 2009 and 2010 (WHO 2008; MSPP Rapport de cas 2011). Following the cholera outbreaks in these two countries, several hundreds of thousands of people were infected and many thousands of people were reported dead in each country (Michelle 2011). Globally approximately 1.7 million people die annually due to use of
unsafe water and sanitation problems (WHO 2011b). On this basis I would like to argue that the cholera, diarrheal and typhoid that were found to be among the predominant diseases in the study area are due to consumption and usage of unsafe water and unhygienic conditions in the study areas.

It was found that many residents in Mnazi Mmoja and Midizini sub-wards live in poor housing condition including: indoor smoke from cooking, overcrowding, filthy external surrounding, and most of them constructed from temporary materials – exposing residents to cold. The problem of poor housing in Tanzania should not be seen as a problem affecting only these two study areas but rather many studies have revealed similar problems in other parts of Dar-es-Salaam as well as in other major towns (Olofsson et al. 2003; Lerise et al. 2004; UN-HABITAT 2009c; Lupala 2005; Ramadhani 2007; Nguluma 2010). Housing problem is also seen a global problem affecting approximately 1 billion people (UN HABITAT 2009e).

Accumulation of smoke in the house as result of cooking with various types of biomass energy sources in houses without proper ventilation as it is in the case of the study area can lead to a wide range of diseases (WHO 2002). Examples of diseases that commonly affect people due to inhalation of smoke are: “lower respiratory infections, chronic obstructive pulmonary disease and trachea, bronchus and lung cancer” (WHO 2002). Approximately 32% of all the deaths recorded in Africa are related to indoor air pollution (WHO 2002) majority of the victims being women and children who are usually involved in household chores including cooking. Though the respondents never mention respiratory diseases as being predominant in the study area, I would like to emphasize that these diseases are critical especially in these study areas where smoke accumulation in the house is rampant. Therefore, further study to assess indoor air pollution and various respiratory diseases in Mnazi Mmoja and Midizini sub-wards are recommended.

Overcrowding, filthy external surrounding, and house construction from temporary materials are other common problems related to housing problems in Mnazi Mmoja and Midizini sub-wards. Overcrowding in houses without proper ventilation can expose residents to pollution from carbon monoxide when biomass energy sources such as charcoal are use, and to various viral and
bacterial diseases (Suarez et al. 2009). A filthy external environment exposes people to various infectious diseases since it creates a suitable environment for vector and pathogen proliferation and hence can lead to various vector-borne and water-borne diseases. The filthy external environment may thus be seen as one of the pathways driving some of the major diseases that were observed in the study areas particularly malaria, cholera, diarrheal, and typhoid. The construction of houses from temporally waste materials often leaves the residents exposed to the cold during rainy seasons a condition that may expose the residents to pneumonia – which is one of the predominant diseases that was mentioned by the respondents. Living in these kinds of houses further exposes the people to attack from disease vectors such as mosquitoes leading to malaria infections.

It was found that solid waste was piling up throughout the study areas including roadsides, drainage systems and walkways due to inadequate waste handling and collection. Kyessi (2002) has shown that many other parts of Dar-es-Salaam city besides the Mnazi Mmoja and Midizini sub-wards are also affected with solid waste management problems mainly due to limited budget and proper waste management strategies. A similar problem is experienced in many cities around the African continent (Bernstein 2004). Improper solid waste management and disposal can lead to a suitable environment for the development and proliferation of disease pathogen especially when it constitutes of a mixture of rotting household waste (Nzioki 2002). Thusly the residents will be exposed to various diseases such as cholera, diarrheal, typhoid especially during the rainy seasons when these waste materials are transported in runoff to surface water sources. Solid wastes can also form stagnant water pools by blocking runoff and storm drainage systems creating fertile vector breeding grounds e.g. for mosquito – this would increase malaria prevalence.

The paths that are used to access most of the residential areas and dwellings were found to be narrow and inaccessible during emergence services. Inaccessible pathways in most urban slum areas and informal settlements globally have been found to be a main hindrance to collection of sewage sludge from filled up pit latrines and among other wastes since service vehicles cannot penetrate these narrow paths (UN-HABITAT 2009a). Consequently, the residents of these areas
are left exposed to hazardous waste which in turn exposes them to a wide range of diseases and other health impacts such as injuries.

Sewage and waste-water disposal system was found lacking in the study areas. These facilities according to WHO (2000b) are a major problem globally where approximately 2 billion people are affected. Lack of adequate sewage and waste-water treatment facilities can pose a major health risk to the urban dwellers of these informal settlements (Lerise et al. 2004; Yongsi 2008). For instance in Cameroon, severe diarrheal was experienced in unplanned settlement because of sanitation problems related to among other factors absence of sewage and waste-water disposal and treatment facilities (Yongsi 2010).

Stagnant water in storm drains due to waste accumulation leading to their blockage was found to be rampant in the study areas. According to Martens et al. (2000) the stagnant water becomes a suitable breeding ground for mosquitos and hence led to increased malaria prevalence. Malaria was found to be the most predominant disease in Mnazi Mmoja and Midizini sub-wards. Additionally, according to Turuk (2010) malaria is a major disease affecting many people globally- the disease leads to over 300 million malaria cases annually and approximately one million deaths each year.

**7.2. What does the study findings implications for policy?**

It has been shown that it is a combination of many interacting factors that lead to accumulation of health risks in the study areas. This implies that the government must strive to effectively address the root causes of the factors that affect the health of the population. To achieve this the government must strive to: provide access to safe water supply sources to all the population; adequate and reliable solid waste collection and disposal system; upgrade the housing in the slums to improve living conditions; and improve accessibility to basic services by contracting wide and all-weather roads to all residential areas. The specific strategies that can be adopted to improve each of the above-mentioned areas are discussed below.
To ensure that all residents get access to safe water supply, the government should expand its water supply system either to every individual household or ensure that the standpipes are many and in close proximity to every household to improve access and reduce long queues. The government further should rehabilitate its old and leaking water supply systems to avoid water loss and contamination. The illegal water connections that are used by some water vendors should be terminated. These are some of the strategies that according to NCWSC (2009) have been successfully applied in water supply systems in many parts of the world including Kibera slums of Nairobi, Kenya. One main benefit from the successful implementation of the safe water supply to part of Kibera was a recorded reduction of health burden for the affected population leading to less expenditure for medical care. However, to be successful the participation of all stakeholders such as the affected slum dwellers, the municipal council, NGOs and other partners is recommended.

To address the housing condition problem an overhaul is necessary in order to ensure that all people live in adequate housing. Adequate housing will mean that the houses themselves are of good liveable standard and that the residents get access to all basic infrastructure and services such as: access to clean water supply; solid waste collection and disposal system; storm water drainage system; sewage and waste water collection and treatment systems; and wide and quality access roads – according to UNHABITAT (2006) this is what is referred to as slum upgrading. However, other alternatives such as rehousing can be explored (UNHABITAT 2006). It is worth noting that upgrading slums requires a lot of finances – it therefore would be advantageous to involve a wide array of stakeholders and development partners including the residents of the slums, private developers, NGOs and other governmental agencies (UN-HABITAT 2003b). Participatory approach has been praised as one of the key factors behind a number of successful slum upgrades globally e.g. in Alexandra Egypt (UN-HABITAT 2003b) and Andhra Pradesh state in India (UN-HABITAT 2010a).

The problem of solid waste collection and disposals can be address through both short-term strategies and long-term strategies. The short-term strategies that can be adopted include use of non-motorized transport (UN-HABITAT 2010b) and decomposing for fertilizer use (Drescher 2002). The non-motorized transport of solid waste enhances waste collection from the slum parts
that are often not accessible by the motorized vehicles due to narrow access paths – this method has proved successful in Nairobi Kenya where it has been applied. Decomposing the organic solid wastes for fertiliser has a twin advantage i.e. it reduces the piling up of potentially unhealthy wastes, and also the resultant organic fertilizer is good for the environment when applied for crop production. But for long-term the government must strive to develop a well-functioning solid waste collection system covering all parts of the slum areas. It may include sorting, collection and re-use of the recyclable waste materials as applied in many developed countries (Gendebien et al. 2003). The decomposable organic waste can be used as fertiliser as described above. Other solid waste materials can be used for energy generation for heating or fuel (Gendebien et al. 2003). Through the adoption of the above strategies the solid waste problem can be solved and hence the health risk it causes to the residents be reduced.

The pollution in storm water can be solved using three main strategies: 1) proper solid waste collection and disposal to avoid it being transported by runoff or being dumped directly into the drainage system; 2) not discharging untreated sewage and waste-water into the storm water drainage system (Parkinson 2011); and 3) ensuring that a functional storm water drainage system is built to cover all the residential areas. But for these strategies to work effectively behavioural change in regard to the handling and dumping of waste by the resident urban dwellers is of vital necessity (Parkinson 2011). To achieve behavioural changes waste handling and disposal education should be provided by the government to all urban dwellers – such education should include the methods of handling waste and their advantages, the adverse impact on the health, environment and the ecosystem, the importance of storm water drainage system to the community at large among other factor. It is important that the planning and implementation of all these changes is conducted in an inclusive and genuine participatory approach involving all stakeholders – this will facilitate successful implementation.

The problem of pollution from sewage and waste-water can be solved through two strategies: expansion and development of the conventional sewage and waste-water system to cover all parts of the slum settlement; and adopting alternative approaches as a short term strategy. Alternative approaches that can be useful for adoption include “composting, incineration toilets, small quarters and public toilet methods” (Nziyoki 2002; WB 2006; Conradin 2007). Like all
other strategies it is important that the strategies are implement with close collaboration with all other relevant stakeholders.

8. Conclusion

There are many factors that pose health risks to the residents of Mnazi Mmoja and Midizini sub-wards. These factors are: use of unsafe water because of limited access to safe water supply, pilling up of solid waste due to inadequate waste handling and collection, poor housing condition including overcrowding, indoor smoke from cooking and filthy external surrounding, stagnant water on storm drains due to waste accumulation leading to blockage, narrow and inaccessible part during emergency services. The factors were driven mainly due to absence of proper urban planning that leads to proliferation of informal settlements following rapid urban population growth, but unmatched and slow expansion of infrastructure and housing. Due to the existence of the above-mentioned health risk factors, the following diseases were found to be predominant in the study areas: malaria, cholera, diarrhoeal, pneumonia and typhoid. It is important for the government to take measures in planning and advocating the upgrading of these informal settlements through more participatory approach by including residents of these settlements.

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40


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9. Appendix

a. Guiding questions in English for interview and focus group discussion:

- What causes sickness?

- Which diseases bring about health risks in these informal settlements?

- What are the emerging health risks?

- Why do these health risks affect these settlements?

- Do people know the health risks that they are exposed to?

- Do people know the causes for the health risks?

- Is there any kind of programme to avoid the potential health risks?

- How do people deal with health risks?
- Are there any rules to follow for avoiding potential health risks?
- What difficulties are faced when avoiding health risks?
- Which restrictions make the avoiding of health risk difficult?
- What are the drawbacks faced when avoiding health risks?

b. Guiding questions in Swahili for interview and focus group discussion:

- Nini husababisha magonjwa ya hatari ya afya katika makazi haya rasmi?

- Ni magonjwa gani yanayo athiri afya katika makazi haya rasmi?

- Je, ni magonjwa gani mapya yanayoji tokeza katika makazi haya rasmi?

- Kwa nini hatari ya afya haya huathiri makazi haya?

- Je, unajua hatarri ya afya inayokuzunguka katika eneo unayo ishi?

- Je, unajua sababu ya hatari ya afya?

- Je, kuna aina yoyote ya mpango ili kuepuka hatari ya afya?
• Ni jinsi gani watu kukabiliana na hatari ya afya?

• Je, kuna sheria yoyote ya kufuata kwa ajili ya kuepuka hatari ya afya?

• Ni matatizo gani unayokabiliana nayo wakati wa kuepuka hatari ya afya?

• Ni vikwazo gani hufanya kuepukaji hatari ya afya ngumu?

• Je, ni hasara gani unayokabiliwa wakati wa kuepuka hatari ya afya?