UNIVERSITY OF GHANA, LEGON

DEPARTMENT OF GEOGRAPHY AND RESOURCE DEVELOPMENT

REDUCING THE RISK: URBAN WATER STRESS AND POOR SANITATION IN THE ASHAIMAN MUNICIPALITY

BY:

EDWIGE ENAM YAWA YEKPLE

(10207837)

THIS THESIS/DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF PHILOSOPHY IN GEOGRAPHY AND RESOURCE DEVELOPMENT DEGREE

MARCH, 2015

DECLARATION

I, Yekple Edwige Enam Yawa hereby declare that, this research is my own work and all secondary data employed in the thesis are acknowledged accordingly. No part has therefore been presented in any form to any institution for the award of any other degree.

Yekple Edwige Enam Yawa

Index Number: 10207837

Signature……..

Date……..

Supervisors

Prof. Paul. W. K. Yankson

(Principal Supervisor)

Signature……

Date……..

Dr. Kwabena Gyekye Awere

(Co-supervisor)

Signature……

Date……..

DEDICATION

I dedicate this work to my father, Mawuenam Kwame Yekple for his prayers, encouragement and unflinching support during this study.

ACKNOWLEDGMENT

I am most grateful to the Lord Almighty for the strength, knowledge, wisdom and grace granted me during the entire period of the study.

I would like to express my deepest appreciation and heart-felt gratitude to my supervisors, Professor Paul W. K. Yankson and Dr. K.Gyekye Awere for the continual and tireless support, guidance and expert advice that they extended to me through discussions, interaction, corrections and constructive criticisms during the entire period of the study.

I also wish to express my warm gratitude to the Planning Officers and the Environmental Officer at the Ashaiman Municipal Assembly and Tema Development Corporation and all the residents of Ashaiman who gave information to support this academic exercise.

I am also grateful to Professor Jacob Songsore and Mr. Austin Ablo for their motivation and encouragement during the entire period of study. To George Gumah, am grateful for assisting me with the map of the study area.

Special thanks to PERI PERI U and USAID for their financial support for the research.

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

LIST OF ACRONYMS AND ABBREVIATIONS

ASHMA	Ashaiman Municipal Assembly
GAMA	Greater Accra Metropolitan Assembly
GHAFUP	Ghana Federation for the Urban Poor
GWCL	Ghana Water Company Limited
IPCC	Intergovernmental Panel on Climate Change
MDG	Millennium Development Goal
MTDP	Medium Term Development Plan
OPD	Out-Patient Department
PAR	Pressure and Release model
TDC	Tema Development Corporation
UETM	Urban Environmental Transition Model
UN/ISDR	United Nation/ International Strategy for Disaster Risk Reduction
UNDP	United Nation Developmental Programme
UNEP	United Nation Environmental Programme
UNICEF	United Nations Children's Fund
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
WSSCC	Water Supply and Sanitation Collaborative Council
WSUP	Water and Sanitation for the Urban Poor

ABSTRACT

Access to safe, adequate water and sanitation has been a global developmental priority due to their intrinsic impacts on the achievement of the Millennium Development Goals (MDG). Despite the implementation of several measures to improve upon access to safe water and sanitation, residents of Ashaiman still struggle daily to acquire water and have access to sanitation facilities.

The research was conducted in four selected communities in the Ashaiman Municipality namely: Adakodzi, Amui Dzor, Jericho and Lebanon to identify and assess the vulnerable conditions of households to environmental inadequacies of potable water and sanitation, so as to device means of reducing the risks associated with them. The study employed the mixed method convergent design of conducting research where elements of qualitative and quantitative viewpoints, data collection and analysis were used in understanding the research problem.

The study revealed that, access to adequate water supply was not necessarily dependent on the physical location of house units but rather on other factors such as lack of building permit, ill-suited housing arrangement of some communities and others. Also, despite the low water supply coverage of 38.5 % for the selected communities, most respondents seem satisfied with water supply situation since they could access water from neighbours and informal water vendors.

On the other hand, unsanitary conditions seem to be the major challenge of respondents as 66% of them did not have any form of domestic toilet facilities. Inadequate solid and liquid waste management practices and poor drainage systems were also major problems identified in the Municipality.

In addressing these problems, water, drainage system and other logistics for waste management must be provided and extended to most deprived communities by the local government and service providers through a Public-private partnership agreement. Also, since planning rules, regulations and procedures are very essential in reducing the vulnerability of settlements to environmental risk problems, they should be strictly adhered to and vigorously enforced by the Assembly so as to have a well-organized and planned urban environment. Furthermore, since majority of households depended on the informal service providers, more attention should be devoted to regulating their activities.

CHAPTER ONE

INTRODUCTION

1.1. Background

Access to safe water and sanitation has been a global development priority for decades. And thus, it is one of the most critical challenge to tackle, if sustainable development and the Millennium Development Goals (MDG) target for access to water and sanitation are to be achieved (Hesselbarth, 2005; UNDP, 2010). Water is an essential resource for health improvement, poverty reduction, food security, and empowerment in various spheres of life (Hesselbarth, 2005; Oluyemo, 2012). Although, it's crucial importance has been widely known, the right to safe water and adequate sanitation remains a promise unfulfilled for the world's poorest citizens (Hesselbarth, 2005).

Moreover, ever since the United Nations declared the International Decade on Drinking Water and Sanitation in 1980 and its inclusion in the Millennium Development Goal's (MDGs) in 2000, water and sanitation issues have remained high on the policy agenda of multilateral and bilateral agencies, national governments and civil society organizations in developing countries (Songsore, 2008). Several measures and strategies have therefore been put in place by various governments to enhance access to water and sanitation facilities for most deprived communities so as to increase the quality of environmental health (Songsore, 2008). In spite of numerous interventions implemented, 783 million people around the world still face water shortage and struggle daily to secure safe water, while 2.5 million people still face basic sanitation problems (UNDP, 2012). The question that arises is why are there millions of people without adequate water and basic sanitation?

Research has shown that in Africa, about 150 million urban residents do not have adequate water supply, while about 180 million (60%) of people especially in urban areas lack adequate sanitation (UN-HABITAT, 2005). This is as a result of numerous and very

complex problems such as institutional bottlenecks, infrastructural and inadequate financial resources (Ainuson, 2010). Zimmerman et al (2008) also identified that population growth places a particular stress on the provision of social amenities. It is in this vain that UNICEF & WHO (2011) reported that the world's population keeps increasing with about 94% of the growth occurring mostly in cities of developing countries. This subsequently increases pressure on the housing sector and existing social infrastructures (Pelling & Wisner, 2009). This situation also results in increased vulnerability of the urban poor as they mostly settle in deprived areas that are environmentally risky (UNDP, 2010). Aside these issues, the emerging phenomena of climate change is also affecting standard of living in cities; most especially, water supply and sanitation issues (Ainuson, 2010; Moore et al, 2003).

In view of these problems, World Water Vision (WWV) recognized that water crisis is not about having too little water to satisfy needs but it is an issue of managing water (World Water Council, n.d). Moreover, large sections of the urban population in low-income and middle-income nations experience rapid population growth, whiles most people live in informal settlements lack access to safe, regular, convenient supply of water and sanitation facilities (Marcotullio & McGranahan, 2007; UNDP, 2010; Pelling, 2007; Mitlin & Satterthwaite, 2012). As such, a large section of the population use contaminated water with limited or no provision for sanitation in their homes (Marcotullio & McGranahan, 2007). Consequently, most of the urban population in these low and middle income nations also lack regular services to the collection of household waste as well as adequate storm drainage infrastructures (Marcotullio & McGranahan, 2007). Therefore, the environmental health implications of inadequate provision of these facilities in urban areas are evident as most households dump and discharged liquid and solid waste

indiscriminately into the environment (Marcotullio & McGranahan, 2007). It is imperative to reduce the risk associated with these environmental inadequacies.

However, there seem to be a complex relationship between unsafe water, sanitation, hygiene and health as identified by Pruss et al (2002); Bosch et al (2001); Marcotullio & McGranahan (2007). This relationship is explained by using the Bradley- Feachem classification of water related diseases (Feachem et al, 1977 cited in Marcotullio & McGranahan, 2007) and the F-diagram by Wagner & Lanoix (1958) cited in Marcotullio & McGranahan (2007). From these two, it became evident that, interventions focused on environmental risk reduction ought to be based on improvement in access to adequate water supply for proper personal and domestic hygiene and sanitation (Pruss et al, 2002). According to Institute of Medicine (2009), even where clean water and flush toilets were readily available, in the case of Africa, lack of hygiene awareness continues to result in outbreaks of water and sanitation related diseases.

Subsequently, it has being realized that, the environmental burden from inadequate water, sanitation and hygiene practices do not only affects human health but development as a whole. Lack of access to adequate water and sanitation services increases households' costs of living, lower income earning potentials, damage well-being and make life riskier especially for the poor and women in particular (Bosch et al, 2001). Since women are primarily responsible for management of household water supply, sanitation and health. Their income earning activities therefore decrease when they spend more time on water collection, maintenance of hygienic conditions and on the welfare of sick children and relatives (UN-Habitat, 2005). The education and empowerment of women and girls are also affected when the provision for water and sanitation facilities are inadequate and unavailable (Hesselbarth, 2005). Thus, providing clean, accessible water and sanitation

facilities do not only prevents needless drudgery and indignity of women but also improves their health and that of the whole family (WaterAid, 2011).

In addition, a report by WHO/UNICEF (2010) indicated that, there exist disparities in levels of access to water and sanitation between regions and countries and even within countries. The report indicated significant disparities in access to water and sanitation facilities between and within urban and rural areas. And even within households, the burden of poor access falls disproportionately on women and children because they are responsible for water collection and are most affected by the related health burdens (Moe & Rhiengans, 2006). What then is the cause of these disparities? WHO/ UNICEF (2010) as well as Moe & Rhiengans (2006) study attributed the inequitable access of water and sanitation to the disparities in fresh water resources, income, power and institutional capacity between and within countries. The inequalities observed in the spatial distribution of access to water points to the facts that certain vulnerable conditions prevail at different areas.

The Department for International Development (2012) portfolio's review on Water, Sanitation and Hygiene (WASH), emphasized that, it is important to assess the vulnerability of people to environmental risk problems associated with inadequate water and poor sanitation if quality of life is to improve. It is therefore important to identify populations that are vulnerable and are at risk in the face of unsafe water and sanitation. Risk reduction involves set of activities undertaken by a community or state to minimize the risk of a disaster in the event that it occurs (UNDP, 2004). Therefore in other to reduce the risks associated with inadequate water provision and poor sanitation, it is important to identify and understand the vulnerable conditions of people in respect to their inadequacies.

1.2. Problem statement

According to the Ghana Statistical Service (2012), the proportion of total population living in urban areas increased from 26% in 1965 to 46.3% in 2005 and then to 51% in 2010. The growths in these areas outpace the growth in infrastructure development and therefore limit the ability of government to provide adequate utility services for its citizens (Ainuson, 2010). So, in spite of the benefits of adequate water and sanitation services to economic wellbeing, Ghana like other developing countries struggles to improve access to water and sanitation to its citizens (Ainuson, 2010; Songsore et al, 2005). Presently, many areas within the country are not connected to the national water utility system (Ghana Water Company Limited, n.d); Ainuson, 2010). Lack of access to adequate quantities of safe, reliable and affordable water, along with poor sanitation and hygiene, therefore impose a heavy burden of disease in Ghana (Kyomuhendo, 2011). It have been discovered that, contaminated drinking water contributed to an estimated 10,000 deaths annually from diarrhoea, the third largest killer of children under 5 years of age in Ghana (WHO/UNICEF, 2008).

The government of Ghana recognizing the essential role of adequate safe water and sanitation in promoting health and development committed itself to increase access to these basic necessities of life (Kyomuhendo, 2011). Despite this commitment, and constant vehement public criticism of inadequate supply of water and sanitation services, the problems still persist in the country.

Ashaiman Municipality, located in the Greater Accra Metropolitan Area (GAMA) of Ghana is a sprawling urban settlement that exhibits all the characteristics of a slum, but has pockets of middle-income residential areas. (Ashaiman Municipal Assembly, Medium Term Development Plan (MTDP), 2010-2013). According to the Ghana Statistical Service (2012), in 2000, Ashaiman population stood at 150,312, whereas in 2010 it stood at

190,972. This rapid population growth coupled with the unplanned nature of the municipal area, poor management and poor attitude of people toward water and sanitation needs account for the challenges in water and sanitation sector in the Municipality (ASHMA MTDP 2010-2013).

Ashaiman is one of the earliest beneficiaries of water supply by the Ghana Water Company Limited due to its location near the Kpone treatment plant. However, what percentage of the populations is served by GWCL? Is every household privileged to have pipe connections? And if so, under what conditions are pipelines connected? Are there public stand pipes that serve households without pipe connections? Answering these questions is crucial in understanding the prevailing inequality in the provision and access to adequate water and sanitation for residents in the Municipality. Furthermore, majority of households in the Municipality are without pipe connection; they therefore rely on water vendors who are either served by the utility company or by water tankers (ASHMA, 2010). This increases the expenditure of households on water consumption and thus reduces the quantity of water use which may affect hygiene practices. Identifying the conditions under which these water vendors operate is thus important if the risks involved in storing and carrying water are to be reduced and prevented.

Sanitation issues in the Municipality are major problems for development. Disposal of liquid waste is one major challenge faced by the Municipality (ASHMA MTDP 2010-2013; Songsore et al, 2009). Most residents do not have well engineered drainage facilities whiles the few ones are choked with solid waste. Due to this, liquid waste normally stagnates and become breeding ground for mosquitoes. On the issue of excreta disposal, most households do not have domestic toilet facilities and are also not connected to the main sewerage network (ASHMA MTDP 2010-2913; ASHMA, 2010). This is so because, most land owners do not deem it necessary to add domestic toilet when constructing their

residential units. While those who formally have, have turned them into stores and dwelling units due to the increasing demand for accommodation (Songsore, 2008; Songsore et al, 2009). As a result there is over dependence on public toilet facilities which leads to the indiscriminate defecation in open spaces and bushes (ASHMA, 2010). In view of this, a number of private shared toilet facilities have been constructed in the Municipality, but will this improvement solve the problem? Are these toilet facilities adequate, accessible and affordable for residents? In connection with refuse disposal, the Municipality is faced with serious problem as most residents still indiscriminately dispose refuse (ASHMA MTDP 2010-2013).

Studies conducted by Songsore et al in (2005, 2009), depicted the Municipality as having severe environmental health problems that come from unmet basic needs of portable water, sanitation, solid waste management and drainage among others. As a result, the major health problems in the area were found out to be preventable and communicable diseases attributable to poor environmental sanitation, ignorance and poverty (Songsore et al, 2009). It is therefore not surprising when in 2009 and 2013, the Municipal Health Directorate reported that, the ten top diseases recorded in the Municipality stems from diseases that thrive in unkempt environment with malaria topping the list followed by acute respiratory infections, skin diseases, diarrhoea and chicken pox in that order.

However, there are spatial disparities in the severity of the problem which is as a result of the inequalities in income levels and residential areas, education and so on within the Municipality (Songsore et al, 2009). What then could be the cause of these disparities? Or why do some areas have better provision for water and sanitation than others? Which groups of people are mostly at risk from inadequate and unsafe water and sanitation services, where are these groups located and how are they affected and coping with the situation? Also what perceptions and attitudes do people have toward water management

and sanitation issues? What are the health and environmental implications on human lives? Further questions that need to be answered are:

- What are the causes of these spatial inequalities in the access to safe water and sanitation?
- Under what vulnerable conditions are residents subjected to in their various communities?
- What is the perception and behaviour of households in regard to their environmental risks problems?
- How are they coping with these problems?

1.3. Objective

In order to provide answers to these questions, the study examined the vulnerable conditions of households to environmental risk problems associated with water stress and poor sanitation.

Sub objectives: To

1. Identify and examine the environmental risk factors and the vulnerable conditions of households.
2. Assess the spatial inequalities with regards to environmental risk factors in the selected communities.
3. Identify and assess households' perception, behaviour and coping strategies with regard to environmental risk factors.

1.4. Proposition

It is assumed that effective risk reduction measures require an understanding of people's vulnerable conditions.

1.5. Justification for the research

The study is an assessment and an understanding of the environmental risk problems of households as a result of inadequate water supply and poor sanitation. The study is also expected to increase the knowledge and provide up to date information on how risks associated with urban water stress and poor sanitation can be reduced so as to improve the quality of life of urban dwellers. It will also serve as a base data for further investigation, as a useful material for academic purposes and as an added literature to existing knowledge.

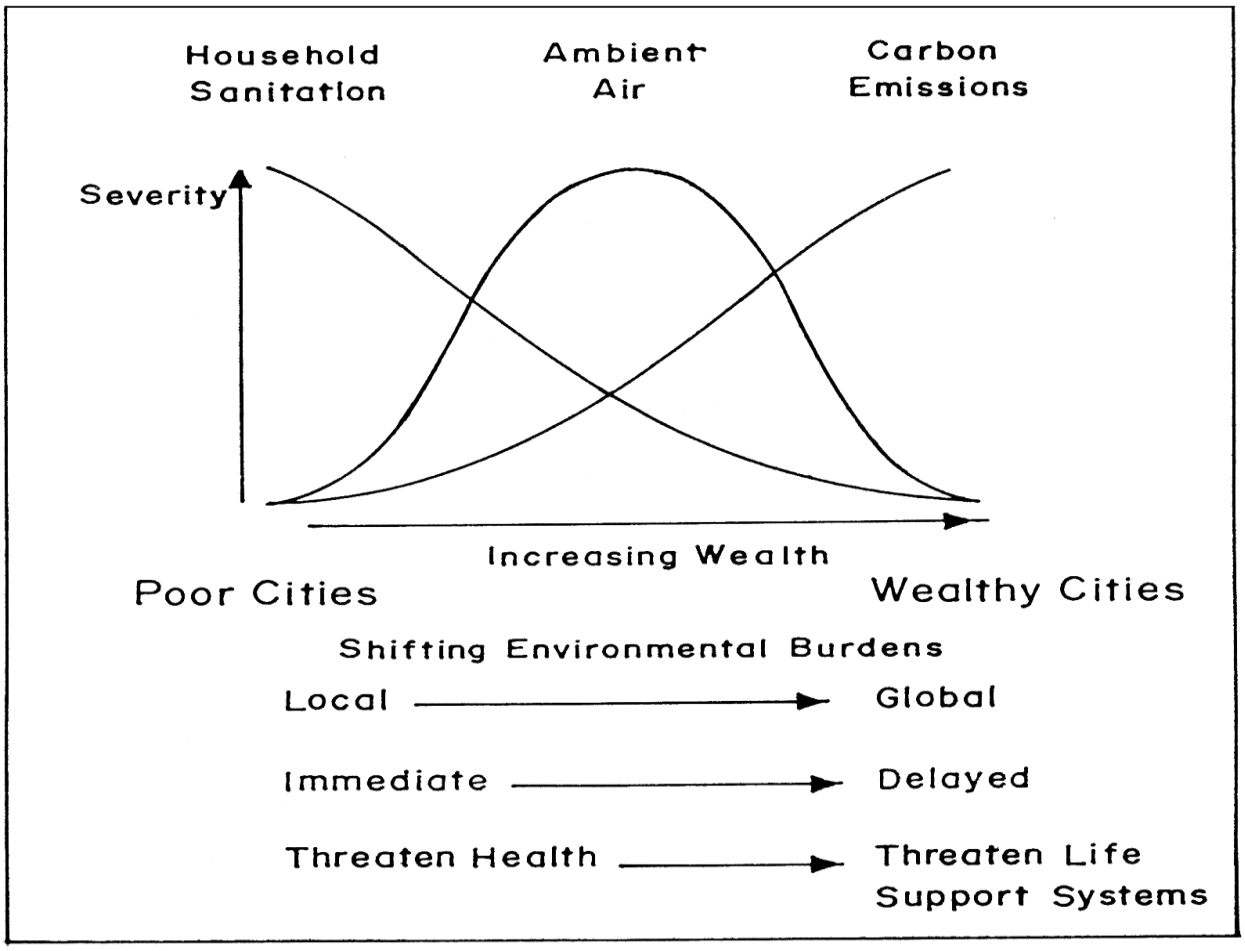
1.6. Conceptual framework

A conceptual framework for understanding and reducing the risks associated with urban water stress and poor sanitation has been captured under the Urban Environmental Transition Model (Songsore & McGranahan, 1993 cited in McGranahan et al, 2001 and Songsore 2004) and the Pressure and Release Model (Blaikie et al, 1994; Wisner et al, 2003).

1.6.1. Urban Environmental Transition Model (UETM)

The Urban Environmental Transition Model as shown in Figure 1.1 postulates that, the nature of environmental risk problems in cities changes with the level of economic development. It argues that, although all components of the environment ultimately exert some influence on human health and well-being, it is the intimate environment of the home and neighbourhood of cities that exerts the greatest influence on people's health and well-being (Songsore & McGranahan, 1993 cited in McGranahan et al 2001; Songsore 2004; Songsore et al 2005, 2009).

Fig 1.1: Urban Environmental Transition Model



Source: Songsore & McGranahan, 1993

The model thus suggests that, the environmental problems of inadequate water supply and poor sanitation practices, poor and overcrowded housing, heaps of uncollected garbage and poor drainage systems are found in the immediate environs of the home and neighbourhood of poor urban cities (McGranahan et al, 2001; Songsore 2004; Songsore et al 2005, 2009). However, as countries develop and move into middle-income status, there is a reduction of environmental risk problems. At this stage, focus is turned to other city challenges like ambient air pollution and water pollution. The model further postulates that, as cities gain high-income status, they are able to address both risks close to the home

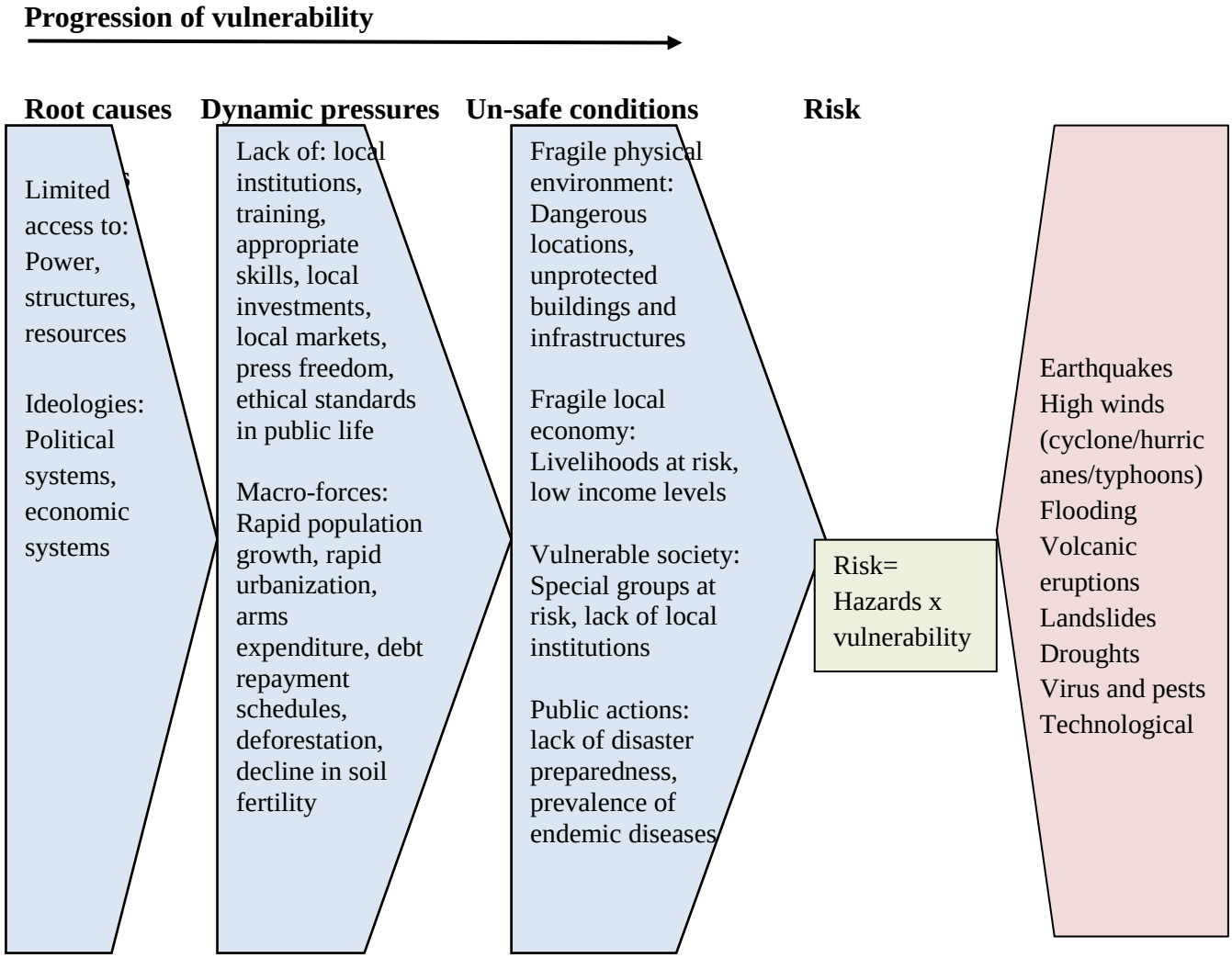
and city wide challenges by using part of their wealth to avoid personal exposure to these risky situations.

This model provides a useful basis for understanding the sanitation situation in Ashaiman. As most of the environmental problems of inadequate water and poor sanitation, poor housing conditions, heaps of uncollected garbage and inadequate drainage systems occur close to the home and neighbourhood of most communities in the Ashaiman Municipality. The Municipality could therefore be said to be at the first stage of the Urban Environmental Transition model. This implies that efforts to reduce environmental risk problems in the Municipality should be tailored toward the immediate environ of the home and neighbourhood of households.

1.6.2. The Pressure and Release Model (PAR)

In order to understand how risks can be reduced, the research focused on the Pressure and Release model (Blaikie et al, 1994; Wisner et al, 2003). This model emphasized the importance of vulnerability of people in the study of risk reduction. The model as shown in figure 1.2, focused on explaining factors responsible for the occurrence of a disaster. The Pressure and Release model, argues that disaster occurs at the tangent between two opposing forces, those of the natural hazards and the processes that generate vulnerability (Wisner et al, 2003). It is when these two forces coincide that a disaster happens. The PAR model also identifies a progression of vulnerability in which root causes are shaped by a series of dynamic pressures which give rise to unsafe conditions (Wisner et al, 2003).

Fig 1.2: Pressure and Release or the Crunch model



Soource: Blaikie et al (1994)

The PAR model identifies a number of factors that give rise to vulnerability. Firstly, '*root causes are the interrelated set of widespread and general processes within a society that is profoundly bound up with cultural assumptions, ideology, belief and social relation of the people concern'* (Wisner et al, 2003). Accordingly, the most important root causes that affect the allocation and distribution of resources among different groups of people include economic, demographic and political processes (Wisner et al, 2003). These underlying causes may seem far but they can usually have powerful influence on the vulnerability of the local people as identified by Venton & Hansford (2006).

Secondly, dynamic pressures have been identified to create vulnerable conditions for people (Venton & Hansford, 2006). These pressures *are structures, processes and activities that translate the effects of root causes both temporally and spatially into particular forms of unsafe conditions that are considered in relation to the different types of hazards people face*'' (Wisner et al, 2003; Venton & Hansford, 2006).The structures are the organizations and individuals who create vulnerable conditions, while the processes are policies and practices or activities undertaken by the structures to effect change whether positive or negative (Venton & Hansford, 2006). Lastly, unsafe or vulnerable conditions created by these pressures are the specific forms in which the vulnerability of a population is expressed in time and space in conjunction with a hazard (Wisner et al, 2003).

Subsequently, as suggested by Venton & Hansford (2006), in reducing the risk of disaster the factors that cause the risk should be addressed. This means that, all the components of the Pressure and Release model have to be addressed. Wisner et al (2003) put it that in other to reduce vulnerability, the pressures have to be released by changing the underlying social, economic and political structures existing in a particular community. This will go a long way to increase the resilience of the people to the risks they face. On the other hand, Bull-Kamanga et al (2003) writing on the same subject suggested that, it is important to know how and why people come to be at risks from the basic necessities of life if disaster risk is to be reduced. Wisner et al (2003) in contributing to the Pressure and Release model suggested the need to understand people's exposure to risks by taking into consideration their social class, income level, educational level, sex, tribe and age group among others in the quest to reduce risk. Therefore, focus should not be on only the hazards that might affect people but also the vulnerable conditions of different groups of people which are determined, constructed and amplified by economic, social and political systems and power (Bull-Kamanga et al, 2003). And thus, changes in these systems will greatly reduce the

vulnerabilities of people to environmental risk problems (Wisner et al, 2003; Bull-Kamanga et al, 2003).

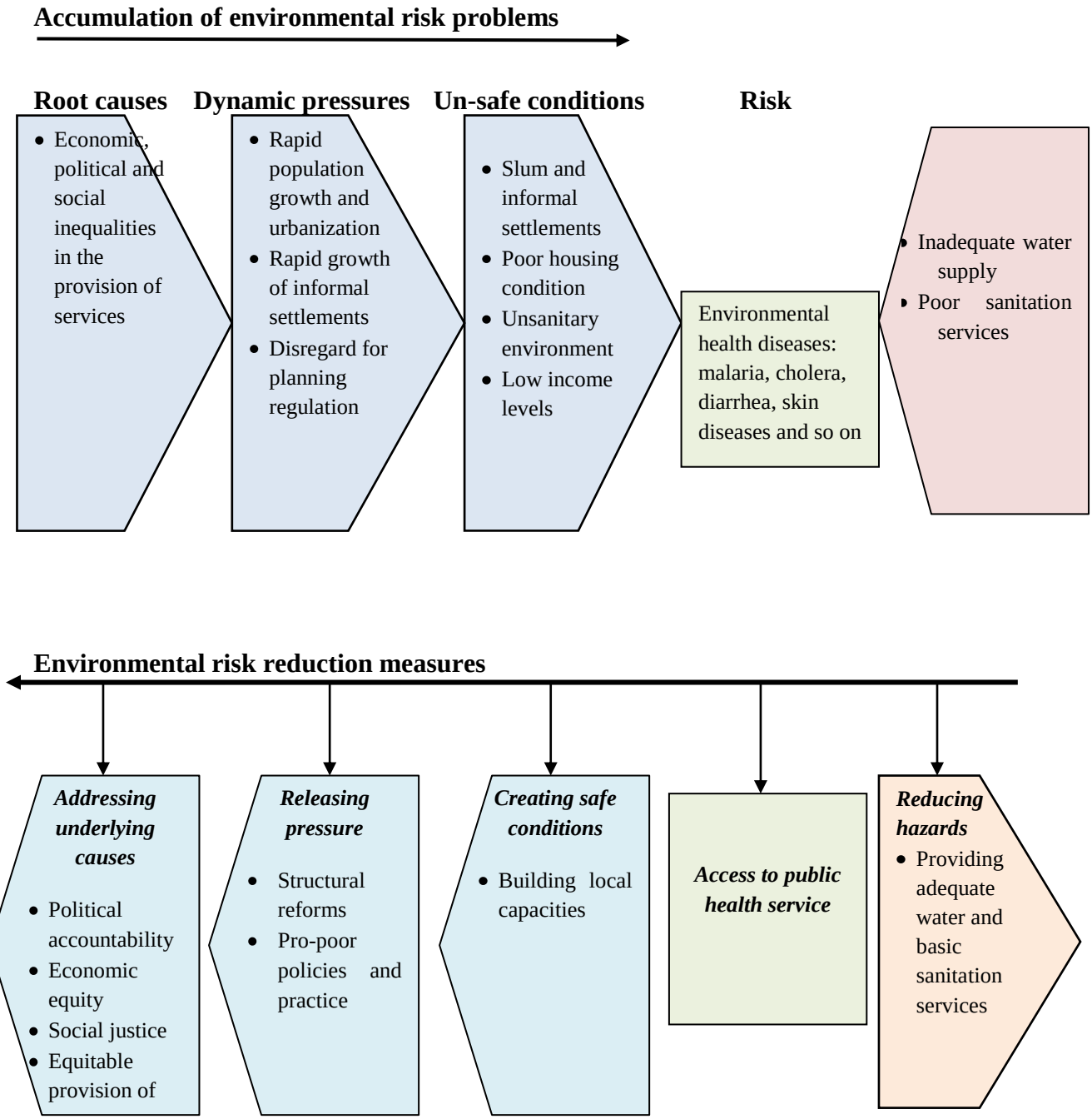
Although the PAR model have being criticized on the basis of it being static and not providing a detailed and theoretically informed analysis of the interaction between the environment and the society at the pressure point (Wisner et al, 2003), it however provides a model for understanding the underlying factors that create vulnerable conditions for households.

1.6.3. Urban water stress and poor sanitation risk reduction process

The UETM and PAR models have been introduced in the research to serve as tools for showing how environmental risk problems accumulate close to the home, due to the interaction between root causes and dynamic pressures that translate into unsafe conditions. The models are also useful in showing how the pressures exerted on the environment can be released so as to reduce the environmental risk problems of households.

As shown in Figure 1.3, limited or lack of access to power and resources brings about economic, political and social inequalities in the access to resources and services. Limited and differential access to income and resources, give rise to economically and politically marginalized areas that lack basic social amenities as identified by Wisner et al (2003).

Fig 1.3: Urban water and poor sanitation risk reduction process



Source: Conceptual framework, adapted and modified from Blaikie et al, 1994

These underlying factors are then channelled by rapid population growth and urbanization without appropriate planning as seen in the Ashaiman Municipality where population increased from 150,312 in 2000 to 190,972 in 2010. This increase in population growth has put pressure on housing facilities thus increasing the growth of slum and informal

settlements in the process. Consequently, more pressure is exerted on social amenities like water supply and sanitation facilities creating myriad of problems for residents.

Urbanization without adequate planning is a major factor responsible for the increasing growth rate of informal settlements and the appalling conditions in which they live. This urbanization process according to UNDP (2010) increases the exposure of people and economic assets to hazards, creating new patterns of risk. Furthermore, Pelling & Wisner (2009) also identified that, urbanization puts pressure on land and housing as migrants move into already overcrowded cities. These new arrivals according to Pelling & Wisner (2009) have no other option than to occupy unsafe land, construct unsafe structures and work in unsafe environment. The historical profile of Ashaiman will attest to this fact raised by Pelling & Wisner (2009).

On the other hand, lack of institutional structures in the provision of services, lack of appropriate planning regulations and differential access to income and resources all combine to create spatial inequalities in the access to basic necessities of life (Wisner et al, 2003). Also it has been discovered that, inappropriate land-use planning and the failure of urban authorities to regulate building standards, contribute to the vulnerability of urban populations to the environmental inadequacies of potable water and basic sanitation. In the case of Ashaiman, lack of building regulations and land use control measures have contributed to the haphazard sitting of buildings (Ainuson, 2010) and its associated environmental risk problems.

Subsequently, when these pressures are exerted on the environment in which urban residents resides, they create unsafe, unhealthy and risky living conditions at the neighbourhood, household and individual level. When these factors coincide with inadequate water supply, poor sanitation services and poor personal and domestic hygiene

practices, it create myriad of environmental health diseases like malaria, cholera, diarrhoea, typhoid fever, skin diseases and so on that serve as a threat to human health and development.

However, no matter the effect of the pressures on the environment, peoples' health and well-being will only be affected when they are exposed to a particular state of living conditions (Integrated Environmental Health Impact Assessment System, n.d) For instance, the socio-economic status of residents, culture and belief systems as well as their behavioural patterns and perceptions about water and sanitation issues, may influence their level of exposure to environmental health problems. This therefore means that, not all members of a particular society are affected equally by a particular risk.

In view of this, the entire factors and processes exerting pressure on the urban environment have to be radically addressed if the risks associated with inadequate water and poor sanitation is to be reduced. Thus, the release measures must be introduced to reduce the pressures exerting on the urban environment so as to create healthy and safe environment for residents. These measures include capacity building of local communities through development; cultural reforms and political accountability etc. These measures must be geared towards improvement in social facilities both at the household and community level (Venton & Hansford, 2006), which requires a coordinated action on the part of the local government, utility service providers and the residents (McGranahan, 2007).

1.7. Operational definition of terms

1.7.1. Water stress

Water stress is the imbalance between water use and water resources or when water resources are under pressure (World Water Council, n.d). To White (2012), water stress is lack of access to adequate quantities of safe, reliable and affordable water for human and environmental uses. Schulte (2014), view water stress as lack of water to meet human and ecological demands. Based on the definitions provided by the two authorities, water stress is define as lack of adequate quantities of safe, reliable and affordable water to meet human and environmental demands.

1.7.2. Poor sanitation

Poor sanitation, include the unsafe collection, storage, treatment and disposal/ re-use/ recycling of human excreta (faeces and urine); the poor management/re-use of solid wastes (trash or rubbish); poor drainage and disposal of household waste water and storm water and the poor treatment and disposal of sewage effluents (WHO/UNICEF & WSSCC, 2008).

However, only aspects of sanitation as defined by the Ashaiman Municipal Assembly were taken into consideration. These include unsafe management of solid waste, unsafe storage of human excreta, poor drainage and disposal of household liquid waste and poor personal hygiene.

1.7.3. Disaster

A disaster is a serious disruption of the functioning of a community or a society to cope using its own resources (The UN Inter-Agency Secretariat of the International Strategy for Disaster Risk Reduction).

1.7.4. Risk

Risk is the probability of harmful consequences, or expected losses resulting from interactions between natural or human induced hazards and vulnerable conditions (UNDP, 2004).

1.7.5. Risk reduction

Risk reduction involves a set of activities undertaken by a community or state to minimize the risk of a disaster in the event that it occurs (UNDP, 2004).

1.7.6. Hazard

A hazard is a potential damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation (UNDP, 2004).

1.7.7. Vulnerability

Vulnerability is the condition determined by physical, social, economic and environmental factors or processes which increase the susceptibility of a community or an individual to the impacts of hazards (UNDP, 2004).

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

This chapter reviews relevant literature on access to safe, adequate water and basic sanitation; and urbanization process that create myriad of problems contributing to the accumulation of risks in urban areas of developing countries in particular. Finally, it examines the opportunities for risk reduction measures in the urban settings.

2.2. Global context of water supply and sanitation

Globally, water and sanitation have been accepted as essential for human life, dignity and human development (WHO, 2012). However, until recently, water and sanitation issues have not received the necessary political attention they deserved in the past years. It is in this vain that Hesselbarth (2005) noted that safe water and sanitation remains a promise unfulfilled for the world's poorest citizens. A year more to meet the 2015 MDG on access to drinking water and sanitation, there still exist inequity in coverage between different countries, urban and rural areas and even within urban areas. This inequality in the access to water and sanitation is one of the enduring characteristics of the water and sanitation sector as identified by Garrett (2014). Garrett further indicated that, lack of sustainability of services contributes substantially to inequality as existing facilities falls into disrepair. As suggested by Pelling (2007) and Cheru [n.d], this inequality is exacerbated by the increasing urban population growth in developing countries. In addition to this Moore et al (2003) and WHO (2012) observed that, inequity in access to water and sanitation is as a result of governments prioritizing urban area needs over rural areas due to the appalling hygienic conditions that are mostly associated with urban poor and slum dwellings.

Despite numerous efforts to increase access to sanitation services, studies conducted by WHO, UNICEF and many other international organizations have indicated that the 2015 basic sanitation target cannot be achieved worldwide. Several arguments have been put forward to explain why the sanitation target cannot be met. Joshi et al. (2011) indicated that, lagging sanitation targets were not issue related to technical failures as argued by Penner (2010) but rather as, it is a result of social, cultural and political disparities in the allocation and access to resources and services. Postel, 2000; Penner, 2010; Joshi et al, 2011 further highlighted that underinvestment in sanitation services, lack of awareness about the extent of ill health that poor sanitation causes and cultural indifference in the use of untreated excreta are major problems responsible for the lagging sanitation target. To Penner (2010), despite the fact that there were structural inequalities in the provision of sanitation services in South Africa, political inequality was also identified as a problem. What then could be the case in Ghana? Are issues pertaining to water supply and sanitation in Ghana, questions of how water and sanitation matters are handled and managed in the face of rapid urbanization, increasing population growth and unplanned city growth? Or they are issues of weak local government structures and the lack of transparency and accountability in city governance as suggested by Owusu (2010) and Bohman (2010)?

Urbanization, which is the gradual increase in the proportion of people living in urban areas has taken momentum globally but it is more pronounced in developing countries. Globally, despite the huge number (over half of the world's population) of people that already living in urban centres of most low and middle income countries, the process is still occurring in these areas (Dodman et al, 2013; Mitlin & Satterthwaite, 2012). Nonetheless, African countries are seen to be urbanizing faster than any other regions in the world (Pelling & Wisner, 2009).

Just like other regions in the world, sub-Saharan Africa is confronted with the challenge of rapid urbanization and population growth. According to Postel (2000), population growth and rapid urbanization have continued to complicate the challenges involved in providing adequate water and sanitation services for all people. Postel (2000) further stated that, the gap in the provision of basic services to improve human health and development persist not because it has not been recognized but because of poverty, under investment, skewed political priorities and rapid population growth. And that the inability of governments and development agencies to keep pace with the high rate of population growth has been a huge challenge in the provision of services. In a related development, Chaplin (1999) and Hardoy et al (2005) cited in Owusu (2010) stressed that, rapid urban growth in many developing countries has far outpaced the capacity of metropolitan and municipal authorities to provide basic services of water and sanitation therefore increasing the environmental burdens of residents. This notion was also highlighted by a UNICEF/WHO report (2011) that confirmed that, in addition to population growth, the process of rapid urbanization impede access to improved source of drinking water. Consequently, Moore et al (2003) indicated that, urbanization has put so much stress on the housing sector in most developing countries that it often results in excess demand and over usage of water from municipal water sources. This has resulted in most treatment plants for water supplies being inadequate in meeting the high demand of the population and as such the cost of water in poor communities were recorded to be significantly higher than in other urban neighbourhood (World Bank, 2000 cited in Moore et al, 2003).

2.3. Water supply and sanitation in Ghana

Prior to the introduction of pipe borne water in Ghana, all urban dwellers as well as their rural counterparts depended on rainwater, wells and lagoons for their daily supply of water

(Bohman, 2010). The introduction of a national water supply system was triggered by the outbreak of a bubonic plague and the insanitary conditions prevailing in the then Gold Coast and in particular Accra (Patterson, 1979 cited in Bohman, 2010).Also, the need to cater for the European officials residing in the colony and the small number of natives remaining after the slave trade motivated the government to introduce public pipe borne water systems into colonial urban centres. Thus, in 1928 the colonial government established the Public Works Department which was responsible for urban and rural water supply. Later in 1948, a Rural Water Development Department was established to focus on rural water supply through drilling of bore holes and the construction of wells (Agyenim & Gupta, 2010; Bohman, 2010; Ministry of Water Resources, Works and Housing Ghana, 2010).

Just as today, urban water delivery in the colonial period was a political issue closely connected to the framing of water as independence and national integrity (Bohman, 2010). Issues regarding urban water and sanitation in this period were associated with weak city planning or unplanned nature of cities, rapid urbanization and growth of urban areas. In a research conducted by Simpson (1909) cited in Bohman (2010), it was revealed that, lack of city planning and its associated unplanned growth as well as rapid urbanization has made laying of pipes and drains difficult; hence, causing serious sanitary problems in the then city of Accra. Simpson (1909) as cited in Bohman (2010) further identified lack of an overall sanitary administration and infrastructure as bottlenecks in the water and sanitation situations of the city. These issues are however still prevailing in the 21st century countries. Why is it so? Have the 21st century governments not learn from past experiences? Are they not doing anything about the challenges of urbanization? Are they ‘‘*reacting piecemeal to the crisis as they emerge’’*? (Martine et al, 2008) Or they ‘‘*consider cities to be stable, healthy and resilient centres of economic growth that deliver*

services and combat environmental problems associated with rapid urban growth'' (Martine et al, 2008). Consequently, McGranahan (2007) noted that the challenge to provide basic water, sanitation and housing to deprived urban settlements was as a result of total neglect and poor understanding of the needs of the poor. McGranahan (2007) stated further that, residents and experts need to understand the various ways in which water, sanitation and hygiene affects health so as to plan and provide services appropriately.

In Ghana, from 1957 up to date, the efforts by various governments in the provision and management of water and sanitation services were centred on the establishment of agencies and departments with specific roles and duties to perform (Agyenim & Gupta, 2010). In view of this, various agencies, departments and ministries were established to manage, regulate and control water as related to their mandates and sector activities. However, in 1965, the water supply division under the Public Works Department was transformed into the Ghana Water and Sewage Corporation after a severe water shortage in 1959 (Bohman,2010; Agyenim & Gupta, 2010; Ministry of Water Resources Works and Housing, 2010; Ghana Water Company Limited website).

Since the 1990s, several reforms aimed at redefining the roles, functions, and decision-making processes of actors in order to address the problems associated with the country's urban water supply and sanitation system were initiated (Osumanu, 2008). Essential to these reforms is the transformation of the Ghana Water and Sewerage Corporation into the Ghana Water Company Limited (GWCL). Additionally, the reforms saw a shift of regulatory oversight from the government to the Public Utility Regulatory Commission (PURC) which is an independent institution (ibid.). The policy reforms also led to the local government taking responsibility for sanitation and wastewater management. Finally reforms also required District, Municipal/Metropolitan Assemblies to ensure 'the

promotion, construction, and use of domestic latrines, and enforce by-laws on the provision of sanitation facilities by landlords' (Osumanu, 2008: 106).

As Agyenim and Gupta (2010) observed, much of the activities by the ministries and different state institutions were heavily dependent on foreign aid, which resulted in much emphasis being laid on areas in which donors wished to invest rather than to follow the strategic direction of the government. This action was partly responsible for the inequity observed in the distribution of water and sanitation services in the country. Subsequently, inadequate funding to carry out maintenance and rehabilitating work due to over dependence on foreign aid had led to the reform and restructuring of the water sector in recent times (Agyenim & Gupta, 2010; Ministry of Water Resources, Works and Housing Ghana, 2010).

At the July 2010 resolution of the UN General Assembly on the right to water, access to water was accepted and adopted as a basic human right. However, there seem to be a conflict between the current water laws in Ghana that operate under the principle of cost recovery and the adoption of water as a human right (Agyenim & Gupta, 2010). The question is how can water as a fundamental human right and sanitation be provided for citizens and accessed by all despite the principle of cost recovery.

2.4. Urban environmental risk problems

According to Mitlin & Satterthwaite (2012), urban areas which are regarded as the safest places to live and work are at the same time the most risky places to reside. Several factors have accounted for this. Historically, it is said that, risk accumulate through inappropriate developmental interventions as a result of rapid urbanization (UNDP, 2004). To Moore et al (2003), rapid and often unplanned urban growth is the source of environmental health problems faced by cities within developing countries. Urbanization processes accordingly

have led to concentration of population in risk-prone areas within cities, through the process of urban expansion; and thus, transforming the environment of cities to generate new kind of risks (UNDP, 2004). This kind of risk as identified by Bull-Kamanga et al, 2003; Songsore et al, 2005 and Dodman et al, 2013 affect mostly the urban poor and ranges from everyday hazards of inadequate water and poor sanitation to poor health caused by poor living conditions to the large scale disasters that can result in heavy loss of life and property.

In the light of this, Songsore, McGranahan & Kjellen, 1997 cited in Songsore et al (2005), stated that, the environment in which individual human beings and households live and their behaviour within that particular environment influences their state of health and well-being. They further argued that, it is this environment close to the home and neighbourhood of individual and households that exerts the greatest influence on people's health and well-being. Songsore et al. (2005) added that, the Greater Accra Metropolitan Area in Ghana was at its first stage of the urban environmental transition model where most of the environmental problems occur close to the home.

Some of these environmental problems include: inadequate water supply, unsanitary conditions, uncollected garbage, poor waste water disposal, crowded rooms, inadequate drains and housing problems among others (Songsore et al, 2005; Marcotullio & McGranahan, 2007; UNDP, 2010; Pelling, 2007; Mitlin & Satterthwaite, 2012). It is however these environmental problems that generate the greatest immediate health impacts of about 85% of ill-health in terms of malaria, cholera, diarrhoea, skin diseases, typhoid fever, dysentery on individuals and households (WHO, 2003 ; UNICEF/WHO, 2004; Oluyemo, 2012; Songsore et al., 2005). These health problems as further stressed by UNICEF/WHO (2004), had affected the income earning activities of household members

especially women as they spend more time collecting water and taking care of sick relatives due to poor environmental related illnesses.

To Dodman et al. (2013) environmental problems are as a result of lack of competent, resource and accountable government in the face of rapid urbanization. To Joshi et al. (2011) and Moore et al. (2003), it is due to the unplanned nature of communities, mismanagement of resources by authorities, poor management and underinvestment in water and sanitation services. In addition, the rapid and unplanned urban growth which is often associated with settlements on marginal lands as argued by Moore et al. (2003) had caused severe environmental degradation. Consequently, due to high population density pressure is exerted on environmental services (Pelling & Wisner, 2009) which could be associated with high possibility of disease transmission and a greater vulnerability to epidemics by urban populace. It is in this context that, improvements in water supply and provision of sanitation services as suggested by Pruss et al (2008), have become an important public health issue that must not be overlooked if environmental health diseases are to be prevented so as to encourage economic growth, yield optimal health gain and ultimately reduce poverty (Pruss-Ustun & Corvalaan, 2006).

2.4.1. Urban water stress

Several arguments have being raised in respect to the definition of water stress. It has also been used interchangeably with water scarcity and shortage on several occasions. According to World Water Vision, the crisis in water issues is not about having too little water to satisfy needs but rather an issue of managing water so badly that billions of people and the environment suffer. To White (2012), it is the lack of access to adequate quantities of water for human and environmental uses. According to the United Nation Environmental Programme (UNEP), water stress occurs when the demand for water

exceeds the available amount during a particular period of time or when poor quality of water restricts its use. In the same way, Schulte (2014) view water stress as the lack of water to meet human and ecological demands. In all this definitions, it was deduced that, the quantity, quality, accessibility and in most cases the affordability of water are aspects that determine whether an area is water stress or not. This notion have however been recognized by the United Nations General Assembly on the Right to water and sanitation in July 2010. It is therefore important to take these aspects into consideration when determining whether an area is having water problem or not.

The quantity of water is about the amount of water present to meet human and environmental needs. As a finite resource, it is important to ascertain whether the amount of water present is able to meet the human and environmental demand of an ever increasing population. According to the United Nations General Assembly on the right to water and sanitation, every human being needs between 50 and 100 litres of water per day for personal and domestic purposes (United Nations, n.d). However this amount decreases due to the increasing population growth of cities and the high rate of pollution by untreated industrial and household wastes as well as chemicals used in farming practices.

Closely related to the amount of water used are the accessibility of water, presence of an in-house pipe connection, the frequency of flow and the cost of water usage. As stated by Moe & Rheingans (2006), per capital water rises when people have household water connection. As this is achieved, household income increases as people spend less time on water collection and taking care of sick relatives. Therefore, the amount of water used a day was found to be depended on the distance of the source region from the home (WHO, 2003). Moe & Rheingans (2006) as well as Howard et al. (2003) also noted that, in situations where people walk for more than one kilometre or spend more than 30 minutes

for total water collection time, per capital water use drops to between five and ten litres per day. And at this level of service, adequate hygiene was not possible. Also Boche et al. (2001) noted that, adequate quantities of water, even low quality water were necessary if people were to practice appropriate hygiene habits needed to break the disease pathway of water related illnesses. Aside this, there are issues of both direct and indirect risks on women and children in particular who collects water from long distance sources (WHO, 2003).

With the presence of in-house pipe connection, some level of adequacy may be achieved. However, frequent interruptions in water flow that encourages the storage and buying of water from unsafe sources could affect the amount of water used. In Ghana it has been realized that, rapid population growth and urbanization without appropriate planning as well as mismanagement of water resources have resulted in GWCL been unable to meet the household and commercial demand (Stoler et al., 2012a, 2012b). This has resulted in the water rationing system instituted by the GWCL. This frequent interruption have left large portion of the population without access to adequate and safe water. As a result people resort to the use of unsafe sources of drinking water, which include: unprotected dug wells, surface water, and water from tanker drivers etc. (UNICEF/WHO, 2006). The consumption of unsafe drinking water sources, increases the risk of diarrhoea, cholera, typhoid fever, dysentery worms, schistosomiasis and other related water borne diseases that contributes to high mortality rate especially among infants (WHO, 2003; UNICEF/WHO, 2004). For instance, the estimated 10,000 deaths occurring annually in Ghana were due to inadequate water supply and poor sanitation practices (WHO/UNICEF, 2008).

Consequently, the quantity of water use was also found to be depended on the unit cost of water. As identified by Nyarko et al. (2008), the cost of water was dependent on the source of water. And that water supply from GWCL was realized to be the cheapest source of water although not reliable than water provided by informal vendors and tanker drivers. Nyarko et al. (2008) as well as Ainuson (2010) noted that, prices charged by informal service providers were higher than GWCL tariff thus increasing the total expenditure on water usage especially for the urban poor. This is however contrarily to United Nation's Right to water which stated the need for affordability of water to everyone.

Subsequently, inadequate water services according to Boche et al. (2001) often bring about some particular kind of risk. This risk could be felt at the individual, household or the community level depending on the level of exposure. This risk could be prevented by improving water supply (Boche et al, 2001; Pruss et al, 2002). In conjunction with this, WHO (2003) added that, since having access to safe drinking water can help avoid risky methods of water collection and storage, actions must be taken to ensure that everyone is able to access a minimum amount of water that is safe, adequate, accessible and affordable.

2.4.2. Poor sanitation in urban areas

Sanitation refers to the provision of facilities and services for the safe disposal of human urine and faeces. It also refers to the maintenance of hygienic condition through services such as garbage collection and waste water disposal (WHO/UNICEF & WSSCC, 2008). Poor sanitation on the other hand include the unsafe collection, storage, treatment and disposal/ re-use/ recycling of human excreta (faeces and urine); the poor management/re-use of solid wastes (trash or rubbish); poor drainage and disposal of household waste water and storm water and the poor treatment and disposal of sewage effluents

(WHO/UNICEF & WSSCC, 2008). This therefore means that, the concept of sanitation applies to a wide range of activities beyond defecation. However, only aspects related to human waste have been stressed in most literatures.

Despite the fact that proper sanitation services and personal hygiene practices are important aspect of human well-being and state of health, the provision for toilet facilities, bathrooms, drainage facilities and logistics for waste management practices were however found to be inadequate in most developing countries (Marcotullio & McGranahan, 2007; Songsore et al, 2005 and 2009; UNDP, 2012; UN-Habitat, 2005). A UNICEF/WHO report (2014) noted that, 26% of the population of sub-Saharan Africa use unimproved sanitation facilities that do not ensure hygienic separation of human excreta from human contact and an additional 25% defecates in the open, resulting in the outbreak of cholera and other water and sanitation related diseases affecting the health and well-being of thousands of individuals in the region.

A careful analysis of the reasons why most developing countries are faced with poor sanitation reveals structural failure on the part of local government, lack of funds allocation for the sector and many others (Penner 2010; Postel 2000). Marcotullio & McGranahan (2007) highlighted that, large sections of the urban population residing in informal and illegal settlements, lacks proper provision for sanitation in their homes. Especially, the regular services to collect household waste and inadequate drainage systems which compelled them to dump their household waste and discharged their waste water indiscriminately into the environment.

Furthermore, solid waste management seem to be a key challenge facing most world cities (UN-Habitat, 2010). In the words of Onibokun (1999), *''Waste management problems have become a monster that has aborted most efforts by city authorities, states and federal*

governments and professionals alike.'' However, events of the 21st century have indicated that, waste in whatever form it may be, has become a major consequences of modernization and economic development (Aziale & Asafo-Adjei, 2013). The storage, disposal, collection and transportation of waste from households and other generating sites has therefore become a growing problem in most urban centres of developing countries (Aziale & Asafo-Adjei, 2013; UN-Habitat, 2010). It has also being realized that, the rapid population growth of countries without appropriate planning have made the collection and transportation of waste more longer and time consuming (Aziale & Asafo-Adjei, 2013; Owusu Boadi & Kuttunen, 2004). In addition to this, separation of municipal waste at the source region according to Zia & Devadas (2008) are considered a key element to a successful solid waste management practice. However, sorting or separating of waste is still a major challenge for the municipal waste management team in Ghana as most household hardly practice it.

Liquid waste is water which has been used once and is no longer good for human consumption (Prakash et al., 2012). Proper and adequate drainage facilities are prerequisite for a proper liquid waste management process. However, as already indicated, drainage facilities and logistics for waste management practices were found to be inadequate in most developing countries (Marcotullio & McGranahan, 2007; Songsore et al, 2005; 2009; MDG, 2012; UN-Habitat, 2005). These inadequacies therefore create situations where liquid waste marred the surroundings close to the home and neighbourhood. In other instances, uncollected garbage on the street and the surrounding often choke drainage facilities causing the stagnation of water which serves as a breeding ground for mosquitoes, flooding, contamination of water bodies and subsequently the spread of water borne diseases (UN-Habitat, 2010; Boche et al, 2001).

Besides, the risks associated with poor sanitation are widely visible as most streets in developing nations are engulfed in filth. According to UN- Habitat report (2010), the accumulation of waste in the vicinity normally offers good conditions for the spread of diseases. The report further indicated that, in the absence of adequate sanitation facilities, toilet paper and in most cases human excreta were mixed with municipal waste which increases the level of exposure through contact by waste handlers. UN-Habitat (2010) as well as Boche et al (2001) further indicated that, children were especially vulnerable to the risk associated with poor waste management because of their behaviour and physiological characteristics. In addition to this, Cointreau (2006) observed that, all activities in the municipal waste management process involve some level of risk either to the worker or to the nearby resident. This means that some level of risk occur from the point of waste handling at the home to the point where it is finally disposed. Risk reduction measures must therefore take into consideration the different stages of waste management if effective reduction is to take place.

2.5. Vulnerability of household's to environmental risk problems

Vulnerability is the condition determined by physical, social, economic and environmental factors or processes which increase the susceptibility of a community or an individual to the impacts of hazards (UN/ISDR, 2004).The term vulnerability is widely used because it brings in notion of threat, risk or stress, of insecurity and lack of power (Klein, 2009 cited in Dodman et al, 2013). It is widely accepted by the Intergovernmental Panel on Climate Change (IPCC) that vulnerability for individuals or households includes three elements. These are exposure to risk, susceptibility to harm when exposed and limitations on the capacity to cope with the impact or to adapt. And as such, most of the literature agrees that

vulnerabilities are influenced by household income and assets, age, gender and other cross-cutting factors (Hardoy & Pandiella, 2009).

2.5.1. Physical vulnerability

Households are vulnerable differently to environmental inadequacies of potable water and basic sanitation based on their location and the built environment (Venton & Hansford, 2006). Physical vulnerability according to ISDR (2004) may be determined by the population density of a place, the remoteness of the settlement, the site, design and the materials used for critical infrastructure and housing . In Ghana, due to the rapid growth of urban areas, the housing market have not been able to keep up pace with the increasing demand especially from the urban poor (Gough & Yankson, 2011). Despite government policies and strategies to increase access to housing for the urban poor, rent charges are still high and burdensome with landlords not able to improve and maintain their properties (Gough & Yankson, 2011). Accordingly, about 60% of residents live in overcrowded, deteriorated and low-income rental accommodations that lack proper basic amenities of portable water and proper sanitation facilities (Arku et al, 2012), resulting in the increasing number of environmental health diseases reported in Out-Patient Department (OPD) of various hospitals in the country.

2.5.2. Socio-economic vulnerabilities

Socio-economic vulnerability refers to the social well-being and economic status of individuals, households and communities (UN/ISDR, 2004). It relates to aspect of literacy, income level, gender issues and presence of social amenities among others. According to Wisner et al (2003), people's exposure to risks differs according to their social class, income level, educational level, sex, tribe and age group among others. They also suggested that, focus should not be on only the hazards that might affect people but also

the vulnerable conditions of different groups of people. These conditions are however, determined, constructed and amplified by economic, social and political systems and power, and as such changes in these systems will greatly reduce the vulnerabilities of people to environmental risk problems (Wisner et al, 2003; Bull-Kamanga et al, 2003).

2.5.3. Environmental vulnerabilities

According to UN/ISDR (2004), environmental vulnerabilities are shaped by lack of resilience within ecological systems and exposure to toxic and hazardous pollutants that increases people's exposure to health risks. Accordingly, a reduction in access to clean air, safe water and sanitation and inappropriate forms of waste management especially in densely populated urban environments like Ashiaman can deepen levels of socio-economic vulnerability. These environmental factors can further increase vulnerability by creating new and undesirable patterns of social discord and economic destitution (UN/ISDR, 2004).

2.6. Household perceptions and coping strategies with regards to environmental problems

The way in which households regard, understand and interpret their problems differ from each other. Risk perception and hygiene behaviour as indicated by Songsore (2008) are aspects of social context that affect the exposure of households to risks associated with inadequate access to safe water and sanitation facilities. Accordingly, Obrist et al (2003) cited in Songsore (2008), noted that, those who live in a particular urban setting are better able to interpret their experiences and respond better to those aspects of the urban life that they consider problematic than outsiders. As a result, setting certain priorities and devising technical solutions would not be able to address the multiple problems of poor

communities adequately if they fail to be accepted by the poor themselves (Songsore, 2008). In view of this, identifying and assessing households' perceptions, knowledge, behaviour and coping strategies are important if specific solutions are to be achieved.

2.6.1. Perceptions and coping strategies with regards to water supply

As already discussed, households' knowledge, perceptions, behaviour and coping strategies to a large extent affect their well-being and health status. In Ghana, rapid population growth and urbanization without appropriate planning as well as mismanagement of water resources continue to erode government's effort in providing adequate water to all urban centres (Stoler et al, 2012a). As a result, the GWCL has been unable to meet households and commercial consumption demands (Stoler et al, 2012a). In view of this, the water rationing system was instituted to provide water to certain parts of the city at selected times and days. This frequent water interruption, low quality and ad hoc storage systems according to Stoler et al (2012b) left large portion of the population without access to adequate potable water. Most people therefore depended on informal water vendors, tanker drivers, rainwater harvesting, hand-dug wells and sachet water among others (Songsore, 2008; Ainuson, 2010; Nyarko et al, 2008; Stoler et al, 2012a; 2012b).

Most at times people become innovative when faced with shortage of any kind, however the type of innovations that come with water shortage to a large extent may not be good for human health. According to Songsore (2008), Ainuson (2010) and Nyarko et al (2008), most residents found in low-income communities depended on informal water vendors and tanker drivers for their daily supply of water when faced with water problems due to the absence and frequent interruptions in municipal water service provision. While others depended on surface water and open dug wells that could jeopardize their health. Despite

the fact that these informal service providers bridge the gap created by the formal utility providers by providing water for residents, the sources of these waters are however questionable (Ainuson, 2010). Ainuson's research in some disadvantaged communities in Ghana revealed that, storage containers of some informal water providers were hardly washed hence questioning the quality of water provided. He also discovered that, most consumers were sceptics about the kind of water provided by the tanker operators since they accused them of providing untreated water for household consumption.

Moreover, Songsore (2008), Ainuson (2010) and UNICEF/WHO (2006) also reported that, due to lack of pipe connection and frequent interruptions, most urban dwellers store water in their homes in drums, barrels, storage tanks and at times open containers that serves as a breeding ground for mosquitoes. Songsore (2008) further noted that, at times even when water was collected from an improved source the containers used for the collection could either enhance recontamination.

Subsequently, in most West Africa nations and for that matter Ghana, the dependent on sachet water as a main source of drinking water has taken momentum (Stoler et al, 2012a). Stoler et al (2012a, 2012b) argued that, due to lack of water infrastructure and the rationing system introduced by GWCL, entrepreneurial water vendors have stepped in to provide water through various means including the packaging of water into sachet water or ''Pure water'' as popularly called. They further stated that, due to the low prices and convenience sachet waters provide, they had gain lots of publicity to the extent that, they were perceived to be of higher quality that pipe water. Given this new trend, the general utility of sachet water from a public health and urban planning point of view becomes uncertain.

2.6.2. Perceptions and coping strategies with regards to sanitation

Proper sanitation services and personal hygiene practices are important aspect of human well-being that must not be overlooked. Providing better sanitary conditions for urban dwellers will give them real benefits in the form of privacy, convenience, safety, dignity and safe hygiene practices in the household and community especially for women and girls (UN-Habitat, 2005). However, the right to safe and adequate sanitation services still remains a promise unfulfilled for the world's poorest citizens (Hesselbarth, 2005).

Mazeau et al (2012) noted that, the population residing in low income, high density urban areas of Sub-Saharan Africa have limited access to individual toilet facilities in their homes which impedes on the right of human being. In Ghana however, it was discovered that, over 70% of urban dwellers rely on shared toilet facilities (WHO/UNICEF, 2012) which is a common practice for households sharing the same quarters, compounds or neighbourhoods where there is limited space for the construction of individual household latrines (Kariuki et al, 2003). This practice is however an unimproved source of sanitation according to the Joint Monitoring Programme. Despite being rated as unimproved, a shared toilet facility viewed by Mazeau et al (2012) may often be the only alternative for people using bucket latrines, plastic bags and those practising open defecation. With respect to this, WSUP (2011) suggested that, shared toilet facilities may provide a solution in congested urban environments where individual toilet facilities remain a technological and physical challenge.

On the other hand Marcotullio and McGranahan (2007) discovered that, large sections of the urban population residing in informal and illegal settlements, were compelled to dump their household waste and discharged their waste water indiscriminately into the

environment due to lack of proper provision for sanitation in their homes, especially, the regular services to collect household waste and inadequate drainage systems.

2.7. Environmental risk reduction in urban areas

In developing countries, reducing environmental health risks forms an integral part of the overall efforts in improving global health (Ezzati et al., 2004). It is thus an important criteria for success in development especially for those who are most exposed to risk (Dodman et al, 2013). However, the extent to which rapidly growing and poorly managed urban areas, increases the risks to environmental health problems has been underestimated and underrated in many developing countries(Bull-Kamanga et al, 2003).In reducing and preventing diseases associated with environmental health problems, it has been realized that, it is essential to identify the risk factors (Pelling & Wisner, 2009), measure and monitor the exposure of the population to major environmental risks and have an assessment of their health effects (UNDP, 2004; Venton & Hansford, 2006). However, data concerning these issues are inadequate (Dodman et al, 2013) thus increasing the problems of environmental health hazards. Also as indicated by McGranahan et al (2001), certain cities are far more successful in reducing their environmental burdens than others. They further explained that, a poor city that is well managed is more likely to have fewer environmental problems than a poor city that is badly managed.

Consequently, Bull-Kamanga et al (2003) suggested certain urban characteristics that increase people's susceptibility to disaster risk. According to them, an identification and understanding of these characteristics is important if disaster risks are to be reduced in urban areas. As already stated, high population density associated with rapid population growth and urbanization increases the amount of solid and liquid household waste generated which becomes a problem when there are no services to collect and remove

them (Bull-Kamanga et al, 2003; Marcotullio & McGranahan, 2007; Pelling & Wisner, 2009). In view of this, Moore et al (2003) noted that, solid waste collection is a major problem in cities in the developing world where inadequate waste collection services present a variety of hazards especially in shanty and squatter settlements. This uncollected solid waste according to Mabogunje (2002) cited in Moore et al 2003 and Songsore (2008) often prevents the free flow of water in drainage systems and also contributes to water pollution. Secondly, the concentration of labour markets which have caused a large section of the urban population to acquire land and build houses outside the official system of land use controls and building standards, disrupt natural drainage channels and thus increases the susceptibility to flood waters characterised urban areas (Bull-Kamanga et al, 2003). Poor quality housing, lack of basic infrastructure for water supply, sanitation, drainage and garbage removal and lack of civil and political rights as well as lack of health care and emergency services are characteristic of most urban poor areas that must not be overlooked (Bull-Kamanga et al, 2003; UNDP, 2004; Songsore, 2008; Dodman et al, 2013). Of great importance is the lack of infrastructure to remove liquid and solid waste that creates myriad of problems (Marcotullio & McGranahan, 2007; Pelling and Wisner, 2009).

Subsequently, the rapid growth of urban population as identified by Pelling & Wisner (2009) has gone beyond the capacity of city authorities to cope with. Despite this incapability, they nonetheless recognized that rapid population growth in towns and cities of Africa could be both a challenge and an opportunity for risk reduction. To them, urbanization provides a critical accumulation of human skills and capability that can be directed towards risk reduction and the same time a disincentive to development. Hardoy et al (2001) also noted that, urbanization have greater opportunities for risk reduction. This they argued based on the fact that urbanization which is usually associated with stronger

economies of scale, higher average life expectancies, higher literacy rate and stronger democracies at the local level could help identifies areas for risk reduction. Hardoy et al (2001) further noted that, urbanization provides many agglomeration economies for the provision of infrastructure and services that help improve quality of life. Martine et al (2008) also argue that, although urbanization has been associated with many environmental problems, it often creates opportunities for reducing environmental pressures when managed well. In support to the above UNDP (2010) indicated that, urbanization does not necessarily lead to increasing disaster risk, but rather help reduce risk when managed properly.

However, Cheru [n.d] and Dodman et al (2013) argued that, in most low and middle income countries, urban disaster risk is configured by the deteriorating and lack of infrastructure and public services, inadequacies of urban governance, unemployment and underemployment, rapidly growing informal sector, overcrowding, environmental degradation and acute housing shortage. Dodman et al (2013) further stressed that, the extent to which countries manage or do not manage their urban development and ensure proper provision of services has very strong influence on the number and scale of disasters experienced. This has accounted for the increasing number of disaster risk cases reported worldwide from everyday risks to large scale disasters that claim lot of lives. Dodman et al (2013) added that, the scale and nature of risk in urban centres is influenced heavily by the quality, capacity and willingness of various governments to work with low income groups, since the local or municipal governments are the actors with the greatest potential to contribute to urban disaster risk reduction. To Pelling & Wisner (2009), local government across most African urban cities were unable to achieve their main objective of reducing disaster risk of any form because, they fail to work properly with local government in

identifying the prevailing risks. This means that most African governments only make empty promises in the verge of getting votes.

A UN/ISDR report (2004) indicated that, risk reduction measures comprise of activities undertaken by a community or state to minimise the risk of a disaster in the event that it occurs. And this must be carried out within the context of sustainable development through the development of individual, social and institutional capacities which entails abilities to reduce exposure to everyday hazards that are human driven. In the words of Pelling & Wisner (2009), risk reduction includes all actions that seek to make individuals, communities or society more resilience to disasters. They therefore suggested that, the process of change was a crucial component needed to influence any action that will reduce risk. This was also stressed by Bull-Kamanga et al (2003) where they noted that, the vulnerability of people to disasters was not natural but was constructed and amplified by economic, social and political systems and that, changes in these systems would greatly reduce the vulnerabilities of people hence reducing disaster risk. Certainly this is not the case as most urban poor residents are still lavishing in environmental inadequacies of sub-standard housings, potable water supply and sanitation services.

Bosch et al (2001) and Pruss et al (2008) suggested that, an increase in the quantity of water supply, improvement in the quality of water, improvement in the means of excreta disposal and the provision of sanitation facilities will help reduce the health and non-health effects of unsafe and inadequate access to water and sanitation, These actions according to them will improve hygiene behaviour, reduce the ingestion of pathogens through contaminated water and reduce the number of pathogens in the environment, which will go a long way to reduce morbidity and mortality rate hence improving quality of life. Giving the fact that, most urban dwellers reside in sub-standard housing and unplanned settlement that do not encourage the provision of services. Also, even where

clean water and flush toilets are available especially in Africa, lack of hygiene awareness continues to result in outbreaks of water and sanitation related diseases (Institute of Medicine, 2009). Therefore, an appropriate risk reduction measures need a multi-hazard approach and must be holistic in nature so as to reduce risks. Even as indicated by McGranahan (2007), efforts to extend water and sanitation services to residents in low and middle-income cities, have limited success partly due to limited funding from the central government. He further identified Public utilities to be the best model for extending affordable water and sanitation to the urban population. However, it was realized that, due to financial constraints, these public utilities ended up providing low-cost and low-quality services to some sections of the population. McGranahan (2007) also noted that, most governments were reluctant to enforce the provision of infrastructure in informal settlements for the fear that, they may be encouraging the expansions of these settlements. The government however forgets that, their inability to provide affordable housing for urban dwellers and the increasing rate of rental fees have partly contributed to the growth of informal and squatter settlements in most developing countries as people were unable to pay the high prices for better accommodations.

CHAPTER THREE

FIELD METHODS AND DESCRIPTION OF STUDY AREA

3.1. Introduction

This chapter presents the techniques and procedures employed in carrying out the research. The chapter explains the research design adopted, identified the sources of data, sampling procedure for data collection and analysis. It also presents the background information about the Ashaiman Municipality, taking into consideration its physical, demographic and economic characteristics, as well as a brief history of its growth and development.

3.2. Field Methods

3.2.1. Research design and strategy

The study employed the mixed method convergent design of conducting research where elements of qualitative and quantitative viewpoints, data collection and analysis were used in understanding the research problem (Creswell & Clark, 2010; Teye, 2012). It was important to use different approaches because they enhanced a better understanding of the research questions than using either approach exclusively (Creswell & Clark, 2010).With this design, the research collected and analysed both qualitative and quantitative data during the same phase of the research process in other to provide a comprehensive analysis of the research problem. Also, it provided different but complementary data on the same topic so as to have better understanding of the research problem (Creswell & Clark, 2010). Also, since social reality is multifaceted, mixed methods designs therefore provide an effective means of explaining the complexity of human behaviour Teye (2012). Data collected were then analysed differently using SPSS to run statistical analysis for quantitative data and manually analysing qualitative data. The two sets of results were

then merged during the interpretation and discussion stage so as to complement each other by providing a more complete picture of peoples' perceptions, behaviours and coping strategies about their deprivation with regards to inadequate water supply and poor sanitation.

3.2.2. Sources of data and techniques of data collection

In other to achieve the objectives of the study, a number of relevant research instruments and methods were employed. Both quantitative and qualitative primary data were collected on the field by conducting in-depth interviews based on an interview guide, informal interviews as well as administering of questionnaires. The questionnaire survey was conducted for households to identify the spatial inequality in the supply of adequate water and the provision of sanitation facilities as well as to identify the risks associated with the inadequacy of these services. It therefore included background information of household members, questions on issues pertaining to water supply, causes of poor sanitation, problems associated with inadequate water and poor sanitation and the perceptions of households on environmental problems in the Municipality. The questionnaires contain both close and open-ended questions. The close ended questions were meant to capture direct answers from the respondents, while the open ended questions were meant to allow respondents to express their views. This was also aimed at obtaining relevant information that could not be obtained by the close ended questions.

Concurrently, in-depth interviews were conducted for selected household members based on an interview guide. This was done to explore individual views and perceptions of environmental risks associated with inadequate water and poor sanitation. In so doing, an in-depth understanding of households' perceptions and behaviours with regards to environmental risk problems was obtained. In view of this, three respondents from

Adakodzi, five from Amui Dzor, two from Jericho and five from Lebanon were selected for an in-depth interview. The selection was based on years of occupancy and willingness to partake in the interview. With this, only respondents whose total years of occupancy were ten years and above were selected since they will be in the better position to explain the changes that have taken place over the years. All interviewees were also questionnaire respondents.

Consequently, focus group discussions were organised to identify groups' perceptions and coping strategies in regard to their deprivation. Participants for the focus group discussions were drawn from the sample of questionnaire respondents and they were selected based on their willingness to participate. A total of two focus groups discussions were carried out. Participants were divided into groups comprising males and females so that the women will not feel embarrassed and intimidated when addressing a particular issue. Moreover, due to the low number of participants from the various communities, participants from the two slum communities of Adakodzi and Amui Dzor were placed in one group while the others from Jericho and Lebanon were also grouped together. In all 28 participants comprising 16 females and 12 males, took part in the discussions as shown in Table 3.2. The discussions took place on one Sunday afternoon with participants provided with refreshment.

In addition, key local government officials and stakeholders were contacted for an in-depth interview to explore their knowledge and understanding of the problem prevailing in the Municipality as well as identify measures and strategies adopted to curb the situation. As shown in Table 3.2, a Municipal Planning Officer and an Environmental Officer at the Ashaiman Municipal Assembly, the Director of Operation at the Ghana Water Company Limited Ashaiman West, and an Officer from Town and Country Planning Department

were selected for the in-depth interview. . Since the interviewees had different occupational backgrounds, different interview guides were used for each interviewee.

Table 3.1: Key informant interviewed

Organization	**Number interviewed**	**Key informants**
Ashaiman Municipality	**2**	**Planning Officer** **Environmental Health officer**
Tema Development Corporation	**1**	**Town and Country Planning Officer**
Ghana Water Company Limited, Ashaiman West	**1**	**District Head**

Source: Field work (2014)

Furthermore, participant observation was done at the individual, household and community level to identify relevant actions, situations and information which people were unwilling to provide (Dawson, 2002; Kumar, 2005, 2011). This was done by taking transect walk horizontally and vertically along the major streets and drainage systems to observe the environmental conditions and housing structures in the selected communities. The observed situations were later entered into a field note book which served as a guide in analysing data collected through questionnaire survey and in-depth interview. Some of the things observed were captured pictorially by the use of a digital camera. In addition, informal interviews were conducted to understand relevant actions and behaviours of community members. This was in the form of normal conversation with special groups as food vendors, public toilet operators and water vendors of which all were women.

Secondary data on the other hand were sought from journals, articles, books, published and unpublished documents, health records and reports including local government reports on environmental sanitation and water as well as Ashaiman Municipal Assembly Medium

Term Development Plan 2010-2013 (ASHMA MTDP 2010-2013). The health record was obtained from the Municipal Health Directorate because the community clinics were not able to provide concise data on ill-health due to poor record keeping.

3.2.3. Sampling techniques

Data collection was carried out with a structured questionnaire for 200 households[1] of the Ashaiman Municipality. The 2010 population census estimated the household population of Ashaiman to be about 32,380 meaning that the sample size is about 0.55% of the household population of the area. Though this sample size is very negligible, the researcher decided to use it due to the financial constraints and limited time of the study. In calculating the sample size, the total number of housing structures in the four communities of Adakodzi 536, Amui Dzor 959, Jericho 442 and Lebanon 910 which amounted to 2847(GHAFUP, 2012; ASHMA, 2010), was taken into consideration. Using the formula given by Miller & Brewer (2003), $n = N/1+N\ (\alpha)^2$, the sample size for the research was calculated where 'N' is the sample frame of 2847, 'n' the sample size and 'α' the margin of error (7%). A sample size of 204 was then arrived at as follows $n= 2847/1+2847(0.07)^2$. A simple proportion formula was then used to calculate the number of houses that were to be selected in each community. They were thus calculated as follows: Adakodzi, 204(536/2847) =38.41, Amui Dzor, 204(959/2847) =68.71, Jericho, 204(442/2847) =31.67 and Lebanon, 204(910/2847) =65.20. However, only a total number of 200 house units were systematically selected for the survey due to time constrain as shown in Table 3.2.

[1] A person or group of persons who lives together in the same house or compound, share same house keeping arrangement and are catered for as one unit

Subsequently, though the Municipality was regarded as a slum settlement, there were pockets of communities that were considered middle and high class residential areas (ASHMA MTDP 2010-2013). Hence, due to the heterogeneous nature of the communities in the Municipality, a multi-stage sampling approach was used for sampling respondents. Based on the categorization by ASHMA, the communities were clustered into two groups; that is, slum and non-slum communities. Two communities were then randomly selected from a slum community (Adakodzi and Amui Dzor) and non-slum community (Jericho and Lebanon). This enabled one to identify the spatial inequalities in the provision and access to water and sanitation facilities.

Subsequently, systematic sampling interval was calculated by dividing 2847/200 = 14.235. This means that every 14th house unit in the selected communities were sampled. However, the first house unit were randomly selected followed by the 14th house unit in that order until all the 200 units were exhausted. A house unit in this context refers to a group of households who share the same toilet and bathroom as well as electricity meter as defined by Mazeau et al (2012). Respondent in each house unit were then purposively selected to respond to a structured questionnaire.

Table 3.2: Sample size of household respondents

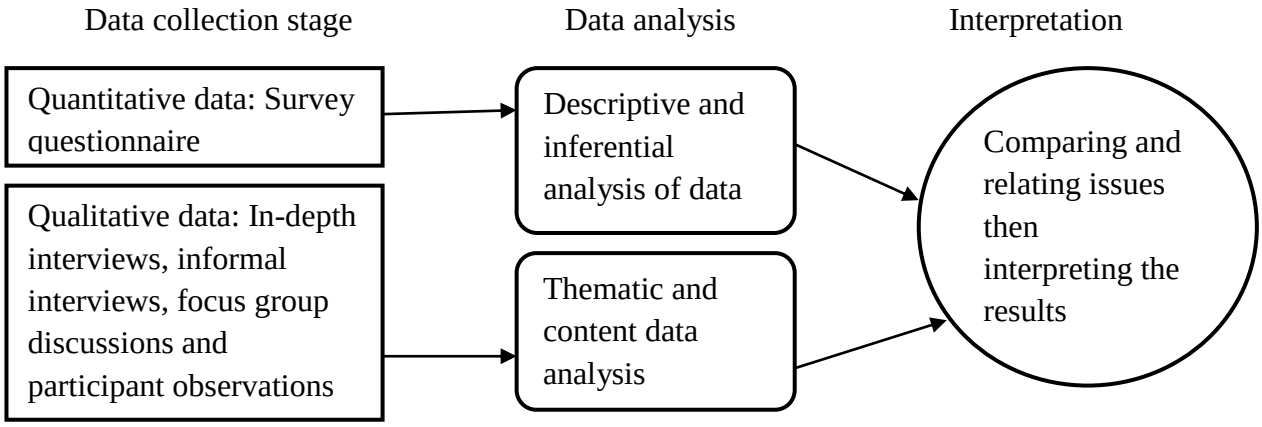
Communities	**Number of Questionnaire respondents**	**Number of formal interviewees**	**Number of informal interviewees**	**Number of participants for FGD**
Adakodzi	38	3	2	5
AmuiDzor	67	5	3	9
Jericho	31	2	1	5
Lebanon	64	5	2	9
Total	**200**	**15**	**8**	**28**

Source: Field work (2014)

3.2.4. Data analysis

The Statistical Software Package (SPSS version 16.0) was used to run different statistical analysis for the quantitative data collected. Analysis was done using descriptive statistic to describe trends and patterns of behaviour and inferential statistics like chi-square to determine the significant association between categorical variables and analysis of variance to test the significance of variance in the income data set of communities surveyed. At various level of analysis, cross tabulations and chi-square tests were employed. For the responses of the open-ended questions of the questionnaire and the qualitative data collected, analysis was done manually by systematically searching, arranging and organizing data into manageable themes. Recorded interviews were transcribed to identify the key issues discussed by the various stakeholders so as to explain emerging patterns and observations. Thus, all the information was read carefully and the text sub-divided into meaningful units. During the FGDs, information regarding perceptions of environmental risk problems were scored differently. The most severe environmental problems were given the highest score of 5 while the least severe problem was given a score of 1 in a descending order. The average score of each problem in each community was then calculated on a gender basis. The qualitative and quantitative data generated were then integrated at the data interpretation stage to give a holistic understanding of key issues. Figure 3.1 shows the sequence involved in the research conducted while Table 3.3 shows a brief overview of the research design.

Fig 3.1: The chain of research design



Source: Adapted from Creswell & Clark, 2010.

Table 3.3: Summary of research design for the collection of data

Objectives	Type of data	Target group and respondents	Analysis
Identify and examine the environmental risk problems and the vulnerable conditions of households.	• Secondary data from reports from Ghana Water Company Limited (GWCL), ASHMA, Zoomlion, clinics and Municipal Health Directorate. • In-depth interviews with key stake holders • Primary data was collected on the field through questionnaires and in-depth interviews for household members • 2 focus group discussions • Participant observation was conducted at the individual, household and community level, informal interviews	Director of Operation at GWCL Ashaiman, Municipal Planning Officer and an Environmental Officer at ASHMA, A Town and Country Planning officer was also selected for an interview. Households: 200 respondents were randomly administered questionnaires 15 respondents were selected for an in-depth interview. 28 participants for FGDs	Descriptive statistic for frequency of water supply, collection and storage of water, adequacy of storm drains, toilets and rubbish collecting services Descriptive statistic for nature of house unit structures Ranking and scoring of environmental risk problems Descriptive statistic on source of water, adequacy, accessibility and affordability Ranking and scoring of causes of inequalities in the access to water and sanitation
Assess the spatial inequalities with regards to environmental risk problems in the selected communities.	• Secondary data from reports from GWCL, ASHMA, and Health Directorate. • Primary data was collected on the field through questionnaires and in-depth interviews • 2 FGDs • Participant observation was conducted at the individual, household and community level and informal interviews	Households: 200 respondents were randomly administered questionnaires 15 respondents were selected for an in-depth interview. 28 participants for FGDs	Descriptive statistic on the availability of domestic toilets, bathrooms, drainage systems and mode of waste disposal at the household and community level. Ranking and scoring of environmental risk factors
Identify and assess households' perception, behaviour and coping strategies with regard to environmental risk problems	• Secondary data from reports from GWCL, ASHMA, and Health Directorate. • Primary data was collected on the field through questionnaires and an in-depth interviews • 2 FGDs • Participant observation was conducted at the individual, household and community level, informal interviews	Households: 200 respondents were randomly administered questionnaires 15 respondents were selected for an in-depth interview 28 participants for FGDs	Hygiene knowledge Perceptions on water supply and the provision of sanitation facilities Coping strategies

Source: Field work (2014)

3.3. Brief description of study area

Geographically, the research covers the Ashaiman Municipal Assembly located within Greater Accra Metropolitan Assembly in the Greater Accra region of Ghana. Regarded as a sprawling urban settlement, it is made up of 10 slum communities (GHAFUP, 2012). However, the research was narrowed down to two slum communities of Adakodzi and Amui Dzor and two non-slum communities of Jericho and Lebanon within the Municipality which were randomly selected. The Ashaiman Municipality was chosen because; it is the fifth largest and rapid growing urban areas in Ghana and as such having severe environmental health problems.

3.3.1. Physical characteristics

Ashaiman Municipal Assembly as shown in Figure 3.2 is located about four kilometres to the north of Tema and about 30km from Accra. Ashaiman falls within latitude 5’’42 north and longitude 0’’01 west. It shares boundaries with Katamanso traditional area on the north and east, Tema Township on the south and Adjei Kojo on the west (ASHMA MTDF 2010-2013).

With a total land cover of 45km2, the area is underlain by the Precambrian rocks of the Dahomeyan formation. Which are made up of metamorphic rocks consisting of granite, gneiss and schist. The soils are mostly sandy clay and as such suitable for the cultivation of vegetables like okro, pepper, cabbage, and cucumber produced mostly in gardens (ASHMA MTDF 2010-2013.

The relief of the area is generally flat and forms part of the Accra-Togo plains; therefore, experiences a dry equatorial climatic condition that extends from the east coast of Ghana into Togo. There are however, some isolated hills in the area and a vegetative cover consisting of savannah grasses and shrubs due to low rainfall. However, human activities

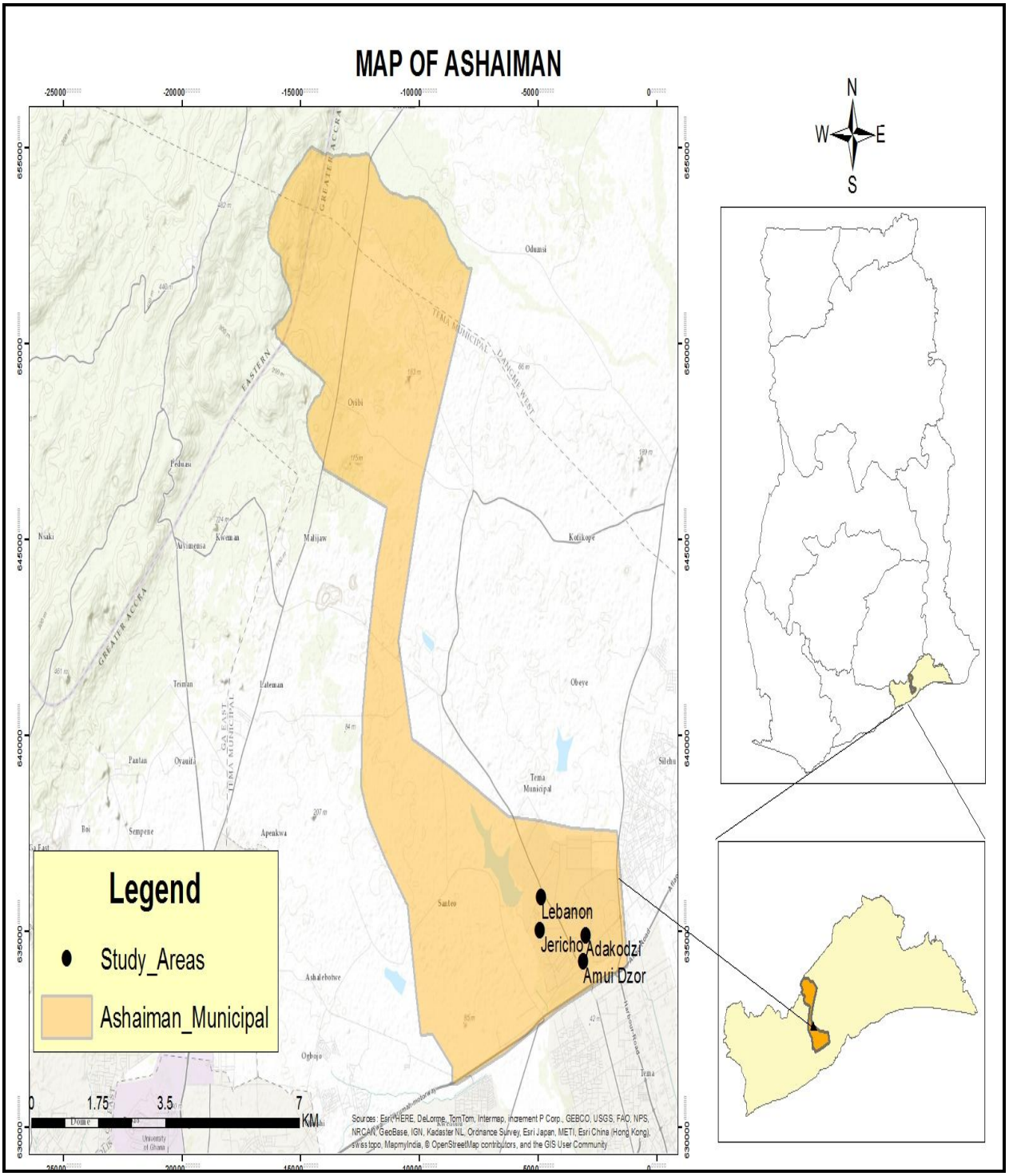
have destroyed the beautiful natural vegetation. Temperatures are high throughout the year and annual rainfall ranges from 730mm to 790mm. Humidity on the other hand, varies with the seasons with a height of 60-80% in the wet season and less than 30% in the dry season (ASHMA MTDF 2010-2013).

3.3.2. Demographic characteristics

Ashaiman is a sprawling urban settlement that exhibits characteristics of a slum especially around the core business arena of the community. However, there are pockets of communities which do not exhibit these characteristics (ASHMA MTDP 2010-2013). As a one town Municipal Assembly that serves as a home of people from different ethnic groups, it is estimated that about 50 different ethnic groups reside in the Municipality (ASHMA MTDP 2010-2013). According to the Ghana Statistical Service (GSS), in 2000 the population of Ashaiman stood at 150,312, this however increased to 190,972 in 2010 at a growth rate of 4.6%.Using this growth rate, the current population is however estimated to be around 226,381 (ASHMA MTDF 2010-2013). This rapid population growth is as a result of massive migration of people especially the youth from both far and near communities in search of job in the Tema Metropolis

It is estimated that, 49.1% of the population were males with 50.9% been females as shown in Table 3.4 (GSS, 2010). In view of the influx of youths into the community, about 65.8% of the population fell within the economic active population (15-64years) which is a good asset to drive the economy of the area especially when provided with the necessary skills (ASHMA MTDF 2010-2013). Despite this good asset, the Municipality is faced with issues of under development as majority of communities are low income areas. This situation calls for the implementation of good developmental policies and strategies if the problem associated with population growth and unemployment is to be solved.

Fig 3.2: Map of Ghana showing the study area



Source: Author's own construct

Table 3.4: Age-Sex composition of Ashaiman, 2010

Age cohort	**Males**		**Females**		**Total population**	
	Absolute	**Percentage**	**Absolute**	**Percentage**	**Absolute**	**Percentage**
0-14	29798	15.57	31065	16.27	60863	31.8
15-64	61606	32.26	63949	33.49	125554	65.8
65+	2324	1.22	2231	1.17	4555	2.4
Total	**93727**	**49.1**	**97245**	**50.9**	**190972**	**100**

Source: Compiled from the 2010 population and housing census

3.3.3. Economic characteristics

In 2010, the census report indicated that over 50% of the economically active population between the ages of 15 and 64 years were employed in the service and commerce sector. Others were engaged in the agriculture sector, small scale manufacturing and processing, quarrying and construction, financial and tourism services (ASHMA MTDP 2010-2013). Table 3.5 shows the various occupations of employed persons in the Municipality in the 2010 census. The Agricultural sector is coming under threat as more farmers are losing their land due to the activities of real estate and industrial developers (ASHMA MTDP 2010-2013).

Table 3.5: Occupation of employed persons in the Ashaiman Municipality in 2010

Occupation	Number of people	Percentage of population employed (%)
Managers	2927	3.35
Professionals	4913	5.62
Technicians and associate professionals	3042	3.48
Clerical support workers	2092	2.39
Service and sales workers	31740	36.30
Forestry and fishery workers	1476	1.69
Related trades workers	19435	22.23
Machine operators and Assemblers	9225	10.55
Elementary occupation	12460	14.25
Other occupation	125	0.14
Total	**87435**	**100**

Source: Compiled from Ghana Statistical Service, occupation of employed persons 15-64 years by region and district, 2010

Furthermore, a household survey conducted in 2012, revealed that on an average a household in Ashaiman earned around GH₵80.00 per month with an average expenditure of GH₵75.00. Considering the various income generating opportunities in the Municipality, one could expect income levels to be higher. However, this is not the case since most households are living in poverty (ASHMA MTDP 2010-2013). Table 3.6 shows the income levels of households in the Ashaiman Municipality.

Table 3.6: Income levels

Monthly earnings in Ghana cedis	Percentage of population
0-9.9	4
10.00 - 50.00	62.9
50.1 – 100	20.9
100.1 – 200	8.9
200.1 – 400	2.3
400.1+	1.3
Average Income GH¢61.30	

Source: ASHMA MTDP (2010-2013)

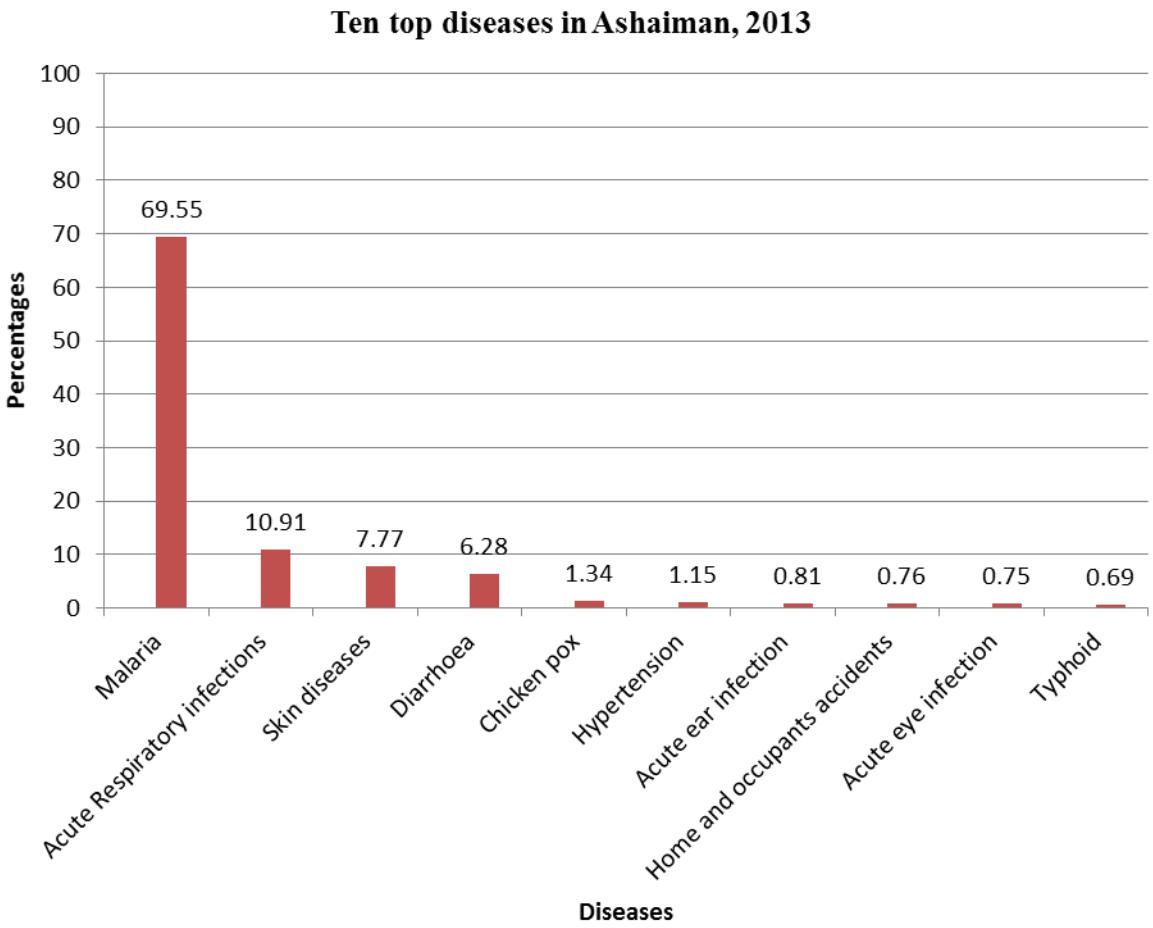
3.3.4. Environmental sanitation:

Ashaiman has well engineered drains along its major roads. However, drainage systems within the residential areas are inadequate and of poor quality with most of them chocked with solid waste. Surroundings in the various communities in the Municipality have therefore been marred with liquid waste compounding the already existing problems of sanitation. It is therefore not surprising that the top-ten diseases reported in the Municipal Health Directorate (2013) report were environmentally related. This drainage situation in Ashaiman continues to affect the health of its citizens and could be a disincentive to potential investors.

Due to the poor record keeping behavior of clinics in the various communities, the Municipal Health Directorate Report on the disease profile of the Municipality was used. Also reports of ill-health of households were taken into consideration. Outpatient records from the Municipal Health Directorate (2013), ranked malaria as the most serious disease in the Municipality. This is undisputable since the poor environmental conditions prevailing in most communities promote the breeding of mosquitoes on stagnant waters. Figure 3.3 shows the ten top diseases recorded in Ashaiman in 2013.

As shown in Figure 3.3, malaria, acute respiratory infections, skin diseases and diarrhoea occupy the first four positions among the top ten diseases reported in the Municipality in 2013 which are environmental related health problems.

Fig 3.3: Ten top diseases in Ashaiman, 2013



Source: Municipal Health Directorate Ashaiman, 2013

3.3.5. The growth of Ashaiman as a squatter settlement

In many cities the history of urban development reveals and gives interesting answers to current developmental issues and problems. Some long established communities may be included or excluded from social amenities because they may be systematically included or excluded from the initial planning process. Moreover, since risks accumulate

historically through inappropriate development interventions (UNDP, 2010), a review of Ashaiman development will help identify the loop holes and hence find solutions to them.

The Ashaiman community grew as a result of the construction of the Tema Harbour and the railway line in the 1960s and since has undergone rapid population growth from 22,000 in 1970 to 70,000 in 1996 then to 150,312 in 2000 and 190,972 in 2010 (Ghana Statistical Service, 2012; ASHMA MTDP 2010-2013). After the construction of the Tema harbour in 1962, an area north of the harbour was acquired to be developed into a residential city. This area later became a magnet for new residents in search of jobs. As time went on, new arrivals of migrants who were unable to find residences in Tema, ended up in this area now known as Ashaiman. Subsequently, during the decongestion of resident in the harbour city, those affected found themselves in Ashaiman as a result of lack of land control and regulation, cheap rental accommodation and its proximity to Tema (Owusu, 1999 cited in Mazeau et al 2012; Ainuson, 2010). This resulted in haphazard development of built up areas and ultimate development of slums in some part of the municipality; especially, around the core business centre (ASHMA MTDF 2010-2013). Also, because it was the home of factory workers, the tendency to provide good quality housing for residents was poor and as such construction of low standard housing was the order of the day.

Hence, over the years, the rapid growth of population and the construction of structures in the area have therefore been faster than local official's attempt to regulate development (Ainuson, 2010). As such, structures have been erected on every available space without the requisite permit. A research conducted by Mazeua et al. (2012) revealed that, the absence of initial planning had resulted in streets and houses having an irregular pattern with high housing density particularly at the southern and central part of the Municipality. They indicated that, different patterns of development were seen at the western, eastern

and northern side of the Municipality. Communities at the western side which were Tema Development Corporation (TDC) planned areas, were characterized by well laid out road and housing plots while the eastern and northern sides were spontaneous areas where new expansions were occurring (Mazeau et al, 2012). Accordingly, there exists serious spatial inequality in the access to water and sanitation services, due to the high degree of spatial heterogeneity with regards to Ashaiman settlement patterns and level of infrastructure provision. Some buildings were erected close to each other while others were erected near gutters and drainage systems. In most cases, some compound houses did not have domestic toilet facilities since every available space in the house were turn into living quarters for rent (Ainuson, 2010).

In actual fact, proper planning rules, regulations, procedures and an integrated urban planning policy are important instruments in reducing the vulnerable living conditions of residents to hazards of any type. However, low enforcement of building regulations and land-use control measures have contributed to the haphazard sitting of buildings resulting in the slum nature of the Municipality. Provisions of social amenities, like pipe-borne water, domestic toilets, a sewerage system, storm drainage, roads, clinics and recreational centres among others were obviously not taken care of. Coupled with this, the macro forces of rapid population growth and rapid urbanization as indicated by the Pressure and Release Model have contributed to the increasing number of migrants in the Assembly. It was therefore not surprising that in 2010, Ashaiman became the fifth largest urban centre in the country. , the number of squatter dwellers increased because of the high prices for rental accommodation in the new developing areas of Lebanon, Jericho, Official Town, Zenu and others Consequently, the lack of legal entitlement to land and lack of building permits have made the acquisition of municipal water systems very difficult. However, in the residential areas planned by TDC, municipal water system has been connected to

houses. All these have resulted in the spatial inequalities witnessed in the access to water and the provision of sanitation facilities in the Assembly.

Today the Municipality is characterized by a complex and diverse urban reality with serious social and environmental problems that include extensive low-income communities, large sections of the population with inadequate access to housing and basic urban infrastructure especially water and sanitation services (ASHMA MTDP, 2010-2013). The Municipality is also now characterized by large scale in-migration, land invasion, a high proportion of the workforce relying on the informal economy for their livelihood, a high cost of living and lack of environmental awareness and weak public administrations (ASHMA MTPD, 2010-2013). Although, Ashaiman was one of the oldest beneficiaries of pipe borne water due to its location near the Kpone treatment plant, over the years, residents are torn between lack of access to adequate water supply and frequent water interruptions. These could be as a result of the dramatic and inequitable process of local urban development that can be traced back to 1960s where it served as a dormitory town for factory workers. What was then known as Ashaiman Township has undergone a massive urban sprawl to the extent that determining its geographical boundaries has become very difficult.

Until recently, the Assembly had initiated a slum-upgrading program aimed at improving the living conditions of slum dwellers. A first phase had been completed and a second phase underway to improve the quality of life of a selected group of slum dwellers. Also, it is hoped that, the urban policy recently inaugurated would serve as a guide to municipal planners in solving the problems of inequity in the provision of services.

CHAPTER FOUR

VULNERABLE CONDITIONS AND ENVIRONMENTAL RISK PROBLEMS OF RESPONDENTS

4.1. Introduction

The chapter presents an assessment of the vulnerable conditions of households and communities to environmental risk problems. It also presents an assessment of the spatial inequalities associated with access to adequate water and sanitation facilities in the four selected communities in the Ashaiman Municipality.

4.2. Socio- demographic characteristic of respondents

4.2.1. Sex and age of respondents

The research interviewed more females than males in the ratio of 67:33. This is partly because while most of the males work outside the homes, females normally work closer to the home by taking care of the home and children. As such, more women were seen in the home than their male counterparts.

Table 4.1: Sex and age distribution of respondents

Age / Sex	25-35	36-45	46-55	56-65	Total
male	25	23	15	4	**67**
female	51	61	17	4	**133**
Total	**76**	**84**	**32**	**8**	**200**

Source: Field work, 2014

As shown in Table 4.1, the age distribution of most respondents was between 25 and 55 years. This indicates that, the population within the selected communities is young and thus falls within the economic active group as reported by the 2010 population census.

4.2.2. Occupation and income levels of respondents

The occupation and socio-economic status of household respondents were important, in that they have an important influence on the way water and sanitation issues were handled in various homes and communities. The research found out that, majority of respondents were employed in the private informal sector that comprised of traders, food vendors, seamstresses, hairdressers, carpenters, painters and so on . Table 4.2 shows the various occupation sectors of respondents in the four communities surveyed.

Table 4.2: Occupation sector of respondents

Employment sector	**Frequency**	**Percentages (%)**
Public sector	26	13
Private formal	14	7
Private informal	146	73
Unemployed	14	7
Total	**200**	**100**

Source: Field work, 2014

The survey also found out that, most household respondents were earning monthly incomes of between GH₵ 50 and 200 as indicated in Table 4.3.

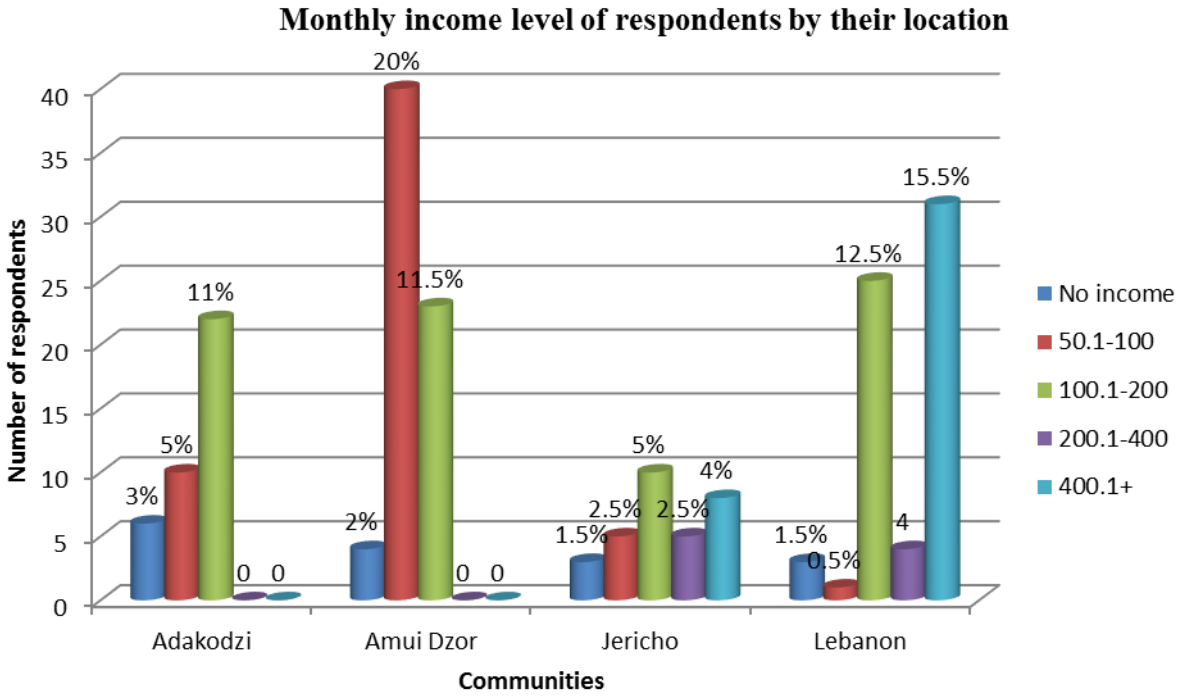
Table 4.3: Monthly income levels of respondents

Income level	Frequency	Percentages (%)
No income	16	8
50.1-100	56	28
100.1-200	80	40
200.1-400	9	4.5
400.1+	39	19.5
Total	**200**	**100**

Source: Field work, 2014

From Figure 4.1, it was revealed that majority of respondents in Amui Dzor and Adakodzi earn a monthly income of between GH₵ 50 and GH₵ 200 with an average monthly income of GH₵ 96.27 and GH₵ 106.58 respectively. On the other hand respondents from Jericho and Lebanon earn a monthly income of between GH₵ 100 and GH₵ 400 with an average income of GH₵ 212.10 and GH₵ 272.27 respectively. With the average monthly income of GH₵ 80 as revealed by a survey conducted by People's Dialogue in 2012 cited in ASHMA MTDP 2010-2013, it could be argued that, households in the selected communities have higher monthly incomes as compared to 2012 and as such could help improve standard of living. This is however debateable given the increasing cost of living in recent time.

Fig 4.1: Monthly income levels of respondents by their various communities

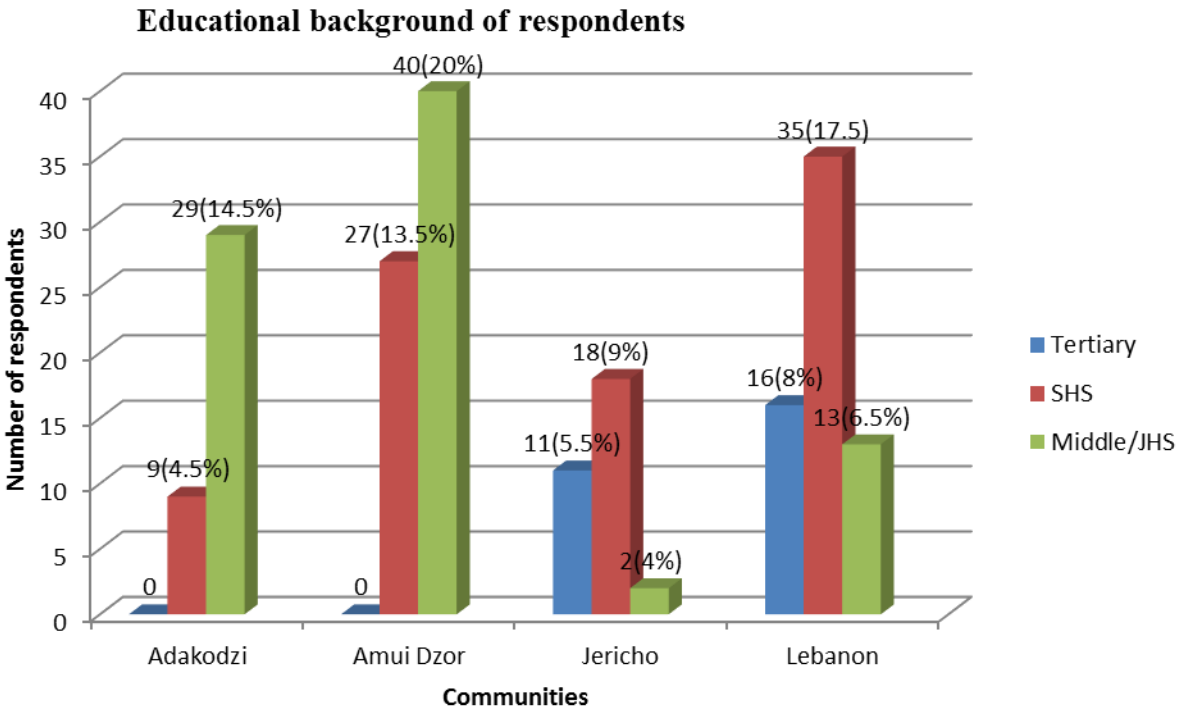


Source: Field work, 2014

4.2.3. Educational background

The study revealed that, majority of respondents in the slum communities had Junior High School Certificate as their highest level of education with a minority of them having attended Senior High School. However, in the communities of Jericho and Lebanon a large number of respondents were Senior High School graduates and tertiary graduates with small number of them been Junior High School graduates as shown in Figure 4.2. This could be responsible for the high number of respondents employed in public and private formal sectors with a monthly income level between GH₵100 - GH₵400 and above in Jericho and Lebanon.

Fig 4.2: Highest education level



Source: Field work, 2014

4.3. Existing vulnerable conditions of communities to environmental risk problems

Vulnerability is a condition determined by physical, social, economic and environmental factors or processes which increase the susceptibility of a community or an individual to the impacts of hazards (UN/ISDR, 2004).This term is widely used because it brings in the notion of threat, risk or stress, of insecurity and lack of power (Klein, 2009 cited in Dodman et al, 2013).

4.3.1. Physical vulnerability

Households in the selected communities were vulnerable differently to environmental inadequacies of potable water and basic sanitation based on their locations and the built environment.

With a high population density of 190,972 as reported by Ghana Statistical Service (2012) and a high population of physical structures in the slum areas of Adakodzi and Amui Dzor as reported by the Ghana Federation for the Urban Poor (GHAFUP) (2012), the study discovered that, housing units in the slum areas were usually built with materials of diverse origin and quality. These comprised of wooden, aluminium and concrete structures mostly used as both living and work places. These houses and structures rarely complied with the official safety standards and as such were haphazardly sited with lack of regular maintenance and the provision for sanitation facilities.

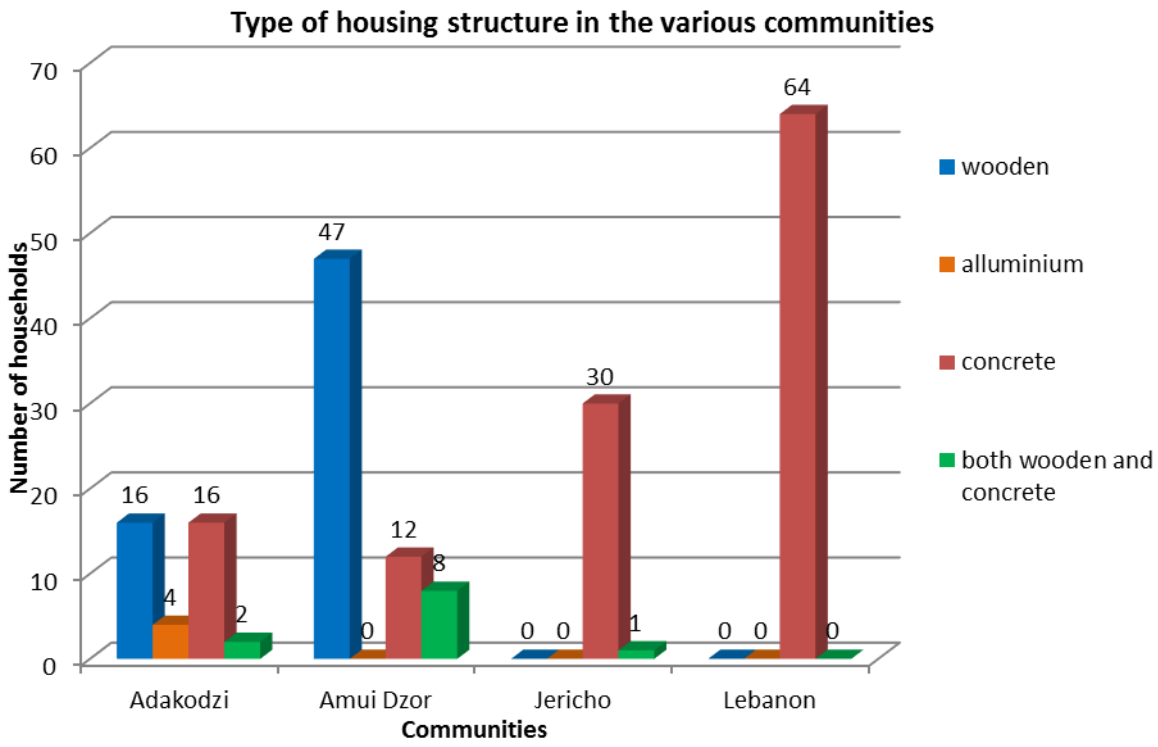
It can be seen from Figure 4.3 that, 70% of house units at Amui Dzor were made up of wooden structures with 18% being concrete and another 12% comprising of both concrete and wooden structures which violate the official building standard of Ghana. Although the Tema Development Corporation (TDC) and Ashaiman Traditional Council were the custodians of the land, there is a threat from TDC to evict community members due to unclear ownership by the two parties (GHAFUP, 2012). This was confirmed by a key informant who stressed that, there was really a threat from TDC but some agreement has been reached.

In Adakodzi, 42% of house units were made up of wooden structures, while another 42% were of concrete. In addition to this, 11% of house units were made of aluminium while 5% of house units were of both concrete and wooden. Unlike Amui Dzor, the Adakodzi community was not under any threat of eviction.

In view of the fact that, the initial settlement did not have a planning component as revealed by the historical development of the Municipality, most houses and structures were just erected haphazardly. Consequently, the provisions of pipe borne water and sanitation facilities for households were not taken into consideration. Also the crowded

nature of the slum communities does not encourage the laying of pipelines to various houses. Until recently, some structures have been pulled down to pave way for road construction which is still underway in the communities especially Amui Dzor. This is expected to facilitate the movement of people and vehicles in the event of any emergency.

Fig 4.3: Type of housing structures



Source: Field work, 2014

Respondents living in the slum communities of Amui Dzor and Adakodzi were also faced with problems of absence of a domestic toilet facility. Since people just squat at any available space, there is no willingness to provide toilet and even bathrooms and the existing ones are poor in conditions. Also due to the high demand for cheap rental accommodation, most landlords have converted toilet and bath rooms into rental apartments thus ignoring the dignity aspect of having a domestic toilet and bath room facilities. Plate 4.1 shows some structures that serve as living spaces for some residents.

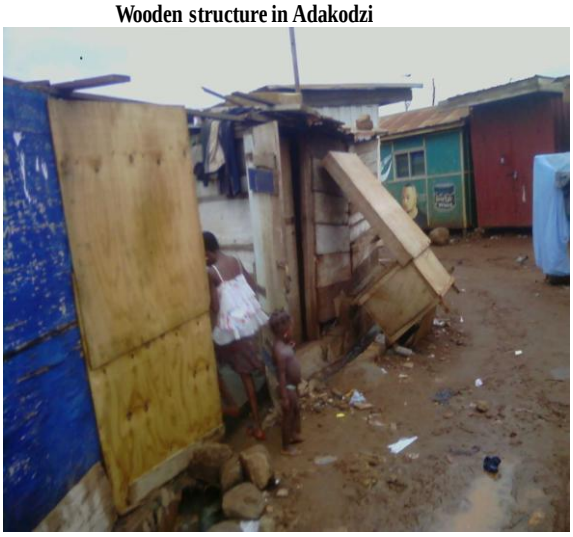
Plate 4.1: House unit structures in the slum communities

Wooden structure in Amui Dzor

Wooden structure in Amui Dzor

Alluminuim structure in Adakodzi

Wooden structure in Adakodzi



Source: Field work, 2014

There is however a great contrast with regards to house units in Jericho and Lebanon where 98.9% of houses were made up of concrete structures. This contrast is due to the presence of an initial planning regulation been introduced and enforced later in the development of the Assembly. Residents in these communities were not faced with any possible eviction since the issue of ownership was clear. However due to lack of building permits, connecting to the municipal water system becomes a problem since operators will only provide service where there is clear ownership of land and evidence of right building

regulation. One may expect that, the issue of absence of toilet facility will be peculiar to the slum areas. However, the research revealed that 61% of residents in Lebanon do not have toilet in their homes. The situation is less in Jericho where a 13% of house units do not have domestic toilet.

In conclusion, one may assert that, the physical location, type of housing structure and the built environment plays an important role in the provision and access to portable water and sanitation services in the Ashaiman Municipality. This mirrored Beall et al (2008, pg 835) views that, ‘‘*where one lives goes a long way in determining their access to basic services’’*. Therefore, in other to reduce the risks associated with inadequate water and poor sanitation, the physical location, built environment and materials used in construction structures should be critically examined and assessed.

4.3.2. Socio-economic vulnerabilities

Socio-economic vulnerability refers to the social well-being and economic status of individuals, households and communities (UN/ISDR, 2004). It relates to aspect of literacy, income level, gender roles and presence of social amenities among others. The research revealed that, there was vast disparity in income levels between households in the slum communities and those in Jericho and Lebanon. Table 4.4 shows the monthly income of respondents while Table 4.5 shows the disparity in income levels between households in the selected communities.

Table 4.4: Monthly income level of respondents by their communities (GH₵)

Income level / Community	0.00-50	50.1-100	100.1-200	200.1-400	400.1+
Adakodzi	6	10	22	0	0
Amui Dzor	4	40	23	0	0
Jericho	3	5	10	5	8
Lebanon	3	1	25	4	31
	16	56	80	9	39

Source: Field work, 2014

This disparity as shown in Table 4.5 depicted the standard deviation of the communities to vary widely from their mean income levels.

Table 4.5: Mean income and standard deviation of communities (GH₵)

Community	Mean	Frequencies	Std. Deviation
Adakodzi	136.05	38	62.58138
Amui Dzor	125.94	67	58.38739
Jericho	325.81	31	254.58167
Lebanon	416.87	64	248.01354
Total	**251.94**	**200**	**220.47951**

Source: Field work, 2014

The research further tested the significance in the mean incomes among the various communities using the analysis of variance statistical test. The result as shown in Table 4.6 revealed that, since the p-value associated with the F-statistic is 0.000 which is less than 0.05 significant level, then one can assert that there is a significant difference in the mean incomes among the communities.

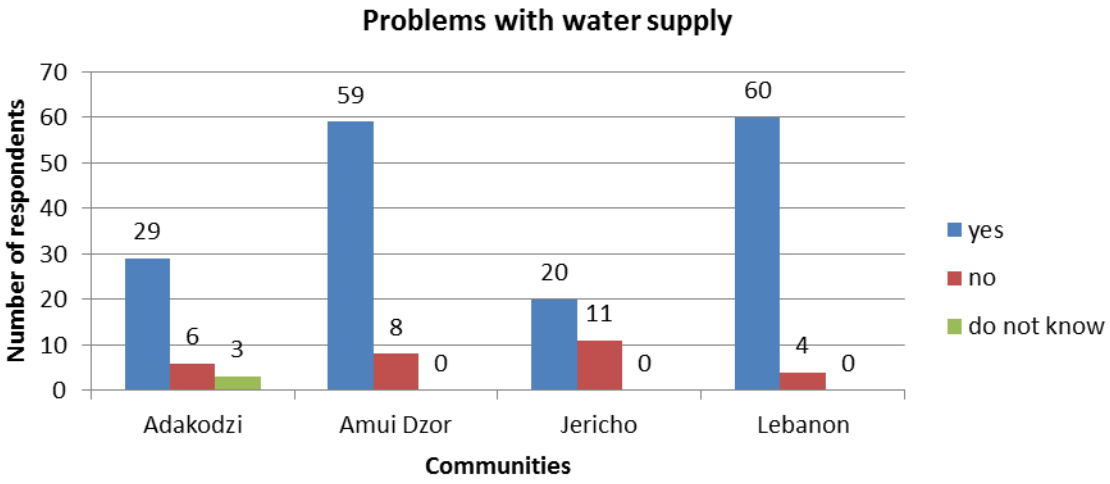
Table 4.6: Anova table

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3484193.785	3	1161397.928	36.778	.000
Within Groups	6189437.495	196	31578.763		
Total	**9673631.280**	**199**			

Source: Field work, 2014

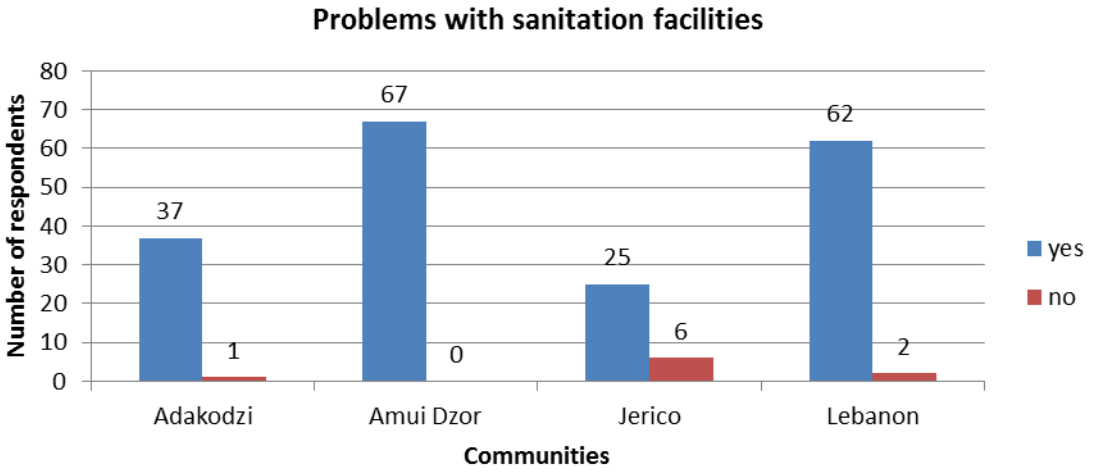
Despite the disparity in income levels among the various communities, over 50% of respondents in all the various income groups agreed having problems with water and sanitation as shown in Figures 4.4 and 4.5. This implies that, irrespective of the income level of respondents 84% and 95.5% were vulnerable to the environmental inadequacies of water and sanitation facilities respectively. This means that problems associated with access to adequate water and proper sanitation in the Ashiaman Municipality goes beyond low income levels to include the dramatic and inequitable process of local urban development that could be traced back to 1960s where it served as a dormitory town for factory workers.

Fig 4.4: Inadequate water supply



Source: Field work, 2014

Fig 4.5: Inadequate sanitation facilities



Source: Field work, 2014

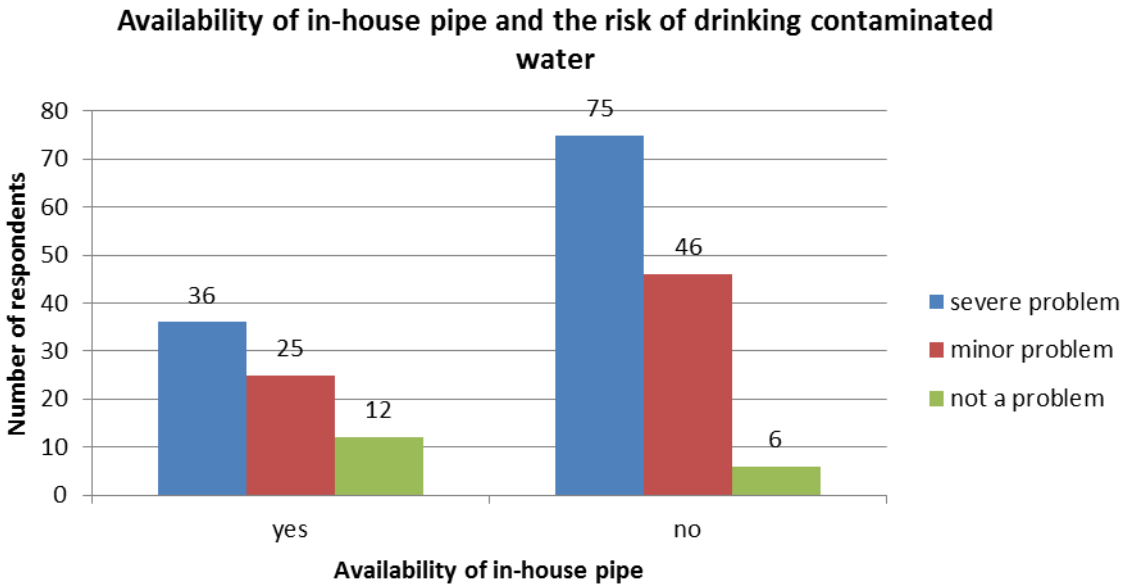
4.3.3. Environmental vulnerabilities

According to UN/ISDR (2004), environmental vulnerabilities are shaped by lack of resilience within ecological systems and exposure to toxic and hazardous pollutants that increases people's exposure to health risks. Accordingly, a reduced access to clean air,

safe water and sanitation and inappropriate forms of waste management especially in densely populated urban environments can deepen levels of socio-economic vulnerability. These environmental factors can further increase vulnerability by creating new and undesirable patterns of social discord and economic destitution (UN/ISDR, 2004).

The research found out that, unavailability of an in-house pipe connection in most house units in Adakodzi, Amui Dzor, Jericho and Lebanon increases households exposure to environmental risks associated with drinking contaminated water and poor personal hygiene. In Figure 4.6, out of the 73 respondents who have pipe connection in their homes, 36 noted that, the fear of drinking contaminated water possess severe problem to them. Some respondents noted that the water collected at times was not clear. On the other hand, 75 respondents out of the 127 who did not have in-house pipe connection were also scared of drinking water from other sources because they fear it might be contaminated as well. Just 16.4% of respondents who have pipe connection and 4.7% of respondents who do not have pipe connection responded that they were not scared of the water they use for either drinking or for household chores. Likewise, the unavailability of domestic toilet, bath rooms and inadequate access to well-engineered drains as well as poor waste management practices all increases households exposure to environmental health risk problems. This could have resulted in the high cases of malaria and many other diseases recorded in the OPD in the Municipality.

Fig 4.6: Availability of in-house pipe and the risk of drinking contaminated water



Source: Field work, 2014

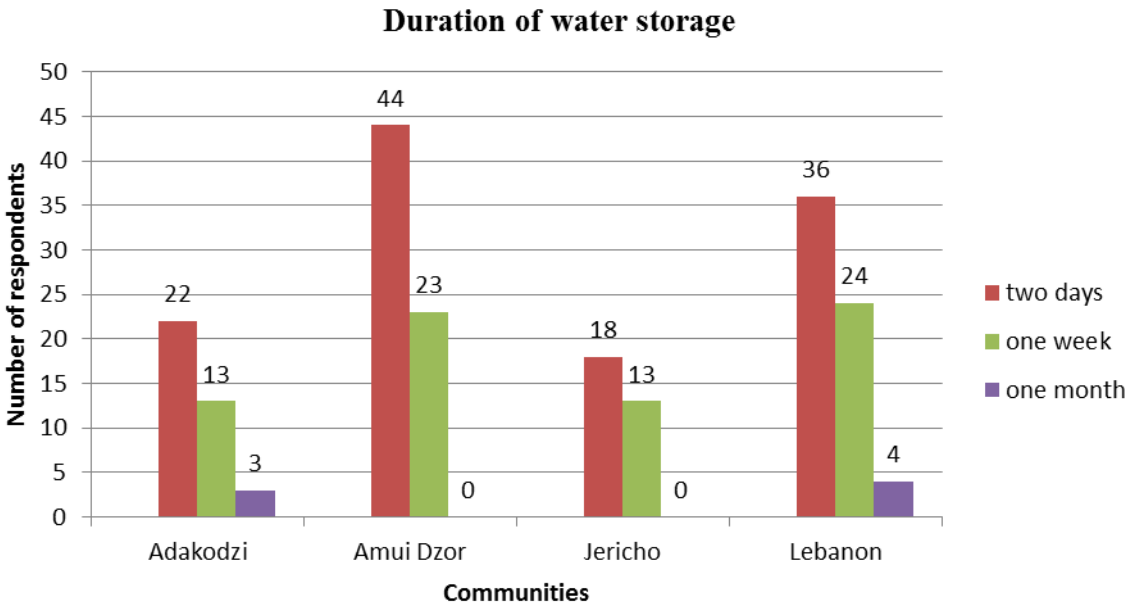
Although most respondents were affected by unavailable in-house pipe and inconsistent water flow by those connected, some households were however able to afford the purchase and installation of ‘‘polytanks’’ or barrels and gallons to store water either for sale or for household consumption than others who heavily depended on informal water vendors.

In relation to this, out of the 73 respondents who had pipe connection in their homes, 39 (53.42%) depended on informal water vendors to supplement the amount of water collected due to the frequent water interruptions experienced. The remaining 34 (46.58%) however stores water in barrels, ‘‘polytanks’’ and other storage containers for use.

On the other hand, the 127 respondents without pipe connection depended solely on informal vendors for their supply. Moreover, duration of water storage ranged from two days to one month depending on the number of household members and the size of the storage container. Figure 4.7, shows the duration of water storage according to the type of community. These findings mirrored what Songsore (2008) and Ainuson (2010) reported

that, the poor in urban areas depended on informal vendors and store water in smaller containers on a daily basis.

Fig 4.7: Duration of water storage



Source: Field work, 2014

4.4. Environmental risk problems and spatial inequalities in the access to water and sanitation

Environmental risk problems identified on the field were inadequate water supply and its associated frequent water interruptions, inadequate and absence of domestic toilet facilities and bathrooms as well as poor solid and liquid waste management practices. On a whole, the poor nature of housing in the various communities could be said to have accounted for the most environmental problems suffered in terms of inadequate water supply and unsanitary conditions.

4.4.1. Access to adequate supply of water

Several reports show that access to safe water is improving in Ghana (Ministry of Water Resources Works and Houses, 2010; Kyomuhendo, 2011). In spite of this progress, GWCL currently meets only about 64% of urban water demand (Ministry of Water Resources Works and Houses, 2010).

4.4.1.1. Access to in-house pipe connection

Ashaiman is one of the oldest communities to benefit from municipal water connection after the construction of the Kpone treatment plant[2] . It is expected that access to safe adequate water will not be a problem. However, the result shows that 63.5% of house units do not have a pipe connection while 36.5% have in-house pipe connections. This is not so different from most cities in Africa countries where according to UNICEF/WHO (2012), less than 20% of the urban population have water piped to their homes. In the case of Ghanaian cities approximately 17% of the population have access to pipe borne water within their dwelling (Osei-Assibey & Grey, 2013). In Figure 4.8, it could be seen that, 66% and 81% of house units in Adakodzi and Amui Dzor respectively do not have pipe connection. This could partly be as a result of slum nature of the community where majority of house units were squatters with structures made up of wooden.

In the squatter settlements of Amui Dzor, majority of landlords do not have legal land documents showing their ownership (GHAFUP, 2012). It therefore becomes difficult for GWCL to provide them with municipal water services. Also until recently, the unplanned and congested nature of the community hindered the laying of pipes for those having legal documentation for their lands. It is however hoped that, the slum-upgrading project

[2]Director of operations at GWCL Ashaiman, interviewed on 9th April 2014

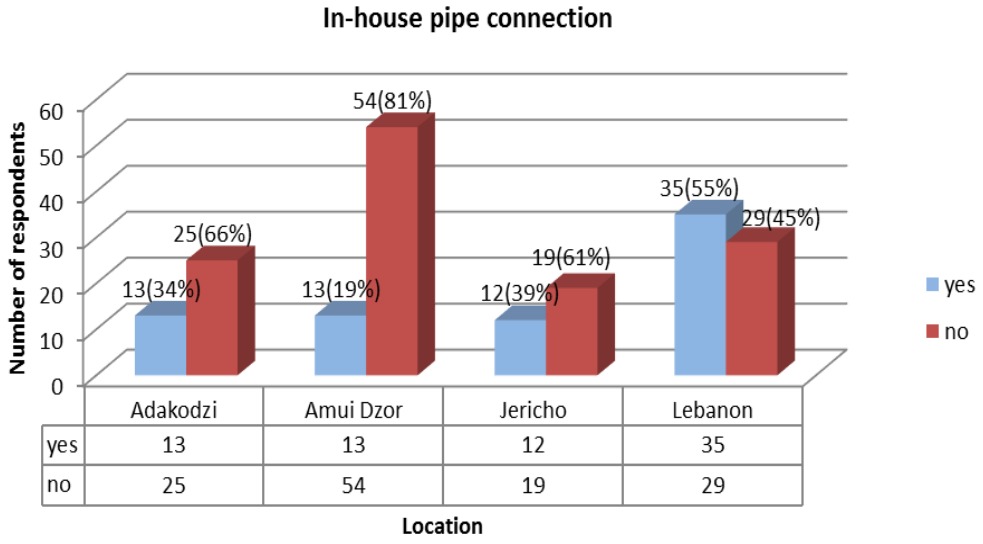
underway will ease the congestion nature of the slum community and allow the laying of pipes for this group of people.

The situation is not so different from Adakodzi where though most land owners have legal entitlement to land, lack of building permit (GHAFUP, 2012) deprived most house units of municipal water systems. It was also realized that, most houses along the road networks get their supply interrupted due to breakdown of pipelines during road constructions. An interviewee lamented as follows:

> *''We use to have water flowing in our taps but after the construction of the road some years back, the water stop flowing. All attempts to get it repair was unsuccessful''* (Interviewed on 2nd May, 2014).

But what could have accounted for the same problem in Jericho and Lebanon which were considered non- slum areas but where 61% and 45% of house units respectively do not have in-house pipe connections.

Fig 4.8: In-house pipe connection by location



Source: Field work, 2014

During the fieldwork, it was found out that the lack of connection could not be solely explained by the absence of land documents, but rather it involved more complex issues of excessive demand over supply, financial constraints, rental conditions, living arrangements and various administrative procedures which most household respondents claim they could not follow. For instance in some parts of Adakodzi, Amui Dzor as shown in Plate 4.2 and even in some parts of Lebanon, the living arrangements made it almost impossible for GWCL to extend pipe service. In the words of Ainuson (2010), the ill-suited living arrangements of most urban poor communities have discouraged the laying of pipe lines as well as the difficulties involve in the acquisition of legal documents for pipe connection.

Plate 4.2: Ill-suited housing arrangement of some communities in Ashaiman

Source: Field work, 2014

4.4.1.2. Frequency of water flow

Despite the fact that 36.5% have in-house pipe connection, they are however torn between several flows interruptions where some taps do not flow at all either due to technical problems or destruction of pipelines during road constructions. During the research period, some areas were reported to have received water supplies once a week or not at all, while others were served every day. At best, water normally flow for few hours or only through the night. According to the Director of Operation at GWCL, the inadequacy of water for equal distribution has accounted for a rationing schedule which directs water flows to certain areas of the municipality on selected days and time. The rationing schedule was designed with the main purpose of promoting equal distribution of limited water resources across a highly populated area (Interview, 9th April 2014). This was confirmed by an interviewee at Jericho. According to her:

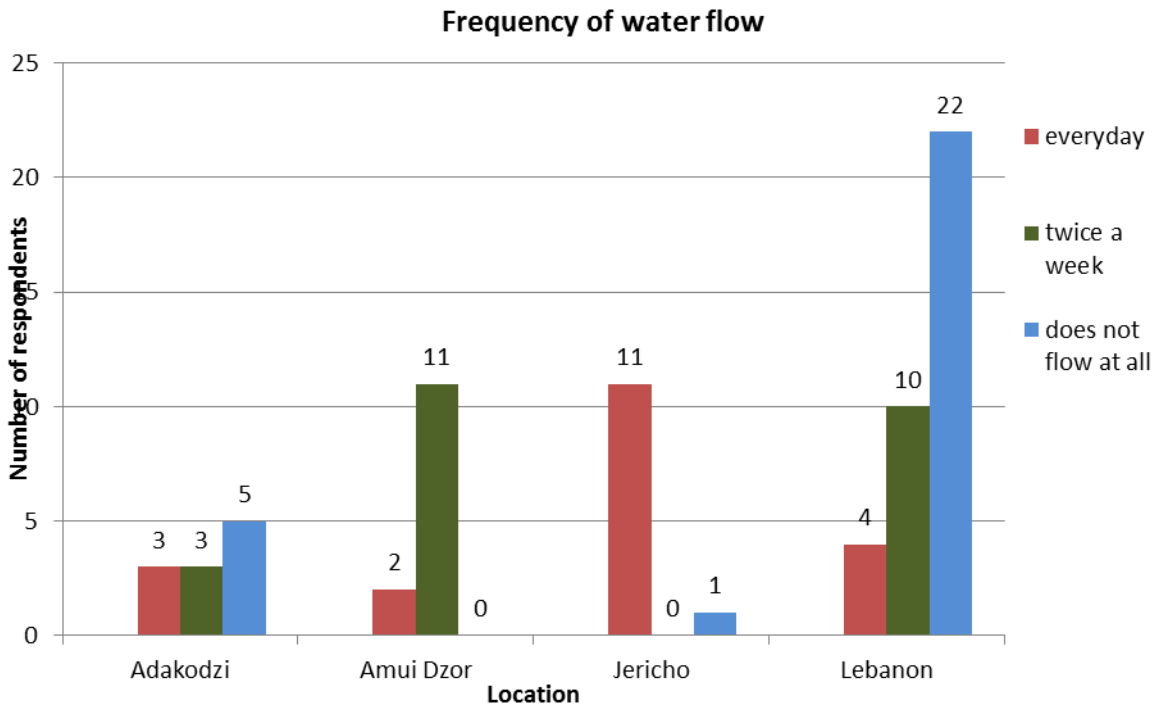
> *''The tap normally flows deep in the night and at dawn with low pressure. Since I have a storage tank which I connect to the tap, I normally get water every day and even sell to residents''. (Interviewed on 2nd May, 2014)*

In Figure 4.9, majority of residents in Lebanon who were reported to have in-house pipe connections, do not have water flowing through their taps for nearly 10 years of occupancy. Other areas were torn between twice a week and everyday mostly at dawn and late in the night. Therefore only those with storage tanks can have water as it flows unaware.

The 63.5% of respondents who do not have pipe connection and those whose taps do not flow as well as those experiencing intermittent interruptions depended on informal water vendors who retail their stored water to neighbours at a price ranging from 0.30p to GH₵1.0 per bucket depending on the community and whether it is solely tap water or

water from tanker drivers. For instance in the slum areas of Adakodzi and Amui Dzor, a 34liters bucket of water which was mainly pipe water from other residents cost 0.20p while in Jericho and Lebanon, a bucket of water cost between 0.40p and GH₵1.0. This supports the findings of Songsore (2008) and Ainuson (2010) which indicated that, while the wealthy households have in-house piping, which are mostly connected to overhead storage tanks, the poor found in most deprived households rely mostly on informal water vendor whose price is four times the amount paid by GWCL customers and communal standpipes, which required drums and containers for in-house water storage.

Fig 4.9: Frequency of water flow



Source: Field work, 2014

4.4.1.3. Procurement and storage of water

The research also found out that, 96% of residents store their water in barrels, gallons and other storage containers which were normally covered. But in the process of procuring the water from vendors, they use open containers which are subjected to contamination even

before it reaches the house. This primary responsibility however rest on the women and the girls in the house creating significant burden when the time for water collection is taken into consideration.

One may also argue about the quality of water from the storage tanks of informal vendors and household, since they were reported to be hardly ever washed. In addition to this, most gallons used for fetching and storing water were however observed to be the breeding ground of algae. This mirrored the findings of Songsore (2008) that, as long as households source of water remain outside the home, there is definitely the possibility of contamination hence hindering personal hygiene. Songsore (2008) further reiterated that, water stored in water drums, barrels, gallons and other containers easily get contaminated since they are hardly washed, raising great environmental health concerns. The research also revealed that, the issue of communal standpipes was gradually fading in the urban areas of Ashaiman as 100% of residents that do not have in-house pipe connection depended on informal water vendors. This could be as a result of the breakdown of majority of these communal standpipes located in the Municipality, which could have served as an alternative source of water for this group of people.

4.3.1.4. Accessibility to adequate water

In as much as the provision of piped water directly into the house has been associated with improved hygiene and reduction in disease (Moe & Rhiengans, 2006), the amount of water a household uses is thus related to its availability and ease of access (Nandy & Gordon, 2009; Moe & Rhiengans, 2006). Nonetheless, 35% and 6.3% of respondents interviewed in Jericho and Lebanon respectively noted that, though they did not have pipe connection the numerous water vendors available had reduced the distance travelled and as such reduced total time for water collection. So to them, they did not have water problems since

they were able to adapt and cope with the problem of not connected to the municipal water system. An interviewee at Jericho noted

> *''Who say we have water problems in Ashaiman? No, we do not. Even though I do not have pipe in my house I get water every day from a neighbour at fee. Well, I do agree that the prices charge is high but I can afford it so no problem'' (Interviewed on 2nd May, 2014).*

Another interviewee at Lebanon said

> *''Why do you people think that we have water problems here? I wish you could come and spend some two weeks here to see whether really we have problems with water. The only problem is that at times, they close the tap for some days and therefore have to depend on tanker drivers for water which are quite expensive. But it is normal everywhere'' (Interviewed on 3rd May, 2014).*

This position was emphasized by a key informant at the Ashaiman Municipal Assembly, who categorically stated that,

> *''We do not have water problems in Ashaiman'' (Interviewed on 11th April, 2014).*

But is this really the case? Her argument was that, since people were able to have access to water whether from their homes or from informal water vendors, they cannot be said to have problems. This notion contradicts JMP classification of improved water source that include an indoor pipe connection and public standpipes among others. Therefore with the low percentage of in-house pipe connection in the Municipality, the high dependency on informal water vendors, the frequent interruptions, one could argue that Ashaiman is facing water problems or experiencing water stress.

But should the services of informal water vendors be discouraged in especially deprived areas which are not connected to the national water system by virtue of their location? Certainly no, this is because informal water vendors could be seen as the solution in a congested and unplanned urban area like Ashaiman. Massive educational programs should rather be organized for these vendors and their tanker drivers so as to educate them on the need to clean the storage tanks regularly and also avoid the fetching of dam waters for domestic purposes.

On economic grounds, the activities of these informal water vendors could however break the vicious cycle of poverty for households who manage these income earning ventures especially women who operate these businesses.

The situation is not so different from the slum areas of Adakodzi and Amui Dzor as 81% of respondents have access to water from informal water vendors at a price that ranges from 0.30p (Pesewas) to GH₵1.0.

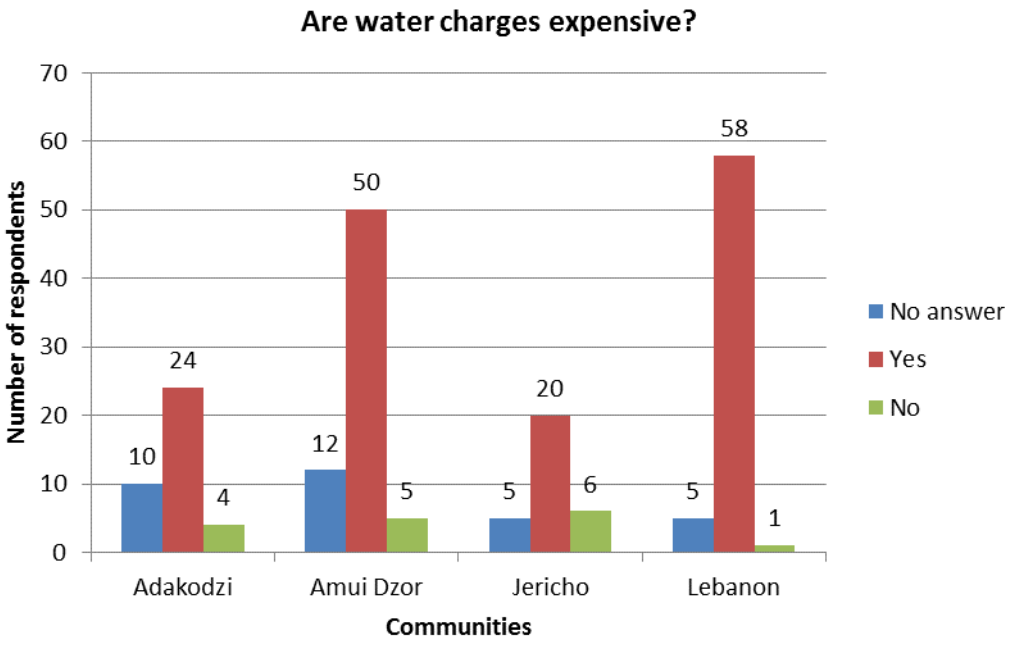
4.4.1.5. Affordability of water charges

On the issue of affordability of water from informal vendors, despite the fact that 76% of respondents agreed to water charges being expensive as shown in Figure 4.10, they seem to be however satisfied with the services of these vendors since their most urgent problems were issues of sanitation. This support the findings of Songsore (2008), who indicated that, most residents in low-income communities were quite satisfied with water supply as long as water could by purchased with bucket from an informal water vendor next door. In the words of an interviewee at Adakodzi:

> *''Everyone is selling water nowadays than first. I can fetch water within ten minutes so even though there is money involved the fact that my household get*

some amount of water, we are satisfied. Gone was the days when you had to walk several metres before getting water'' (Interviewed on 15th April, 2014)

Fig 4.10: Affordability of water charges



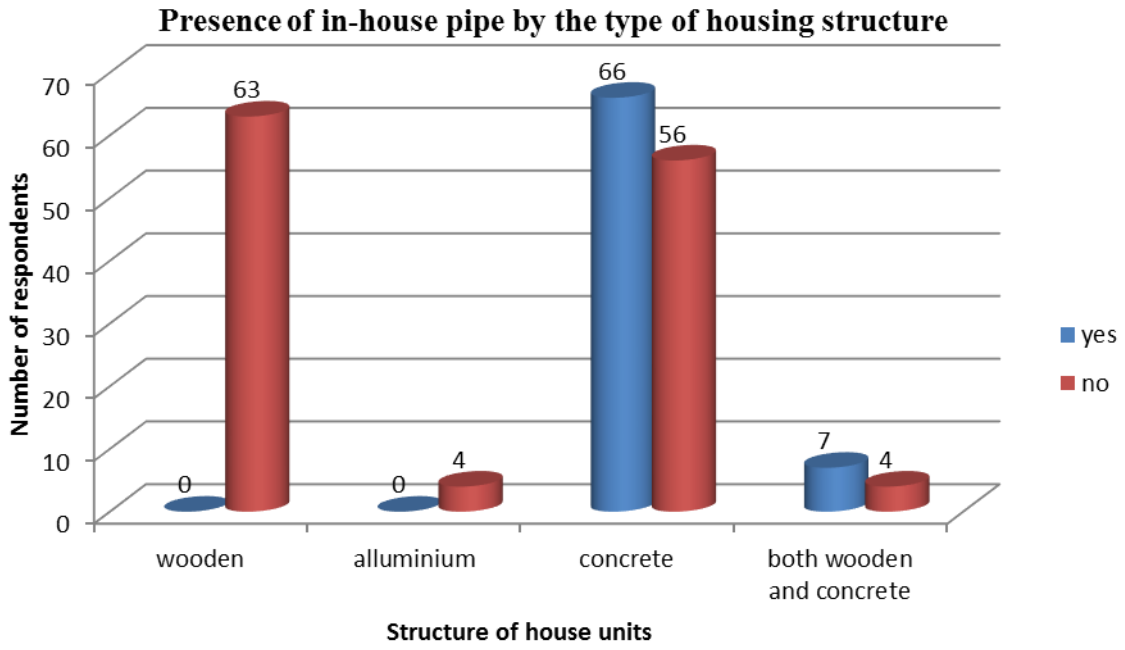
Source: Field work, 2014

Another interviewee at Amui Dzor noted:

''Although I spend so much buying water, it is better than not having at all or have to travel long distance to fetch water''. (Interviewed on 15th April, 2014)

Another issue arising from the survey was the relationship between the type of housing unit and the presence of an in-house pipe connection. Figure 4.11 shows that, all respondents living in wooden and aluminium structures are found in the slum areas of Adakodzi and Amuidzor and as such do not have pipe connection in their homes. One may expect respondents staying in concrete structures to have pipe connections. However, the result shows that 46% of respondents residing in concrete houses also did not have pipe connection in their houses.

Fig 4.11: Presence of in-house pipe by the type of housing structure



Source: Field work, 2014

When subjected to the chi-square test, the result shows that, there was an association between the type of community that is whether slum or non-slum and the presence of an in-house pipe. As shown in Table 4.7, the Pearson t-statistic and p-value result of 13.946 and 0.000 respectively indicated an association between the type of community and the presence of in-house pipe. Since the p-value of 0.000 is less than 0.05 there is a significant association between the presence of an in-house pipe and type of community.

Table 4.7: Cross tabulation and Chi-square test

Classification of communities	**Presence of pipe connection**		**Total**
	Yes	**No**	
Slum	26	80	**106**
Non-slum	47	47	**94**
Total	**73**	**127**	**200**
Pearson chi-square=13.946, P-value=0.000			

Source: Field work, 2014

4.4.1.6. Source of drinking water

A safe adequate drinking water is essential for the human body. According to the JMP, a safe drinking water is one that is sourced from an in-house pipe connection, communal standpipes, protected wells, boreholes etc. However, the study revealed that 55% of residents in the four communities depended on sachet water as a source of drinking water. Another 41% make use of both pipe water and sachet water (Pure water) while a small margin of 4% depended on pipe water as their main source of drinking water. This confirmed the report from WSMP Ghana summary sheet (2009) that, in Ghana there is an increasing trend in the use of sachet water as about 6% of the total population uses sachet and bottled water as a main source of drinking water especially in the urban areas. But then, what could have accounted for this behaviour change? Is sachet water safe for consumption since it was not included in the JMP classification of improved sources of water? Or should the classification be revised to include sachet water? These are questions that need to be critically examined and answered if the MDG on water and sanitation have to be achieved.

However, it could also be argued that, the low percentage of households with in-house pipe connection could be responsible for the low dependency on pipe water. However, residents noted that, the risks of drinking contaminated water deter them from drinking pipe borne water which according to JMP is an improved source of drinking water. In percentage wise 55.5% of households were scared of drinking pipe water because they fear it might be contaminated.

Residents further explained that, most pipelines were located in improvised gutters and also visible on the surface making room for cross-contamination. This was confirmed through personal observation as shown in Plate 4.3. When the director of operation at the GWCL was interviewed on this issue, he explained in the following statement:

> *''We do not lay pipes in gutters. What happens is that normally during the construction of roads some pipelines will have to be removed for gutters to be built. After the construction instead of those affected to exercise patience they relay the pipes near these gutters.*

Also since majority of residents do not have pipe connection in their homes, drinking pipe water stored by vendors becomes risky. So residents rather prefer sachet water even though it is not included in JMP classification of improved source of drinking water. In the words of an interviewee at Lebanon:

> *''There was a time I drank pipe water from my own house for close to two weeks. After some time I fell sick and was diagnose of typhoid fever. I was then advised by the doctor to boil my water before drinking. Since that time I get scared to drink pipe water. I rather prefer to drink 'pure water' than to become sick again trying to drink pipe water whether boiled or not'' (interviewed on 3rd May, 2014).*

Another interviewee vehemently stated:

> *''I drink sachet water because I do not have an in-house pipe. I buy water from vendors so there is no way I will drink that water. This is because they hardly wash their storage tanks. In fact I have not seen any of them washing their tanks before so I would not drink that water. I will use it for other domestic things but definitely not drinking''* (interviewed on 3rd May, 2014).

Plate 4.3: Pipelines located on the surface ground

Source: Field work, 2014

In the slum areas of Adakodzi and Amui Dzor, most people make use of the pipe water as their source of drinking water. Although majority do not have in-house pipe connection, they depended on the small percentage of neighbours who have pipe and have connected the taps to storage tanks. Water from these neighbours are collected and used for all forms of domestic chores including drinking. When asked whether they were not scared of drinking contaminated water, an interviewee at Amui Dzor noted:

> *''Why should I be scared, water is water? I have been drinking pipe water for close to ten years now and nothing have happened to me. And even if my household is to use sachet water, where is the money to buy enough for all seven members of the household?'' (Interviewed on 15th April, 2014)*

On the whole, 55.5% of respondents stated that, the risk of drinking contaminated water was a general problem that discourages them from drinking pipe water either from their homes or neighbours. Could the problem be related to the un-availability of pipe in the home and frequent interruptions? Table 4.8 shows the cross-tabulation of the two variables. It shows that, with the 36.5% of respondents who have pipe connection in the

home, only 5.5% of these respondents used it for drinking purposes. Also, 50.7% depended on sachet water for drinking purposes.

Table 4.8: Contingency table

Pipe connection	Source of drinking water			Total
	pipe water	sachet water	both pipe and sachet	
Yes Count	4	37	32	73
% of source of drinking water	50.0%	33.6%	39.0%	36.5%
No Count	4	73	50	127
%of source of drinking water	50.0%	66.4%	61.0%	63.5%
Total Count	8	110	82	200
% total	4.0%	55.0%	41.0%	100.0%

Source: Field work, 2014

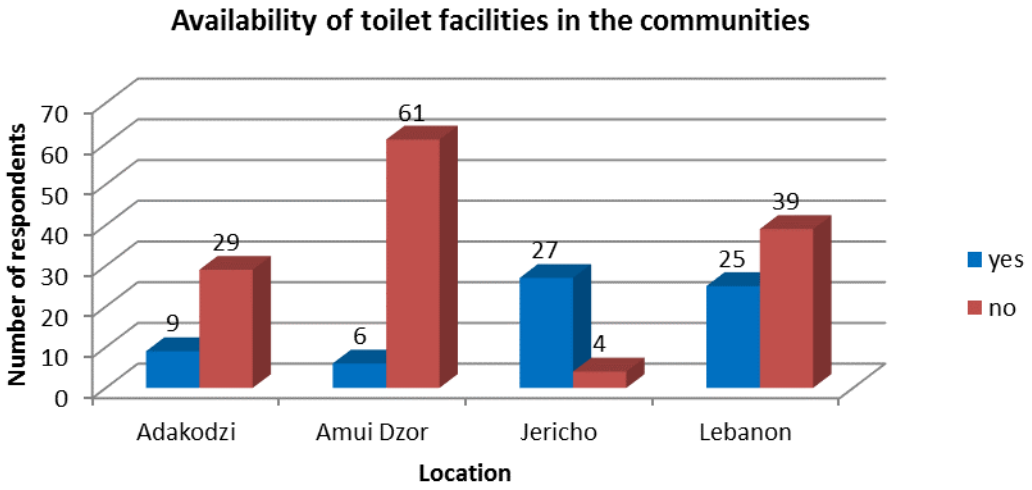
4.4.2. Access to basic sanitation facilities

Access to basic sanitation is essential for health and for dignity. However access to basic sanitation services remains a serious problem in the Ashaiman Municipal Assembly. In the slum areas of Adakodzi and Amui Dzor, access to toilet facilities, bathrooms, drains and proper waste disposal methods and management were major challenges. This support the findings of UNDP (2006) which revealed that, just as in slums and shanty towns the provision for basic sanitation is poor with ‘‘flying toilets’’ a major problem, having serious health implication for children who play in the streets. GHAFUP (2012) also indicated that, access to domestic toilet and adequate drain facilities were major developmental priorities in the two slum areas surveyed.

4.4.2.1. Access to domestic toilet facilities

In all four communities surveyed 66% of residents do not have domestic toilet facilities, with 67.4% of them located in the slum areas of Adakodzi and Amui Dzor. Figure 4.12 shows the number of households with and without toilet facilities in the various communities. With the 66% of resident without toilet facilities, 29.5% depended on public toilet and 38% private shared toilet facilities. It was however observed that, the public facilities were poorly managed while the private facilities operated by private individuals at a fee were better managed. The fees charged ranged from 0.30p for the public toilets to 0.40p and 0.50p for private shared toilets per visit. For private shared toilets, the prices differ based on the type of facility that is whether it is water closet or a KVIP and also whether one uses paper or toilet roll to clean up.

Fig 4.12: Presence of domestic toilet



Source: Fieldwork, 2014

To some extent, one may be tempted to assume that there is an association between the availability of domestic toilet and the type of community that is, whether slum or non-slum. Whereas, residents in the wooden and aluminium structures found in the slum areas do not have domestic toilets, 47% of residents in concrete structures in both slum and non-

slum communities also do not have domestic toilet. One may expect that, landlords whose houses are made of concrete will make provision for toilet facility but this was not the case. When asked, one landlord at Adakodzi noted that, the poor management of domestic toilets by residents has necessitated its closure. Other landlords were however not willing to make any comment on the issue hence the conclusion that, it was a deliberate attempt not to provide one. The use of the shared toilet facilities therefore became the order of the day which according to JMP is unimproved sanitation facilities. When subjected to a chi-square test, it was found out that, there was an association between the presence of a domestic toilet and the type of community that is whether slum or non-slum. Table 4.9 shows the chi-square test values for the variables. The Pearson chi-square statistical and p-value recorded for the association were 35.9227 and 0.000 On the other hand, despite being rated as unimproved, shared toilets may be the only option for people using plastic bags and practicing open defecation. And as indicated by Water and Sanitation for the Urban Poor (WSUP), 2011, shared toilet facilities may provide solutions for households in congested urban environment where domestic toilets remain a challenge. Therefore in a congested urban place like Ashaiman, a shared public or private public toilet may be the solution. But these facilities should be properly managed so as to prevent any environmental health problems. However, efforts are being made by the Municipal Assembly to provide domestic toilet for residents through a Public Private Partnership agreement.

Table 4.9: Cross-tabulation and chi-Square Test

Type of community	**Presence of toilet facility**		**Total**
	Yes	**No**	
Slum	16	90	106
Non-slum	52	42	94
Total	**68**	**132**	**200**
Pearson chi-square= 35.9227, P-value= 0.000			

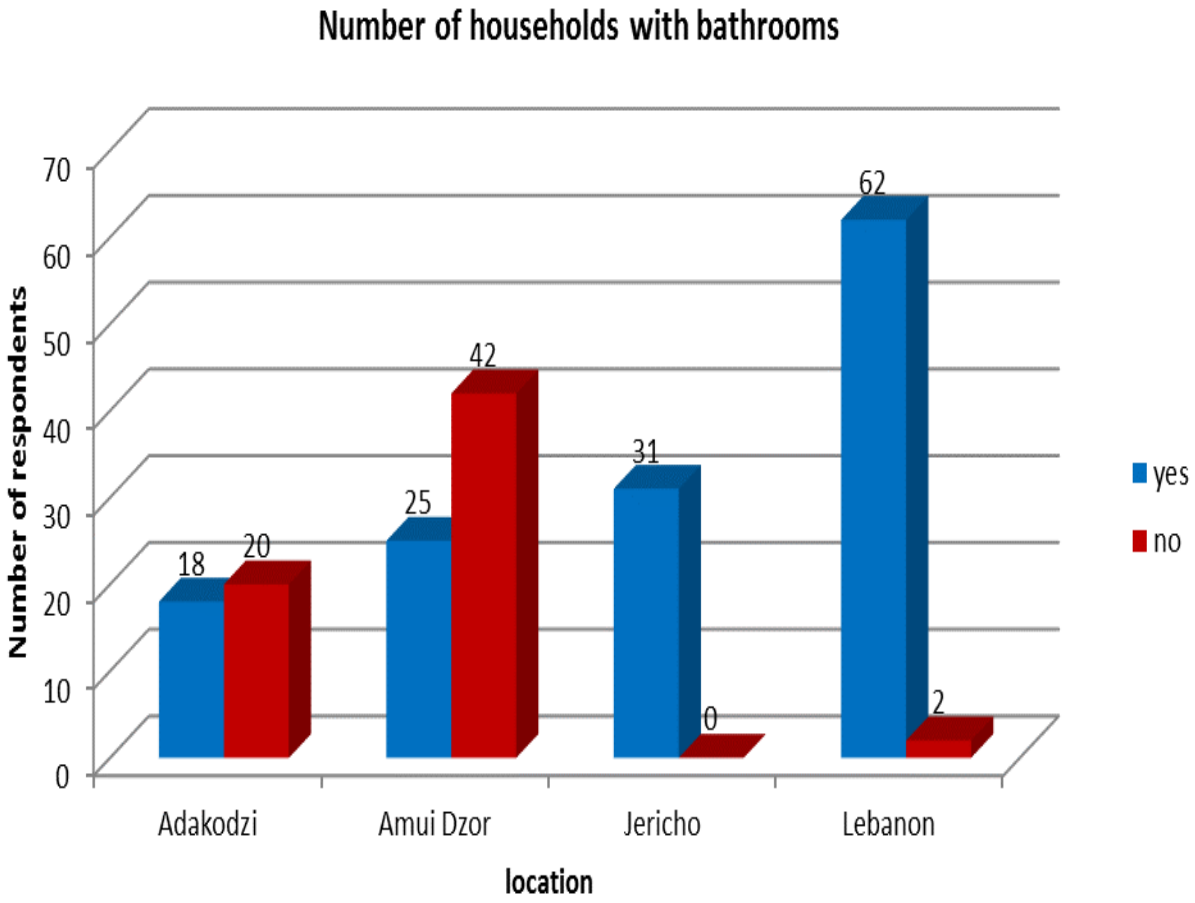
Source: Field work, 2014

4.3.2.2. Access to bathrooms

An indoor bathroom facility is necessary if personal hygiene is to be achieved. However, the study revealed that, 32% of house units do not have bathrooms. Majority of this percentage as revealed by the research reside in the wooden and aluminium structures which characterized the slum areas of Adakodzi and Amui Dzor. Residents therefore make use of the shower services available in the various communities at a fee. These shower facilities are found mostly in the slum areas where a domestic shower facility is absent and they operate early in the mornings around 4:30 and closes around 22:00 in the evening.

However, all respondents in Jericho and majority of Lebanon respondents reported having access to a bathroom facility unlike their correspondents in Amui Dzor and Adakodzi. Figure 4.13 shows the number of respondents with bathroom in the various communities, while Plate 4.4 shows some shower facilities patronized by residents in the slum communities.

Fig 4.13: Presence of domestic bathrooms



Source: Field work, 2014

Plate 4.4: Shower facilities in the slum communities

Source: Field work, 2014

4.3.2.3. Access to adequate drainage facilities

A well-engineered drainage system in a community not only prevents the occurrence of flood but also ensure proper disposal of liquid waste. By observation it was discovered that, there were well engineered drains along the major roads in the Municipality. These drains are however chocked with solid waste of all kind even human excreta. At the

communities and households level, the drainage systems were poor as there were no well-engineered drainage systems. The situation is worst in the two slum area where households resort to throwing liquid waste on the ground. The situation seems to be better in Jericho but worst off in Lebanon where residents complain bitterly about the absence of drains. An interviewee stressed:

> *''We do not have gutters, so when it rains the place get flooded creating problems for us. We want the government to constructs gutters so that we can throw our waste water in them and also for the area not to be flooded in the event of a rainfall''. (Interviewed on 2nd May, 2014)*

One phenomenon that runs through all the areas surveyed was the linking of bathroom and kitchen waste pipes into the available drains. Due to the absence of drains, some residents have resorted to the digging of shallow channels to serve as drainage systems. These channels are however filled with solid waste causing the area to flood during raining season. This flood waters later serves as breeding ground for mosquitoes which spread malaria. This supports the Municipal Health Directorate ten top disease rankings in 2013 which ranked malaria as the first ten top diseases in the Ashaiman Municipality. Plate 4.5 shows typical improvised drainage facilities in the slum communities of Adakodzi and Amui Dzor.

Plate 4.5: Improvised drains in the slum areas

Source: Field work, 2014

4.4.2.4. Solid waste management

Proper disposal and management of solid waste is important if total sanitation is to be achieved. Even though the Municipal Assembly claim there are well regulated way of collecting waste, waste management needs of the communities, need to be improved.

In Jericho majority of residents were provided with plastic bins with no means of separating and disintegrating solid waste. On the other hand, majority of households in

Adakodzi, Amui Dzor and Lebanon, do not store their waste in plastic bins but rather in baskets, unused buckets, sacks, polythen bags and at times paper box. To compound the problem, waste are left uncollected for days by the agencies responsible thereby, attracting the presence of flies and animal scavengers as well as polluting the air due to the stench that emanate from these waste, affecting the health of household members in the process.

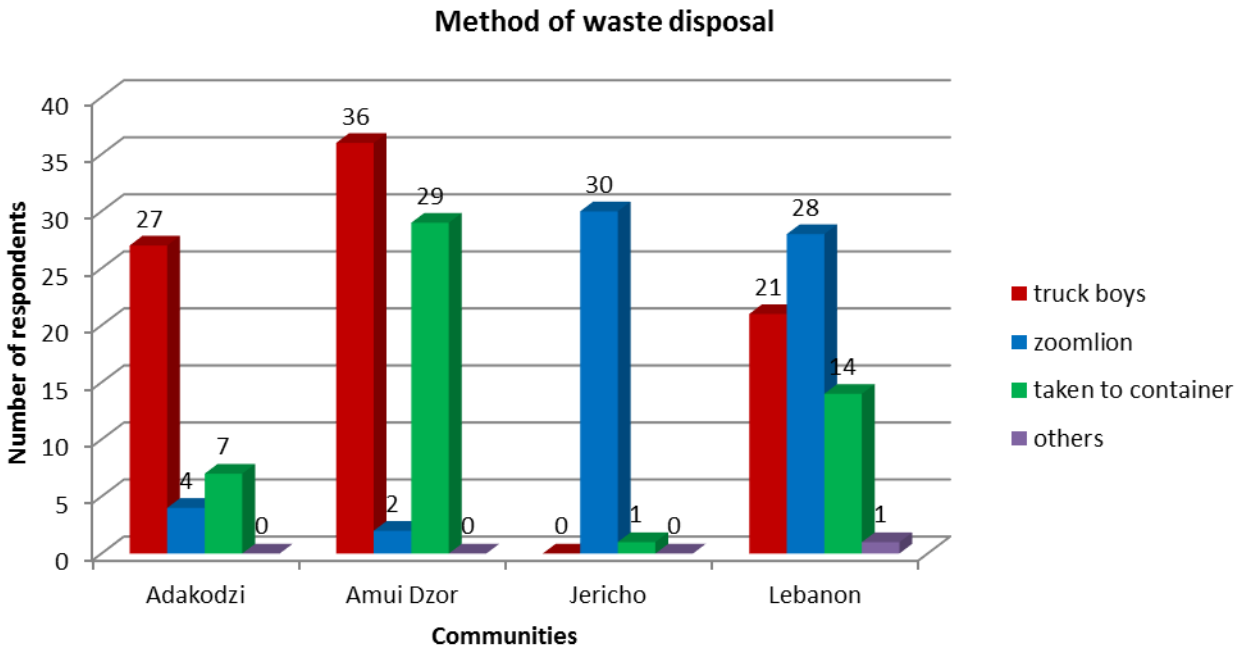
Among residents of Jericho majority of respondent employ the services of Zoomlion personnel who collect their household waste at a fee once a week or once every two weeks. At times, wastes are left uncollected for weeks attracting houseflies due to their overflow nature. In the other three communities, residents either depended on Zoomlion personnel, truck boys or take their waste to the nearest garbage container as indicated in Figure 4.14. Waste generated at markets and stations are collected by personnel from Zoomlion however, heap of garbage were left uncollected in these places posing health threat to market women and drivers as well as their passengers.

Despite this backlog, the research brought to light, the nature of waste management and the role of private waste collection agencies in the management of waste in the Ashaiman Municipality. Although, majority of respondents were not satisfied with their services, they agreed that, the private waste collection agencies indeed play a key role in improving sanitation in the Municipality. Respondents further urged them to increase their effort. It was observed that, the extent to which respondents separate household waste generated was the same across all the four communities surveyed. There was no sorting of waste by respondents as all types of solid waste generated were stored in the same container compounding the problem of waste management at the destination area.

There is therefore the need to have proper waste management practices, timely collection of waste and increasing the number of waste bins and containers in communities. This

mirrored the report by Songsore (2008) that residential and commercial solid waste management remains one of the most intractable problems within Greater Accra Metropolitan Assembly.

Fig 4.14: Method of waste disposal



Source: Field work, 2014

4.5. Conclusion

In summary, the research revealed that, residents in all the four communities of Adakodzi, Amui Dzor, Jericho and Lebanon were all at risk from inadequate water supply and poor sanitation. Also it was realized that, due to several interruptions in water flow and the fact that most house units were not connected to the municipal water systems, reliance on informal vendors was the order of the day. On the issue of sanitation, the overall picture conceals huge differences in the presence of toilet and bathroom facilities as well as drainage systems and waste disposal methods between the various communities surveyed in the Ashaiman Municipality. In general, the spatial inequalities in the access to water

and sanitation services have different patterns and as such needs different approaches in handling the issues.

CHAPTER FIVE

RISK PERCEPTION AND COPING STRATEGIES OF RESPONDENTS

5.1. Introduction

This chapter presents the perceptions of household members about their environmental risk problems of inadequate water and unsanitary conditions as well as their coping strategies with regards to these problems.

5.2. Perceptions of environmental risk problems

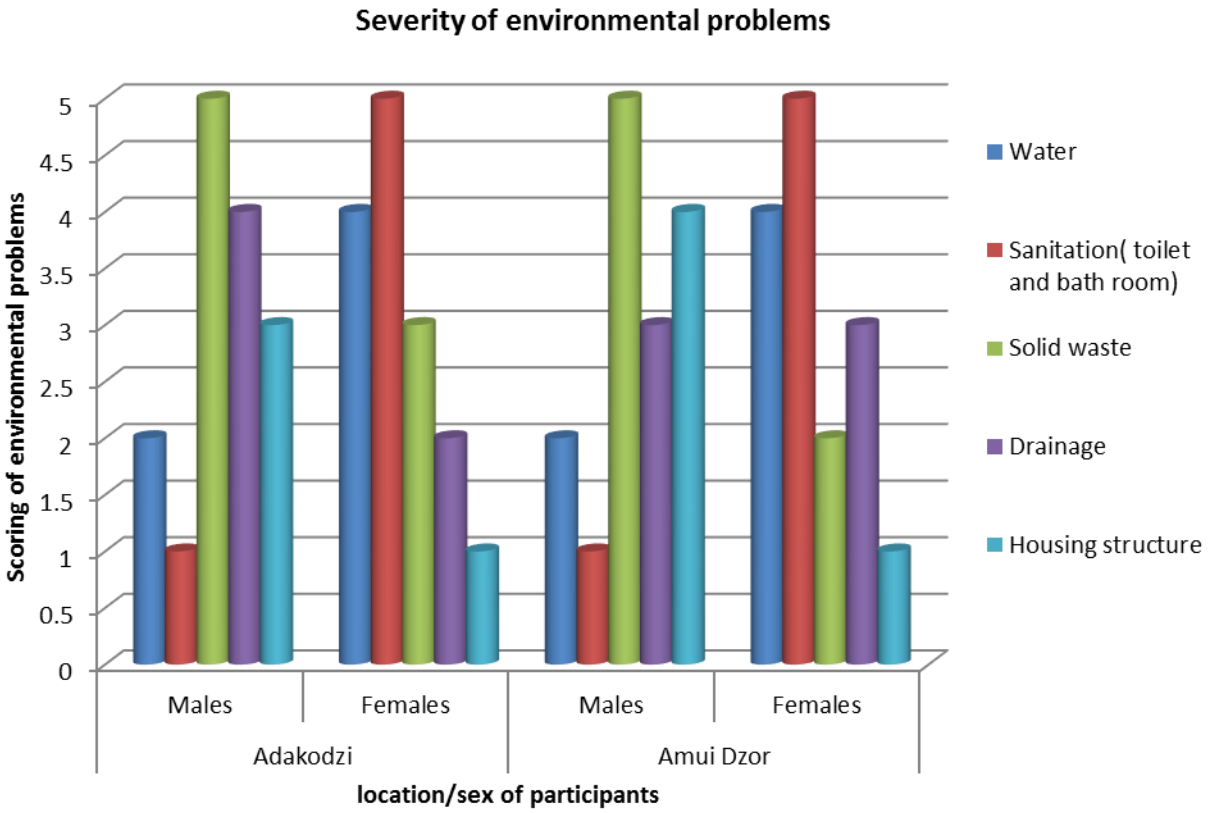
According to Songsore (2008), risk perception and hygiene behaviour are aspects of the social context that affect the exposure to risks associated with inadequate access to safe water and sanitation facilities. During the FGDs, information regarding perceptions of environmental risk problems were scored differently. The most severe environmental problems were given the highest score of 5 while the least severe problem was given a score of 1 in a descending order. The average score of each problem in each community was then calculated on a gender basis.

By order of severity as shown in Figure 5.1, female respondents in Adakodzi and Amui Dzor ranked sanitation, water, solid waste and drainage as their main problem confronting them at both the household and community levels. Their male counterparts however ranked solid waste management as their main concern followed by drainage systems and housing structure in that order. Sanitation issues for instance toilet facilities and bathrooms were ranked first by the women in the slum communities because of their privacy needs especially during menstruation where bathing becomes a priority for personal hygiene. In support of this, an interviewee at Adakodzi lamented as follows:

''My dear, it is embarrassing but what can I say? During menstruation, I spent a lot in a day using the shower, because I normally use it two to three times and each visit cost ranges from 0.50p to Ghc1.0 depending on the level of water availability. So when that time comes I normally run out of money given the small income I earn from my petty trade.''(Interviewed on 15th April, 2014)

On waste disposal, most households in the two slum communities employ the services of truck boys while others take their waste to the rubbish containers.

Fig 5.1: Severity of environmental problems in Adakodzi and Amui Dzor

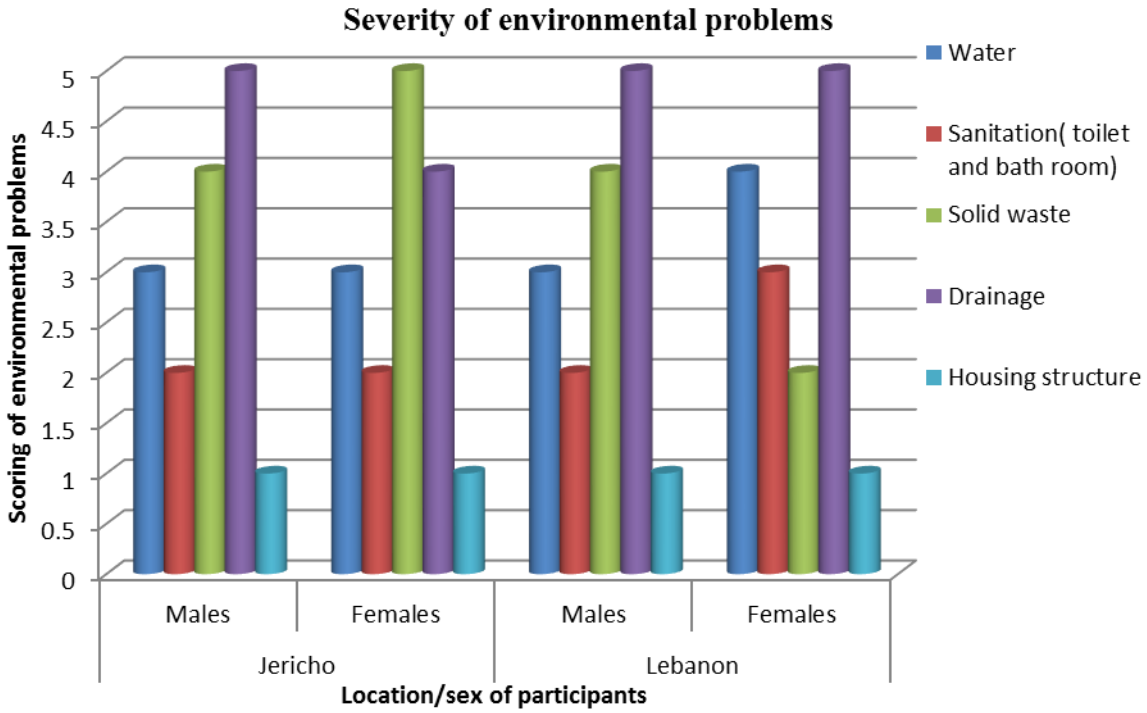


Source: Field work, 2014

The trend however changed a bit in Lebanon and Jericho where both males and females perceived drainage, solid waste and water as their main environmental problem aside other

problems as shown in Figure 5.2. This could be as a result of the high percentage of house units with access to toilet facilities and bathrooms as compared to respondents from Adakodzi and Amui Dzor.

Fig 5.2: Severity of environmental problems in Jericho and Lebanon



Source: Field work, 2014

An interviewee at Lebanon made the following comment:

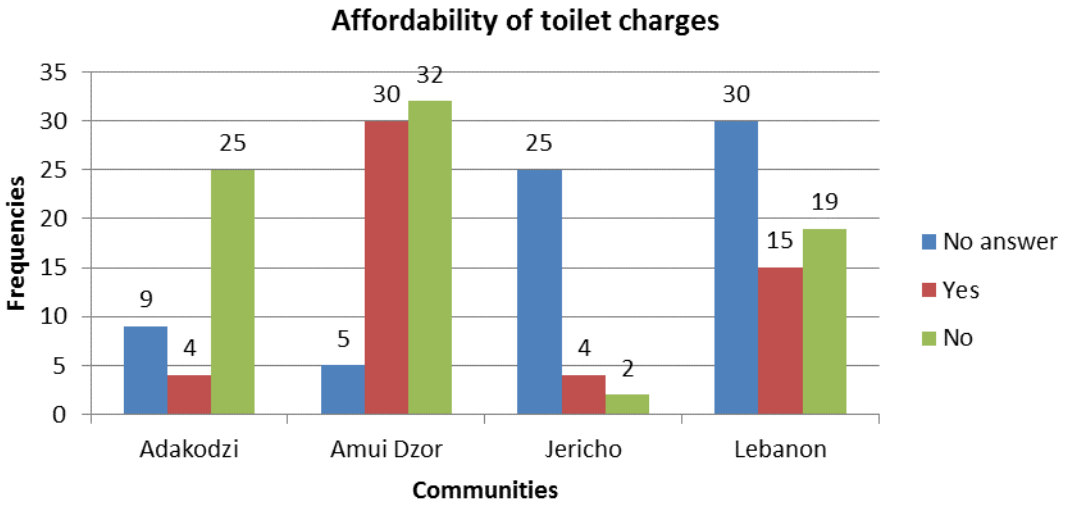
> *''We need gutters in this area. Look there is water everywhere; our children cannot play outside the house. Even if they do they come home dirty and smelling of bad odour. Mosquitoes and houseflies are everywhere, we fall sick frequently and when diagnosed, they said we have malaria. The authorities have to sit up and do their job.''(Interviewed on 2nd May, 2014)*

This comment not only expresses the serious drainage problems in the community, but also highlights the significant relationship between absence of adequate drainage systems and the adverse health problems encountered.

By participant observation, solid waste seems to be the most serious problem in the central market and lorry stations where lot of wastes were generated.

Generally, it was observed that toilet user fee were usually not affordable mostly for respondents residing in the slum communities as shown in Figure 5.3. This fee ranges from 0.40p to 0.60p for private shared toilets and 0.30p for public shared toilets per visit. Some respondents also noted that, the private shared toilets in particular impose additional cost on their household expenditure as they were unable to afford these facilities at some points in time due to the high price charged.

Fig 5.3: Affordability of toilet charges



Source: Field work, 2014

There was however a variation of the environmental burdens of water, sanitation, solid waste, drainage systems and house structure among different groups of people based on their gender. The fact that solid waste, water, sanitation and drainage have featured as being the four most severe environmental problems among households indicates the overwhelming severity of these problems.

5.3. Coping strategies with regards to inadequate water supply and poor sanitation

Different water and sanitation behaviours and coping strategies were observed and identified during the survey of the various communities. As the research has already identified, the selected communities in the Ashaiman Municipality were seen to be experiencing shortfalls in water supply from the Ghana Water Company limited. This poor urban water supply situation has resulted in consumers using various coping strategies. These coping strategies include buying water from informal water vendors or neighbours, tanker drivers, building water storage facilities and buying sachet water for drinking.

5.3.1. Informal vendors

The research revealed that, 83% of respondents were coping with inadequate water supply through several ways. 76.4% of these respondents were consumers that do not have pipe connections in their homes and 23.6% of those underserved by GWCL through frequent water interruptions. Although coping strategies like rain water harvesting and the use of hand-dug wells existed, 82.5% of respondents in the communities surveyed, depended on informal water vendors and supplemented it with rain water during the raining seasons.

It was also discovered that, majority of respondents in all four communities, were quite satisfied with water supply as long as water could be purchased by buckets and bowls from an informal water vendor next door. This explains the low priority given to the

access of water as revealed by the survey. On the other hand, although respondents understood the health implications of poor water handling and the need to close their water storage facilities to prevent contamination, most respondents noted they use open containers for water collection to the house. They however stored their collected water in closed containers to prevent recontamination. This behaviour is of great concern when taking the contamination rate of water from the source to the destination area into consideration.

5.3.2. Sachet water

Another coping strategy of respondents was the use of sachet water or ‘‘Pure’’ water as a main source of drinking water. As indicated by the Ghana Water and Sanitation Platform (2009), the use of pipe water as a main source of drinking water was under threat in most urban areas of the country. The research revealed that, 55% of respondents depended on sachet water as their main source of drinking water as against 4% that solely used pipe water for drinking purposes. This increasing trend in the use of sachet water could be explained by the current perceptions of people regarding pipe water as revealed by Stoler et al (2012a, 2012b).According to Stoler et al (2012a, 2012b), the frequent interruptions of pipe water supply coupled with unavailability of in-house pipe connection and the poor quality of water provided at times deter people from drinking pipe water making them perceive sachet water to be safe and pure than pipe water. The research also revealed that, since 82.5% of respondents depended on informal vendors for water supply, the quality of water they collect was questionable. They would rather prefer to drink sachet water. But then, is sachet water an improved source of drinking water? Is it of high quality? Are the indicators for safe drinking water target been revised to include the use of sachet water? What are the implications of this behaviour change in the achievement of the MDG goal

seven, target C of halving by 2015 the number of people without safe, adequate drinking water?

Taking it from a different angle, the increasing use of sachet water has also contributed to the solid waste menace in the country. Despite its convenience and the perception of higher quality than the tap water, research has shown that, sachet water waste constitute a huge proportion of plastic waste generated in the country as most consumers indiscriminately litter the sleeves in gutters and on the street (Stoler et al, 2012a). In spite of its adverse environmental impact, sachet water distribution has become an important source of drinking water for most urban dwellers in Accra and for that matter Ashaiman as identified by Stoler et al (2012b).

5.3.3. Public and private operated toilet facilities

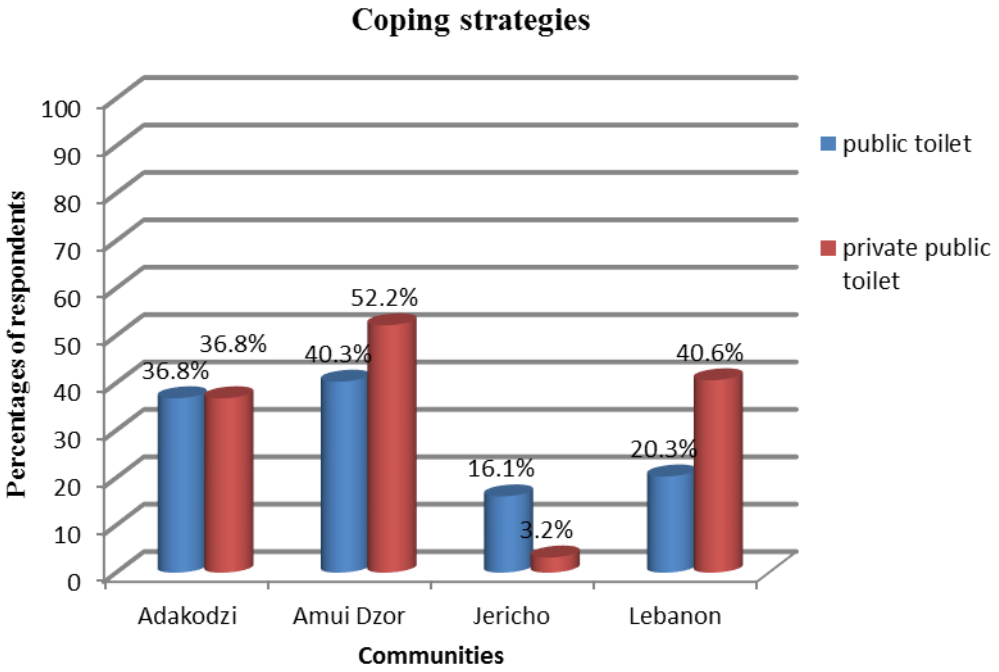
It was also revealed that, due to the absence of domestic toilet in most households in the slum communities and in Lebanon, outdoor defecation of neighbourhood children becomes the regular norm. In the slum areas of Adakodzi and Amui Dzor, children who cannot use the public and private shared toilet facilities, normally defecate in chamber pots and rubber bags, which are later disposed by their mothers. This exposes the women to raw excreta hence endangering their lives.

In Amui Dzor in particular, it was revealed that, most of the open defecation behaviours took place in the night even when most toilet facilities have not closed for the day. In addition to this, long queues especially at dawn compel people to defecate in the open or in rubber bags which are later disposed into drains or into household garbage containers.

The situation is however different in Jericho that has 87% of respondent having access to a domestic toilet facilities although it was shared by multiple households in the same house unit. Although, 61% of respondents in Lebanon do not have domestic toilet, most

respondents noted that, open defecation and defecating in rubber bags were minimal in the community. It can therefore be argued that, the negative attitude of residents in the slum community of Amui Dzor has contributed to the poor environmental conditions prevailing in the community as compare to Lebanon community which although majority do not have domestic toilet, their positive attitude toward sanitation issue has contributed to the few cases of open defecation and rubber method recorded in the area. The study further revealed that, 29.5% of respondents use public toilets while 38% use private public toilets operated by private individuals. Figure 5.4 shows the various coping strategies of respondents in their various communities.

Fig 5.4: Toilet facilities coping strategies



Source: Field work, 2014

5.3.4. The use of shower facilities

Another aspect of personal hygiene under threat was the unavailability of bath rooms. As the research has already stated, majority of respondents in the slum areas of Adakodzi and Amui Dzor do not have bathrooms in their respective house units. They therefore depended on private shower facilities at a fee. Children in these house units however, bath in the open depriving them of their privacy especially the young girls.

5.3.5. Solid waste disposal coping strategies

It was realized that waste disposal methods varied by community type. Majority of residents in Jericho depended on the services of the Zoomlion personnel. However, in Lebanon residents depended on the services of truck boys, Zoomlion personnel while some others take their waste to the waste disposal containers or some recognized dump sites at a fee. The cost involved was depended on the volume of the waste and the bargaining power of the resident. Some respondents noted that, they burn some of the waste so as to reduce the volume for disposal.

On the other hand, in the slum areas where most respondents employ the services of truck boys, it was observed that, most residents also engaged in burning of waste and disposal of waste in water logged areas which they perceive could prevent flooding. This however encourages the breeding of mosquitoes and other insects responsible for the spread of environmental health diseases.

5.3.6. Improvised drainage facilities

A major phenomenon in most of the communities except Jericho is the absence of well channelled drains. This is due to the fact that most house units in Lebanon and the slum areas were unplanned and as such harphazardly sited with no room for social amenities.

Most areas in Lebanon and the slum areas of Adakodzi and Amui Dzor were therefore marred with liquid waste from kitchens and bath rooms. Some residents in Amui Dzor therefore resort to digging shallow drains to pave way for liquid waste. These drains are however filled with solid waste preventing the free flow of water. Others place buckets at the back of their bathrooms before bathing which they later throw on the ground. This behaviour however creates the breeding ground for mosquitoes responsible for the spread of malaria. It is therefore not surprising when the Municipal Health Directorate recorded malaria as the leading cause of ill-health among residents in the Municipality in 2013. It is therefore hoped that, the slum-upgrading project underway will provide a lasting solution to the problem in the slum areas in particular and as such the need to construct engineered drains in Lebanon and part of Jericho.

In conclusion, just as Songsore (2008) indicated that, issues of behaviour change at the community and household level should be given equal consideration along with the provision of water and sanitation infrastructures, the research also identified the need to increase the education of residents on their environmental risks problems, if they are to maximize the health benefits of various water and sanitation interventions.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1. Introduction

This chapter presents the overall issues related to urban water stress and poor sanitation in the Ashaiman Municipality.

6.2. Overview of the study

The study sought to identify and assess the vulnerable conditions of households to environmental risk problems, so as to device means of reducing these risks. The objectives of the study were to identify and examine the environmental risk problems and the vulnerable conditions of households to these risks, identify and assess households' perception, behaviour and coping strategies with regard to environmental risk problems and finally to assess the spatial inequalities with regards to these environmental risk problems in the selected communities.

The study employed the mixed method convergent design of conducting research where elements of qualitative and quantitative viewpoints, data collection and analysis were used in understanding the research problem. The instruments employed for the data collection were questionnaires, in-depth interviews, focus group discussions, observations and informal interviews.

6.3. Summary of key findings

The research found out that, access to adequate water supply was not necessarily dependent on the physical location of house units but rather on other factors such as lack of building permit, ill-suited arrangement of house units and others. Moreover, a greater number of residents surveyed in the slum areas of Adakodzi and Amui Dzor lived in areas

which had never been served and may never be served with water by the municipal water system due to the ill-suited living arrangement and the illegal status of the settlement of residents. It also revealed that, respondents irrespective of their different income levels were vulnerable to the inadequacies of potable water and safe sanitation facilities.

In view of the fact that, majority of respondents in the various communities were not connected to the municipal water system, while those connected were faced with frequent interruptions, several coping strategies were developed to enable them adjust to the situation. These coping strategies included access to water from informal water vendors at a fee that ranges from 0.30p to GH₵ 1.0 per 34 litre buckets, rainwater harvesting during the raining seasons and the over reliance on sachet water as the main source of drinking water.

The research also highlighted absence of domestic toilet and bathrooms as major sanitation issues confronting residents. Respondents therefore resorted to the use of public shared and private shared bathrooms and toilets at a fee that ranged from 0.30p and 0.50p per visit as well as the use of shower facilities operated mostly by private individuals at a fee. Inadequate solid and liquid waste management practices and poor drainage systems were also major problems identified in the Municipality. Another problem was the untimely collection of household waste by service providers, which create myriad of health problems for residents.

On a whole, there were large inequalities in access to basic services due to the inequitable distribution of services. The study thus, revealed multiple risk accumulation in the acquisition of water and the use of sanitation facilities in the Ashaiman Municipality. These risks need to be reduced if quality of life is to improve.

Finally, the evidences from the study suggested that, not much progress has been made in addressing the problem of inadequate water and poor sanitation for the increasing urban population of Ashaiman.

6.4. Conclusion

Reducing risks associated with urban water stress and poor sanitation in the Ashaiman Municipality is a prerequisite toward the improvement of quality of life and is at the heart of achieving the MDGs. However, despite the physical expansion of the Ashaiman Municipality, the necessary expansions of services with regard to water and sanitation have not seen any meaningful improvements.

As a human right, access to water and sanitation therefore become priority areas for development for most governments and as such must be taken seriously. However, more work needs to be done in achieving this goal. In actual fact, urban dwellers are supposed to benefit from better social services provided for them by their respective local governments. Nevertheless, most residents in the selected communities in Ashaiman are enjoying only few benefits due to their local government's inability to provide services. Therefore, providing and improving access to these basic necessities of life becomes a prerequisite toward the reduction of environmental risk problems.

In fact, issues related to environmental risk reduction require a holistic approach. The Urban Environmental Transition (UET) and the Pressure and Release (PAR) models were therefore used as a conceptual framework for understanding the accumulation of environmental risks problems and identifying ways of reducing these risks. The approach considered the root causes of risks down to their implication on quality of life. While the UET model fits the environmental analysis of inadequate provision of water and sanitation

services in the home and neighbourhood, the PAR model provides the basis for understanding why these inadequacies exist and how they can be reduced or tackled.

Despite the fact that the PAR model was too focused on political issues and natural hazards, it however provides a chain of causation that needs to be critically examined if the risks associated with inadequate water and poor sanitation are to be reduced. A critical look therefore at the vulnerable conditions and the coping strategies examined, suggested a chain of causation that stemmed from economic, political and social inequalities. This implies that, the environmental risk problems identified in the Ashaiman Municipality did not occur in a vacuum but were triggered by political, economic and social factors as revealed by the historical profile of the Municipality. This historical profile provided evidence of economic, political and social inequalities in the access to water and sanitation which were embedded in the lack of access to quality housing facilities. The rapid urbanization process and the haphazard siting of structures that characterized the early development of Ashaiman in the 1960's served as major root and dynamic causes of vulnerable and unsafe conditions for residents due to the housing deficit experienced. As a result, the water and sanitation issues of households suffered severely with water and sanitation related illnesses topping the list of diseases in the Municipality in recent times.

Moreover, since these environmental problems occurred close to the home and neighbourhood as revealed by the research, it is important to tailor actions for risk reduction towards the immediate environ of the home and neighbourhood if the risk problems are to be reduced effectively. Nonetheless, achieving this aim requires a coordinated action between local government, service providers, communities and household members.

6.5. Recommendations

Based on the findings of the research, the following measures were recommended to reduce the risks associated with inadequate water and poor sanitation in the Ashaiman Municipality.

- Water, drainage systems, waste bins and other logistics for urban waste management need to be provided and extended to most deprived communities in the Municipality by the local government and service providers through a Public-private partnership (PPP) agreement. Also, domestic toilet and bathroom facilities need to be provided by respective landlords. New house owners who do not provide toilet and bathroom facilities in their various houses should be prosecuted and charged. This will help reduce the number of houses without toilet facilities especially in newly developing settlements.
- Furthermore, since planning rules, regulations and procedures are very essential in reducing the vulnerability of settlements to environmental risk problems, they should be strictly adhered to and vigorously enforced by the Assembly especially in the newly developing communities so as to ensure that the Municipality offers good and safe living environment for residents. Recalcitrant land owners should be prosecuted and charged when found flouting the rules and regulations. Doing this will help bring sanity in the sitting of buildings which will intend provide a well-organized and planned urban environment.
- Additionally, since majority of households depended on the informal service providers more attention should be devoted to regulating their activities. Massive educational programs should be organized for these service providers by the Assembly and GWCL. This will help ensure that, informal service providers provide better services

in a more hygienic and safe way for households in the community. This will help reduce the risks associated with improper water and waste handling.

- Also, there should be a continual monitory and routine check of pipelines by GWCL officials so as to repair broken pipes in the various communities to prevent wastage of water and cross-contamination.

REFERENCES

Agyenim B. Joseph and Gupta Joyeeta (2011): The evolution of Ghana's water law and policy. *Review of European Community and International Environmental Law*, 19: 339-350. Doi: 10.1111/j.1467-9388.2010.00694.x

Ainuson G. Kweku (2010): Urban Water Politics and Water Security in Disadvantaged Urban Communities in Ghana. *African Studies Quarterly*, Volume 11, Issue 4, pp 59-82

Arku G, Luginaah I and Mkandawire P (2012): You Either Pay More Advance Rent or You Move Out: Landlords/Ladies' and Tenants' Dilemmas in the Low-income Housing Market in Accra, Ghana. *Urban Studies* 49: 3177 DOI: 10.1177/0042098012437748

Ashaiman Municipal Assembly (2010): *Ashaiman Medium Term Development, Plan 2010-2013*

Ashaiman Municipal Assembly (2010): *Municipal Environmental Sanitation Action Plan*

Aziale K. Lawrence and Asafo-Adjei Ellen (2013). Logistic Challenges in Urban Waste Management in Ghana, (A case of Tema Metropolitan Assembly). *European Journal of Business and Management.* Vol.5, No.32 pp 116-129

Beall, J, Owen C and Susan P (2008): Victims, villains and fixers: The urban environment and Johannesburg's poor. *Journal of South African Studies*, Volume 26, No 4, page 835.

Blaikie. P., Cannon, T., Davis, I., and Wisner, B. (1994): *At risk: Natural hazards, people's vulnerability, and disasters.* Routledge: London.

Bohman Anna (2010): Framing the water and sanitation challenge: A history of urban water supply and sanitation in Ghana 1909-2005. Doctoral Dissertation in Economic History, Umea University. fill:///C:/Users/User/AppData/Local/Temp/FULLTEXT01.pdf (12/3/2014)

Bosch C, Kirsten H, Gloria R, Claudia S and Lee T (2001): Water, sanitation and poverty. Draft for comments http://www.intussen.info/OldSite/Documenten/Noord/Internationaal/WB/PRSPSourcebook/Water,sanitationandpoverty.pdf (20/2/2013)

Bull-Kamanga L, Diagne K, Lavell A, Leon E, Lerise F, MacGregor H, Maskrey A, Meshack M, Pelling M, Reid H, Satterthwaite D, Songsore J, Westgate K and Yitambe A (2003). From everyday hazards to disasters: the accumulation of risk in urban areas. *Environment and Urbanization,* 15: 193, DOI: 10.1177/095624780301500109 http://eau.sagepub.com/content/15/1/193

Chaplin, S.E. (1999): Cities, sewers and poverty: India's politics of sanitation. *Environment and Urbanization*, 11 (1), 145–158.

Cheru Fantu [no date]: Globalisation and uneven urbanization in Africa: The limits to effective urban governance in the provision of basic services. http://zirup.org/downloads/globalisation%20and%20uneven%20urbanization%20in%20africa.pdf (12/01/2014)

Cointreau Sandra (2006): *Occupational and Environmental Health Issues of Solid Waste Management Special Emphasis on Middle- and Lower-Income Countries.* The International Bank for Reconstruction and Development/ World Bank http://siteresources.worldbank.org/INTUSWM/Resources/up-2.pdf (13/11/2014)

Creswell John and Plano Clark (2010): *Designing and conducting mixed methods research.* London: Sage

Dawson Catherine (2002): *Practical research methods*. New Delhi, UBS Publishers' Distributors

Department for international development (2012): Water, sanitation and hygiene portfolio review, March 2012 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/214187/DFID_20WASH_20Portfolio_20Review.pdf. (02/03/2013)

Dodman D, Brown D, Katie F, Hardoy J, Johnson C and Satterthwaite D (2013): *Understanding the nature and scale of urban risk in low- and middle-income countries and its implications for humanitarian preparedness, planning and response*. International Institute for Environment and Development. http://pubs.iied.org/10624IIED.html. Earthscan, London

Ezzati M, Utzinger J, Cairncross S, Cohen J. and Singer H. (2004): Environmental Risks in the Developing World: Exposure Indicators for Evaluating Interventions, Programmes, and Policies. *Journal of Epidemiology and Community Health*, Volume.59, No. 1, pages. 15-22

Feachem RG, McGarry M, Mara D (1977): *Water, Waste and Health in Hot Climates.* John Wiley & Sons; Chichester.

Garrett John (2014): Bridging the divide. *WaterAid briefing paper*, http://www.wateraid.org/what-we-do/our-approach/research-and-publications/view-publication?id=8ccdc986-f992-4616-bf4a-48b156b1b58e. (04/03/2014)

Ghana Federation of the Urban Poor (2012): Ashaiman City wide slum profile report, 2012. Ashaiman Municipal Assembly

Ghana Statistical Service (2002): *2000 Population and Housing Census, summary report of final result.* GSS, Sakoa Press Limited, Accra, Ghana

Ghana Statistical Service (2012): *2010 Population and Housing Census, summary report of final result*. GSS, Sakoa Press Limited, Accra, Ghana

Ghana Water Company Limited (n.d.): Executive summary. http://www.gwcl.com.gh/pgs/hmp.php. Retrieved March 26, 2013

Gough V. Katherine and Yankson Paul (2011): A Neglected Aspect of the housing market: The caretakers of Peri-urban Accra, Ghana. *Urban Studies*, 2011 48: 793-810, DOI: 10.1177/0042098010367861

Hardoy A, Hardoy J, Pandiella G and Urquiza G (2005): Governance for water and sanitation services in low-income settlements: experiences with partnership-based management in Moreno, Buenos Aires. *Environment and Urbanization*, 17 (1), 183–199.

Hardoy Jorgelina and Gustavo Pandiella (2009): Urban poverty and vulnerability to climate change in Latin America. *Environment and Urbanization*, 21(203-224)

Hardoy, J, Diana M and David S (2001): *Environmental Problems in an Urbanizing World*, Earthscan Publications, London.

Hesselbarth Susanne (2005): Socio-economic impact of water supply and sanitation project. https://www.kfw-entwicklungsbank.de/migration/Entwicklungsbank-Startseite/Entwicklungsfinanzierung/Sektoren/Wasser/Engagement-der-KfW-Entwicklungsbank/Wirkungen.pdf. (20/2/2013)

Howard, G. & Bartram, J. (2003).*Domestic water quantity: Service level and health.* World Health Organization, Geneva, Switzerland

http://www.urbanfischer.de/journals/intjhyg (6/11/2012)

Institute of Medicine (2009): *Global issues in water and sanitation.* The national Academies press, Washington (DC) US.

Integrated Environmental Health Impact Assessment System (n.d.): The DPSEEA framework, file:///E:/conceptual%20framework/DPSEEA.htm. Retrieved July 9 2014

Joshi D, Fawcett B & Mannan F (2011): Health, hygiene and appropriate sanitation: experiences and perceptions of the urban poor. *Environment and Urbanization*, Volume 23(1): 91–111. http://eau.sagepub.com/content/23/1/91

Kariuki M, Collignon B, Taisne R & Valfrey B (2003): *Better water and sanitation for the urban poor: Good practices from Sub-Saharan Africa.* European Communities and Water Utility Partnership, Washington DC.

Klein, Richard T. (2009). Identifying countries that are particularly vulnerable to the adverse effects of climate change: an academic or a political challenge? *Carbon and Climate Law Review* 3: 284-291.

Kumar Ranjit (2005). *Research methodology A-step-by-step Guide for beginners* (2nd Edition), Singapore Pearson Education.

Kumar Ranjit (2011). *Research methodology A-step-by-step Guide for beginners* (3rd Edition), Singapore Pearson Education.

Kyomuhendo Marion (2011): National Strategy for Household Water Treatment and Safe Storage in Ghana. UNICEF and Republic of Ghana

Mabogunje, A. L. (2002): Poverty and environmental degradation: challenges within the global economy. *Environment* 44, 8-11

Marcotullio J. Peter and McGranahan Gordon (2007): *Scaling urban environmental challenges: From local to Global and back.* London, Sterling VA

Martine G, McGranahan G, Montgomery M & Rogelio F (2008): *The New Global Frontier: Urbanization, Poverty and Environment in the 21st Century*. IIED and UNFPA, Earthscan London

Mazeau Adrien, Scott Rebecca and Tuffuor Benedict (2012: Sanitation-A neglected essential service in the unregulated urban expansion of Ashaiman, Ghana http://sfc2012.org/mazeau_scott_tuffuor.pdf (02/03/2013)

McGranahan Gordon (2007): *Urban environments, wealth and health: shifting burdens and possible responses in low and middle-income nations.* Human Settlements Programme: International Institute for Environment and Development (IIED).

McGranahan Gordon, Jacobi Pedro, Songsore Jacob, Surjadi Charles and Kjellen Marianne (2001).*The Citizens at Risk: From urban sanitation to sustainable cities.* Earthscan Publication Limited

Miller R. L. and Brewer J. D. (2003): *A-Z of Social Research*. Sage publication limited, London

Ministry of Water Resources, Works and Housing Ghana (2010): Water and Sanitation Sector Performance Report**.** File:///C:/Users/User/AppData/Local/Temp/Final_Sector_Performance_Report[1].pdf (13/4/2014)

Mitlin Diana and Satterthwaite David (2012): *Urban Poverty in the Global South: Scale and Nature*. Routledge, London

Moe Christine L. and Rheingans D Richard (2006): Global challenges in water, sanitation and health. *Journal of water and health,* volume 4, pg 41-57 http://www.iwaponline.com/jwh/004/S041/004S041.pdf. (10/03/2013)

Moorea Melinda, Gould Philip, Keary S. Barbara (2003): Global urbanization and impact on health. *International Journal of hygiene and environmental health.* Volume 206, pg 269-278

Nandy Shailen and Gordon David (2009): Children Living in Squalor: Shelter, Water and Sanitation Deprivations in Developing Countries. *Journal of Children, Youth and Environments*, Volume. 19, No. 2: pp. 202-228

Nyarko K. B., Odai S. N., Owusu P. A. and Quarter E. K. (2008): Access to sanitation and safe water: Global partnerships and local actions- Water supply coping strategies in Accra. 33rd WEDC international Conference Accra, Ghana, 7-11 April 2008.

Oluyemo Catherine Ajoke (2012): Women's Empowerment as Determinant for Maintenance and Sustainability of Portable Water and Sanitation Facilities in Ekiti State, Nigeria. *International Journal of Interdisciplinary Social Sciences*, Volume 6, Issue 4 http://www.SocialSciences-Journal.com, ISSN 1833-1882

Onibokun, Adepoju G. (1999): *Managing the Monsters; Urban Waste and Governance in Africa*. International Development Research Centre, Ottowa.

Osei-Assibey Eric and Grey Kwasi Steve (2013): *2010 Population and Housing Census Report: Millennium Development Goals in Ghana.* Ghana Statistical Service

Osumanu, I. K. (2008). Private Sector Participation in Urban Water and Sanitation Provision in Ghana: Experiences from the Tamale Metropolitan Area (TMA): *Environmental Management*, 42:102-110.

Owusu Boadi K. and Kuttunen Markku (2004): Municipal solid waste management in the Accra Metropolitan Area, Ghana. *The Environmentalist*, 23,211-218, Kluwer Academic Publishers

Owusu George (2010): Social effects of poor sanitation and waste management on poor communities: a neighborhood-specific study of Sabon Zongo, Accra. *Journal of urbanism: International Research on Place making and urban Sustainability*, 3:2, 145-160, DOI: 10.1080/17549175.2010.502001

Owusu Thomas (1999): The growth of Ashaiman as a squatter settlement in the Tema District of Ghana. *The Arab World Geographer,* 2(3), 234-249

Patterson, K.D, (1979): Health in Urban Ghana: The case of Accra 1900 –1914. *Social Science and Medicine,* Vol. 13B pp 251 – 268. Pergamon Press Ltd. Great Britain.

Pelling Mark (2007): *Investigating urban risk accumulation in six countries in Africa.* International Federation of Red Cross and Red Crescent Societies: Pro-Vention Consortium. http://www.preventionweb.net/files/2338_AURANMay07.pdf. (06/05/2013)

Pelling Mark and Wisner Ben (2009): *Disaster Risk Reduction: Cases from Urban Africa.* Earthscan, London

Penner Barbara (2010): Flush with inequality: sanitation in South Africa. http://places.designobserver.com/entry. (11/19/2013)

Postel L. Sandra (2000): Water and world population growth. *Journal of American Water Works Association,* Vol. 92, No. 4, pp. 131-138

Prakash Manu, Singh Upneet and Kumar C. Ajith (2012): *Handbook on Scaling up solid and liquid waste management in rural areas.* Water and Sanitation Programme, Vashima New Delhi

Pruss A, Kay D, Fewtrell L, Bartram J (2002): Estimating the burden of disease from water, sanitation, and hygiene at a global level. *Environ Health Perspective* 2002, 110:537-542.

Pruss-Ustun A, Bos R, Gore F, Bartram J: Safer Water, Better Health (2008): *Costs, Benefits and Sustainability of Interventions to Protect and Promote Health* Geneva: WHO; 2008.

Pruss-Ustun A, Corvalan C. (2006): *Preventing disease through healthy environments: Towards an estimate of the environmental burden of disease.* Geneva: World Health Organization Published by Tearfund.

Schulte Peter (2014): Defining Water Scarcity, Water Stress, and Water Risk: It's Not Just Semantics. http://pacinst.org/water-definitions/ accessed on 8/6/2014

Songsore (2008): Environmental and structural inequalities in Greater Accra. *The journal of the international institute,* Fall, volume 16 no.1, pp 8-13

Songsore J., Nabila J. S., Yangyuoru Yvon, Amuah Eric, Bosque-Hamilton E. K., Etsibah K. K., Gustafsson Jan-Erik and Gunnar Jacks (2005). *State of Environmental Health: Report of the Greater Accra Metropolitan Area 2001*. Ghana Universities Press Accra.

Songsore J., Nabila J. S., Yangyuoru Yvon, Bosque-Hamilton E. K., Avle Sebastian, Amponsah Paulina E. and Alhassan Osman (2009): *Environmental Health Watch and Disaster Monitoring in the Greater Accra Metropolitan Area, 2005.* Ghana Universities Press Accra.

Songsore, J. (2004): *Urbanization and health in Africa: Exploring the interconnections between poverty, inequality and the burden of disease.* Accra: Ghana Universities Press.

Songsore, J. and McGranahan, G. (1993): Environment, wealth and health: towards an analysis of intra-urban differentials within the Greater Accra Metropolitan Area, Ghana. *Journal of Environment and Urbanization,* 5, 10–34.

Songsore, J., McGranahan, G., and Kjellen, M. (1997): An Environmental Health Indicator Profile for the Greater Accra Metropolitan Area (GAMA) Ghana. Prepared for Workshop on Public Participation and Urban Environmental Health

Services, A Concerted Action Financed by the European Commission, 23-26, September, Bamako, Mali.

Stoler J, Fink G, Weeks J, Appiah O, Ampofo J and Hills A (2012a): When urban taps run dry: Sachet water consumption and health effects in low income neighbourhoods of Accra, Ghana. *Health Place*; 18(2): 250–262. doi:10.1016/j.healthplace.2011.09.020

Stoler J, Weeks J and Fink G (2012b): Sachet drinking water in Ghana's Accra-Tema Metropolitan area: past, present and future. *Journal of Water Sanitation Hygiene Development*, 10.2166/washdev.2012.104. Doi: 10.2166/washdev.2012.104

Teye K. Joseph (2012): Benefits, challenges and dynamism of positionalities associated with mixed methods research in developing countries, evidence from Ghana. *Journal of Mixed Methods Research* XX(X) 1-13

UN-Habitat (2005): *Financing Urban Shelter: Global Report on Human Settlements 2005*. United Nations Human Settlements Programme. London and Sterling

UN-Habitat (2010): *Solid waste management in the world cities: Water and sanitation in the world cities.* Earthscan, London

UNICEF and WHO (2004): *Meeting the MDG Drinking-Water and Sanitation Target: A Mid-Term Assessment of Progress*. World Health Organization and United Nations Children's Fund. New York and Geneva

UNICEF and WHO (2006): *Meeting the MDG drinking water and sanitation target: the urban and rural challenge of the decade.* New York and Geneva

UNICEF and WHO (2011): *Drinking water: Equity, safety and sustainability*. Geneva, Switzerland.

UNICEF and WHO (2012): *Progress on drinking water and sanitation 2012 update.* New York and Geneva

UNICEF and WHO (2014): *Progress on drinking water and sanitation 2014 update.* New York and Geneva

United Nation Development Programme (2006): *Human development report 2006. Beyond scarcity: Power, poverty and the global water crisis.* New York USA.

United Nation Development Programme (2010): Urban risk management: Bureau for Crisis Prevention and Recovery http://www.undp.org/content/dam/undp/library/crisis%20prevention/disaster/6Disaster%20Risk%20Reduction%20-%20Urban%20Risk%20Management.pdf. (06/05/2013)

United Nations (n.d): Water. http://www.un.org/en/globalissues/water/ Retrieved June 8 2013

United Nations Development Programme (2004): A global report: Reducing Disaster Risk a challenge for development. Bureau for Crisis Prevention and Recovery Website: www.undp.org/bcpr 2004. (06/05/2013)

United Nations Development Programme (2012): *Millennium Development Goal Report (2012).* United Nations, New York

United Nations Inter-Agency Secretariat of the International Strategy for Disaster Reduction (UN/ISDR) (2004): *Living with Risk: A global review of disaster reduction initiatives* Version - Volume II Annexes. United Nations: Geneva, Switzerland

Venton Paul and Hansford Bob (2006): *Reducing risk of disaster in our communities.* Published by Tearfund, Teddington UK

Wagner E.G, Lanoix J.N. (1958): *'Excreta disposal for rural areas and small communities'* WHO monograph series. Geneva: 1958. p. 39

Water and Sanitation for the Urban Poor (WSUP) (2011): *When are communal or public toilets an appropriate option?* Topic brief, London: UK. http://www.wsscc.org/sites/default/files/publications/wsup_topicbrieficommunalpublictoilets_2011.pdf (03/20/2014)

Water and Sanitation Sector Monitoring Platform Ghana summary sheet (2009): Status of Ghana's drinking water and sanitation sector.http://www.wsmp.org/downloads/country-summary-sheet-09.pdf accessed on 02/05/2013

WaterAid (2011): Sustainability framework. www.wateraid.org/publications (12/04/2013)

White Christ (2012): *Understanding water scarcity: Definitions and measurements* | Global Water forum http://www.globalwaterforum.org/ (2012/05/07)

WHO (2003): *The Right to water.* World Health Organization, Health and human rights publication series; no.3. Geneva.

WHO (2012): *Global Analysis and Assessment of Sanitation and Drinking water (GLASS) report 2012: UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water; the challenge of extending and sustaining services.* Switzerland

WHO and UNICEF (2008): *Progress on Sanitation and Drinking Water: Special Focus on Sanitation, 2008 Update.* World Health Organization, Geneva and UNICEF, New York.

WHO and UNICEF (2010): *Joint Monitoring Programme for Water Supply and Sanitation: Progress on Drinking Water and Sanitation.* New York and Geneva:

WHO and UNICEF (2012): *Progress on Sanitation and Drinking Water: 2012 update.* UNICEF, New York and WHO: Geneva.

WHO, UNICEF and WSSCC (2008): 10 things you need to know about sanitation. *Habitat International* 32 58-73. http://www.unwater.org/downloads/media/sanitation/10Things.pdf (10/03/2013)

Wisner B, Blaikie P, Cannon T and Davis I (2003): *At risks natural hazards, people's vulnerability and disasters* (2nd edition). Routledge, London http://www.preventionweb.net/files/670_72351.pdf (08/19/2013)

World Water Council (n.d): Water crisis http://www.worldwatercouncil.org/library/archives/water-crisis/ Retrieved February 2, 2013

Zia H and Devadas V. (2008): *Urban solid waste management in Kanpur: Opportunities and perspectives.* Habitat International 32 (58-73).

Zimmerman J, Mihelcic J, Smith J. (2008): Global stressors on water quality and quantity. *Environmental Science and Technology*, 42 (12):4247–4254

APPENDICES

APPENDIX 1

Questionnaire for households

This questionnaire is design for a research on reducing the risks associated with water stress and poor sanitation in the Ashaiman Municipal Assembly. All information provided will be treated as strictly confidential and for academic purpose only.

PART ONE

Section A: Bio Data

1. Community name …….
2. Sex: 0. Male 1.Female
3. Age: ……
4. Marital status: 0. Married 1. Single 2.Divorced 3.Separated 4. Widow
5. What is your highest level of education? 0. No education 1. Primary 2.Middle/JHS 3. SHS 4. Tertiary 5. Others ……..
6. What do you do for a living? (Occupation)…….
7. How much is your monthly income?
8. How much is your monthly expenditure?
9. Type of structure 0. Wooden 1. Alluminuim 2. Concrete 3. Both wooden and concrete
10. Type of ownership 0. Rented compound house 1. Own house 2. Family house
11. Year of occupancy ……..
12. Number of rooms/households in the house
13. Number of people in the house ……..

Section B: Accessibility of water

14. What is your main source of drinking water? 0. Pipe water 1. Sachet water 2. Both
15. Do you have pipe connected to your home? 0. Yes 1. No

16. If yes how many days does the tap flow in a week? 0. Everyday 1. Twice a week 2. Does not flow at all
17. If not, where do you get water from? (Alternative water source) 0. Vendors 1. Streams 2. others
18. How far and how long (in meters and minutes) does it take you to walk to where you fetch water?
19. Is the water you fetch sufficient to meet your household requirements? 0. Yes 1. No
20. If not, how do you manage or cope with the situation?

.....

.....

.....

21. If you have pipe connected to your home, how much do you pay on the average as water bill per month? .....
22. If you buy water outside the house, how much do you pay for a bucket of water? ……..……..
23. Is it expensive to you? 0. Yes 1. No
24. If you buy water from water vendors on smaller trucks or tankers, how much do you pay per trip? …….....
25. Do you think water price per trip is expensive or affordable to you? 0. Expensive 1. Affordable 2. Don't know 3. Others
26. Where do you store your water? 0. Open containers 1. Closed containers 2. Others …….....…….
27. How long do you store water? 0. One week 1. Two weeks 2. One month 3. others (specify) ……
28. Do you think there are problems with water supply and delivery in your area? 0. Yes 1. No 2. Don't know
29. What are these problems? /What do you think is the cause of this problem?

……

……

……

30. How do you think the problem can be solved?

……

……

Section C: Issues pertaining to the supply of water (What will you say about the following issues of water supply in your area? Tick ( ) as appropriate in the columns under: Severe problem, minor problem, not a problem and don't know, in the table below).

Water issues	0. Severe problem	1. Minor problem	2. Not a problem	3. Don't know
31. Interruptions in water supply				
32. High water prices from water vendors				
33. Too much time is wasted in search for water when not connected to household tap				
34. Children are usually too late or absent from school				
35. Risk of drinking untreated and contaminated water from open wells, surface water and vendors				
36. Increased work load of women in the household				

37. What will you say about the quality of the water that you drink? 0. Good 1. Salty 2. Coloured 3. Bad odour 4. Have some particles inside 5. others (specify)

38. Do you think water bills should be increased in order to improve water supply and delivery services? 0. Yes 1. No 2. Don't know

39. Give reasons for your answer

……

……

……

PART TWO: Sanitation

Section A: Access to sanitation facilities

1. Do you have toilet facility in the house? 0. Yes 1. No
2. If yes, what type? 0. WC 1. KVIP 2. Pit latrine 3. Pan latrine 4. Others
3. How many households share a toilet facility? …….
4. If no, how and where do you defecate? 0. Public toilet 1. Private public toilet 2. Open defecation 3. Others (In the night how do you manage)
5. Is there any cost involve in your choice above? 0. Yes 1. No
6. If yes, how much? ……..
7. Is this affordable? 0. Yes 1.No 2. Indifferent
8. How do you dispose of your household garbage? 0. Truck boys 1. Zoomlion 2. Taken to container
9. Do you have bathroom? 0. Yes 1. No
10. How do you dispose of your liquid waste from bathrooms and kitchen? 0. Into gutter 1. On the floor

Section B: Issues pertaining to sanitation

11. Do you think there are problems with sanitation in your area? 0. Yes 1. No 2. Don't know

What will you say about the following issues/problems of sanitation in your area? Tick ( ) as appropriate in the columns under: Severe problem, minor problem, not a problem and don't know, in the table below.

Sanitation problems	0. Severe problem	1. Minor problem	2.Not a problem	3.Don't know
12. Indiscriminate disposal of solid waste				
13. Indiscriminate defecation in open spaces and bushes				
14. Absent of domestic toilet facilities				
15. Poor and inadequate drainage				

systems				
16. Choked drains				
17. Disposing of liquid waste in the surroundings				
18. Uncontrolled development				
19. Poor attitude toward sanitation issues				
20. Presence of flies and mosquitoes in the home				
21. Uncollected garbage in the surrounding				

22. What do you think should be done to avert these problems?

……

……

……

Section C: Domestic and personal hygiene

23. Do you wash your hands after visiting the toilet? 0. Yes 1. No

24. Do you wash your hand with soap and water after visiting the toilet? 0. Yes 1. No
2. Only with water

25. Do you wash hand with soap before cooking? 0. Yes 1. No

26. Do your children under five years wash their hands after visiting the toilet? 0. Yes 1. No

27. Do you wash your hands before eating? 0.Yes 1. No

28. Do your family household members wash their hands with soap after visiting the toilet? 0. Yes 1. No

29. How do inadequate water and sanitation services affect your personal, family and occupational life?

……

……

……

30. What do you think should be done to reduce the risks associated with inadequate water and poor sanitation?

……

……

Section D. Household health

31. Did any member of your family have diarrhoea in the last two weeks? 0. Yes 1.No

32. Do you have children less than five years? 0. Yes 1. No

33. If yes when was the last time they had diarrhoea? 0. Two weeks ago 1. A month ago 2 Six months ago 3. Can‘t remember

34. When was the last time a family member had malaria? 0. Two weeks ago

1. A month ago 2. Six months ago 3. Can’t remember

APPENDIX 2

Interview guide for key informants

Section A: GWCL

1. As a District Head Office, do you have a storage facility?
2. How many gallons of water does the assembly need on a daily basis? Or volume required
3. How many gallons is been provided daily? Or volume pump daily
4. For how long have the situation of inadequate supply and rationing of water existed?
5. How many houses are been served by the co-operation?
6. Have there been expansion or extension works in the District?
7. What are your future projections considering the increasing population growth?
8. What is been done to improve water supply and accessibility?
9. What are your benchmarks? Or what should the public expect from you?
10. What have been your business plans over the years?
11. What policies are been put in place to ensure safe supply and deliver of water?
12. Has there been any private participation over the years?
13. Prices
14. Monitory and evaluation of projects

Section B: Section C: Municipal Assembly

1. A brief historical profile ofAshaiman.
2. What accounts for the spatial inequality in the planning of the Municipality? Or why are certain communities well planned and others not?
3. How are the various settlements classified?
4. Which areas are considered middle class and which are not? And on what basis are they classified?
5. The slum upgrading project, which communities are been upgraded?
6. What are your future developmental plans for Ashaiman in terms of housing and the provision of infrastructures like water and sanitation?
7. Are there problems with building rules and regulations?
8. Why are people not adhering to building codes in the new emerging communities?
9. What is your organization doing to make sure people adhere to building regulations?

10. Since there is over dependence on public toilet, what is the Municipal doing to ensure that domestic toilets are provided by landlords?

Section C: Household Key informants

1. What are the major challenges your community faces regarding access to water?
2. Is there a problem with the distances covered to water for household chores?
3. What other sources do your community resort to when there is water shortage?
4. What are the problems your community faces regarding access to and use of toilet facilities?
5. What are the challenges your community face regarding waste management?
6. How do you see the drainage system in your community?
7. What is your idea of the usage of drainage system by your community members?
8. What do you think can be done to solve these problems?