INVESTIGATING THE INTRA-URBAN INEQUALITIES AND ENVIRONMENTAL INJUSTICE ON URBAN DEPRIVATION IN DAR ES SALAAM CITY – TANZANIA

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Investigating the Intra-Urban Inequalities and Environmental Injustice on Urban Deprivation in Dar Es Salaam City – Tanzania

By

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Abstract

Spatial indicators of inequality, rather than simply poverty, and environmental injustices are two essential tools for today's urban policy makers and planners (UNHSP, 2004 pp. 86). Most research on urban deprivation in Sub-Saharan Africa has been based on monetary indicators (income and consumption). Little attention has been given to non- monetary dimensions such as access to water, sanitation, health, housing quality, education and quality of living environment (Mitlin *et al.*, 1996; Martínez, 2005; Shimeles, 2006). Moreover environmental injustices have been neglected in urban deprivation analysis, although there is clear evidence as documented by (Bullard, 1996; Harvey, 1996; US-EPA, 1998; Robin and Diana, 2002; Damery *et al.*, 2007) that deprived communities also suffer disproportionate exposure to environmental hazardous area.

This study investigates intra-urban inequalities and environmental injustices in Dar-es-salaam city-Tanzania, using multiple sources of information such as access to physical infrastructure, access to social infrastructure, quality of living environment and human resources to develop an index of multiple deprivations. The index developed used data at ward level and applying Spatial Multi-Criteria Evaluation. The index combined with environmental injustices through GIS, in order to analyze whether multiple deprivations are spatially clustered and whether highly deprived areas also face disproportionate exposure to environmental hazards. The combination leads to hotspots that can be identified for area based policy intervention.

Results indicate that there is spatial clustering of deprivations within the city. Highly deprived wards are clustered away and near to city centre. Deprived wards suffer a disproportionate exposure to environmental hazards burden than other social groups. Environmental hazardous areas, leads into unstable community which results into weak local economies, poor public services, health problems and high concentration of vulnerable groups (hotspot areas).

Area-based policy targeting is an effective way to support highly deprived communities to get out from deprivation.

Keywords: Intra-urban inequality; Environmental injustices; urban deprivation; spatial multi-criteria evaluation; index of multiple deprivations; Area based policy intervention

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"To the Living God be Glory, Honour and Might"

Deo Damian Msilu
Enschede, the Netherlands
March, 2009

List of Abbreviations and Acronyms

BOD:	Biochemical Oxygen Demand
CBO:	Community Based Organisation
CIUP:	Community Infrastructure Upgrading Programme
CHRGJ	Centre for Human Rights and Global Justice
DAWASCO:	Dar es salaam Water Supply Company
DCC:	Dar es salaam City Council
EIA:	Environmental Impact Assessment
ESRF:	Economic and Social Research Foundation
GIS:	Geographical Information System
GSIM:	Governance and Spatial Information Management
HBS:	Household Budget Survey
IMD:	Index of Multiple Deprivations
JICA:	Japan International Cooperation Agency
LGSP:	Local Government Support Programme
MDG:	Millennium Development Goals
MLHHSD:	Ministry of Lands, Housing and Human Settlements Development
NEMC:	National Environmental Management Council
NBS:	National Bureau of Statistics
NGO:	Non Governmental Organisation
NHS:	National Housing Cooperation
NSSF:	National Social Security Fund
OECD:	Organisation for Economic Co-operation and Development
PDRF:	Plot Development Revolving Fund
REPOA:	Research on Poverty Alleviation
SMCE:	Spatial Multi-Criteria Evaluation
TANESCO:	Tanzania Electric Supply Company
TBL:	Tanzania Breweries Limited
Tsh:	Tanzanian shilling
UCLAS:	University College of Lands and Architectural Studies
UDEM:	Urban Development and Environmental Management
UN:	United Nations
UNCHS:	United Nations Centre for Human Settlements
UNICEF:	United Nations Children's Fund
UNDP:	United Nations Development Programme
UN-ESCAP:	United Nations Economic and Social Commission for Asia and the Pacific
UNHSP:	United Nations Human Settlement Programme
URT:	United Republic of Tanzania
USA	United States of America
US-EPA	United States Environmental Protection Agency
WCED:	World Council of Environmental Development
WHO:	World Health Organisation

Dedication

Dedicated
to
My late mother
Immaculata Cosmas Mgimwa

Table of contents

List of figures

List of tables

1. INTRODUCTION

1.1. Background information

Spatial indicators of inequality, rather than simply poverty, and environmental injustices are two essential tools for today's urban policy makers and planners (UNHSP, 2004 pp. 86). Intra-urban inequalities, environmental injustices and urban deprivation are the main problems in both developed and developing countries that need immediate attention to be addressed in order to achieve Millennium Development Goals for sustainable development (Martínez, 2005; Vasilis and Gaki, 2006).

The links between inequalities and environments are multiple and complex. The environmental condition of urban areas in the African continent ranges from fair to deplorable, with most cities of the region falling into the final category. Urbanization process, economic transformation, privatization and deregulation are usually seen as responsible for an increase in spatial segregation, social polarization and spatial inequalities (Kim, 2008). Socio-economic polarization and the deterioration of the built environment result into divided cities (Vasilis and Gaki, 2006).

The concept of environmental justice has gained greater recognition in recent years, as social goals (e.g. equity, fairness, and justice) which have themselves gained greater prominence through almost universal efforts to promote sustainable development (Robin and Diana, 2002; US - EPA, 2004; Namdeo, 2008). The concept draws attention to the questions of whether certain socioeconomic groups, including the economically and politically disadvantaged, bear a disproportionate burden of environmental externalities, and whether policy and practice are equitable and fair when a particular social group is disproportionately burdened with environmental hazards (Coenen and Halfacre, 2003; US - EPA, 2004; Namdeo, 2008).

Recent discussions on inequalities have recognized its multidimensional characters, rather than poverty approaches which have focused solely on issues of income and consumption with less attention on non income (Baud *et al*., 2008). This deprivation is linked to ways in which households live and work. The access they do or do not have to collective and/ or state-provided resources and the extent to which poor households can make their needs heard politically or can organize collectively to build up assets (Mitlin, 2004; Martínez, 2005; Baud *et al.*, 2008).

1.2. Problem justification

Sub-Saharan African cities are often portrayed as being in crisis. The challenges they face include rapid population growth, lack of economic dynamism, governance failures, severe infrastructure and service deficiencies, inadequate land administration, poverty and social breakdown. However, urban centres continue to grow and to function despite the severity of these challenges (UN-Habitat, 2002).

Inequalities in income, health, education, and poverty present significant economic and political challenges for the governments of many developing countries. While systematic evidence on the extent of spatial inequality in developing countries is still relatively scarce, a growing body of work has documented the existence of spatial inequalities in many forms in various countries in Asia, Europe, Africa and Latin America (Kim, 2008).

Urban poverty studies in the past have often been characterized by lack of disaggregated data to show the spatial pattern of deprivations and inequalities. However, recent studies have used census data at the ward level to highlight the pattern of spatial inequalities, the census usually presents data on a variety of indicators which makes it possible to construct index of multiple deprivation (Baud *et al.*, 2008). This method gives a good idea about spatial pattern of inequalities within the city, but they usually exclude the impact of environmental injustices. Environmental injustices means disproportionate exposure to environmental hazards (such as waste facilities) and goods (such as access to green space) across society (Walker *et al.*, 2003).

The environmental justice approach was pioneered in the USA by civil rights activists and is now receiving increased attention in Europe, due to the rights embodied in the 1998 Aarhus Convention, (Walker *et al.*, 2003), and also in developing countries due to the rights stipulated in Article 25 (1) in (CHRGJ, 2003) of the Universal Declaration of Human Rights, which states that *"Everyone has the right to a standard of living adequate for the health and wellbeing of himself and of his family, including food, clothing, housing and medical care and necessary social services.*

The relationship between economic integration and inequalities still remains unresolved and a hotly debated issue (Bullard, 1996). Agglomeration economics, postulates that the market forces generate internal and external economies of scale and as a result strengthen the trends for concentration of activities in a given region that results into negative external effects on the social environments such as deterioration of the urban environment. For example urbanization process leads to high urban expansion and social class division (Vasilis and Gaki, 2006).

Intra-urban inequality occurs in urban areas around the world. However, inequalities in habitat conditions or access to social and physical infrastructure are particularly evident in cities in developing countries. In this cities, problems concentrate in certain areas, affecting the quality of life of those living in the area. Recently, different urban indicators initiatives and governmental reports have expressed the need to use small area information, while at the same time encouraging the study of intra-urban inequalities within rapid growing cities (UN-Habitat, 2002; Martínez, 2005)

Despite its assessment that economic integration is a positive process, it points out that the integration costs and benefits are very difficult to be uniformly distributed in different territories, some areas benefit more than others and this leads to social polarization and increasing inequalities (Martínez, 2005).

This approach underlines the necessity for the design of development policies for regions suffering from inequalities and also implies that policies should possess a systemic design to offset the market forces and thus to enhance the development in less developed regions or countries (Vasilis and Gaki, 2006).

Inequalities and environmental injustices have received much political and scholarly attention in developed and developing countries. Environmental justice is based on the principle that all people have a right to be protected from environmental pollution and to live in good environment (Walker *et al.*, 2003). "*Environmental justice is the equal protection and meaningful involvement of all people with respect to the development, implementation and enforcement of environmental laws, regulations and policies and the equitable distribution of environmental benefits"* (Bullard, 1996; John, 2005).

Typical environmental justice problems associated with urban areas include neighbourhood degradation, disproportionate burden of environmental problems and socio-economic inequalities (UN-Habitat, 2002). Deprived communities suffer the worst air quality, and are more likely to live near to polluting industrial sites, hazardous waste sites which are often found in urban areas (Bullard, 1996; US - EPA, 2004).

The measurement and analysis of the impacts of intra-urban inequality and environmental injustice on socio-economic deprivation are crucial for cognitive purposes (to know what the situation is); for analytical purposes (to understand the factors determining this situation); for policymaking and monitoring purposes in order to design interventions best adapted to the issues (Shimeles, 2006).

A recent characterization of urban inequalities lists eight types of deprivation; namely inadequate and unstable incomes, lack of education and housing, inadequate provision of public infrastructure (piper water, sanitation, drainage, roads and footpaths), limited safety nets for those unable to pay for services, inadequate protection of poorer groups through laws and rights, and powerlessness of poorer groups within political and bureaucratic systems (Mitlin, 2004).

These deprivations indicate very clearly that intra-urban inequalities consist not only of lack of employment and income, but also influenced by the collective structures of constraints which make it difficult for poor households to meet their own needs and to gain access to collective provisions of services from which they are excluded (Martínez, 2005; Baud *et al*., 2008).

1.3. Problem Statement

Urban growth in Tanzania has outpaced the development of infrastructure and social services and it has also totally overwhelmed municipal authorities in most cities (Kombe, 1995; UNCHS-Habitat, 2001; Kironde, 2006). Urban environments in Tanzania and Africa in general are characterized by insufficient provision of safe water, inadequate level of appropriate sanitation, inadequate disposal of solid waste, inadequate drainage of surface water, poor personal and domestic hygiene, inadequate housing, overcrowding and inadequate education and energy services (UNCHS-Habitat, 2001; WHO, 2007).

The problem of inequalities and uneven distribution of social and economic infrastructures has interested politicians, planners, and scientists for many years, the issue of spatial inequalities has become particularly urgent in the developing countries, where inequalities in the levels of development and in the quality of life continued to persist (Kim, 2008).

Some strategies to address this concern have been formulated in the context of regional planning. Despite this concerns, there seem to be little consensus on the causes of intra-urban inequalities and how policy makers should respond on this circumstances (Kim, 2008).

Most of the research on inequality in sub-Saharan Africa has been based on monetary indicators as part of poverty analysis at National level (Mitlin *et al.*, 1996; Shimeles, 2006) while putting less attention on non- monetary dimensions such as health, housing quality, education, environmental condition and access to basic services that will help to develop targeted policy to hotspot areas with regard to available resources. Therefore, spatial information dis-aggregated to the lowest level at which decisions on interventions are made within cities could contribute to improving local governance (Henninger, 2002).

There is increasing recognition of the links between poverty and the environment and that the poorest communities live in the worst environments (US - EPA, 2004), yet environmental injustice aspect has been neglected in analyzing urban deprivation. This highlights the need to bring together environmental, social and economic policy objectives under the banner of environmental justice.

Environmental health researchers concerned about environmental justice argue that communities who are segregated in neighbourhoods with high levels of poverty and material deprivation are also disproportionately exposed to physical environments that adversely affect their health and well-being (Bullard, 1996; Walker *et al.*, 2003). Environmental injustices arises due to unequal access to environmental remediation, regulations and inequity in the provision of basic services to neighbourhoods (Coenen and Halfacre, 2003).

Examining this issues will offers environmental health researchers new insights into the junctures of the socio-economic inequality and public health on one hand, and the political and economic forces that lead to urban deprivation on the other hand (Bullard, 1996; Schweitzer, 2007; Morello, 2006).

This study will apply multiple concepts in analyzing intra-urban inequalities and environmental injustices that will contribute to reducing existing limitations in our understanding of urban deprivation.

Therefore the research intends to investigate the intra-urban inequalities and environmental injustices on socio-economic deprivation and determine the spatial patterns of urban inequalities in Dar es Salaam city with assistance of GIS and statistical techniques.

1.4. Main objective

The main objective of this research is to investigate the effect of intra-urban inequalities and environmental injustices on urban deprivation and to determine the spatial pattern of deprivation within the Dar es Salaam city.

1.4.1. Specific objectives

1. To develop an index of intra-urban inequalities/deprivations for Dar es salaam city.
2. To analyze the spatial patterns/clustering of socio-economic inequalities.
3. To investigate the environmental injustices and analyze how they are linked to socio-economic deprivation on which hotspots can be identified.
4. To determine policy intervention measures taken in the region for reducing urban deprivation.

1.4.2. Research questions

1. What are the major indicators valid for describing intra-urban inequalities in Dar es Salaam city?
2. To what extents are different indicators of inequalities are spatially concentrated and how does it affect environment in Dar es Salaam city?
3. What types of facilities should be included in determining the existence of disproportionate environmental burdens?
4. To what extent is intra-urban inequalities and environmental hazardous areas are spatially concentrated within the city, such that hotspots of inequalities emerge?"
5. How has urban governance been affected by the pressing need for physical and social infrastructure service provision for sustainable urban development?
6. What actions have local government, civil society and the private sector done in the region to strengthen efforts to achieve sustainable development?

1.5. Expected output

- Multiple concepts in analyzing intra-urban inequalities and environmental justices that will contribute more knowledge in understanding about urban deprivation.
- Index of intra-urban inequalities that will help to depict variation of socio-economic indicators within the city.
- Environmental injustices and how are they connected to socio-economic deprivation on which hotspots can be indentified
- Nature and extent of urban deprivation in Dar es salaam city
- Government accountability in responding to urban deprivation

1.6. Conceptual model of the research

Figure 1-1 below indicated the conceptual model of the research which is comprised by socio-economic indicators derived from census data at ward level which were translated into index of urban inequality by applying spatial multi-criteria evaluation and in other hand the model is comprised of environmental aspect derived from different environmental injustices sources, which was combined with the index of urban inequality using Arc GIS techniques to form multiple urban deprivation in which hotspot of poverty can be identified.

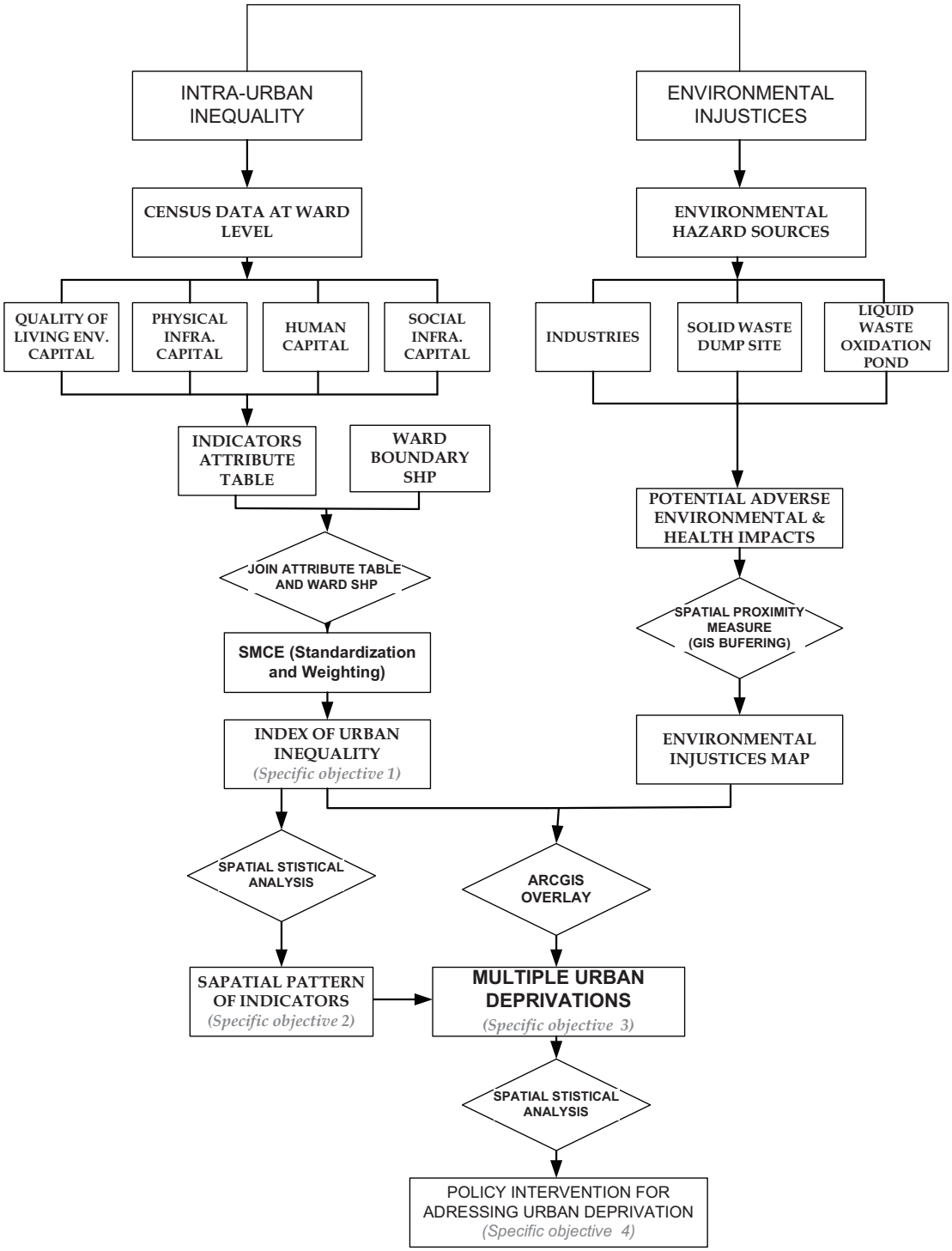

Figure 1-1: Conceptual model

1.7. Research strategy

The research commenced with an extensive literature review on existing knowledge in three key areas of study; these include intra-urban inequality, environmental injustice and urban deprivation. The main aim of desktop study was to identify existing knowledge gaps on analyzing urban deprivation and subsequently conceptualize and define research problem, objectives and questions respectively.

The empirical model shown in Figure 2-2 summarizes the research design, its divided into three parts; problem formulation phase, which entails a literature review on the existing relevant documents on the area of interest in order to assist in conceptualizing the research study and derive variables to be investigated, Field work phase entails data sources and collection techniques such as interviews, consultation, discussions with key informants and field observation and Data analysis phase includes method of data processing and analysis.

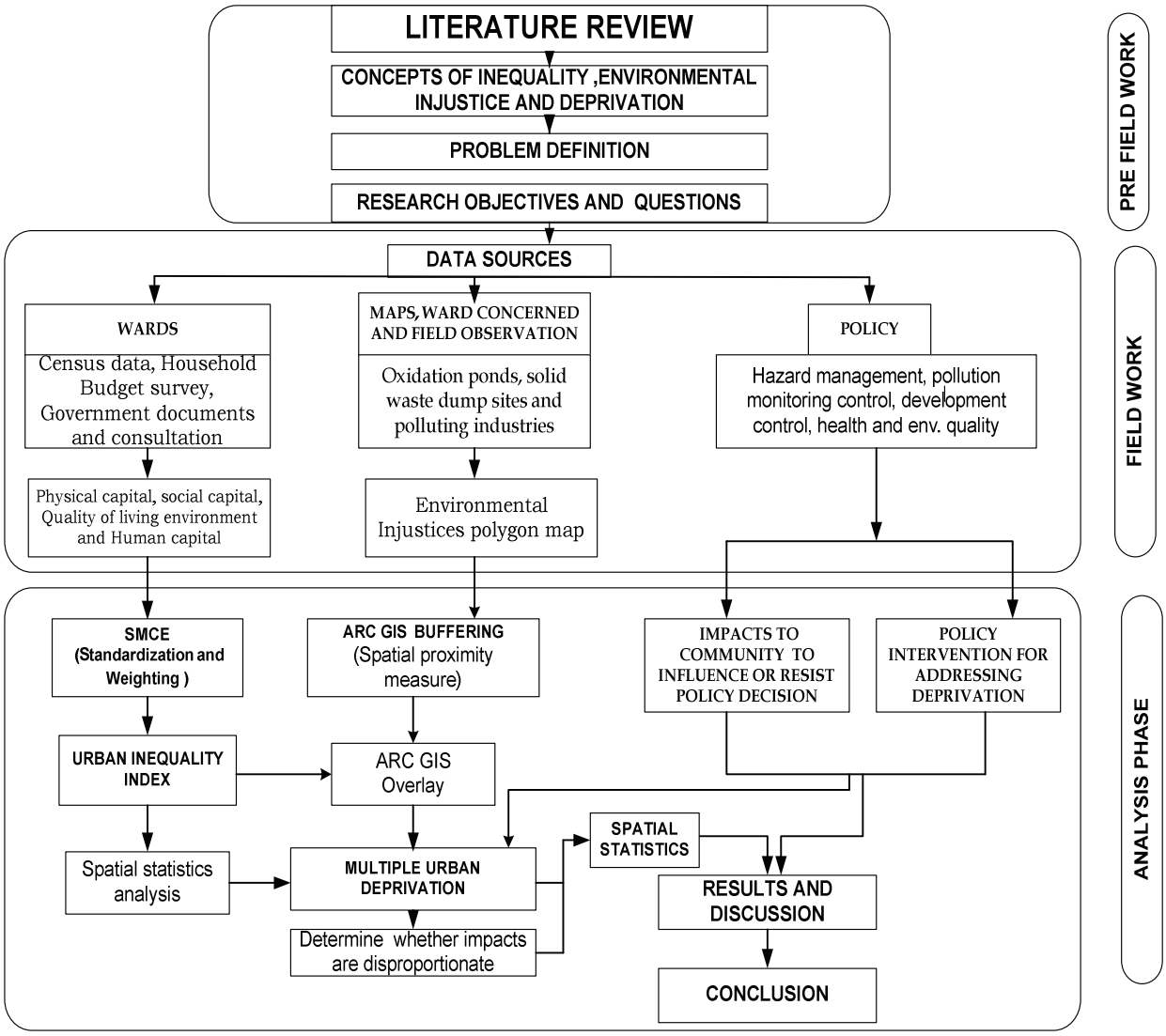

Figure 1-2: Research design and process model

1.8. Significance of the Research

Even though the study was conducted in Dar es Salaam city in Tanzania, the concepts and techniques applied in this study can be useful towards analyzing urban inequalities in other urban areas in developing countries, especially for urbanizing cities. The research provides relevant information and understanding on the field of intra-urban inequalities and environmental injustice on urban deprivation. The guiding principles extracted from the findings will be useful for researchers, policy-makers, practitioners and institutions interested in the area of urban inequalities and environmental injustice. It is also expected that through

this research, additional knowledge on the field of urban deprivation will be obtained, that will contribute in reducing existing limitations in understanding about deprivation.

1.9. Thesis Structure

The research is organized into eight chapters.

The first chapter contains background information, Problem justification and problem statement, objectives of the study, research questions, conceptual model, research strategy and significant of the research.

The second chapter deals with the conceptual and theoretical framework along with the literature reviews on existing knowledge relevant to the study. It includes the concept of inequality, inequality and sustainability, environmental justice and injustices, urban deprivation, index of multiple deprivation and area based deprivation

The third Chapter presents a brief introduction of the study area. It discusses the physical, demographic, administrative structure, socio economic conditions, urbanization and intra-urban inequalities and environmental status of the study area.

The fourth chapter presents the methodology processes carried out to accomplish the research objectives, including the research techniques, sources of data and collection methods, method of data processing, analysis and reliability and validity of the outcome.

Chapter five, six and seven present the main findings of the research. Chapter five presents the techniques followed in the development of indicators for physical infrastructure, quality of living environment, social and human capitals and overall index of multiple deprivation and finally spatial pattern of indicators and impacts to local economies. While, chapter six discusses the source and distribution of environmental injustices, process used in mapping hotspots wards and the socio-economic impacts of environmental injustices within the city and Chapter seven discuss the intervention measures taken by Government to reduce urban deprivations, it starts with the concept of urban governance and constraints of good governance in Dar es salaam city

Chapter eight concludes by presenting the issues discussed in this research and recommendation for further study.

2. LITERATURE REVIEW ON INEQUALITY, ENVIRONMENTAL INJUSTICE AND URBAN DEPRIVATION

2.1. Introduction

This chapter provide insights to different concepts and definitions applied with regard to intra-urban inequalities, environmental injustices and urban deprivation. Also the inequalities and environmental injustice in developing and developed countries discussed in this chapter and end up with in-depth description of inequalities in Tanzania in relation to Dar es salaam city.

2.2. Review on urban inequalities

2.2.1. Key concepts of urban inequality

Inequality in terms of socio-economic perspective means "differences in access to social and economic infrastructure services and differences in quality of life and social wellbeing between different population groups and between geographical areas"(Shimeles, 2006).

Inequality defined by (Mitlin *et al.*, 1996; Martínez, 2005; Kim, 2008) "*as the differential appropriation of wealth (income and assets) by different individual and social groups, relative to each other in a given geographical area".*

Recently, concern has been growing about the lack of discussion on inequality, mainly because attention has been given to urban poverty (Mitlin *et al*., 1996). This lack of discussion has been reflected in international and governmental programmes for "urban poverty alleviation" in (UNCHS-Habitat, 2001). Two causes have been recognized in (Mitlin *et al.*, 1996 pp.3) "*the increased emphasis on market driven approaches to development over the last 10 to 15 years"* and the "*increased willingness to perceive income inequalities as important in providing individual incentives for entrepreneurship"*. An analysis of urban poverty alone usually reveals the extent to which the low-income households lack adequate provision of basic needs, but urban inequality can highlight how the quality of provision varies between income groups and within geographical area or how most low-income groups are paying far more for basic needs than middle or upper income groups. This resulted in scepticism about the role of governments intervention measures in addressing inequality (Martínez, 2005).

Castells (1999 pp.71) grouped inequality, polarization and poverty as a process of "social differentiation" and defined as follows:

"*Inequality* refers to the differential appropriation of wealth (income and assets) by different individual and social groups, relative to each other".

"*Polarization* is a specific process of inequality that occurs when both the top and the bottom of the scale of income or wealth distribution grow faster than the middle, thus shrinking the middle, and sharpening social differences between two extreme segments of the population".

"*Poverty* means not having enough financial resources to meet needs. It's an institutional

defined norm concerning a level of resources below which it is not possible to reach the living standards considered to be the minimum norm in a given society at a given time."
In this research, the term "inequality" is used, since it better reflects multidimensional (including spatial) aspects of the phenomenon, such as income, housing, land ownership, health, education and access to basic services such as water, sanitation and electricity.

2.2.2. Theories of urban inequalities

Agglomeration economies[1], postulates that the market forces generate internal and external economies of scale and as a result strengthen the trends for concentration of activities in a given territory (Armstrong and Jim, 2000; Vasilis and Gaki, 2006). Despite its assessment that economic integration is a positive process, it points out that the integration costs and benefits are very difficult to be uniformly distributed in different territories, since some of them benefit more than others and this leads to polarization and increasing inequalities (UN, 2001).
From the perspective of theory, spatial inequality is fundamentally determined by the location decisions of firms and households. Firms choose locations to maximize profits whereas households do so to maximize job market outcomes and utility. While firms and households generally care about the quality of both of their regional and urban environments, there is no widely accepted general theory of spatial location that seems to incorporate regional and urban location decisions in a unified manner (Armstrong and Jim, 2000; Kim, 2008).
Spatial inequalities are an established fact of urban life, as demonstrated by the considerable literature of social geography which has been concerned with the study of regional differentiation. Most researches and different organization show the fact that many forms of deprivation have spatial expression and have recommended policies and instituted courses of action which are area based specific solutions (Herbert, 1975; Henninger, 2002; Martínez, 2005; Rebecca, 2003).

2.2.3. Inequality – Sustainability

Equity, together with quality of life, is usually included in the conceptualization of sustainability. In 1987, the World Commission on Environment and Development defined sustainable development as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987; OECD, 1995). Equity is defined in (WCED, 1987; OECD, 1995) as social solidarity in terms of fairness to people living now and in the future. Social equity and quality of life are one of the most important aspects of sustainability.
The concept of sustainability was extremely diffused in the agendas of various local governments, agencies and NGOs, especially after the 1992 Rio Earth Summit, which established Agenda 21.

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[1] A concentration of economic activities in related sectors in a geographical area brought about by, among others, external economies such as a pool of skilled labour; local investments, increasing returns on scale planned by local authorities which leads into cumulative causation model in Armstrong, H. and T. Jim, Eds. (2000). Regional Economics and Policy. third edition, Blackwell Publishing.

The declaration resulting from that summit particularly mentions in its fifth principle the importance of reducing inequalities for sustainable development: "All States and all people shall cooperate in the essential task of eradicating poverty as an indispensable requirement for sustainable development, in order to decrease the inequalities in standards of living and better meet the needs of the majority of the people of the world"(Coenen and Halfacre, 2003).

2.3. Review on Environmental injustice and Equity.

2.3.1. Concepts and definition

Environmental justice approach hinges on the notion of equitable access to a healthy, pollution free environment and to the resources required to support a healthy life without compromising the opportunities of future generations as shown in figure 2-1 below (Maantay, 2002; Robin and Diana, 2002; US - EPA, 2004; Damery *et al.*, 2007). Development cannot be sustainable if it imposes the costs of development on other individuals or future generations (Margo, 1997; Coenen and Halfacre, 2003; Martínez, 2005).

Equity is the central goal of sustainable development as described in above subsection 2.2.3 above, that equity is considered as social, economic, geographic, and procedural.

Social equity involves decision that does not reflect to any subgroup, economic, age, or occupation biases.

Geographic equity means that the location, spatial configuration, and general proximity of environmental threats is similar across population and

Procedural equity implies that governing rules and regulations, evolutions criteria and enforcements are applied in non discriminatory manner (Bullard, 1996; Robin and Diana, 2002) all these are relevant to Environmental justice.

Environmental justices is defined in (Bullard, 1996; USEPA, 1998; Walker *et al.*, 2003; US - EPA, 2004; Damery *et al.*, 2007) "*as fair treatment and meaningful involvement of all people regardless of group or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies and the equitable distribution of environmental benefits".*

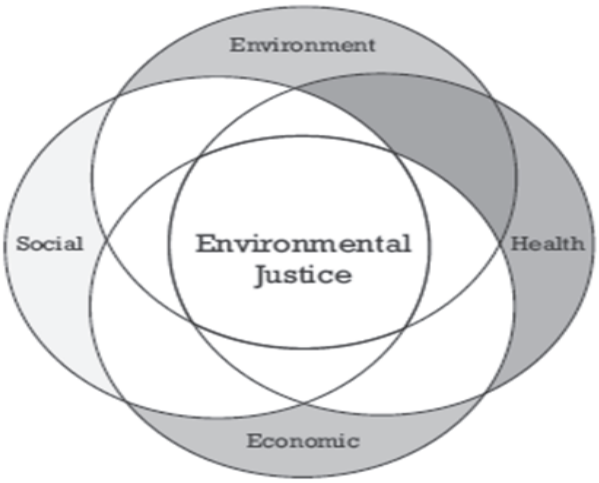


Figure 2-1: Concept of Environmental justices as adopted from (US - EPA, 2004)

Environmental injustice defined as the *"disproportionate exposure of poor communities to pollution, and its associated effects on health and environment, as well as the unequal environmental protection and environmental quality provided through laws, regulations, governmental programs, enforcement"*(Maantay, 2002; Coenen and Halfacre, 2003; Walker *et al.*, 2003).

Inequalities in the distribution of environmental hazards have given birth to the environmental justice movement in developed and developing countries. In Los Angeles, for example, maps of pollutants concentration unfailingly show the hot spots near industrial areas where people of lower social class are living (Robins, 1999).

2.3.2. Principles of Environmental justices

Robin (2002 pp.12) described three main principles of Environmental justice such as distributional justice, procedural justice and entitlements;

The *distributive justice* concerns that no social group, especially if already deprived in other socio-economic respects, should suffer a disproportionate burden of negative environmental impacts, for this standard to be met, the distribution of harms should not be more prevalent for any identifiable subgroup than another (Robin and Diana, 2002).

However, most of previous literature on environmental justice shows the disproportionate location of and exposure to toxic substances via landfills, superfund sites and incinerators near minority and poor communities (Bullard, 1996; Maantay, 2002; Robin and Diana, 2002; Coenen and Halfacre, 2003). Application of this distributional justice standard to policy would have the following policy implications; environmental hazards, including the waste itself, should be equitably (or equally) distributed across the population and remedial actions should be taken to clean up contaminated sites until contamination is evenly distributed (Coenen and Halfacre, 2003).

Procedural justice focuses on the process through which environmental decisions are made (Robin and Diana, 2002). The principle concerned that all communities should have access to the information and mechanisms to allow them to participate fully in decisions affecting their environment (Coenen and Halfacre, 2003). It involves two aspects; Procedural fairness and the effective ability of groups to participate in apparently fair processes. Issues of community empowerment and access to the resources necessary for an active role in decisions affecting people's lives are crucial. Procedural equity is the extent to which governing rules and regulations and enforcement are applied in a non-discriminatory manner (Bullard, 1996; Robin and Diana, 2002).

Entitlements approaches seek to ensure that individuals (and communities) have effective access to and control over environmental goods and services necessary to their well-being (Bullard, 1996; Robin and Diana, 2002). The entitlements approach is compatible with the precautionary principle, that is, the idea that policymakers should prioritize preventing adverse impacts rather than redressing or remediating them after they have occurred. When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established

scientifically (Robin and Diana, 2002). In order to achieve Sustainable development in cities, a strong social justice element is necessary. The issue is not just to reduce environmental hazards from industry in cities but to give priority to those social groups facing greatest risk.

2.4. Urban deprivation

Deprivation takes many different forms in every known society. People can be said to be deprived if they lack types of diet, clothing, housing, household facilities, fuel, educational, working, social conditions and good living environment in the societies to which they belong (Townsend, 1987 pp.126).

Urban deprivation is defined in (Nolan, 1996; Margo, 1997; Noble *et al.*, 2006) *"as levels of unmet need in living conditions and experiences"*, while levels of income and access to other financial resources are often crucial in determining the living conditions and activities of individuals, the concept of deprivation relates to a broader range of factors which affect people's quality of life and enable or prevent them participating fully in society. Also urban deprivation is defined by (Townsend, 1987) in (Herbert, 1975; Martínez, 2005; Wong, 2006; Baud *et al.*, 2008) "*as state of observable and demonstrable disadvantage conditions relative to the local community or wider society to which an individual, family or group belongs*". The definition focuses on conditions encountered by community such as physical, environmental and social circumstances. Deprivation can only be removed or reduced when public resources are distributed to those areas suffering from multiple forms of deprivation (Wong, 2006).

2.4.1. Key aspects of the construction of index of urban deprivation

According to (Carr-Hill, 2002) there are three different levels in construction of indexes; these include;

- The lowest level : made up of the 'variable' or 'indicator'
- The intermediate level: whereby single capital is made up of one or more groups of indicators
- The highest level: An index which comprises more than a single capital/domain made up of more than one indicator.

Rakodi and Tony (2002; 2006) developed five capitals for describing livelihood strategies and vulnerability in urban area. The concept of livelihood strategies is influenced by factors that fuel their vulnerability and police institutions and processes. Vulnerability as defined by (Rakodi and Tony, 2002) as "*the insecurity of the well-being of individuals, households or communities in the face of changing environment. Environmental changes threatening welfare economically, socially or politically".* The five capitals comprising livelihood strategies are;

- Human capital as labour resources available to households (skills, knowledge, information, ability to work, health etc.),
- Physical capital as the basic infrastructure service to community (transport, shelter, water, energy, sanitation etc.),
- Social capital as social resources (networks, groups, trust, access to institutions etc)
- Financial capital as productive capital (savings, credit, remittances and pensions) which reflects a wider range of ways in which households build up financial reserves (or experience vulnerability),
- Natural capital (living environment). Figure 2-2 indicates the conceptual model of livelihood strategies in urban area as developed by Rakodi, 2002

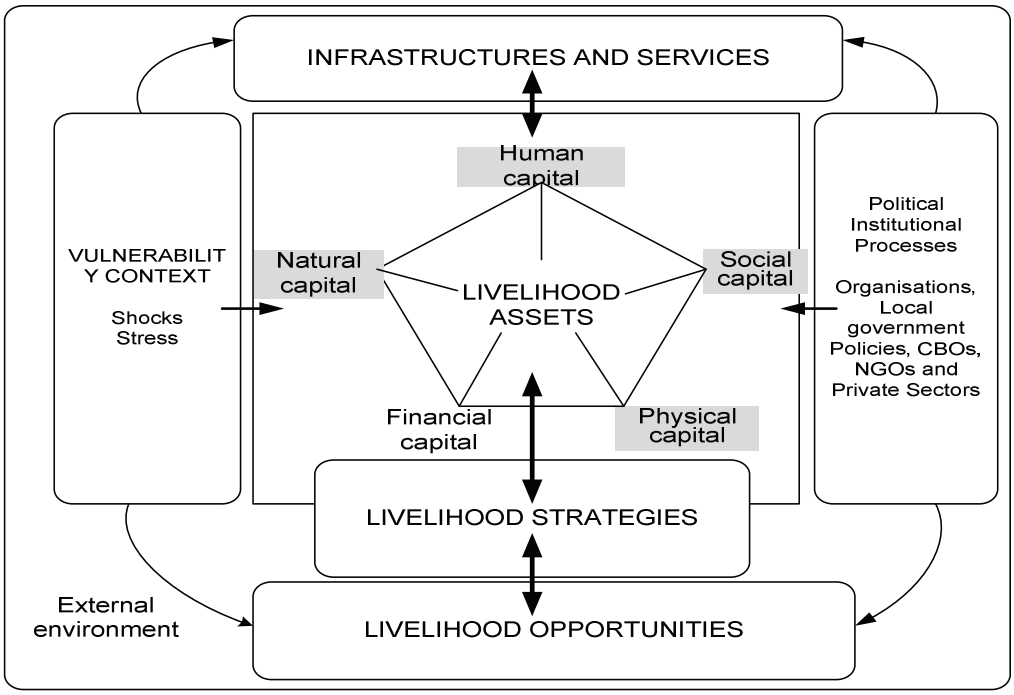


Figure 2-2: Urban Livelihoods framework[2] by Rakodi, 2002 as developed by DFID

2.4.1.1. Selecting indicators and capital

Capital and indicators can be selected based on theoretical dimensions of urban deprivations in similar cases. Survey and numbers of public consultation stages can be included over the decision of such selection (Bunting, 2000; Noble et al., 2008). Besides, reliable data availability is also a crucial factor in the selection of indicators. Moreover Wong (2006 pp.105) developed four main steps for indicator development, these include conceptual consolidation, analytical structuring, identification of indicators and creation of index. Hence the research relies on these steps in developing indicators valid for describing intra-urban inequalities.

2.4.1.2. Standardizing and Weighting indicators

When indicators are in different units of measurement, they need to be standardized before combining them under a selected capital. Different techniques and methods for standardizing indicators have been developed. One of the most widely used is through the construction of Z-scores (Townsend, 1987; Bunting, 2000) or applying spatial multi criteria evaluation analysis using ILWIS (Baud *et al*., 2008). The study applies spatial multi criteria evaluation method using ILWIS for standardizing of indicators and transforming into indices.

Weighting is always necessary when indices are required to be combined together to create multiple index. The widely accepted weighting techniques for determining explicit weights in a composite index, as discussed by (De Kruijk and Rutten, 2007) include expert weighting set by specialists, or societal determination, Principal Component Analysis and Explicitly set weights by another mechanism, such as equal weighting.

[2] The study adopted and modified the model, the highlighted capitals applied in this study

Basing on the above techniques, there are five weighting approaches to be applied as developed by (Townsend, 1987; Bailey *et al.*, 2003; Noble *et al.*, 2008) as described below:
Firstly, using theoretical considerations, taking into account available research evidence where similar theories and methods are applied to build similar index. Secondly, the weight might come from the perceived experience from the survey preferences and can be validated through multivariate analysis of the indicators (using regression analysis).
Thirdly, it is also possible that individual capital scores are kept evenly or unevenly weighted in accordance with particular focus of public expenditure on particular areas of policy. Fourthly, expert opinions and opinions from policy makers can be taken into account and upon consensus, necessary weighting of the indicators can be determined. Finally, weighting can be made entirely arbitrary by simply choosing weights without reference to the above considerations, or even selecting equal weights in the absence of empirical evidence.
In this study the first and second approach will be applied for weighting methods basing on survey preference and available theories and methods applied to build similar index.

2.4.2. Measuring deprivation at local level

There is interest in analyzing spatial patterns and concentrations of different forms of deprivation in both developing and developed countries. This is reflected in the variety of case studies for mapping deprivation, for example in Europe – UK, Asia- India and Africa - South Africa.
Many attempts especially in Britain have been made to measure deprivation at local level by constructing indices that include a range of demographic, socio-economic and environmental factors derived from census data and from non census data to reflect the presence of different forms of deprivation within a local area (Nolan, 1996; Martínez, 2005; Baud *et al.*, 2008; Noble *et al.*, 2008).
There are a variety of deprivation indices currently in use which have been developed to measure urban deprivation at local level both in developed and developing countries, for example (Noble *et al.*, 2006; Noble *et al.*, 2008) developed English Indices of Multiple deprivation in UK- 2007, (Baud et al., 2008) developed Index of Multiple deprivation in New Delhi –India and (Bailey et al., 2003) developed Index of deprivation in Scotland.
Since the mid 1960s the aim of creating an index (or indices) to measure deprivation at the local level to identify priority areas and target hotspot area has been a consistent feature of government policy. At times this indices have been concerned with specific areas of policy for example education or health only, but from 1980s the idea of a national index of 'multiple deprivation' at the local level has become a central concern to combine both financial indicators and other variables such as access to basic needs and environmental indicators (Townsend, 1987; UN-Habitat, 2002; Bailey *et al.*, 2003; Baud *et al.*, 2008; Noble *et al.*, 2008).

2.4.2.1. Multiple Deprivations

Multiple deprivation is a composite index using the livelihoods framework as base to define its variables and parameters (Baud *et al.*, 2008). The index of deprivation combines a number of indicators, chosen to cover a range of economic, social and environmental issues into a single deprivation (Noble *et al*., 2008). This allows each group or geographical area to be

ranked relative to one another according to their level of deprivation.

Many of these indices have been developed to underpin the allocation of resources to deprived areas (Noble *et al.*, 2006; Noble *et al.*, 2008). Despite recognizing income and consumption deprivations in its own right, it should not be the only measure of urban deprivation. Other dimensions of deprivation such as non income dimensions and environmental variables contribute crucial further information about determining deprivation of an area (Margo, 1997)

The approach in this study allows the measurement of different dimensions of deprivation, such as physical capital, social capital, human capital and environmental capital and combining these into an overall multiple deprivations. Combining indicators which are in different units of measurement needed to be standardize (Bradshaw *et al*., 2000; Gordon *et al.*, 2000).

2.4.2.2. Area-level multiple deprivation

Cemlyn (2002 pp.13) described two different meaning to area deprivation: a compositional meaning and collective meaning.

A compositional meaning of area deprivation is where an area is considered to be deprived if it contains a large number or proportion of deprived people. Proportion of deprived community will be identified using index of multiple deprivation.

A collective meaning refers to the possible presence of `area effects', that is, the additional deprivation in an area which is above and beyond those attributable to the concentration of deprived people in the area. In this study collective deprivation will be used to describe proportion of deprivation using index of multiple deprivation and environmental injustice as an additional attributable to socio-economic deprivation.

2.5. Mapping hotspots of multiple deprivation

Hotspot is the location or activity where the adaptation potential of environment and population is at immediate risk of being exceeded. Hotspot is a critical stage of environmental degradation irreversible in the absence of human intervention that can gradually lead to extremely tense socio-economic situations associated with a severe degradation of environmental resource base (Gommes and White, 2004).

A critical issue in mapping environmental justice is the lack of a reliable risk exposure index (Maantay, 2002). Previous studies of environmental equity lack both a valid measure of the sources of pollution to which people may be exposed, and relationship between proximity to those sources and the likelihood of exposure (Maantay, 2002).

Actual risk from source of pollution depends on many variables such as type of facility, waste emitted, quantities emitted and height of smokestack, exit velocity, wind direction and speed. Simple distance proximity equations are inadequate for measuring risk exposure (Maantay, 2002).

Hence, spatial proximity measure using Geographic Information Systems (GIS) applied to map environmental injustice and instances of disproportionate exposure of certain populations to environmental hazardous area.

2.6. Inequalities in developing countries

Rapid urbanization is unquestionably one of the most complex socio-economic phenomena of the 21st century (Sawio, 2002; UN-Habitat, 2003; Kironde, 2006). The impact of rapid urbanization brings about many changes in urban areas particularly in developing countries. Unlike urbanization that took place in industrialized countries, urbanization in most developing countries, particularly in Sub-Saharan Africa, specifically Tanzania is characterized by: rapid population growth, urban sprawl, weak capacity of local authorities to supply basic infrastructure and facilities, rapid increase of unemployment, urban poverty and accumulation of waste (UNCHS-Habitat, 2001; Sawio, 2002; Kironde, 2006).

The growing inequalities in developing countries' cities are expressed vividly in the enormous discrepancies in access to basic services between different urban residents (UN-Habitat, 2003; UNICEF/WHO, 2004). Social differences and competition which are reflected in residential areas, urban forms, social mobility, and quality of life all tend to increase inequalities. Asia and Africa are the two regions where coverage of basic services is lowest for both water supply and sanitation(UN-Habitat, 2003; UNICEF/WHO, 2004).

This inequality manifests itself in the vast differences in the levels of service infrastructure that is accessible to residents of poor neighbourhoods versus those of the upper- to middle-income areas within any city. The poor living in informal settlements typically lack access to municipal electricity, water, transportation, sewage and garbage collection services (UN-Habitat, 2003). Drawing from the Johannesburg example, Beall writes that "changing patterns of residential polarization are increasingly associated with shifting trajectories of economic development in the city, resulting in new geographies of exclusion" (Beall, 2002 pp.49).

Africa's rapid urbanization is happening in a context of widespread of poverty, shrinking economies and acute scarcity of resources for the urban local government authorities (Gilbert and Josef, 1992; UN-Habitat, 2002). Table 2-1 indicates inequality among regions global wise, the least being in Africa.

2.7. Inequality in Western European cities

The problem of inequality in Europe is very much related to that of social exclusion/social cohesion and segregation. Increasing levels of inequalities within cities might be a symptom of the existence of this problem.

Referring to the Dutch case and particularly to the city of The Hague, Kruythoff *et al.* 1997 in (Martínez, 2005) express the commonality and policy awareness of deprivation within Europe. The problem of deprived areas is not exclusively a Dutch problem and other cities have suffered this problem to an even greater degree. Kruythoff *et al*. mention the extended use of policy "to keep the contrasts between neighbourhoods and among population groups from getting out of hand". The arguments indicated that there is an increment in socio-spatial segregation in the cities of The Hague, Birmingham and Brussels. It is interesting to note that some of the causalities or roots of segregation/inequality referred to in European cases are similar to those in cities in Developing countries such as Nairobi, Lagos and Dar es Salaam.

In the European cities (Martínez, 2005) pointed the causalities of inequalities such as sub urbanization, the decline of industrial sector, declining job opportunities, lack of market opportunities for low income households (e.g. employment, retail), limited quality and

availability of public sector services (including housing) and limited strength of social networks, the influx of working immigrants from abroad.

The UN-Habitat Global Urban indicators indicates that industrialized countries are better off in both indicators compared to other developing countries, African countries being the least compared to other continent as indicated in table 2-1 below.

Table 2-1: Comparison of local government revenue levels and percentage of households connected to utility services worldwide

Region	Annual LG Revenue per capita	Percentage of household connected to social services					
		Water	sewerage	Electricity	waste	Health level	Education
Africa	15	38	13	43	26	50	52
Asia	248	63	39	86	44	78	73
Latin America and Caribbean	252	77	63	92	40	83	76
Industrialized countries	2763	99	98	99	100	95	97

Source: UN- Habitat, Global Urban Indicators Database, 2002.

2.8. Inequalities in Tanzania Mainland

The Tanzanian 2000/01 HBS confirms that income poverty is high and social facilities are usually in poor conditions and inadequacy. It also points to high inequality between different groups within the regions. The biggest gap is between urban and rural populations. At one extreme, Dar es Salaam is substantially better off compared to the rest of the country (NBS, 2002).

Overall, 10% of Tanzanian households are connected to the electricity, with an additional 2% having electricity from other sources. Coverage of the electricity is most extensive in urban areas, high coverage of about 59% of households in Dar es Salaam and 30% in other urban areas (NBS, 2002; REPOA, 2007).

Accessibility to social services, almost two-thirds of Tanzanian households are within two kilometres of a primary school; even in rural areas 58% are within this distance. This suggests distance is not a large impediment to primary schooling for most households. Most households are reasonably close to primary health-care facilities. Even in rural areas, over 90% are within 10 kilometres of a dispensary or health centre. Over 90% of households are within six kilometres of a dispensary or health centre in Dar es Salaam, Kilimanjaro and Kigoma, while less than half of the households in Dodoma are within that distance. The average distance to a hospital is 21 kilometres and 26 kilometres in rural areas (NBS, 2002; REPOA, 2007).

The major problem regarding to physical infrastructure services in Tanzania is lack of safe and clean water supply. Overall, 44% of Tanzanian households still use unprotected sources of drinking water, including wells and springs and surface water such as rivers and lakes. Some 39% use piped water and another 16% use protected wells or springs see table 2-2 below. People in urban areas have better drinking water supplies than the rural population. Some 53% of rural households depend on an unprotected water supply, while 86% of households in Dar es Salaam and 76% in other urban areas have both community and private

piped water of some kind. Rural households must also travel further to their supply, with only 49% within one kilometre (NBS, 2002; REPOA, 2007)

Table 2-2: Source of drinking water in Tanzania and Dar es salaam city

	Dar es salaam		Other urban		Rural areas		Tanzania Mainland	
	91/92	00/01	91/92	00/01	91/92	00/01	91/92	00/01
Piped water	93.0	85.7	72.7	75.6	24.5	28.3	35.9	39.3
Private piped	22.1	13.7	20.3	15.1	1.1	0.8	5.2	3.8
Piped elsewhere	71	72.1	52.4	60.5	23.5	27.5	30.7	35.5
Protected sources	3.8	7.9	10.9	12.4	10.3	17.6	10.0	16.2
Public well	3.5	4.7	10.4	7.5	9.4	13.3	9.2	11.8
Private well	0.4	3.2	0.4	4.2	0.7	1.4	0.6	2.0
Spring	0.0	0.0	0.0	0.7	0.2	2.9	0.2	2.4
Unprotected sources								
Public well	1.8	3.6	10.1	11.2	63.9	53.2	52.1	43.6
Private well	1.7	2.2	5.5	5.1	26.5	21.2	21.9	17.5
Spring	0.1	1.0	0.8	1.2	2.6	3.8	2.2	3.2
River, dam or lake	0.0	0.2	0.4	2.0	11.6	12.4	9.2	10.0
Others	0.0	0.1	3.4	3.0	23.2	15.8	18.8	12.8
	1.4	2.8	6.2	0.8	1.2	0.9	2.0	1.0
Total	100	100	100	100	100	100	100	100

Source: NBS, 2002

Poverty remains overwhelmingly in rural areas; about 87% of the poor live in rural areas. The rise in household consumption is influenced by an increase in inequality. The Gini coefficient, which measures inequality, increased from 0.34 to 0.35. The richest 20% of the population now account for 44% of household spending, compared with 43% in 1991/92; the poorest 20% accounted for just 7% of expenditure in both years. The biggest rise in inequality was in urban areas, particularly Dar es Salaam (NBS, 2002; REPOA, 2007).

2.9. Environmental Injustices in Developed and Developing Countries

Environmental justice, with its emphasis on public health, social inequality, and environmental degradation, provides a framework for public policy about the impact of discrimination on the environmental health of diverse communities in both developing and developed countries. Indeed, activists, academics, and some decision makers argue that biases within environmental policy making and the regulatory process, combined with discriminatory market forces, result in disproportionate exposures to hazardous pollution among the poor and communities (Robin and Diana, 2002; Schweitzer, 2007).

In the UK, evidence strongly suggests that the distribution of environmental impacts and resources is income-related. Generally, poorer people live in worse environments. A recent Friend of the Earth study correlated the Environment Agency's factory emissions data with the Government's 'Index of Multiple Deprivation'. It found that 11,400 tones of the carcinogenic chemicals emitted to the air from large factories in England in 1999, 82 percent was from factories located in the most deprived wards (Carolyn *et al.*, 2001). In England, the most deprived wards experience the highest concentrations of nitrogen dioxide (NO2), fine particulates (PM10), sulphur dioxide (SO2), carbon monoxide (CO), and benzene. People in deprived wards are exposed to 41% higher concentrations of NO2 than those people living in

wards of average deprivation. There are also clusters of wards that have poor aggregate air quality and high deprivation in London, Manchester, Sheffield, Nottingham and Liverpool (Bullard, 1996; Satterhwaite, 1999; Noble *et al.*, 2008).

In most African countries, the urban poor are over exposed to environmental risk and life threatening diseases that are preventable. Existing environmental infrastructure is sadly inadequate of providing social services such as water or hygienically treating household liquid, solid wastes, hazardous and toxic industrial waste. Most of these problems are found in poor communities in informal settlements with no access roads often stumble in pools of open sewage, mountains of stinking garbage since trucks cannot get there and drainage channels hardly exist (Cheru, 1992; Fujita, 2002). In addition to poor water and sanitation services, each day liquid waste (including toxic substance and industrial waste) are being disposed of using inadequate on-site methods. Airborne particulate readings in the developing world are often ten times higher than peak levels allowable in the United States. This situation endangers the health and productivity of the urban poor, especially women and children (World Commission on Environment and Development (WCED, 1987).

2.10. Conclusion

The aim of this section was to set out our understanding of the concepts of inequalities and environmental justice and how it contributes to urban deprivation. Deprivation is valuable for its focus on the lack of services, housing, household facilities, fuel, educational, working and social conditions and good living environment or social relations which result from a lack of financial resources.

The discussion of different capitals raises questions about the types of social relationship which deprivation measures should focus on and about the relationship between income and social connectedness. Environmental justice is generally accepted as being concerned with "how the good and bad things should be distributed within a society" (Bailey *et al.*, 2003 pp.12). Deprivation measures may therefore provide good measures of certain injustice and social discrimination and provide good starting points for further investigation of the processes involved. Comparisons of levels of deprivation between different social groups using multiple indicators may provide important evidence of the existence of socio-economic deprivation or discriminatory processes. The ability to disaggregate deprivation measures for relevant social groups at lower level is therefore important in order to depict reality and variation of deprived societies within the city.

3. INTRA-URBAN INEQUALITY AND ENVIRONMENTAL INJUSTICE IN DAR ES SALAAM

3.1. Background information of the case study area

3.1.1. Geographical location

The City is located between latitudes 6.36 degrees and 7.0 degrees to the south of Equator and longitudes 39.0 and 33.33 to the east of Greenwich. It's situated along the coast of the Indian Ocean in Tanzania. The city is one of the fastest growing in sub-Saharan Africa experiencing problems of rapid urban growth under poverty.

The total surface area of Dar es Salaam City is 1,800 square kilometres, comprising of 1,393 square kilometres of land mass with eight offshore islands, which is about 0.19% of the entire Tanzania Mainland's area. Temeke Municipality has the largest land surface area followed by Kinondoni while Ilala has the smallest area.

Table 3-1: Distribution of the total land mass area of Dar -es-salaam City, by Municipality

S/no.	Municipality	Total land mass (kilometre square)
1	Temeke	652
2	Kinondoni	531
3	Ilala	210
	Total	1393

Source: City Council, surface area and Economic survey 2002

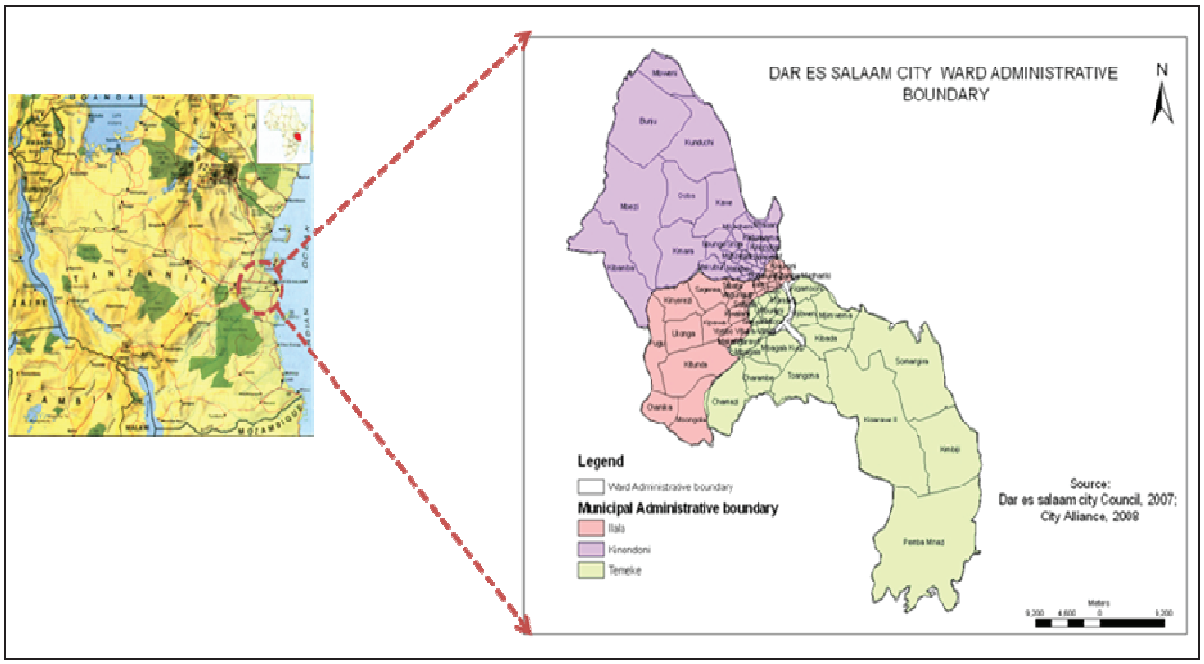


Figure 3-1: Location of Dar es Salaam city

3.1.2. Climate

The City experiences a modified type of equatorial climate. It is generally hot and humid throughout the year with an average temperature of 29ºC. The hottest season is from October to March during which temperatures can raise up to 35ºC. It is relatively cool between May and August, with temperature around 25ºC.

There are two main rain seasons; a short rain season from October to December and a long rain season between March and May. The average rainfall is 1000mm (lowest 800mm and highest 1300mm). Humidity is around 96% in the mornings and 67% in the afternoons. The climate is also influenced by the south-westerly monsoon winds from April to October and north-westerly monsoon winds between November and March. The City is divided into three ecological zones, namely the upland zone comprising the hilly areas to the west and north of the City, the middle plateau, and the low lands including Msimbazi valley, Jangwani, Mtoni, Africana and Ununio areas. The main natural vegetation includes coastal shrubs, Miombo woodland, coastal swamps and mangrove trees (DCC, 2004; DCC and JICA, 2007).

3.1.3. Administrative Structure of Dar es Salaam

Dar es Salaam consists of administratively three Municipalities: Kinondoni, Ilala and Temeke Municipality. The Dar es Salaam city council and Kinondoni, Ilala and Temeke municipal councils operate in the same jurisdictional areas. Thus, the City Council performs a coordinating role of three municipalities and prepares a city-wide framework to enhance sustainable urban development. Each municipal council provides social and economic services to residents, including measures to improve and accelerate local economic activities and public services in health, education, infrastructure development, urban development, etc. Municipality is further divided into administrative unit of ward, where at least one councillor is elected by voting from the people living in the ward. There are 73 wards in Dar es Salaam City: 22 wards in Ilala Municipality, 27 wards in Kinondoni Municipality, and 24 wards in Temeke Municipality see figure 3-2 below (DCC, 2004; DCC and JICA, 2007).

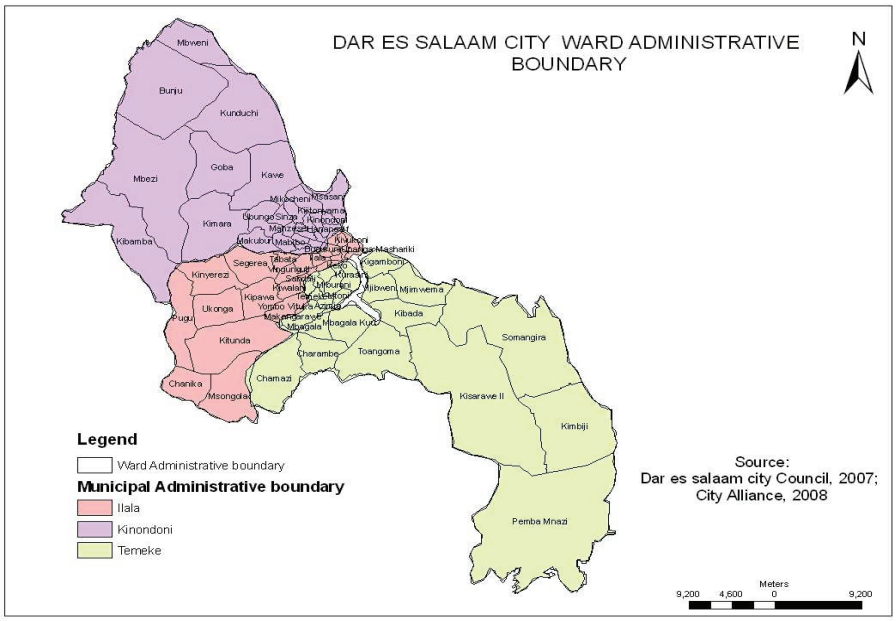


Figure 3-2: Map of Dar es Salaam city showing ward administrative boundary

3.2. Urbanization trends in Tanzania

The country has experienced continued, steady population growth over the past three decades. According to the data from (NBS, 2002), which has been conducted four times by the National Bureau of Statistic (NBS), the population of Tanzania mainland has nearly tripled since 1967; the population increased from 11.9 million persons in 1967 to 17.0 million persons in 1978, 22.4 million persons in 1988 and to 33.4 million persons in 2002 as indicated in Table 3-2 below. The average annual population growth rate was 3.3 percent between 1967 and 1978, 2.8 percent between 1978 and 1988 and 2.9 percent between 1988 and 2002 (NBS, 2002).

Table 3-2: Population Trends in Dar es Salaam, 1978, 1988 and 2002

Year	Tanzania mainland population	Population growth rate
1967	11,900,000	(1967 -1978) = 3.3%
1978	17,036,499	
1988	22,455,207	(1978 - 1988) = 2.8%
2002	33,461,849	(1988 - 2002) = 2.9%

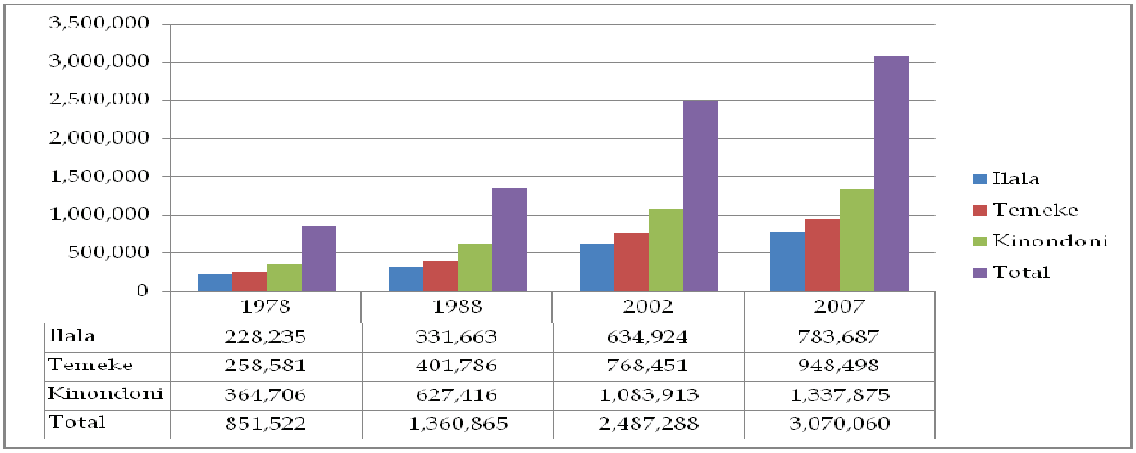
Source: The United Republic Tanzania Population and Housing Census, 2002, NBS

3.2.1. Population growth in Dar Es Salaam

Dar es Salaam is one of the city in Sub-Saharan Africa experiencing rapid urbanization and it is the fastest growing region in Tanzania mainland. The population of Dar es Salaam in 1978 was 782,000. Today the population of Dar es Salaam is estimated to be over 3,000,000.

The city occupied about 7.4 percent of the national population in 2002. The average annual growth rate was 4.4 percent between 1988 and 2002, which was nearly 1.5 point higher than national average during the same period. In general urbanisation in Dar-es-Salaam city is characterised by unguided spatial expansion, settlement densification, proliferation of informal settlements, deterioration of social services and public utilities.

Kinondoni Municipality had the highest growth rate of 5.6 percent per annum during the period between 1978 and 1988, followed by Temeke Municipality with 4.5 percent per annum and Ilala Municipality with 3.8 percent per annum. During the period between 1988 and 2002, Ilala and Temeke Municipalities had growth rates of 4.7 percent per annum, while Kinondoni Municipality dropped to 4.0 percent per annum, which was 1.6 point lower than that in the previous period between 1978 and 1988. This figures indicate that Kinondoni Municipality experienced a rapid population growth in the 1970s and 1980s and more recently the population growth has shifted to Ilala and Temeke Municipalities in the 1990s and the early 2000s (NBS, 2002; DCC, 2004).



	1978	1988	2002	2007
Ilala	228,235	331,663	634,924	783,687
Temeke	258,581	401,786	768,451	948,498
Kinondoni	361,706	627,416	1,083,913	1,337,875
Total	851,522	1,360,865	2,487,288	3,070,060

Figure 3-3: Population trends by Municipality in Dar es Salaam, 1978, 1988, and 2002 and projected 2007 (NBS, 2002)

3.2.2. Population density in Dar es Salaam

The average population density in Dar es Salaam as a whole was about 15 persons/ha in 2002 and each municipality was: 21 persons/ha in Kinondoni Municipality, 18 persons/ha in Ilala Municipality and 10 persons/ha in Temeke Municipality. Looking at the population density at ward level, high population density with more than 300 persons/ha can be seen in the wards adjacent to the City Centre, such as Magomeni (367 persons/ha), Makurumula (340 persons/ha), Ndugumbi (443 persons/ha) and Makumbusho (321 persons/ha) in Kinondoni Municipality; Ilala (337 persons/ha) in Ilala Municipality; and Azimio (533 persons/ha) and Tandika (361 persons/ha) in Temeke Municipality (NBS, 2002; Lupala, 2002.; DCC, 2004; DCC and JICA, 2007).

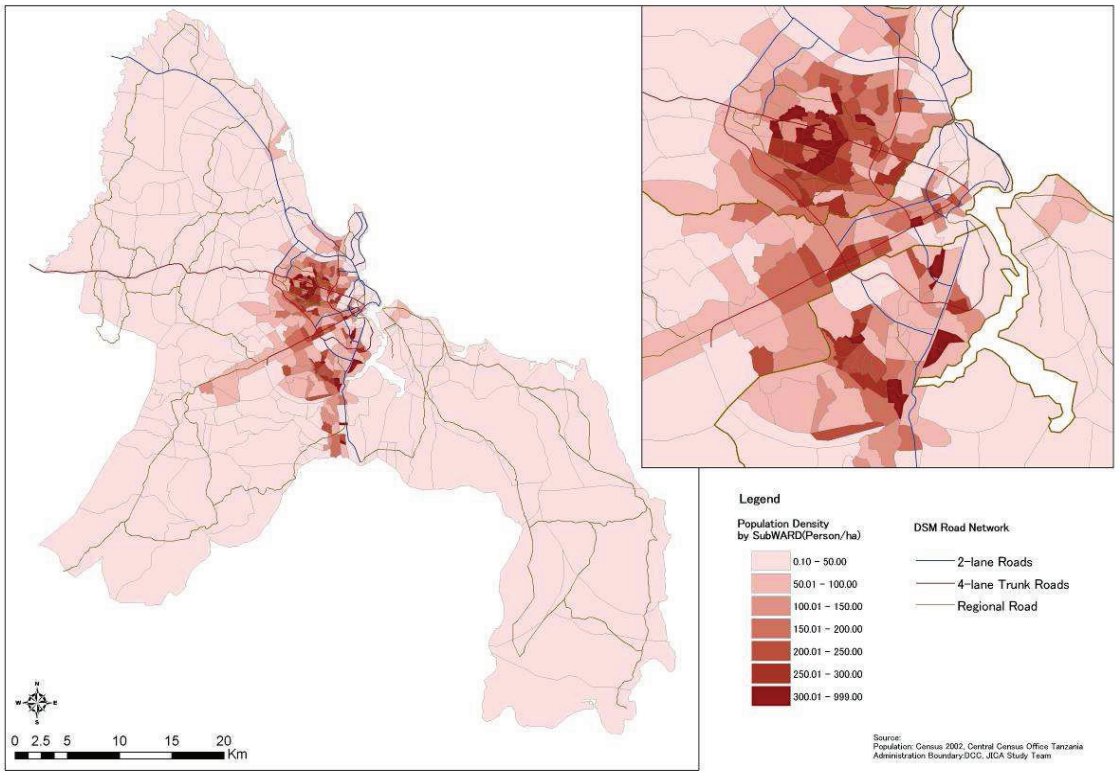


Figure 3-4: Population density in Dar es salaam city (DCC and JICA, 2007)

3.2.3. Commercial and industrial Activities

Most of commercial and business activities are concentrated in the City Centre. The central and local government institutions, banks and private business activities are concentrated in wards such as Mchafukoge and Kivukoni. Wholesale and retail commercial activities are concentrated in Kariakoo and Mchafukoge.

The industrial activities in Dar es Salaam is mainly small-scale light manufacturing industries, such as textile, chemical, food processing, beverage, plastic products, cement, etc. Small-scale industries or cottage industries are scattered throughout the city. Majority of industrial establishments are located in Ilala Municipality and Temeke Municipality, especially along Nyerere Roads. Seaport facilities and its related warehouses are located in Kurasini and Chang'ombe in Temeke Municipality, respectively.

3.3. Urbanization and Intra-urban inequalities

Urbanization trends in Dar es salaam like in other developing cities has been fuelled by high rate of natural population increase in cities combined with high influx of rural migrants. The process of urbanization is one of the most important dimensions of economic, social and physical change in urban growth and management (Lerise *et al.*, 2004). Basic demands resulting from this phenomenon are land for city expansion, housing for population, infrastructure and public service provisions.

One of major issues arising from rapid urbanization is the increasing socio-economic inequalities within the city. The major factors influencing intra-urban inequalities are un-coordinated spatial expansion and settlement densification, proliferation of informal settlements, deterioration of social services and public utilities, decline in formal employment and increasing level of crimes and victimization as discussed in the following sections.

3.3.1. Urban sprawl and uncontrolled horizontal expansion

Three years after independence, in 1963 Dar es Salaam was largely developing in accordance to urban planning practices and the extent of the built up area was confined within a radius of about six kilometres. Ten years later, the city and other urban centres in Tanzania became a destination of an influx of rural –urban migrants. In coping with housing provision, individuals bought land in peripheral areas and constructed houses (Lupala, 2002.). That process lead to a rapid horizontal expansion of the city mainly along its radial roads. By 1978 the built up area of the city had expanded to more than double its 1960s spatial size. Specifically the city had extended to 14 kilometres along the Pugu (Nyerere road beyond the current airport, it covered 12 kilometres along the Morogoro and Bagamoyo roads. The southern arm of the city towards Kilwa did not extend much largely due to a very poorly maintained road (Kombe *et al.*, 2002; Lupala, 2002.; DCC, 2004).

By 1992 the general radius of the city remained at 12 kilometres, but up to 16 kilometres along Bagamoyo road and ten kilometres along Kilwa road after the road were improved. The northern arm along Bagamoyo road had reached 32 kilometres while the western arm reached 28 kilometres. Both the south-western part and the southern arm expanded to 20 and 14 kilometres respectively see figure 3-5 below. The implications from this urban sprawl are increased needs and costs for supplying roads and drains. Due to weak urban economy proper roads are neither constructed nor existing earth roads properly maintained. Potholes

are common in this areas (Kombe *et al.*, 2002; Lupala, 2002.; DCC, 2004).

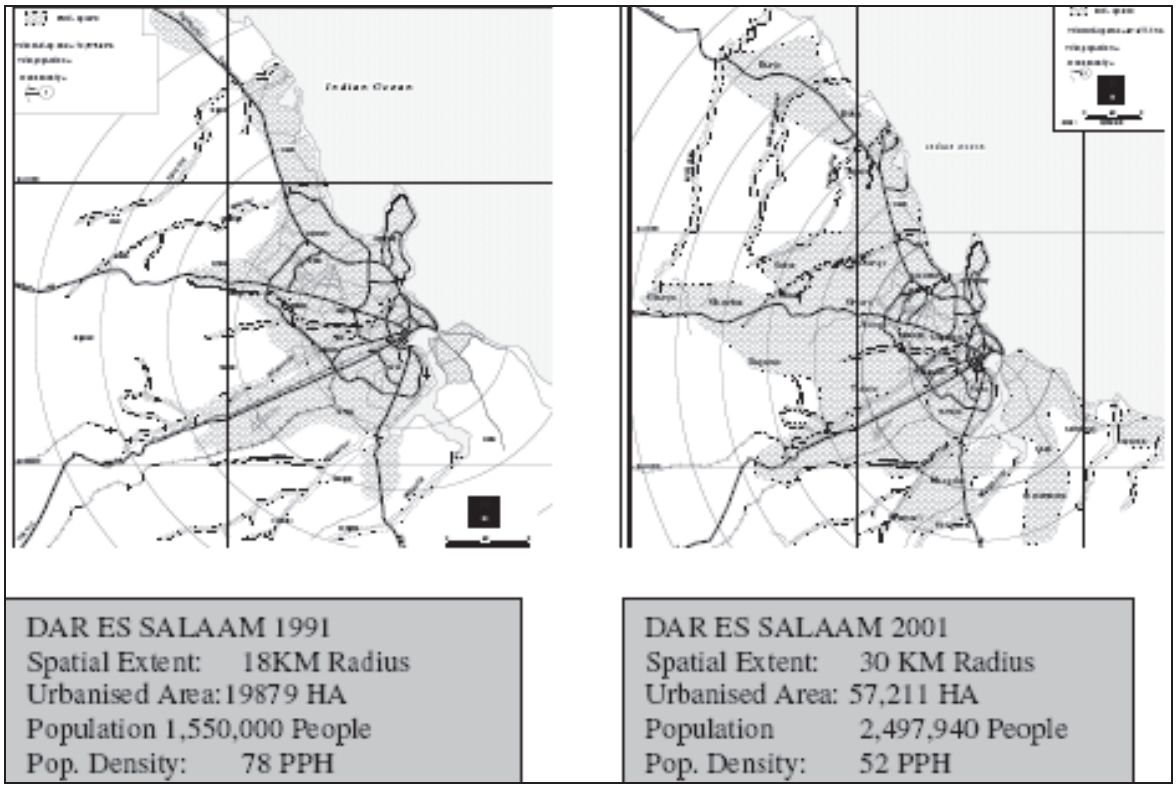


Figure 3-5: Spatial extent of Dar es salaam city (Lupala, 2002.)

3.3.2. Proliferation of informal settlements

The decades 1970-1980, and 1980-1990 observed remarkable increase in number, size and growth of informal housing in Tanzania (Kombe, 1995; Lupala, 2002.; Lerise and Kyessi, 2003). In Dar es Salaam for example, the number of informal settlements increased from 25 in 1979 to 40 settlements in 1990. By 2000, this number had increased to 50. By 1992, it was estimated that out of the total 170,000 housing units of Dar es Salaam, approximately 127,500 units representing 75% were located in informal settlements (Lupala, 2002.).

Informal settlements are characterized by unguided housing densification and spatial disorderliness that inhibit provision of basic services, for instance portable water and access roads. Some of the informal settlements are located in environmentally hazardous[3] areas including flood prone areas and steep slopes (Lerise *et al.*, 2004). Increasing housing density has resulted into poor sanitation, poor solid waste disposal and collection, vehicular inaccessibility in case of emergencies such as fire accidents and low level of service provision in terms of education, health and security, which together may compound into increased exposure to heath, economic and environmental risks among urban dwellers (Kombe, 1995; Lupala, 2002.; Lerise and Kyessi, 2003).

[3] Harmful or dangerous areas

3.3.3. Deteriorating social services and public utilities

The rapid urban population growth and diminishing capacity of the government to provide or facilitate the provision of needed services and public utilities has overburdened the services and utilities in most of the settlements. For example, while in the 1960s almost all residents in Dar es Salaam were served with piped water supply, in 1992, only 26% had water supply on their plots. Many residents have been forced to search for alternative sources of water (underground), which is not safe for drinking. Majority of the residents (90%) use pit latrines as the main sanitary system (Lerise and Kyessi, 2003; Kyessi, 2005). The use of polluted groundwater has subjected residents to a number of waterborne diseases such as cholera, dysentery and typhoid. The low level and deteriorating service provision lead into a number of problems, which contribute in the accumulation of different forms of risks. For example, there is an increasing risk with respect to health hazards resulting from the situation that most of the refuse is uncollected and piles of decaying waste are found in many settlements. Household budget survey of 2000/2001, indicate that only 59% of the total population had electricity, 43% had water supply, 90% had acceptable pit latrines but only 5% was connected to sewerage system, 40% of wastes collected, 78 % of the total population have access to health facilities within 5km radius as indicated in table 3-3 below;

Table 3-3: Accessibility of socio-Economic services and public utilities in Dar es Salaam

S.NO	Type of social services and utilities	MUNICIPALITY		
		Ilala	Kinondoni	Temeke
1	Percentage of Household access to clean water supply network	49	51	30
2	Population percentage access to health facilities within 5km radius	72	72	90
3	Household having acceptable pit latrines	88	90	90
4	Population per health facility	1/33	1/97	1/97
5	Percentage of unplanned settlements	70	70	60
6	Percentage of Household connected to sewer system	5	7	4
7	Percentage of household connected to electricity	63	78	55
8	Percentage of employment	45	48	43
9	Percentage of solid waste collected	40	48	38

Source: City Alliance, 2008, Municipal Environmental profile, 2007, HBS, 2002, fieldwork, 2008

3.3.4. Increasing urban poverty

The rapid urbanisation trends in many Tanzanian towns have been linked with a wide spread of poverty. Poverty remains high despite the interventions which have been put in place to check on poverty. Table 3-4 below indicates that 7.5% of Dar es Salaam population is

unable to get adequate food (food poverty) and 17.6 % unable to get basic needs (basic needs poverty) (NBS, 2002)

Table 3-4: Trends of Poverty indicators in Dar es Salaam

Indicator	Poverty index 1991/92	Poverty index 2001/2002
Food poverty	13.60%	7.50%
Basic needs poverty	28.1	17.60%

Source: Household Budget survey, 2001

A study conducted in 2002 by water AID revealed that the poor in Dar es Salaam were paying about 48% of their monthly incomes for transport costs to reach the various livelihood areas in the city and spending almost 50% of their monthly income for getting safe and clean water (Kombe *et al.*, 2002; WaterAID and Tearfund-Tanzania, 2003).

Table 3-5: Comparison of charges paid for clean and safe water by poor community

Type of consumer	Amount paid per month and volume consumed	Cost per liter	Paid to
Household with a connection to water supply network	Tsh 15,000 for high pressure and 10,000 low pressure zones. It's estimated that high pressure zone are consuming 4500 liters/ month.	Tsh. 0.30	DAWASCO
Household which buys water from water vendors for 500 Tsh. for each 20 litres	Tsh. 60,000 average of 80litres/ per day = four jerry cans. (2400 L/Month) (500 x 4 x 30) = 60,000Ths	Tsh. 25	Rate paid to water vendors

Source: Water AID and tearfund, 2003 and Field work, 2008

As a results most of households which are buying water from water vendors get water for washing or bathing from other sources such as shallow wells which are already polluted because they cannot afford to pay Tsh. 2000 every day. Given increasing trends in urban poverty, coupled with increasing costs of living, many households are increasingly becoming vulnerable to risks related to waterborne diseases such as diarrhoea, cholera and dysentery. Schistosomiasis and malaria are also commonly found in most of unplanned areas (WaterAID and Tearfund-Tanzania, 2003 pp. 31) as shown in table 3-6 below:

Table 3-6: Common diseases found in hazardous areas survey done by City alliance, 2008

S/no.	Ward name	Water borne diseases (Diarrhoea, Cholera, Schistosomiasis, Dysentery) (Percentage of respondents)	Malaria (Percentage of respondents)
1	Manzese (20)	82.4	95
2	Mburahati (15)	96.2	100
3	Mikocheni (66)	53.3	100
4	Msasani (13)	57.1	98.5
5	Tandale (73)	92.3	100
6	Buguruni (20)	80	100
7	Jangwani (14)	100	100
8	Kinyerezi (15)	80	100
9	Kipawa (38)	25	100
10	Kiwalani (15)	81.6	100
11	Tabata (26)	64.7	100

12	Vingunguti (81)	90.3	97.5
13	Keko (58)	47.8	96.6
14	Kurasini (13)	7.7	76.9
15	Mbagala (82)	6.1	84.1
16	Mtoni (15)	20	93.3

Source: City Alliance, 2008 (Figures in brackets indicates number of respondents)

3.4. Dar es Salaam socio-economic inequalities in the context of Tanzania

The growing importance of cities is not only due to their increasing number and size. They also have a growing influence in the process of economic transformation and globalization because of the numerous political, economic, social and ecological activities cantered within it. Cities are powerful engines of growth, in many cases more powerful than national economies. Cities are centres of innovation due to forces that shape or drive globalization finance, production, marketing, information, and knowledge production (Gilbert and Josef, 1992).

The City of Dar es Salaam generates more than one third of the total Tanzanian tax revenue. Enormous disparities continue to exist within the city as regards to the existence level of its inhabitants. One part of the city population has an extremely high standard of living that offers more comfort and quality of life than ever before. Another substantial section of the city population is excluded from this development and lives in extensive informal areas with little or no access to public services.

The socio-economic inequalities in Dar es Salaam are contributed by urban settings which act as a magnet, attracting men and women hoping for a better life. However, even though they may appear to offer big opportunities, they are also places where great inequality exists, which can be identified spatially and socially as depicted in table 3-7 below. Indeed, a large portion of the city population consists of those whom success has passed by, of poor people and households. In Dar es Salaam a recent study (REPOA, 2007) indicated that more than 20% of the population lives in a situation of absolute poverty.

Table 3-7: Dar es salaam Socio- economic indicator in relation to Tanzania Mainland

S/no.	Social services	Dar es salaam city		Tanzania Mainland	
		1991/92	2000/2001	1991/92	2000/2001
1	Percentage of Household with private piped water supply	22.1	14	5.2	3.8
2	Percentage of Household connected to electricity	50.2	56.4	6.6	9.2
3	Percentage of Household with improved sewerage facilities	3	4	10	17
4	Illiteracy rate	9	7.6	25	25.2
5	Employment rate	42	45	12.5	15
6	Percentage of Household with modern walls and roofing	88	98	25	44
7	Mean distance to education facilities	1.5	0.8	3	1.8
8	Mean distance to hospitals		2.8		21.3
9	Average persons per sleeping room	2.5	2.5	2.5	2.4

Source: URT (Household Budget survey, 2002, Poverty and Human Development report, 2007)

Although Dar es Salaam region seems to be better off compared to other regions, the aggregated values given above do not fully capture the depth of inequalities within cities. Enormous differences in infrastructure investment exist between poor wards and more affluent areas.

The water and sanitation-related health burden for children under five in Africa, for instance, is 5 times higher than it is in high-income countries (UN-Habitat, 2003). Those not served are obliged to use water from streams and other surface sources, which in urban areas are often little more than open sewers, or to purchase water from unsanitary vendors. As a result, the poor are overexposed to environmental risks and life threatening diseases that are preventable (UN-Habitat, 2003 pp. 57 - 87).

3.5. Environmental setting

3.5.1. Hazard Lands

The low lying areas along the river valleys, steep slopes and flood plains refer as hazard land, which, due to natural factors or environmental development interactions are not suitable for human habitation. Although the law does not allow the occupation of these areas, a number of poor people do occupy them. For example along the river valleys of Msimbazi, Sinza, Mzinga, Kizinga, Yombo, Mwera, Mlalakuwa, Mbezi, Tegeta, Nyakasengwe, Mpiji, Nguva, Ukooni, Bandarini, Mbugani, Mtandika Mbezi, Vingunguti, Kigogo, Keko all these area are prone to flooding during heavy rainfall (DCC, 2004; Temeke Municipal Council, 2007) .

In 1998 heavy rains, known as EL-NINO caused flooding along Msimbazi and other valleys, many people lost their lives, and others were left homeless. These lands are developed mainly due to the lack of development control which has led to mushrooming of houses in areas where can be easily swept away by floods.

Other hazard lands include; Vingunguti oxidation ponds and solid waste dump site, this areas poses health problems to inhabitants of its surroundings who are exposed to chemical pollution, due to their closeness to unplanned human settlement. Leachates4 from the site flows towards Msimbazi valley, that lead to water pollution which is used for domestic and gardening (Ilala Municipal Council, 2007).

[4] Liquid which has percolated through or drained from waste material which contains soluble components of the waste

3.5.2. Solid wastes generation and management

The city is estimated to generate about 3156 tones of waste per day; only about 35 – 40% of waste generated is collected daily. The waste is from residential, industrial areas and commercial establishments like markets and other informal sectors (DCC, 2004). The composition of waste generated in the City is analyzed in Table 3-8 below according to source.

Table 3-8: Sources of waste and their amounts in Dar es Salaam city

S/no.	Source of wastes	Amount in tones/day	Percentage
1	Kitchen wastes (Households)	1338	42
2	Paper	222	7
3	Textiles	129	4
4	Grass	732	23
5	Metal	63	2
6	Glass	96	3
7	Leather and Rubber	33	1
8	Soil and ceramic	33	1
9	Others e.g plastic bags, bottles and boxes	510	16
Total		3156 tonne/day	100%

Source: DCC, City environmental Profile, 2004, Solid waste management, field work, 2008

3.5.3. Sewerage and liquid waste management

In terms of sewerage and liquid waste provision, only central commercial core and the immediately surrounding older residential areas are served by underground piped sewerage, a system which has not been extended during the past forty years. The remainder of the urbanised area is served by local septic tanks and pit latrines. Industrial liquid waste is treated at the level of individual factory and it seems that many industries have no treatment at all.

3.6. Conclusion

The challenges of rapid urbanization of Dar es salaam is the sprawling of the city beyond the limits and weak capacity of local authorities to supply basic infrastructure services, rapid increase of unemployment, proliferation of informal settlements and poor solid waste management.

Overcoming the problems that go with urbanization is one of the key challenges of urban local authorities. Efforts should aim towards improving human basic needs by improving quality of living environments, alleviating urban poverty and strengthening municipal autonomy and decentralization of social and economic services.

4. RESEARCH METHODOLOGY

4.1. Introduction

A research design is a procedural plan, structure and strategy of undertaking the research so as to obtain answers to research questions and objectively validly economically. Kumar (2005) defined research design as "*the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure to ensure their validity and accuracy*". It conceptualizes the operational plan to undertake various procedures and tasks required in the study (Kumar, 2005).
This study applied multiple sources of information from Census data of 2002 and Household budget survey of 2001, Municipal councils, City council, City alliance under UN-Habitat, Dar es salaam Water Supply Company (DAWASCO), Tanzania Electric Supply Company (TANESCO), NGOs such as Research on Poverty Alleviation (REPOA) and Social Economic Research Foundation (ESRF), at Ward levels and from local peoples to address a broad range of issues.

This chapter described the data sources and techniques used for collection of primary and secondary data needed to answer the research questions and to achieve research objectives. Also the chapter described the process used in the development of indicators for index of multiple deprivations. Tools of data analysis of both spatial and non spatial data are also explained in this chapter.

4.2. Data source and collection techniques

The study is based on multiple sources of information both primary and secondary. Different techniques were used to collect data. Field data collection tools involved official interviews, discussions with key informants, field observation and strategic sampling of specific area. The selection of wards for detail study was based on geographical proximity of variables such as polluting industries, waste dump sites, treatment plants and houses in hazardous areas. A checklist and questionnaire were used to gather information.
Primary data was collected through interviews and discussions with local leaders and famous elders and field observations. Secondary data were collected from governmental and Non Government organizations both at City, Municipal level and ward level. The sources and collection techniques of data for the study are outlined below.

4.2.1. Official interviews and discussion

During the field work official interviews and discussion was the main research instrument applied for collecting data. Table 4-1below indicates the summary of the type and sources of the collected data during fieldwork.

Table 4-1: Source and Type of data collected during field work

No.	Type of Data	Source	Year
A: Physical infrastructure			
1.	Access to water, sanitation and sewerage at ward level	DAWASCO, Municipal Water department (Ilala, Temeke and Kinondoni) City Alliance	2007 and 2008
2.	Energy sources (Access to electricity) at ward level	TANESCO, Municipal Councils (Ilala, Temeke and Kinondoni) City Alliance	2007 and 2008
3.	Solid and liquid waste production and management Contractors and their performance in solid waste collection in Dar es salaam	Municipal Council(Ilala, Temeke and Kinondoni) NEMC, Solid and Liquid waste Management Authorities	2007
4.	Housing conditions	Ministry of Lands and City Alliance	Survey done from 2004 - 2007
B: **Demographic data**			
1.	Population in each ward, House hold size and population density at City, municipal and ward level	National Bureau of Statistics (NBS)	2002
2.	Level of Illiteracy (Who have never attended school)	Household Budget survey (NBS)	2002
C: Economic data			
1.	Income levels and sources	City Alliance, Municipal Councils	2004 - 2007
D: Social infrastructure			
1.	Availability and quality of health facilities and education facilities in each ward	Municipal Council(Ilala, Temeke and Kinondoni), City Council	2007
2.	Access to market places	Municipal Council(Ilala, Temeke and Kinondoni), City Council	2007
3.	Socio-economic indicators for all three Municipalities (Ilala, Temeke and Kinondoni)	National Bureau of Statistics (NBS), REPOA and City Alliance	2000/2001 2007
4.	Educational level (Secondary education level)	Household Budget survey NBS	2002
E: Environmental problems data			
1.	Data on the environmental sources of stress and likelihood of exposure , health risks in areas around oxidation ponds and waste dump sites	NEMC, REPOA, Municipal councils	2008
2.	Hazardous areas and associated problems	Municipal councils, local leaders	2008
3.	Number and location of dump site, polluting industries and oxidation ponds	Municipal councils	2008
4.	Common diseases found around hazardous area	Health centres and Municipal profiles	2008
F: Policy			
	Housing development policy (2000), Strategic Urban Development Planning Framework(2006) Dar es salaam Land development master Plan Tanzania Poverty reduction strategy, 2007 Environmental policy and regulations, pollution monitoring and management plan The environmental management Act, 2004	Municipal Councils – Urban Planning department National Environmental Management Council (NEMC	2000-2007
G: Maps			
	Digital map indicating , wards boundary, areas covered by informal settlements, Distribution of health and market places	City Alliance, Municipal Council	2007

Source: Field work, 2008

4.2.2. Field observation and discussion with local leaders in hazardous area

During the field work, participatory observation was also applied as tool to collect information in selected hazardous areas in order to get insight to the people's livelihood, environmental problems and physical and socio-economic infrastructures that are found in the selected area. This would provide valuable contributions to understand the existing real situations and the overall situation of the poor and the extent to which they are exposed to environmental injustices.

Also local leaders and some famous elders were approached for interviews and discussion in areas where oxidation ponds, dump sites[5] and some polluting industries are located within residential areas in order to understand if the location of oxidation ponds and solid waste disposal sites are causing negative health impacts to surrounding settlements. The data collected were the historical background of the area, health problems and the intervention taken by the local government.

4.3. Data preparation and processing

The collected data from different sources was in a hard copy format and in soft copy formats. These data was converted to appropriate data format for processing and ultimately analysis. Data preparation was done by entering into Excel and SPSS[6] sheet immediately after field survey.

The socioeconomic data, environmental injustices data and spatial data collected from the field work was processed using Arc GIS and ILWIS Geo-software in light of literature reviews, research objectives and questions.

4.3.1. Selection of indicators for developing index of urban inequality

Wong (2006 pp. 105) mentioned four main steps for indicator development, these include conceptual consolidation, analytical structuring, identification of indicators and creation of index as indicated in figure 4-1 below. In this study indicators were developed based on this steps and availability and validity of collected data.

[5] The term 'dump site' implies an operational which solid waste are dumped onto land without proper control to protect the public health and environment

[6] Statistical package for social science

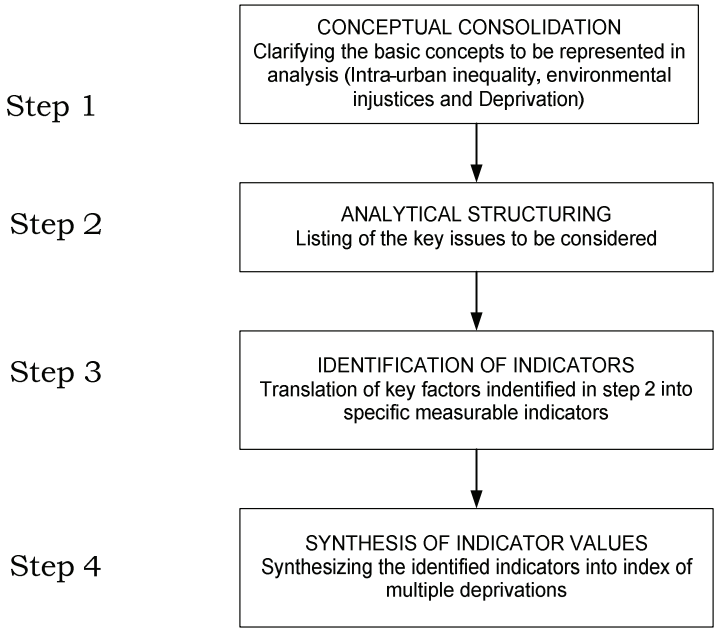


Figure 4-1: steps used for indicator and capital development (Adopted from Wong, 2006)

In order to develop an index of urban inequality, the study applied the concept of urban livelihood strategies as developed by (Rakodi and Tony, 2002; Rakodi, 2006), the concept comprised of five capitals that are influencing urban deprivation/vulnerability as indicated in figure 2-2 in the chapter 2. The study adopts the model; however only four capitals were considered in this study due to data availability; these include Physical, Social, Human and quality of living environment capitals.

Basing on the above steps, adopted urban livelihood strategies model and collected data in line with literature review on similar studies and official consultation during field work, the following indicators and capitals was selected for the purpose of this study to describe urban inequalities in Dar es salaam city as indicated in table 4-2 below, which then was aggregated and standardized using Spatial multi-criteria evaluation method.

Table 4-2: Capital and indicators used

Capital	Indicator	Data source
Access to Physical infrastructure services	Access to water tape within the Household	DAWASCO, Household Budget survey Municipal Profiles and City Alliance
	Access to electricity	TANESCO, Household Budget survey Municipal Profiles and City Alliance
	Access to sewerage system	DAWASCO, Household Budget survey Municipal Profiles and City Alliance
Quality of Living Environment	Housing condition	City Alliance
	Overcrowding (Population density and average person per house hold	Census Data, Municipal Profiles and City Alliance
	Unplanned area	Digital map, City Alliance
	Solid waste collection	City Council, Municipal Profiles and City

		Alliance
Access to Social Infrastructure Services	Accessibility to primary health facilities	Digital point data, Municipal Profiles
	Accessibility to market places	Digital point data, Municipal Profiles
Human resources capital	Income	City Alliance, REPOA, Municipal Councils
	Secondary education level	Household Budget survey (Census)
	Level of illiteracy rate	Household Budget survey (Census)

4.3.2. Spatial Multi Criteria Evaluation

The default option used to simplify an indicator set is to combine or aggregate individual indicators into a single multiple index using spatial multi-criteria evaluation method. The scores for chosen factors for each spatial unit can be assessed to see which exceed a threshold value on a set number of factors qualified.

The variables used to develop capitals as indicated in table 4-2 above, first have been standardized using the min-max method in ILWIS soft ware. Then the variables have been weighted by considering their relative importance using direct method indicating benefits and costs depending on the nature of input variable for example high value was indicated as benefit for access to water, sewer and electricity. However, high value in other hand was assigned as costs for unplanned and walking distance to health facilities.

Weighting of variables was based on population preferences derived from prioritized public services by household survey obtained during field work, expert consultation and literature review in similar study. Then the indicators were translated into the Index of Physical Infrastructure Deprivation (IPID), Index of Social Infrastructure Deprivation (ISID), Index of human capital (IHC) and Index of Quality of Living Environment Deprivation (IQLED). Finally the developed capitals were also weighted basing on their relative importance and translated into Index of Multiple Deprivation (IMD).

4.4. Method of data analysis

Data analysis provides sense and answers in relation to research objective and questions for the data collected during the field work. Indicators alone are idle information, which hardly convey any meaningful message for policy making. It's the analysis of indicators against the wider context and policy objectives that provides the added value of converting information into intelligence (Wong, 2006).

The research strategies employed simultaneously both qualitative and quantitative methods using spatial and social statistical packages such as Geo-Da and SPSS.

4.4.1. Spatial Statistical testing

This test has been applied to the developed indices to explore the phenomenon of spatial clustering. This measure investigates whether a variable is correlated with itself. Subjects that are close to each other are more likely to have values similar to each other as compared to pairs of subjects that are far apart (Anselin, 1996; Anselin, 2002). Cluster analysis technique was also applied to classify areas under study into relative homogeneous groups using Geo-Da statistical package. The characteristics of each cluster are identified from

descriptive statistics of each variable. This analysis provides information for identifying the target area for a particular policy decision (Most affected by the variable being measured) as explained in (Wong, 2006 pp. 87).

This test can reveal different spatial patterns in the data. Spatial autocorrelation that is more positive than expected from random indicates the clustering of similar values across geo-space, while negative spatial autocorrelation indicates that neighbouring values are more dissimilar than expected by chance (Anselin, 1996; Anselin, 2002). In negative correlation patterns, subjects appear to repulse each other. Therefore the absence of autocorrelation implies that data are independent.

4.4.2. Simple linear Regression analysis

Also statistical testing such as regression was applied to test the correlation between developed indices to test the strength of their relationship and how it contributes to overall deprivation. Wong (2006 pp. 86) described regression analysis as statistical model used to provide a convenient summary of the importance of various indicators (Independent variables) according to their strengths in explaining the variation of the single all important measure (Dependent variable).

Simple linear regression was done between Index of Physical deprivation and Index of Quality of Living environments, then Index of Social deprivation and Quality of living environment deprivation. Then, finally was done between individual capitals with overall index of multiple deprivations.

Data processing and analysis of environmental injustices variables was done by applying spatial proximity measure (GIS Buffering) to determine population that lives within a set distance of the site and then over-layed with Index of Multiple Deprivation to determine the hot spot areas.

4.5. Reliability and Validity of data

Validity is the degree to which the outcome reflects what it intends to measure, while reliability refers to the consistency and accuracy of a research finding. In this kind of research one of the difficult tasks is achieving valid and reliable results.

There were some factors in this study that can affect the validity and reliability of the intended output.

One of the problems was the variation of data value and units of measurements from different sources. Some data were obtained in percentage, some in numeric and other in qualitative measure.

Also it was difficult to secure data that are aggregated at ward level some variables such as employment and expenditure due to lack of data base systems.

Precaution measures were taken in order to maintain and ensure the reliability and validity of the outcome of this study. These are:

Multiple sources of information in order to cross check the reliability and accuracy. Field visit and discussion with local people gives the insights of the reliability of documented data and the reality. Combining both qualitative and quantitative methods in data analysis increases the strength of the drawing conclusion.

5. PROCESS OF INDICATORS AND INDEX DEVELOPMENT

5.1. Introduction

This chapter analyses the indicators[7] and type of capitals valid for describing intra-urban inequalities. It starts with the methodological procedures on how to develop indicators, processing indicators within GIS environment using SMCE and performing sensitivity analysis. The chapter present results of developed indices such as index of physical infrastructure capital, quality of living environment capital, human capital and Social infrastructure capital and the overall index of multiple deprivations. Finally statistical analysis was carried out to analyse the spatial patterns of indicators.

5.2. Indicators and type of capitals valid for describing intra-urban inequalities

Suggestions were made during discussion and consultation with different experts in Municipal council, City Alliance and in Research on Poverty Alleviation as to how particular aspects of deprivation might be measured. Some of the suggested indicators included unemployment counts, poor access to services such as (water, sanitation, electricity, health, education, markets), level of solid waste management, overcrowding, informal settlements, housing condition, assets, educational level, illiteracy rate and income level.

In order to obtain the strength of indicator development for the measures of multiple deprivations, (Wong, 2006) provide four methodological process of indicator development as described in chapter four, these include;

1. Conceptual consolidation by clarifying the basic concepts to be represented in relation to which indicators will be used
2. Analytical structuring which sets out the structure and requirement upon which key components or capitals of the indicators are to be developed and assessed
3. Identification of indicators which involves a laborious search for wide range of possible indicators to measure the capitals identified in the analytical framework and
4. Creation of index of multiple deprivations which involves synthesising the developed indicators according to their relative importance into a single measure that will be used to identify hotspot and for policy targeting.

In order to fulfil the above four steps the concept of livelihood strategies by Rakodi (2002) on urban deprivation was adopted and modified as indicated in figure 5-1 below

[7] Aggregates of raw and processed data derived from a series of observed facts used to quantify and simplifies phenomena to understand complex realities.

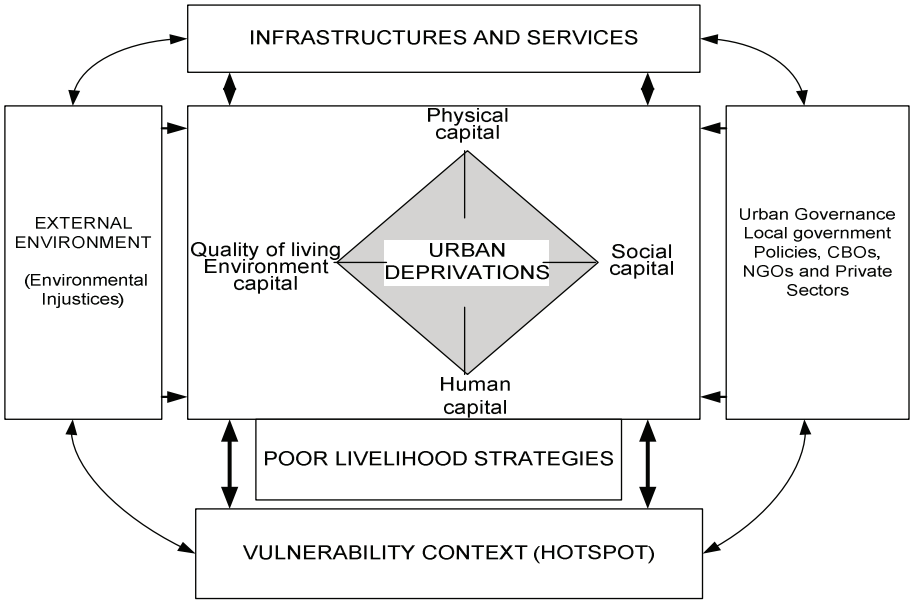


Figure 5-1: Modified livelihood strategies concept from Rakodi, 2002

The concept of livelihood strategies above is influenced by factors that cause their vulnerability and police institutions and processes. Vulnerability is defined by (Rakodi and Tony, 2002) as "*the insecurity of the well-being of individuals, households or communities in the face of changing environment. Environmental changes threatening welfare economically, socially or politically"*. With these changes often come increasing risk and uncertainty and declining self respect. The key feature of deprivation is the high degree of exposure and susceptibility to risks, stress and shocks with little capacity to recover quickly from them.

The concept above was then, linked with the conceptualisation of multiple deprivations outlined in chapter 2 that the measures of intra- urban inequalities should comprise several indicators which have to be combined to form index of multiple deprivations.

Therefore, four types of capital deprivation were used in describing intra-urban inequalities; these include Physical infrastructure capital, Quality of living Environment capital, Human capital and Social infrastructure capital as indicated in above conceptual model. The capitals chosen were validated on the basis of discussion made with officials and data collected during field work surveys carried out within Dar es Salaam city. Each capital comprises several indicators selected from the data collected as shown in table 5-1 below:

Table 5-1: Indicators and capitals used

Capital	Indicators	Criteria
Access to Physical Infrastructure Services	Percentage of household with direct access to water tape	Higher percentage is better
	Percentage of household connected to Electricity at ward level	Higher percentage is better
	Percentage of household with direct access to Sewerage system at ward level	Higher percentage is better
	Housing condition (Houses built using blocks and iron sheet)	Higher percentage is better

Good Quality of Living Environment	Overcrowding (Population density and average person per house hold	Lower percentage is better
	Total area covered by unplanned settlements in each ward	Lower percentage is better
	Percentage of solid waste collection in each ward	Higher percentage is better
Access to Social Infrastructure Services	Average walking distance to primary health facilities	Lower distance is better
	Average walking distance to market places	Lower distance is better
Human Resources	Average income in each ward	Higher percentage is better
	Level of illiteracy rate	Lower percentage is better
	Secondary education level	Higher percentage is better

Source: Census report, City Alliance, Municipal Profiles and Fieldwork, 2008

5.2.1. Physical infrastructure capital

Physical infrastructure capital is defined by (Rakodi and Tony, 2002; Rakodi, 2006) as "*the basic infrastructure (transport, shelter, water, energy, communications) and the production equipment which people need to pursue their livelihoods"*. Under this study physical capital is comprised of only three indicators, such as access to water, sewerage system and electricity.

This indicator is more crucial to be included because inadequate provision of public infrastructure (piped water, sanitation, electricity and drainage) increases health burdens and cost of living among the poor people, hence inequalities. According to household budget survey of 2000/2001, only 59% of the total population had electricity, 43% had water supply, 90% had acceptable pit latrines but only 5% had connected to sewerage system.

5.2.2. Quality of living environment Capital

The study on the quality of living environment[8] in the cities of both developing and developed countries is gaining interest from a variety of disciplines such as planning, geography, sociology, economics, psychology, political science, behavioural medicine, marketing and management (Li and Weng, 2007 in Andrew, 1999 and Foo, 2001), and is becoming an important tool for policy evaluation, rating of places, urban planning and management. Quality of life is the degree of well-being felt by an individual or group of people determined by quality of living environment.

A poor physical environment has a direct impact on quality of life. It can be seen as a deprivation as financial resources which is a major determinant of an individual's ability to secure housing in areas with a reasonable quality. Some aspects of the physical environment may also contribute to poor health outcomes of people who live in the area. Quality of living environment is defined by (Lim *et al.*, 1999; Phillips, 2006) as "*an individual perception of their position in life in the context of culture and value system in which they live in relation to their goals, expectation, physical health, social interaction and environmental*

[8] The physical factors of the surroundings of human beings including the land, water, atmosphere, climate, odours and the social factors of the aesthetics

perspectives (pollution, access to scenic areas), housing quality, cost of living (cost of owner-occupied and private rented housing), population density and agglomeration of population in specific areas".

The quality of living environments capital is comprised by six indicators such as level of solid waste collection reflecting visual quality of the environment, housing condition, area covered by informal settlements which normally lacks access roads and storm water drainage channels, population density and average person per households as indicator of overcrowding.

5.2.3. Social infrastructure capital

Social capital has been defined by (Rakodi and Tony, 2002; Rakodi, 2006) as "*social resources (networks, membership of groups, relations of trust and reciprocity, access to wider institutions of society)"*. Also (Harriss, 2001; Harriss, 2001) discussed the distinctions in social capital made between 'bonding social capital' reflected within homogeneous communities, bridging social capital between different communities and linking social capital, between different social status and power. Social infrastructure capital helps the households to survive from shocks and stress and provides networks to support inward enterprises development.

The main purpose of this capital is to measure the extent to which people have poor geographical accesses to certain key services such as health facilities, education facilities and market places and to measure the spatial distribution of social services within Dar es Salaam city. This domain is designed to capture the effects of living in area with poor access to social services. Poor access may have a number of impacts including higher costs in travelling to use services or less frequent usage, and both may be considered as direct deprivations.

Two types of indicators used to develop social capital; average distance to health facilities and average distance to market place. The data used to extract the distances in each ward was the digital point data provided by City Alliance and Municipal Councils, showing the distribution of clinics and markets within the city.

Most households are reasonably close to primary school and health-care facilities. Over 78% of the total households in Dar es Salaam have access to primary health facilities within five kilometres. This suggests that, distance is not a large impediment to primary schools and health facilities for most households within the city (NBS, 2002; REPOA, 2007).

5.2.4. Human capital

Human capital is defined by (Moser, 1998 pp. 4) as the "*health situation, which determines people's capacity to work, and skills and education determining the returns to their work"* and by (Rakodi and Tony, 2002) as *"labour resources available to households*". The census does not provide data on the health situation within households, which limits the possibilities of including it. Therefore, under this capital it's mainly focused on the household's secondary education level and average income as main indicator of determining household's capacity and labour capital using the number of illiterate people within the ward as reflected in the percentage of people excluded from education at any level (illiteracy).

5.3. Combining capitals into index of multiple inequalities

In the conceptual model presented in chapter two, the developed capitals are conceived as independent dimensions of multiple inequalities, each with their own additive impact on intra-urban inequalities and deprivation. Spatial Multi-Criteria Evaluation (SMCE) technique is the method used to combine indicators into capital indices and translating indices into index[9] of multiple inequalities.

The main aim of measuring inequalities is to provide a broad picture of relative levels of needs and difference between areas or social groups that might be used to guide the allocation of resources or to monitor change over time. Alternatively, measures might emphasise depth of coverage and better understanding of the factors causing deprivation to guide policy design.

5.4. Processing the indicators and capitals within GIS

To apply the conceptual multi-criteria model at wards level using ILWIS (Academic 3.3), indicator values characterising the four capitals were derived from several census data, Official interviews and from Government official documents at the ward level and were matched to the digitised shape file boundaries of the wards using Arc GIS. Within the Arc GIS, an attribute map was created for each indicator showing its spatial distribution across the wards. Then the map was exported as shape file to ILWIS via ARC View/SHP files and finally was converted to raster maps which are readable in ILWIS- Spatial Multi criteria Evaluation under raster operation.

5.4.1. Spatial Multi Criteria Evaluation (SMCE)

Having obtained a set of capitals and indicators such as access to water, electricity, sewerage system, distance to health facilities and market places, housing condition, level of solid waste collection, area covered by unplanned settlements, population density, average income, illiteracy rate, education level and average number of persons in each ward, which needed to be combined into an overall index of multiple deprivations measure. First, the indicators were standardized and weighted based on their relative importance and translated into index of intra- urban inequalities deprivation using Spatial Multi- Criteria Evaluation (SMCE) in ILWIS Geo-soft ware.

Spatial multi-criteria evaluation analysis is defined by (Sharifi and Retsios, 2003) as *"Process that combines and transforms geographical data (the input) into a decision (the output). This process consists of procedures that involve the utilization of geographical data, the decision maker's preferences and the manipulation of the data and preferences according to specified decision rules".*

SMCE allows assessment of multiple criteria of several options/alternatives in order to help understanding their impacts, pros and cons, their related trade-offs and the overall attractiveness of each option.

[9] A number or value derived from set of data used to compare variables with one another

5.4.1.1. Criteria used in SMCE

The index of multiple deprivations preferably constructed on the bases of the following spatial factors:

1. High percentage of household with direct access to water taps is better
2. High percentage of household connected to electricity is better
3. High percentage of household connected to sewerage system is better
4. High percentage of good housing condition is beneficial
5. Low average number of population density is better for quality of living environment
6. Low area covered by informal settlements in each ward is better for improvement of accessibility and provision of physical infrastructures such as roads, storm water drainage system and open spaces
7. High percentage of solid waste collection per ward is better for good quality of living environment
8. Short average walking distance to health facilities is better for improved accessibility
9. High average income earners per ward is beneficial for high capability of household to access and afford basic needs
10. Low percentage level of illiteracy rate per ward is better for determining high rate of working class
11. High percentage level of secondary education is better for determining good quality of jobs and low level of unemployment rate.

The data supporting the above criteria were converted to maps by joining with ward boundary shape file and was then rasterized to be used as spatial factors input geo data. The spatial factors are non-binding and are considered as preferred situations that can compensate each other

Figure 5-1 below indicates the evaluation tree used to develop index of multiple urban inequalities

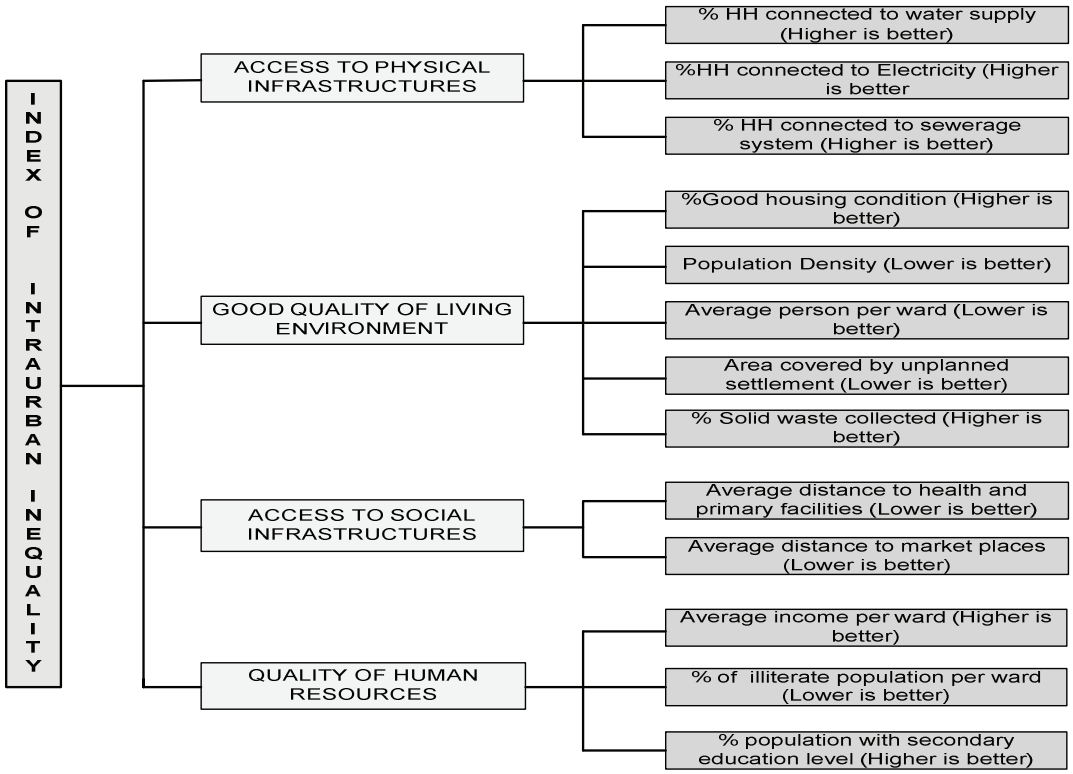


Figure 5-2: SMCE tree used; Adopted from Baud, 2008 and modified by author

In this process multidimensional geographical data and information can be aggregated into one-dimensional values for the alternatives. Figure 5-3 below indicates the process involved in developing index of multiple urban inequalities.

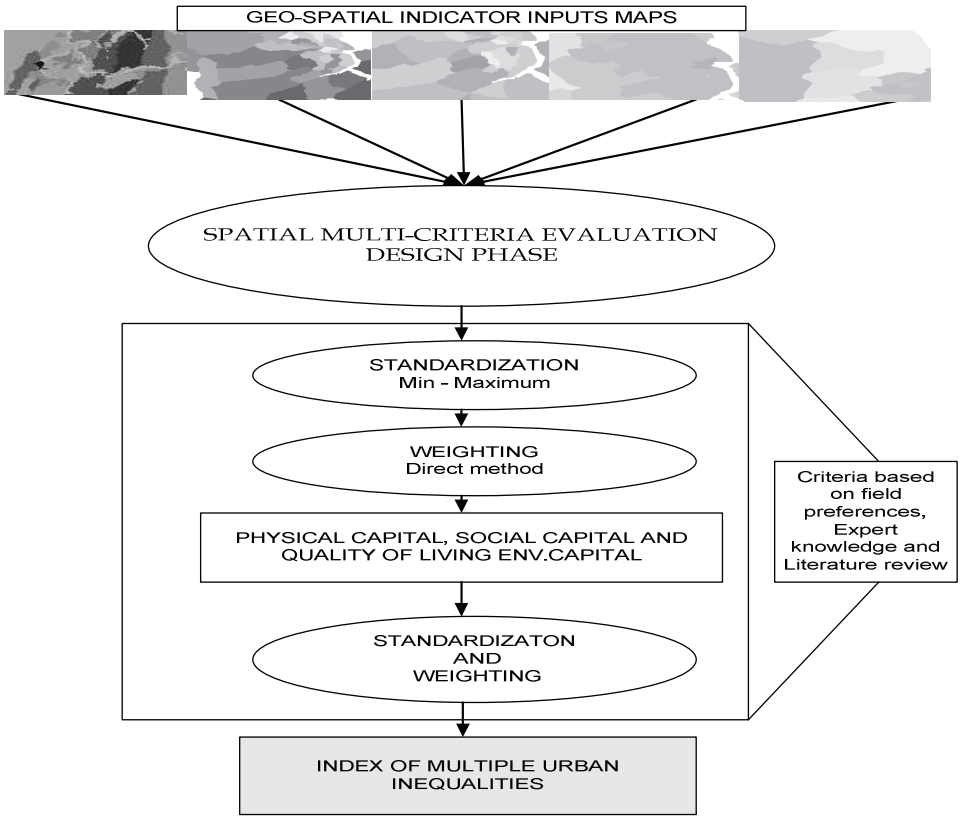


Figure 5-3: Spatial Multi-criteria Evaluation steps; Adopted from (Sharifi and Retsios, 2003)

5.4.1.2. Standardization

The values in the different indicator input maps mostly have different meanings, and are expressed in different units of measurement (e.g. distance maps, population, area costs, percentages etc). In order to compare criteria with each other, all values has to be standardized, i.e. transformed to the same unit of measurement (from 0 to 1 using minimum - maximum standardization) and by specifying higher as benefit and higher as cost depending on the capital type of an input variable (Sharifi and Retsios, 2003).

5.4.1.3. Weighting of Capitals

Weighting always takes place when elements need to be combined together. Analyzing urban deprivation as a multidimensional concept subsequently raises the question of how to measure overall deprivation and how to weigh the different indicators. Indicators were weighted in order to indicate their relative importance with respect to the sub goal (Capitals) using direct method. Similarly, capitals were also weighted in order to indicate their relative importance, with respect to the main goal (Intra-urban inequalities/deprivation). Weights are always numbers between 0 and 1 and weights cannot be negative. For the factors within a group; the sum of the weights of the factors equals 1 (Sharifi and Retsios, 2003).

Several solutions to the aggregation problem have been proposed, but all have been unsatisfactory on one or more accounts due to some weaknesses. For example a composite index, such as the Human Development Index of the UNDP (in De Kruijk and Rutten, 2007) was developed by assigning equal weights to each dimension. These, do not bear any correspondence with population preferences and the realities of the region under study (De Kruijk and Rutten, 2007). On the other hand, Principal Components Analysis (PCA) allows the available data to determine the relevant dimensions and optimal weights associated with each dimension, rather than making a priori assumptions. Nevertheless, these approaches have drawbacks as well, because obtained weights are very rigid and may not necessarily be appropriate for the region concerned (De Kruijk and Rutten, 2007). Weights should ideally reflect the relative importance of each of the dimensions.
There fore in order to overcome these challenges this study developed index of multiple deprivation by assigning different weights to indicators of intra-urban inequalities using population preferences, where such preferences were derived from priority rankings of services from household survey respondents which was done by Ministry of Lands Housing and Human Settlements Development from 2004 – 2006 as shown in table 5-2 below and were supported by expert consultation and the wider available academic literature.

Table 5-2: Prioritized of public services in Dar es Salaam city

	Ilala			Kinondoni			Temeke		
Indicator	Percent	Total respondent	Ranked order	Percent	Total respondent	Ranked order	Percent	Total respondent	Ranked order
Water	33	22890	1	31	25678	1	34	23457	1
Solid waste and environmental management	21	13227	2	20	15032	2	24	16110	2
Roads (Informal settlement)	18	11245	3	20	14097	3	22	14747	3
Sewerage system	14	8573	4	15	10716	4	8	5432	5
Storm water drainage system	10	5942	5	9	6798	5	10	6023	4
Health and education facilities	4	2109	6	5	3467	6	2	1310	6
Total	100	63986		100	75788		100	67079	

Source: Ministry of Lands and Dar es salaam City Alliance, 2007

The criteria for selecting a set of weights for the standardised domains are as follows:

- The importance of their contribution to an overall concept of deprivation within the city basing on population preferences given during fieldwork.
- Robustness/ strength of the indicators comprising the capital.

The physical and quality of living environment capital were regarded as the most important contributors to the concept of urban inequalities and the indicators comprising the capitals were very robust. Hence it was decided that they should carry more weight than the social and human capital. Based on these criteria the following weights have been used (weights must total 100%):

Table 5-3: Weighting of indicators and capitals

Capital	Weights %	Indicator	Weights (%)	Remarks
Physical capital	30	Access to water	40	Higher is better
		Access to Sewerage system	40	Higher is better
		Access to Electricity	20	Higher is better
Quality of living Environment	30	Solid waste collection	30	High is better
		Unplanned settlements	30	Low area is better
		Housing condition	10	High is benefit
		Population density	20	Low density is better
		Average person per household	10	Low number is better
Social capital	20	Average distance to health facilities	50	Short distance is better
		Average distance to market	50	Short distance is better
Human capital	20	Average income	30	High income is better
		Secondary education level	30	High level is better
		Percentage of illiteracy rate	40	Low is better

5.4.1.4. Sensitivity analysis

Sensitivity analysis is a measure of the impacts on outcomes by changing one or more key input values about which there is uncertainty. It can be performed on different combinations of input values which are altered at once and then a measure of mathematical model can be computed (Pascual *et al.*, 2003)

In this study, sensitivity analysis is based on indicators used to develop index of multiple deprivations. Sensitivity is performed as a series of tests in which weighting value of capitals were changed to see how a change in the weighting values causes a change in the overall index of multiple deprivation. This was done using Geo-Visual software as indicated in figure 5-4 below.

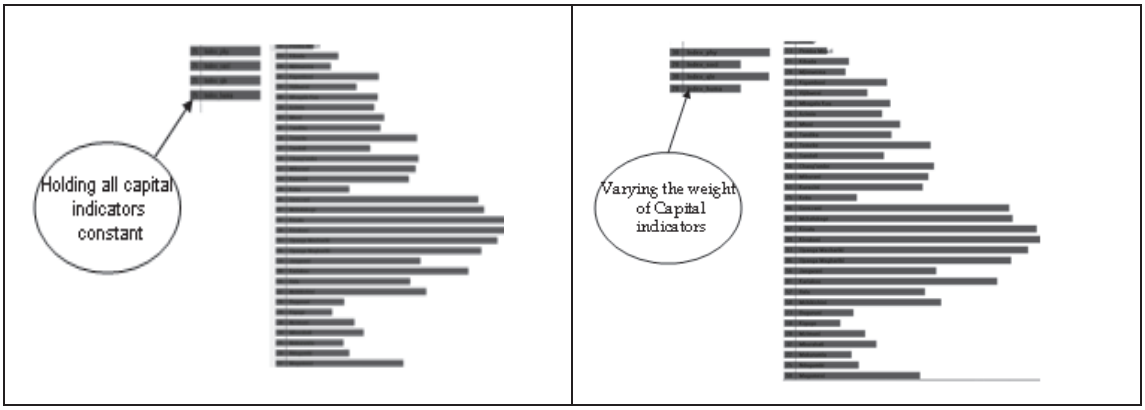


Figure 5-4: Sensitivity analysis output from Geo-Visual

The result after assigning indicators equal weights without considering their relative importance, high scores indicating low deprivation was obtained to wards which are found in city centre and low scores to wards which are immediately surround city centre as indicated in figure 5-4 above. Meanwhile after varying the weights of indicators basing on their relative importance high scores were obtained to the same wards, although the scores were bit higher, this indicates that assigning weights according to relative importance of variables is more subjective, while equals weights reflecting less subjectivity of indicators. Cullen and Frey (1999) suggest that a high correlation between an input and an output variable indicate the substantial dependence of the variation in output and the variation of the input (Cullen and H.C. Frey, 1999).

A simple visual assessment of the influence of an input on the output is therefore possible using scatter plots as indicated in figure 5-5 below.

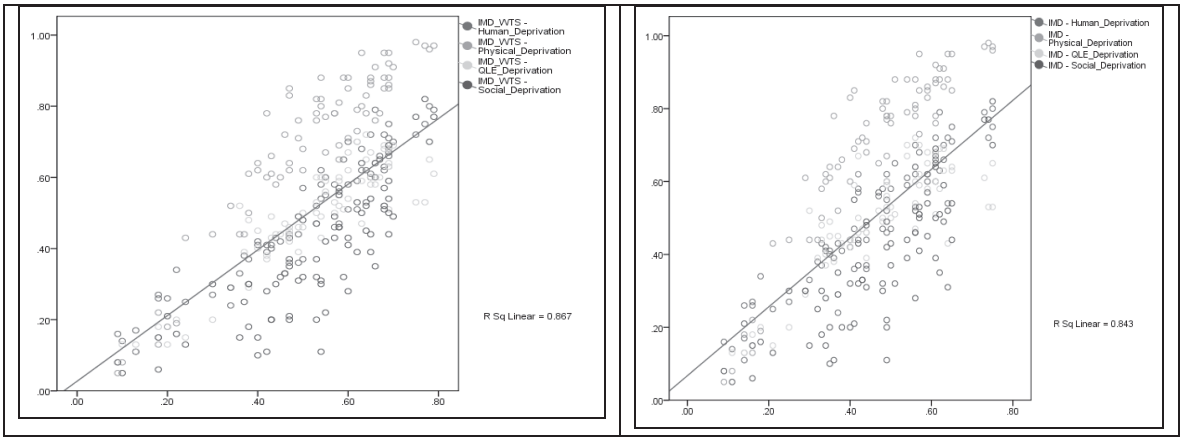


Figure 5-5: Correlation of inputs and output after varying the weights of capital indicators

From the above figure 5-5; high correlation (R^2 = 87%) between the input variable (Physical, quality of living environment, human and social capitals) and the output variable index of multiple deprivation (by varying the weights of all input variable), is an indication of the possible effect of area's variation on the output, However, after holding equal weights to all input variables the correlation (R^2 = 84%) was obtained, this indicates no substantial differences. The study adapted the first alternative of assigning indicators different weights as it shows strong correlation compared to the second alternative.

5.5. Presentation of results and analysis

The output maps generated is the result of the weighted and standardized formula's as specified in criteria tree and aggregated at ward level. The output maps have the index value ranging between 0 and 1, wards with values near 0 are regarded as less deprived and wards with value near to 1 are regarded as most deprived.

5.5.1. Index of quality of living environment

The analysis of the quality of living environment conditions in Dar es salaam city indicates a spatial patterning of inequality with a concentration of public services needs in certain wards. The index of quality of living environment indicates how big the inequality in quality of environment is within the city; minimum value of index is 0. 08 (better off wards) and maximum is 0.81 (highly deprived wards) See figure 5-6 below.

Low deprivation in quality of living environment in terms of housing condition, overcrowding (population density), level of solid waste collection, informal settlements is found in City centre and in prime wards such as Kivukoni (0.08), Kisutu (0.13), Mchafukoge (0.12) Upanga (0.13) and Mikocheni (0.15), where most of the public and social basic needs are found.

High deprived wards in quality of living environment is found in wards adjacent to city centre such as Makurumla (0.72), Keko (0.70), Kigogo (0.69), Tandale (0.67), Buguruni (0.65), Vingunguti (0.68), Manzese (0.68), Kiwalani (0.67) as indicated in figure 5-6 below. Large area of these wards is unplanned and is where majority of poor people are living in order to reduce cost of transport to their livelihood areas (city centre).

Meanwhile, highly deprived wards also found outside the city centre, for example Kisarawe II, Chanika, Mbweni, Msongola, Pemba Mnazi, Toangoma and Mbweni, because these are still rural wards, hence the housing condition and accessibility to basic public services is also poor. Basing on the average value as indicated in figure 5-6 below, total area of the city which is highly deprived above average (0.48) covers about 13135 ha which is equivalent to 91% of the total area. This reflects that most of the wards are characterized by poor quality of living environment such as poor solid and liquid waste management.

Index value		Area (m2)
Min	0.08	409216
Max	0.72	223886048
Avg	0.48	34386011
StD	0.17	50564505
Sum	24.52	1444212480

Total area above average (0.48) = 1313540544 square metre

Area covered by ward above average = 90%

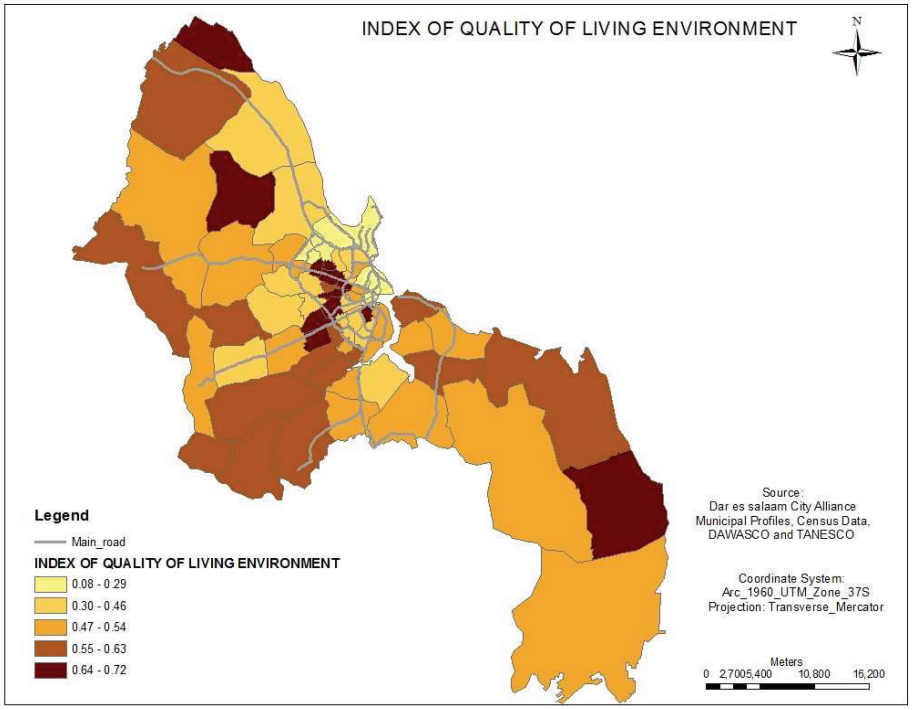


Figure 5-6: Map showing index of quality of living environment deprivation

Note: Low value of index indicates low deprivation and highest value of index indicates high deprivation

5.5.2. Index of Physical infrastructure deprivation

The previous subsection described the pattern of inequality in the quality of living environment in Dar es Salaam city. The concern in this part is to find whether the distribution and access to physical infrastructure services such as water, electricity and sewerage system is also influenced by quality of living environment.

The index reflects the overall differences between wards within Dar es Salaam city in the access to physical infrastructure services such as water, electricity and sewerage system. This represents the capacity of the household to fulfil one of the human basic needs, which is also closely related to health conditions.

Figure 5-8 below indicates the summary of the index; the minimum is 0.05 for better off wards and maximum being 0.98 for worst areas and average value being 0.70. This indicates that in Dar es Salaam city most of the households have poor access to physical infrastructure services.

High deprivation is seen in wards outside the city centre, the most being Pemba-Mnazi (0.98), Somangira (0.97) and Chanika (0.97). Meanwhile, high physical deprivation is found to wards which are adjacent to city centre such as Kiwalani (0.92), Vingunguti (0.91), Tandale (0.88), Kigogo (0.88), Manzese (0.85), Segerea (0.85), Yombo-vituka (0.85) and Buguruni (0.83) as indicated in figure 5-8 below). High deprived areas in terms of accessibility to physical infrastructure services are found in informal settlements areas, as these areas are characterized by unguided housing densification and spatial disorderliness

that inhibit provision of basic services. Increasing housing density has resulted into poor sanitation, solid waste disposal and collection that account to high inequalities between planned and unplanned areas.

Lupala (2002.) found that informal settlements in Dar es Salaam covers about 75%.With regard to pixel value generated during data processing, the area covered by wards above the average value (0.70) was 13227.5Ha and the total area of the city is 14442Ha as indicated in figure 5-8 below, this data shows that about 92% of the total area is above the average value, this represents that large area of the city do not have physical infrastructure services especially water and sewerage services.

Household Budget survey 2000/2001, indicates high inequalities in physical infrastructure services within the city as indicated in figure 5-7 below, overall within the city only 59% of the total population had electricity, 43% had water supply, only 5% had connected to sewerage system (90% depends on pit latrine which are always overflowing during rain season due to high level of water table).

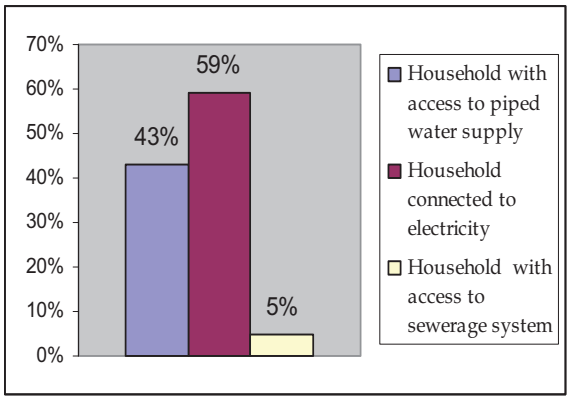


Figure 5-7: Physical capital inequalities (Household Budget Survey, 20002)

Index value		Area (m2)
Min	0.05	409216
Max	0.98	208466144
Avg	0.70	33586337
StD	0.27	52727003
Sum		1444212480

Total area covered by wards above average (0.70) = 1322745712

Area covered by wards above average = 92%

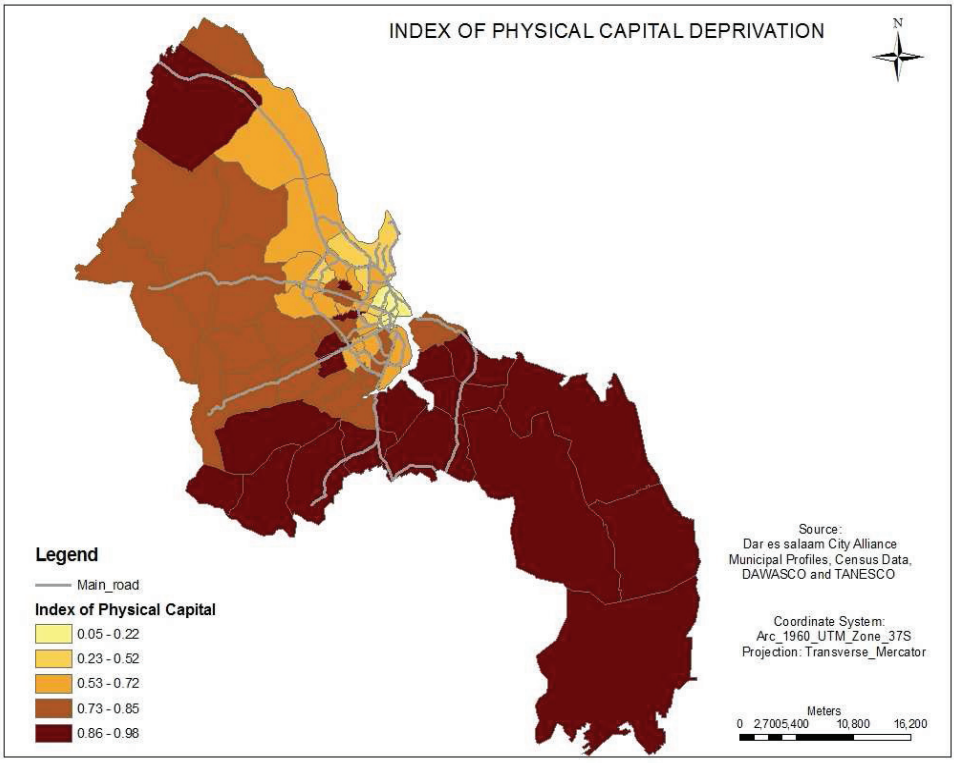


Figure 5-8: Map showing index of physical infrastructure capital deprivation

Note: Low value of index indicates low deprivation and highest value of index indicates high deprivation

There is high correlation (R^2 = 70%) (See figure 5-9 below) between index of quality of living environment and index of physical capital as most of the wards which are deprived by index of quality of living environment are also deprived by physical infrastructure services. This is true because wards with poor housing condition, high informal settlements area are also characterized by poor access to water and sewerage system.

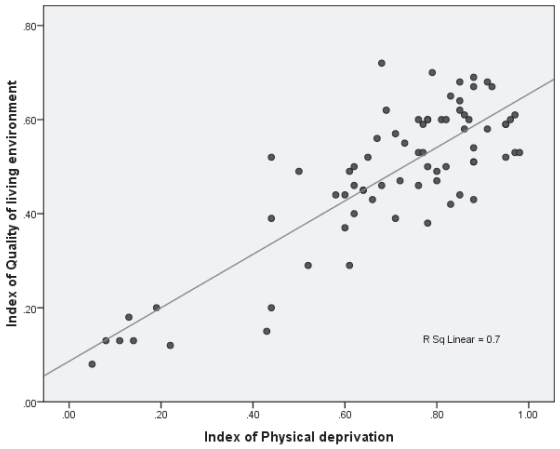


Figure 5-9: Correlation between index of physical and quality of living Environment

5.5.3. Index of social capital deprivation

In previous subsections described the spatial distribution pattern of indicators for quality of living environment and physical infrastructure. The question in this part is to check, whether there is correlation between previous indices and the geographical accessibility of social infrastructure services such as health centre and market places.

This part is crucial because, majority of the population in Dar es salaam city do not have private transport, so then the actual distance from the primary social facilities is particularly critical.

The results indicate that most of the social services are concentrated in city centre, and the overall average is 0.33, minimum being 0.05 for less deprived wards and maximum being 0.82 for highly deprived wards. The average of 0.33 indicates that most of the household are within a reasonable walking distance; however there is uneven distribution of services. The research done by (NBS, 2002; REPOA, 2007) shows that over 78% of the total households in Dar es salaam have access to primary health facilities within reasonable walking distance.

The distribution of social infrastructure that is administered locally seems to compensate for inequalities and favour the most disadvantaged areas. This is due to fact that most of the health care centres and some schools are provided by private sectors and concentrated in city centre and in high population area. The worst-off wards are found outside the city especially in Temeke Municipal Council, for example Toangoma (0.82), Pemba Mnazi (0.77), Somangira (0.77) and Kimbiji (0.70). This is due to fact that this wards are found in remote area (rural areas), where most of social services are provided by Government. However the geographical location and size of ward contributes to high variation (See figure 5-10 below).

Index value		Area (m2)
Min	0.05	2363328
Max	0.82	274838224
Avg	0.33	46587499
StD	0.22	53821500
Sum		1444212480
Total area above average = 1135353104		
Area covered by ward above average = 70%		

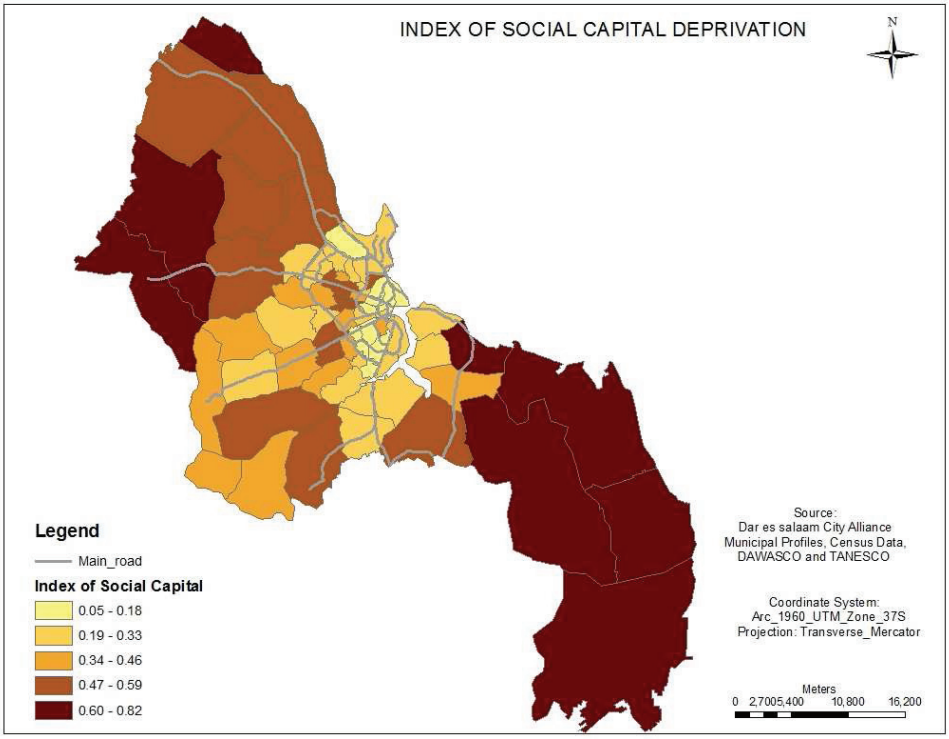


Figure 5-10: Map showing index of social infrastructure capital deprivation

Note: Low value of index indicates low deprivation and highest value of index indicates high level of deprivation

The above map indicates that there is positive correlation between qualities of living environment, physical and social capital deprivation as reflected in wards which are found about 3 km from the city centre such as Kigogo, Buguruni, Keko, Vingunguti, Manzese and Tandale. Meanwhile, wards which are found outside the city centre are also highly deprived in both capitals as described in previously subsections.

5.5.4. Index of human capital deprivation

This index reflects the differences between the capacity of the household to access physical infrastructure services such as water, electricity and sewerage system and to afford to live in good housing condition which represents the capacity of the household to fulfil one the human basic needs.

Figure 5-11 below, contains the table which indicates the summary of the index value; the minimum is 0.14 and maximum being 0.80 and average value being 0.50. A minimum value represents less deprived wards in terms of income and illiteracy level. Well of wards are found in city centre to wards such as Kisutu (0.14), Kivukoni (0.16) and Upanga East (0.17).

High deprivation is seen in wards outside the city centre, the most being Kimbiji (0.80), Kibada (0.79), Somangira (0.79), Kisarawe (0.75) and the wards which are adjacent to city centre such as Kiwalani (0.67), Vingunguti (0.70), Manzese (0.62), and Tandale (0.61) as reflected in figure 5-11 below.

Highly deprived areas are found in informal settlements as this area are characterized by poor housing condition, high unemployment rate, low income and high illiteracy rate. Some of the

informal settlements are located in environmentally hazardous areas including flood prone areas and steep slopes (Lerise et al., 2004), because majority in these areas can not afford to access serviced land for housing development. Total area covered by the index above the average (0.50) is 71%, this reflects that most of the household in Dar es salaam are low income groups living in poor quality of living environment due to weak sources of income and livelihoods as general.

Index value		Area (m^2)
Min	0.14	409216
Max	0.80	204171680
Avg	0.50	30727925
StD	0.20	47608193
Total area above average = 1030510432		
Area covered by ward above average = 71%		

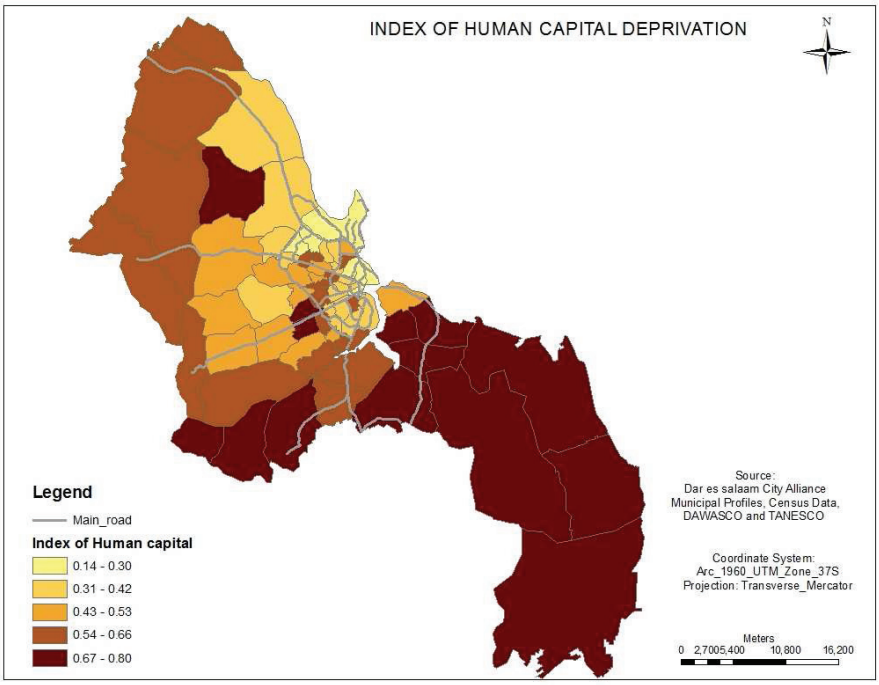


Figure 5-11: Map showing index of human capital deprivation.

Note: Low value of index indicates low deprivation and highest value of index indicates high level of deprivation

There is high correlation (R^2 = 72%) between index of human capital and physical capital, as most of the wards which are deprived by index of human capital are also deprived by physical infrastructure services. Also, there is high correlation (R^2 = 64%) between index of human and quality of living environment. This is true because most of low income people are living in informal settlements with poor housing conditions as shown in figure 5-12 below. This area is also characterized by poor access to water and sewerage system.

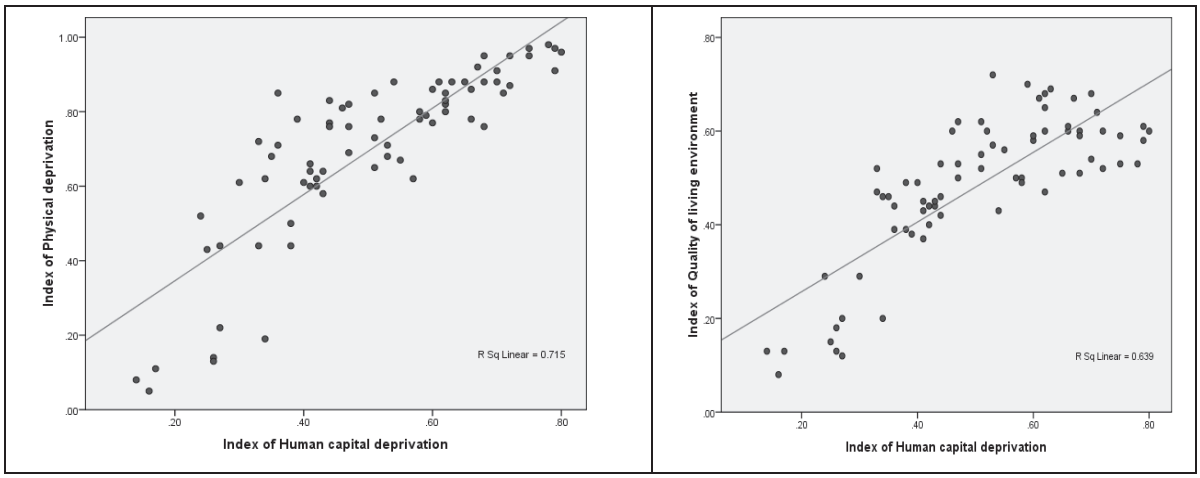


Figure 5-12: Correlation between human and physical and quality of living environment deprivations

5.5.5. Statistical testing of the predictors of indicators

The influence of the selected factors or variable on the levels of deprivation in each capital was assessed using ordinary least square (OLS) regression in which each capital deprivation index was defined as dependent variables and constituting variables as explanatory variables (Predictors). The summary of output for the OLS estimates is given in table 5-4 below

Table 5-4: Statistical testing of the predictors of capitals

Model	Predictors	Coefficients	P-value	R^2	Standard error of estimate
Index of Physical infrastructure deprivation	Constant • %HH connected to water supply • %HH connected to Sewerage system • %HH connected to electricity	0.045 0.004 0.006 0.001	 0.000 0.000 0.020	0.97	0.04030
Index of Social infrastructure deprivation	Constant • Average distance to health facilities • Average distance to market place	0.966 -0.078 -0.024	 0.000 0.000	0.91	0.06040
Index of Quality of living environment deprivation	Constant • % of solid waste collected • % of unplanned areas • % of good housing condition • Population density • Average person per household	0.246 0.005 -0.002 0.004 0.001 -0.008	 0.000 0.000 0.000 0.000 0.456	0.94	0.04768
Index of Human capital deprivation	Constant • Average income • % of Secondary education • % of illiteracy	0.299 $1.122\ 10^{-6}$ 0.007 -0.004	 0.000 0.000 0.008	0.82	0.07290

From the above table 5-4, the regression model for each capital is statistically significant since probability of all predictors is significant at p-value less than 5% significance level. This means that at least each of the variables contribute to respective capital indicator. The adjusted coefficient of determination (R^2) of OLS which measures the amount of variability to the extent to which the predicted output match the observed values is found to be (R^2= 97%) and standard error of estimate of 0.04 for index of physical capital, R^2 = 91% and standard error of estimate of 0.06 for index of social capital, R^2 = 94% and standard error of

estimate of 0.05 for index of quality of living environment and R^2 = 82% and standard error of estimate of 0.07 for index of human capital which is much higher for all predicated index and thus indicating good model fitting.

5.5.6. Pearson's correlation coefficient (r) of developed indices

Pearson's correlation coefficient (r) is a common measure of the strength of the association between the two variables. The correlation between two variables reflects the degree to which the variables are related.

A correlation is a number between -1 and +1 that measures the degree of association between two variables (call them X and Y). A positive value for the correlation implies a positive association (large values of X tend to be associated with large values of Y and small values of X tend to be associated with small values of Y).

Table 5-5 below indicates Pearson Correlation Coefficient (r) of the developed four indices, the result indicates that the strength of association between the capitals is very high with (r = 0.68, r = 0.59, r =0.84, r = 0.71, r = 0.85 and r = 0.80), and the correlation coefficient is very highly significantly at (P < 0.01). This strong association is also reflected in previously subsection, that most of the wards in city centre are less deprived in both indicators, while wards which are outside the city centre, found to be very deprived in both indicators. However in wards which are between peri-urban and city centre some are deprived in both indicators and others are only deprived in one capital and well off in other capitals.

Table 5-5: Pearson's Correlation between four capitals

	Index of Social deprivation	Index of Physical deprivation	Index of quality of living environment	Index of Human deprivation
Index of Social deprivation	1			
	73			
Index of Physical deprivation	0.675**	1		
	0			
	73	73		
Index of quality of living environment	0.587**	0.837**	1	
	0	0		
	73	73	73	
Index of Human deprivation	0.712**	0.846**	0.799**	1
	0	0	0	
	73	73	73	73

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 5-13 below provides a brief comparison of average index values of four indices. The results indicate reasonably high deprivations in access to physical infrastructures, followed by human and quality of living environment. The trends indicate weak ability of poor community to access good social services and to attract local economies for boosting their livelihood strategies.

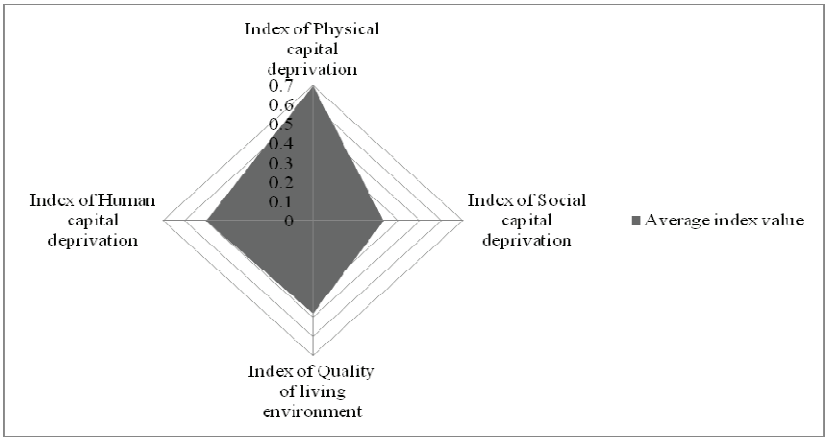


Figure 5-13: Comparison of average index values

5.5.7. Index of multiple urban inequalities

In the previous subsection described the pattern of deprivation using four capitals and comparing the trend of deprivation by each capital. In this section the main concern is see the pattern of inequalities by combining all capitals such as physical, social, environmental and human capital into index of multiple deprivation and to investigate the most and least deprived area within the city.

The Index of Multiple urban inequalities as described by (Noble *et al.,* 2008) is a "*Measure of multiple deprivations at the small area level, the model of multiple inequalities underpins the idea of distinct dimensions of deprivation which can be recognised and measured separately*".

These are experienced by individual ward in an area and also people may be counted as deprived in one or more of the capitals, depending on the number of types of deprivation that they experience (Noble *et al.,* 2008).

The ward itself can be characterised as deprived relative to other wards, in one of the capitals of deprivation, on the basis of the proportion of people in the area experiencing the type of deprivation in question. In other words, the experience of the people in an area gives the area its deprivation characteristics. As reflected in the above sub section that some wards experienced multiple deprivation, meaning that one ward can be deprived by both capital and others being deprived in one capital and better-off in other capitals.

The results from the analysis indicate that high deprivation in both capitals is seen in wards which are outside the city centre about 35Km from the city centre, the most deprived being Somangira (0.79), Kimbiji (0.78), Pemba-Mnazi (0. 75), Kisarawe (0.77), Mjimwema (0.69) and Chanika (0.71). Meanwhile, wards which are adjacent to city centre between 3km and 10km from city centre are also highly deprived in both capitals; these include Kiwalani (0.69), Vingunguti (0.70), Keko (0.62), Manzese (0.68), Buguruni (0.64), Kigogo (0.68) Tandale (0.65), Makurumula (0.64), Mburahati (0.58) and Ndugumbi (0.62). Large area of these ward are informal settlements characterized by high housing densification and spatial disorderliness that inhibit provision of basic services. Increasing housing density has resulted into poor sanitation and poor solid waste management.

Less deprivation in both indicators is found in wards which are found within 3km from city centre and along All Hassan Mwinyi road, due to fact that most of these wards are occupied by Government institutions and other wards are prime area where most of the social and economic

services are found (see figure 5-14 below). Wards which are found between 10km and 20km from city centre indicate variation in deprivations as these wards are occupied by both groups (high income, medium and low income people).

Figure 5-14 below indicates the summary of the index; the minimum is 0.09 and maximum being 0.79 and average value being 0.51. This indicates that in Dar es Salaam city most wards are deprived in both capitals such as physical infrastructure services with an average value of 0.70, social infrastructure access with an average of 0.33, quality of living environment with an average of 0.48 and human resources with an average value of 0.50. With this trend physical infrastructure services is the main problem within the city scoring higher values than other capitals and with large area about 92% covered above average within the city.

Index value		Area (M^2)
Min	0.09	534448
Max	0.79	313004496
Avg	0.51	32093611
StD	0.19	56055680
Sum		1444212480
Total area covered below average (0.51) = 1353486832 m^2		
Area covered by ward above average is 94%		

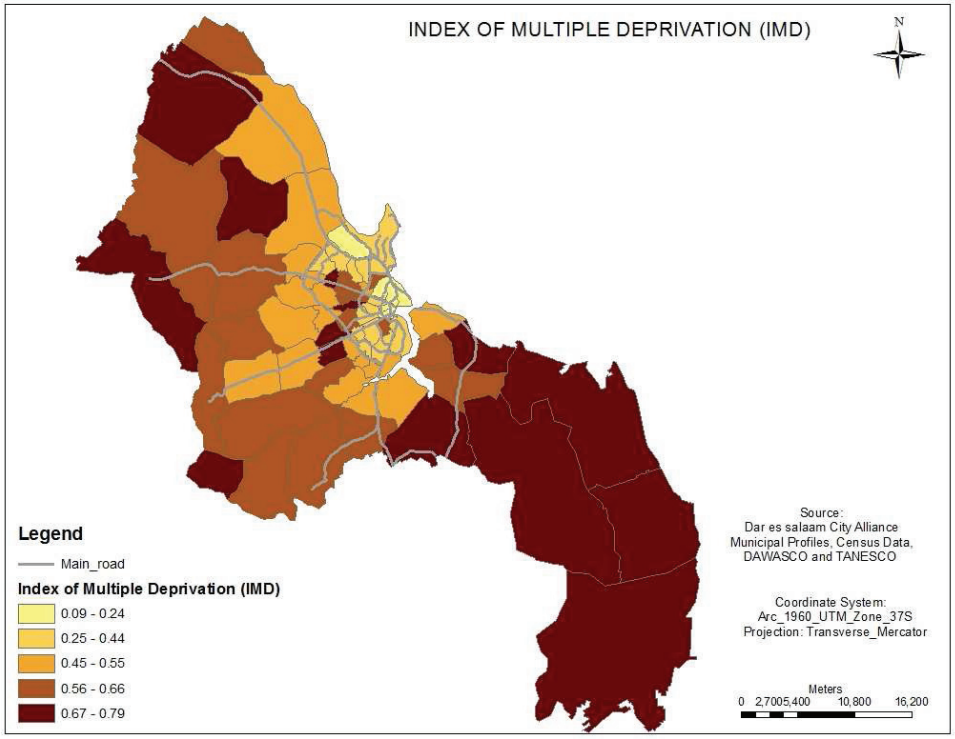


Figure 5-14: Map showing Overall index of multiple deprivations (IMD)

Note: Low value of index indicates low deprivation and highest value of index indicates high level of deprivation.

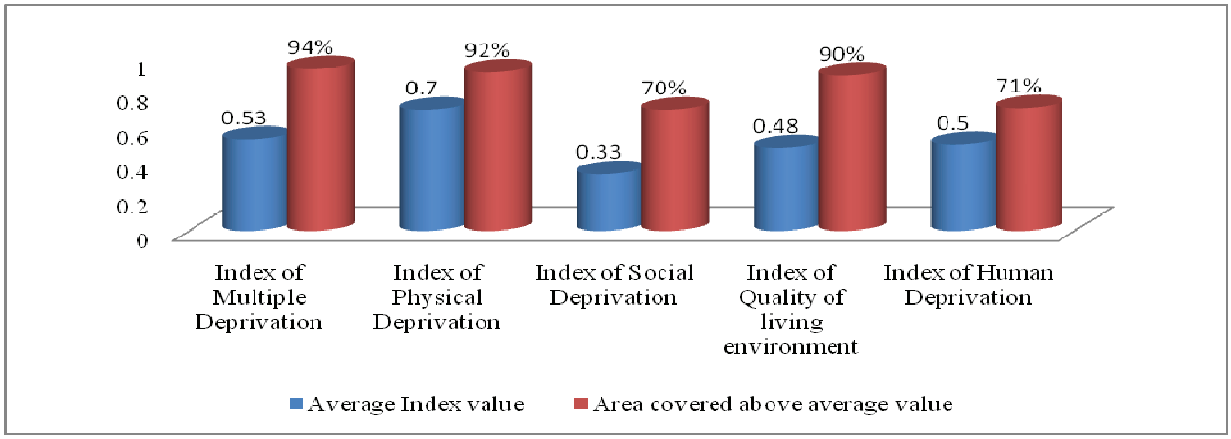


Figure 5-15: Cross comparison between the average value of capital indexes and the overall index of multiple deprivation indicating average index value and area covered by wards above average value.

5.5.8. Correlation of index of multiple deprivation (IMD) and capital indices

Pearson Correlation Coefficient (r) indicates that all the individual types of capital are significantly correlated with the overall index of multiple deprivations (IMD) as shown in table 5-6 and figure 5-16 below.

This is an indication that the different types of capital are dependent of each other and are significant in their own right in contributing to the overall level of intra- urban multiple deprivation in Dar es salaam city.

The strongest correlation between IMD and capital indices is found in human resources deprivation (r = 93%), followed by physical deprivation (r = 92%), quality of living environment deprivation (r = 87%) and lastly in social infrastructure deprivation (r = 77%). This suggests that priority areas for households livelihood improvements include providing more employment to increase income generating services, better access to clean and safe water, improved sanitation and better housing and basic facilities, better solid and liquid waste management, improving informal areas, followed by education and counteracting discrimination patterns.

Table 5-6: Pearson correlation between IMD and corresponding capital index

		Index of Multiple deprivation	Index of Human deprivation	Index of Physical deprivation	Index of Quality of living environment	Index of Social deprivation
Index of Multiple deprivation	Pearson Correlation	1				
	N	73				
Index of Human deprivation	Pearson Correlation	0.93	1			
	Sig. (2-tailed)	000				
	N	73	73			
Index of Physical deprivation	Pearson Correlation	0.92	0.85	1		
	Sig. (2-tailed)	000	000			
	N	73	73	73		
Index of Quality of living environment	Pearson Correlation	0.87	0.80	0.84	1	
	Sig. (2-tailed)	000	000	000		
	N	73	73	73	73	
Index of Social deprivation	Pearson Correlation	0.77	0.72	0.68	0.59	1
	Sig. (2-tailed)	000	000	000	000	
	N	73	73	73	73	73

**. Correlation is significant at the 0.01 level (2-tailed)

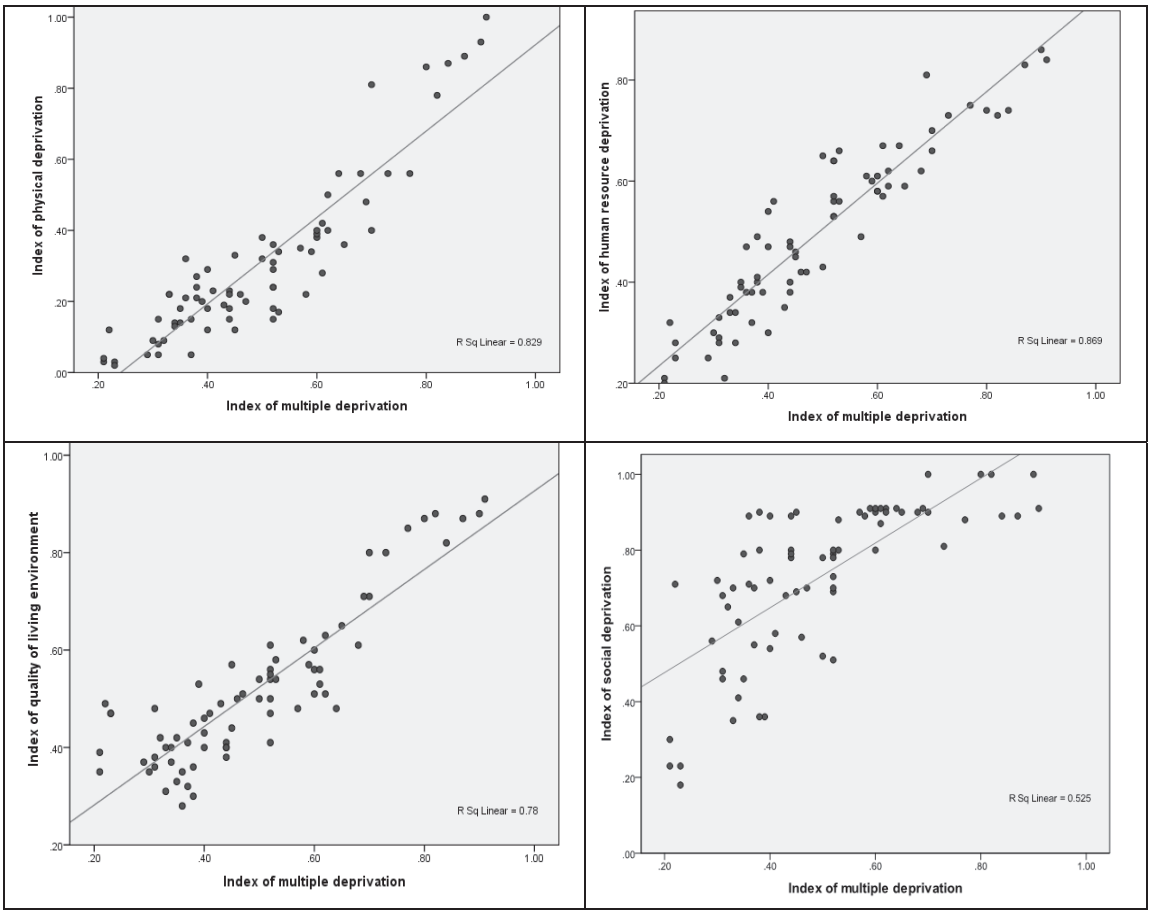


Figure 5-16: Correlation between Index of Multiple deprivation and corresponding capital indices

5.5.9. Spatial autocorrelation and Clustering of indicators

There are many statistical tests for measuring the presence or absence of spatial autocorrelation. Moran's I statistical test applied to measure the presence or absence of spatial autocorrelation of selected indicators. These require measuring a spatial weights matrix that reflects the intensity of the geo-spatial relationship between observations in wards.

Autocorrelation means that a variable is correlated with itself, subjects that are close to each other are more likely to have values that are more similar, and pairs of subjects that are far apart from each other are more likely to have values that are less similar (Haining, 1990; Anselin, 2002). The spatial structure of the data refers to the patterns that may exist such as clustering and gradients are example of spatial structure that is positively correlated (Fortin and Dale, 2005). Spatial autocorrelation that is more positive than expected from random indicates the clustering of similar values across geo-space, while negative spatial autocorrelation indicates that neighbouring values are more dissimilar than expected by chance. In negative correlation patterns, subjects appear to repulse each other. Therefore the absence of autocorrelation implies that data are independent.

5.5.9.1. Moran I statistical test

A standard measure to check for the presence or absence of spatial autocorrelation is the Moran's I statistics which is performed under the assumption that the observations were

drawn from normal distribution; the Moran's I thus was evaluated under the assumption of normality.

Moran's I is defined as

$$I = \frac{n}{S_0} \frac{\sum_{i=1}^{n} \sum_{j=1, j \neq i}^{n} w_{ij} z_i z_j}{\sum_{i=1}^{n} z_i^2} \qquad \text{Equation} \qquad [1]$$

Where N is the sum of observations, Wij is the element in the spatial weight matrix corresponding to the observation pair i,j, Zi and Zj are observation for the location i and j.

The Moran's I value ranges from -1 to 1; the expected value of Moran's E(I) = -1/(n-1); values of I greater than E(I) signifies positive autocorrelation and values of I less than expected E(I) indicates absence of spatially autocorrelation.

The results of the Moran I test for index of physical capital, quality of living environment, human capital, social capital and multiple urban deprivations under randomisation are as shown in table 5-7 below:

Table 5-7: Spatial Autocorrelation of developed indices

Index	Moran (I) statistics	Expected Moran (E[I])	P - Value	Mean	Standard Deviation
Physical capital deprivation	0.736	- 0.014	0.010	-0.010	0.079
Quality of Living Env. deprivation	0.571	- 0.014	0.010	-0.025	0.078
Social capital deprivation	0.753	- 0.014	0.010	-0.009	0.080
Human capital	0.627	-0.014	0.010	-0.015	0.079
Multiple Deprivation	0.669	- 0.014	0.010	-0.011	0.075

From the above table 5-7, the results of Moran's I statistics for Index of physical capital is 0.736 which is greater than the expected Moran's E [I] -0.014. Also the P-value of 0.010 is less than significant level of 0.05, these signifies that there is highly positive autocorrelation of physical infrastructure services such as water, sewer and electricity among 73 wards in Dar es Salaam, meaning that wards that are close to each other are more having similar values. This is true as reflected in the description above that most of the services are concentrated in city centre and in prime areas, while in some wards which are outside the city centre the services are very rare. Meanwhile, the Moran's I statistics for Index of social capital is 0.753 which is greater than the expected Moran's E [I] -0.014 with the P-value of 0.010 < 0.05, standard deviation of 0.080 signifies highly positive autocorrelation of indicators of social infrastructure services among 73 wards in Dar es Salaam, meaning that wards that are close to each other have similar values. As seen in the previous section, wards within the city centre are better off compared to wards that are found outside the city centre and peri-urban areas, where most of informal settlements are found.

Further more, the Moran's I statistics for Index of quality of living environment and human capital is 0.571 and 0.627 respectively which is greater than the expected Moran's E [I] -0.014 with the P-value of 0.010 < 0.05, also signifies positive autocorrelation of indicators of quality of living environment such as informal settlements, housing condition, solid waste management and low income groups among 73 wards in Dar es Salaam.

In additional to the above, the Moran's I statistics for Index of multiple urban deprivation is 0.669 also is greater than the expected Moran's E [I] -0.014 with the P-value of 0.010 < 0.05, standard deviation of 0.073 signifies that there is also positive autocorrelation of capitals used, this indicates that wards which are highly deprived in both capitals are close to each other as seen to wards like Vingunguti, Kiwalani, Buguruni and Kigogo and outside the city centre. Also wards which are well-off are also clustered or close to each other.

5.5.9.2. Moran I scatter plot

The Moran scatter plot[10] provides a visual exploration of spatial autocorrelation in quadrants. Anselin (1996; 2002) describe spatial autocorrelation as "the spatial lag of the variable on the vertical axis and the original variable on the horizontal axis" (spatial lag being the values of its neighbours).The four quadrants in the Moran scatter plot provide a (classification) spatial clustering of four types of spatial autocorrelation.

Quadrant I (upper right) indicates High values of y surrounded by similarly high values; Quadrant II (Lower right) indicates low values of y surrounded by dissimilarly high values; Quadrant III (lower left) indicates low values of y surrounded by similarly low values and Quadrant IV(upper left) indicates high values of y surrounded by dissimilarly low values (Anselin, 1996; Anselin, 2002)

The gradient of plot gives the Global Moran I statistics of the observation. As can be seen from the graph in figure 5-17 and 5-18 below, the gradient of all index is positive, indicating presence of positive spatial autocorrelation, which means that there are high index values in quadrant I surrounded by similarly high values and low values of index in quadrant III surrounded by similarly low values.

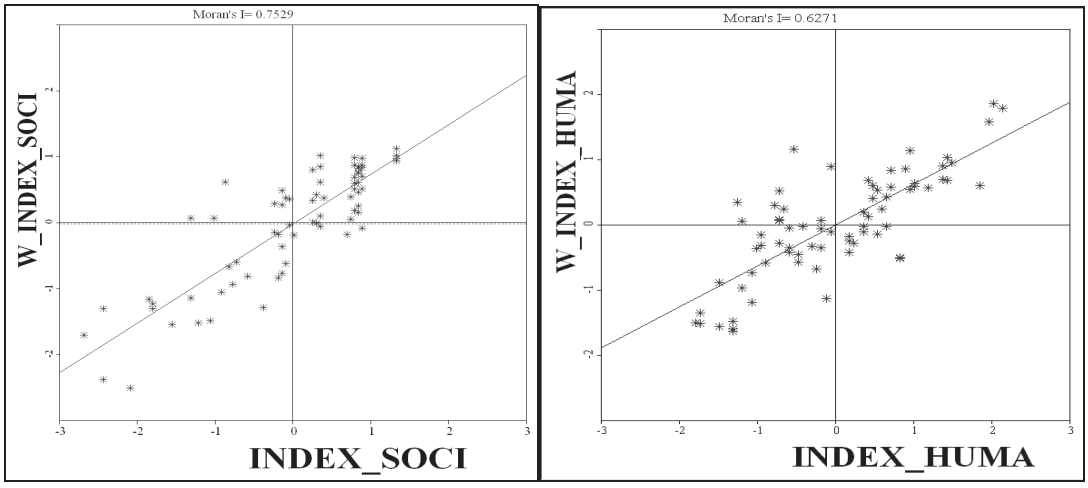


Figure 5-17: Moran's Scatter plot of index of social capital and index of human deprivations

[10] Is a statistical tool for visual exploration of spatial autocorrelation in GeoDa, the spatial statistical package developed by Anselin

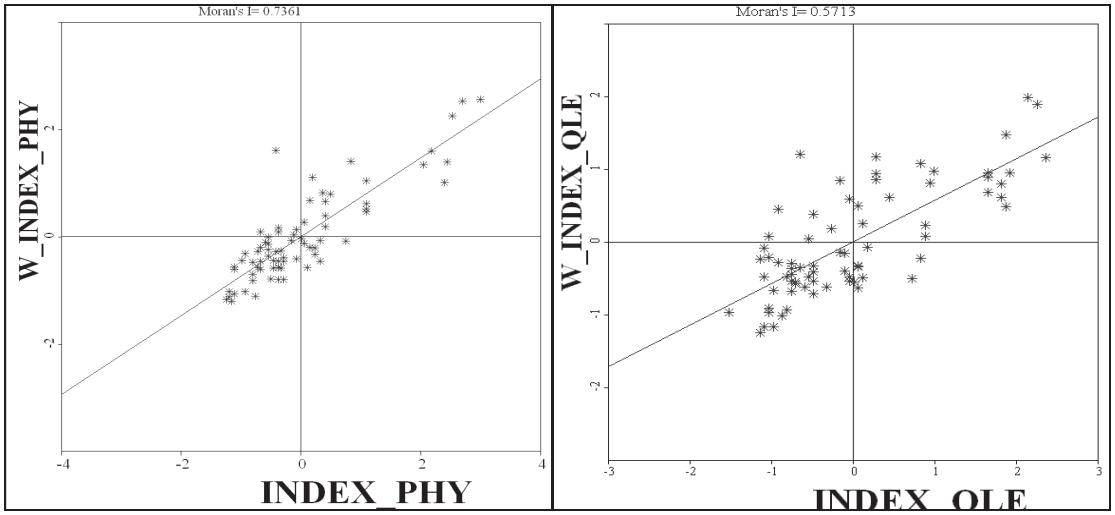


Figure 5-18: Moran Scatter plot of index of physical capital and index of quality of living environment

5.5.9.3. Spatial clustering of indicators

Spatial clustering indicates spatial similarity or dissimilarity of level of deprivation in neighbouring wards. Spatial clustering of indicators determined using the Moran's I scatter map[11] which contains information on only those locations that have a significant Local Moran statistic p-values below 0.05.

It's decomposed into four types of spatial association between a location and its neighbours. Two of these categories imply positive spatial association (high-high and low-low) and the two categories imply negative spatial association (high – low and low – high values).

Figure 5-19 below shows the Moran's I scatter plot map for the four capitals (A, B, C, D). The results indicate significant value of positive spatial autocorrelation. Meaning that, less deprived wards in both capital indicators and the overall index of multiple deprivations are clustered within city centre. While highly deprived wards are clustered outside and close to city centre. However, there is slight variation in wards that are found between city centre and peri – urban areas, some parts are having low values of both indices and surrounded by high values and vice versa. Therefore, there is a significant correlation between index of multiple deprivation and corresponding capital Indices.

[11] Is a statistical tool for visual exploration of spatial clustering (similarity and dissimilarity) of variables in GeoDa, the spatial statistical package developed by Anselin

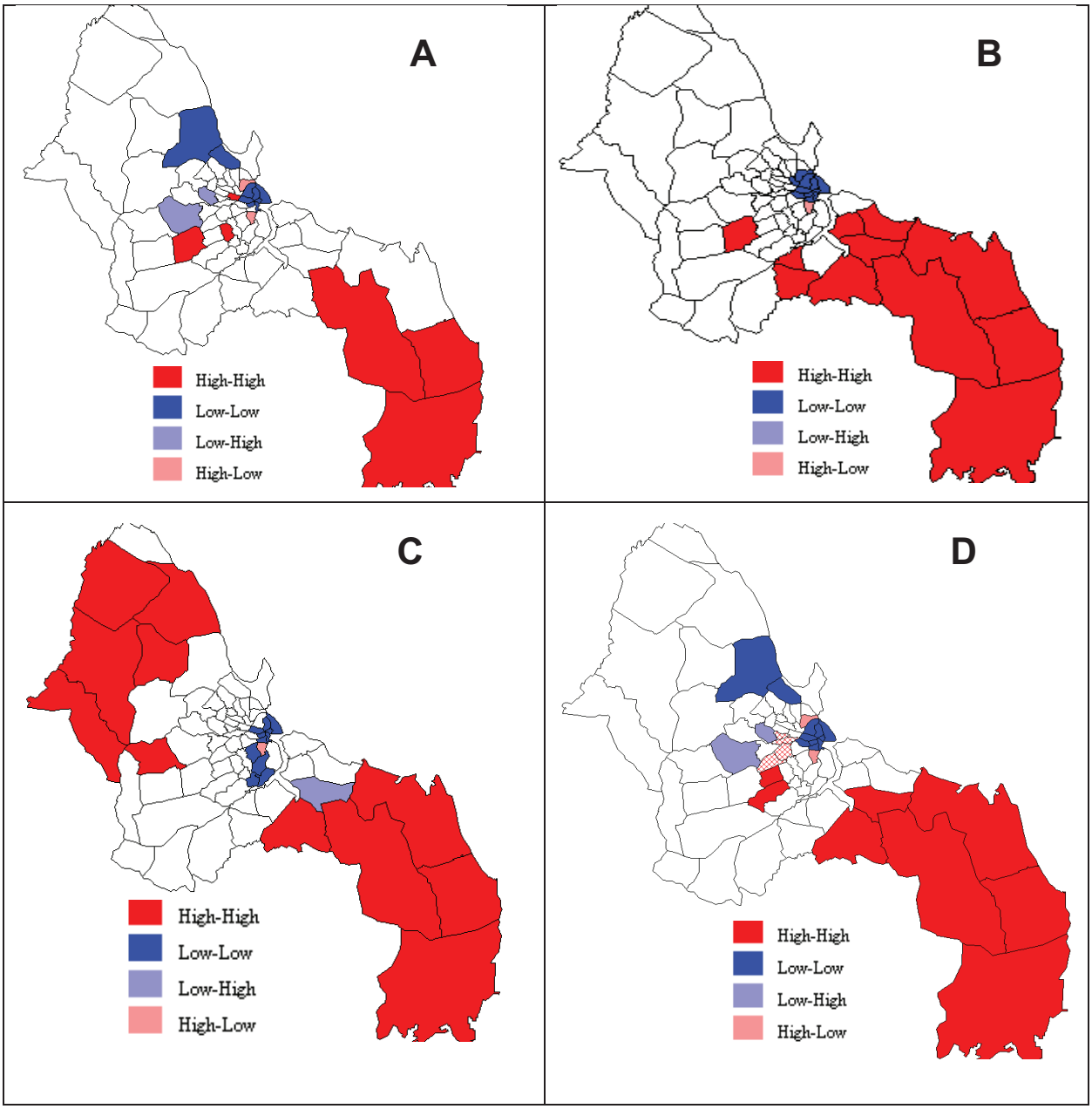


Figure 5-19: Moran's scatter maps indicating index of quality of living environment (A) and physical capital (B) index human capital (C) and index of multiple deprivations (D)

5.5.10. Ordinary Least Square Regression Analysis

Regression analysis is a technique used for the modelling and analysis of numerical data consisting of values of a dependent variable and of one or more independent variables (explanatory variables). The dependent variable in the regression equation is modelled as a function of the independent variables, corresponding parameter ("constants"), and an error is treated as a random variable. It represents unexplained variation in the dependent variable.
The parameters are estimated so as to give a "best fit" of the data. Ordinary least square regression (OLS) is defined by the

$$y_i = \beta_0 + \beta_1 x_{1,i} + e_i \qquad \text{Equation [2]}$$

Where by y_i is the outcome variable, β_0 is the intercept of the line, β_1 is the coefficient of first predictor X1, and ei is the difference between the predicted and the observed values of Y for the ith participant.

Table 5-8: Results form Ordinary Least Square regression analysis

REGRESSION
SUMMARY OF OUTPUT: ORDINARY LEAST SQUARES ESTIMATION

Data set : **MODIFIED_OUTPUT_IMD_QIE_IHC_IPC**
Dependent Variable : **IMD_INDEX** Number of Observations: 73
Mean dependent var : 0.49 Number of Variables : 5
S.D. dependent var : 0.17 Degrees of Freedom : 68

R-squared : 0.95 F-statistic : 334.26
Adjusted R-squared : 0.95 Prob(F-statistic) : 6.41e-044
Sum squared residual: 0.10 Log likelihood : 135.49
Sigma-square : 0.00 Akaike info criterion : -260.98
S.E. of regression : 0.04 Schwarz criterion : -249.52
Sigma-square ML : 0.00
S.E of regression ML: 0.04

Variable	Coefficient	Std.Error	t-Statistic	Probability
CONSTANT	-0.02	0.03	-0.78	0.44
INDEX_HUMA	0.39	0.06	6.48	0.00
INDEX_QLE	0.31	0.06	5.32	0.00
INDEX_SOCI	0.14	0.03	4.24	0.00
INDEX_PHY	0.19	0.04	4.41	0.00

From the above table 5-8; the results of the independent variables such as index of human, physical, quality of living environment and social capital are positively related to dependent variable (Index of multiple of multiple deprivations). As it is indicated in the table above the regression model is statistically significant since probability of all predictors are significant at p-value 0.000 much lower than 5% significance level. This means that at least one of the factors contribute to overall index of multiple deprivation and spatial clustering.

Table 5-9: Statistical Model fitting

Model	R	R^2	Adjusted R Square	Std. Error of the Estimate
	0.98	0.95	0.95	0.04
a. Predictors: (Constant), index of human capital, index of social capital, index of quality of living environment capital and index of physical capital deprivation				
b. Dependent Variable: Index of multiple deprivation				

The above table 5-9 indicates that, Ordinary least square regression in linear model summary predicts that the overall correlation between dependent (Index of multiple deprivation) and independent variables (Predictors) gives an R-squared which measures the amount of variability of 95% indicating high correlations between the observed variables. This means that only 5% of the variation in intra-urban inequalities that cannot be explained by indicators and index of multiple deprivation, there must be other factor(s) as well that influence more clustering in some wards especially in city centre.

5.5.11. The impacts of clustering of indicators in local economies

A rationale for positive autocorrelation and clustering of social-economic indicators within a city reflects that multiple deprivations in highly deprived wards have cumulative and qualitative different effects on individual's communities, local economies and infrastructures provision than less concentrated poverty, forming one category of area effects (hotspots).

This indicates that in any intervention to support poor communities, additional special interventions such as area-based policy targeting is an effective way to support highly deprived communities and infrastructure provision in these areas, so as to promote local economic development and reducing inequalities within the city.

Figure 5-20 below conceptualizes the idea of area-based policy intervention approach by identifying claim-duty relationships linking individuals and institutions, and determines the gap in capacity of claimholders to claim their rights and of duty-bearers to fulfil their obligations.

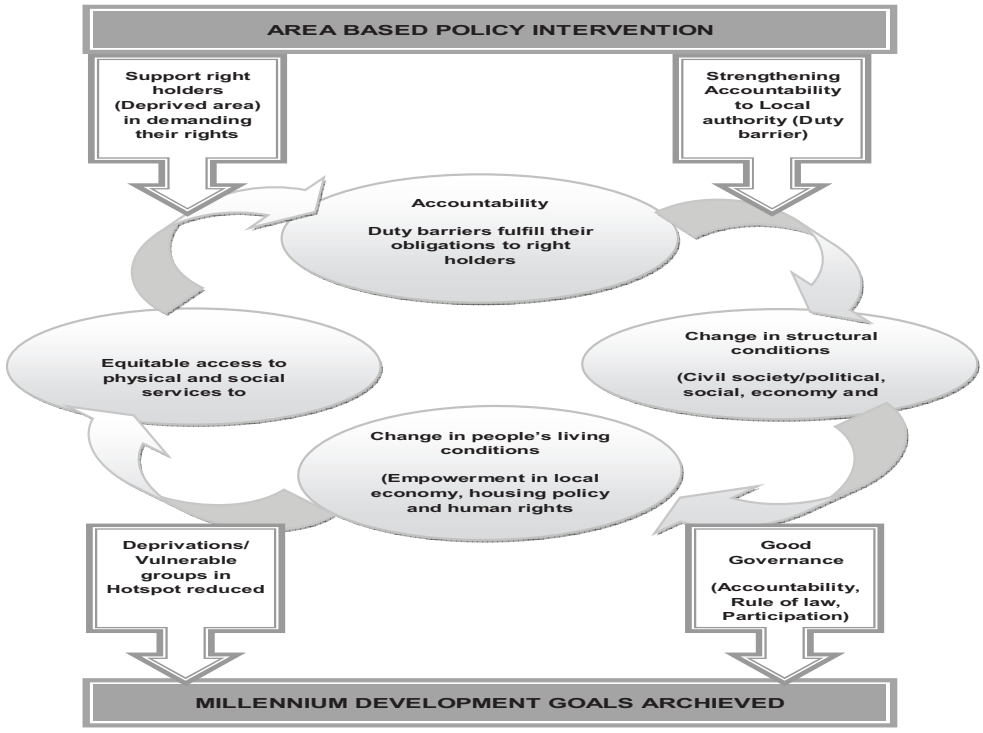


Figure 5-20: Area- based policy intervention concept modified from UN-Habitat, 2007

5.6. Conclusion

The index of multiple deprivations developed makes it possible to indicate the level of deprivation concentrated at the ward level, rather than using data aggregated at regional level which hides the realities. It provides information which identifies the nature and concentration of deprivation at ward level before deciding on intervention programmes.

The spatial patterns of inequalities found in Dar es Salaam indicate that some wards experiences multiple sources of deprivation where hotspots of poverty emerge and are clustered together in some low income wards and wards which are outside city centre. There is also variation in the type of deprivation experienced with different capital deprivation such as in physical, human, social and quality of living environment capitals existing in several wards, but high deprivation is seen in physical deprivation with an average index of 0.70.

For each capital, the maps indicate the specific types and spatial pattern of deprivations that occur at that ward, which is useful for policy makers to identify the wards which should have priority in financial allocation for specific intervention which might reduce existing deprivation.

6. ENVIRONMENTAL INJUSTICES IN DAR ES SALAAM CITY

6.1. Introduction

Environmental injustice as described in (Maantay, 2002) is the disproportionate exposure of poor communities to pollution, hazardous wastes and the associated effects on health and environment, as well as the unequal environmental protection provided through laws, regulations, governmental programs and enforcement.

Environmental Act (URT, 2004) described hazardous waste as "solid, liquid, gaseous or sludge waste which by reason of its chemical reactivity, environmental or human hazardousness, its infectiousness, toxicity, explosiveness and corrosiveness is harmful to human health, life or environment". The concept of environmental injustice in this study is not only based on intra-generational (equity for all people currently alive) but also taking into account equity for future generations.

The research question in this part is concerned with "*What types of facilities should be included in determining the existence of disproportionate environmental burdens*[12]*?*

Many of the studies revealed that hazardous wastes which are found from transfer stations, disposal sites such as dump sites and oxidation ponds and some small industries cumulatively create more environmental burden to local communities (US-EPA, 1998; Walker *et al.,* 2003). Field survey done in Dar es Salaam to some wards reflects that poor communities are more exposed to environmental burden, because most of the disposal sites and industrial facilities that are found in low income communities are typically worse polluters than those in high income neighbourhoods. For example oxidation ponds that are found in Mikocheni and Kawe (University area) are quite different with those found in Vingunguti, Buguruni, Kurasini and Mabibo.

6.2. Types of environmental injustices

6.2.1. Solid waste disposal site

Solid disposal site defined by (URT, 2004) as the final stage in solid waste management system, the conditions for suitable solid waste sites as indicated in Environmental Act, 2004 section 118 (2) "*Local Authority should ensure that the selected area is adequate in size and situated away from residential area; ensure the area is fenced off and secured to prevent unauthorized persons from entering and regular treating of wastes"*. Also section 115 (2) stipulates that "*In the determination of the appropriate disposal for solid waste generated by different types of markets, business centres, residential areas and institutions within their respective areas, local government authorities shall ensure that the solid waste is classified and appropriately stored depending on whether it is organic waste, plastics, glass or metals*", before being disposed to final dump site (URT, 2004).

[12] Means any area upon which an environmental easement has been imposed

The situation in Dar es Salaam city is quite different with what is stipulated in Environmental Acts, because most of solid waste disposal sites are found near to residential area and it is poorly managed, for example dump sites located in Kigogo, Vingunguti and Mtoni. In these site wastes are not classified or grouped are usually disposed directly from different sources. This results in spontaneous fires which cause extensive airborne smoke and the release of gases and leachates from the waste which become potential threats to the environment and the health of the public such as unending outbreak of cholera and TB diseases.
It is common for the residents in Dar es Salaam city to complain about the poor management of dump sites. For example the Tabata dumpsite was closed down officially in 1991 by a court order, following the successful application by the residents to have it closed down because of the environmental and health risks it posed (NEMC, 1996; JICA, 1997). Also other dumpsites were closed by similar actions. Unknown quantities of industrial waste and hospital waste are also transported to Kigogo dump site and obviously contain hazardous materials which are being disposed without supervision or protection of the environment. At the same time there is uncontrolled spreading of the site causing waste to contaminate neighbouring water courses along Msimbazi river which threatens potential users downstream.

Solid waste collection service is relatively good in the prime commercial and residential wards of Mchafukoge, Kariakoo, Gerezani and Kisutu, Upanga East and West, Mikocheni, Msasani and in Kivukoni. The service is inadequate in the other lower status wards as described in previous section. Figure 6-1 below reflects how poor people are affected by poor managed solid waste disposal site in Kigogo ward.

Figure 6-1: Nature of solid waste and closeness to residential houses in Kigogo ward (Field work, 2008 –Kigogo dump site*)*

The biggest challenge in solid waste management in Dar es Salaam is that, although the generators in households level removes waste from their immediate surroundings, a lot of it accumulates at transfer stations, on common grounds, along natural drainage channels and along the streets with little coordinated remedial action. In high density areas the problem is influenced by insufficient land to dig pits for solid waste, and no open spaces are available for draining liquid wastes as results wastes are being dumped along natural or artificial drains which erode civic morals, and have other aesthetically offensive outcome. All these cause

pollution (smell, surface and ground water pollution for example), and health problems See figure 6-2 below;

Figure 6-2: Solid wastes being dumped along Tandale River and along natural drainage in Vingunguti (Field work, 2008)

6.2.2. Industrial Wastes

During the first two decades of independence, Dar es Salaam introduced many industries to enhance economic development. These industries in Dar es Salaam includes metal-working, steel and iron, cotton textiles, leather, chemical, food processing and beverages and non metal products, including cement and asbestos. Although most of these industries have had major problems since the 1980s and many are working below 50% capacity, they generate enormous amount of waste and don't have treatment plants. This leads to direct discharge of raw waste into water sources and into oxidation ponds. Few industries that are connected to the sewerage system discharge raw sewerage composed of chemicals that kill organisms responsible for biological decomposition of the waste. Figure 6-3 below indicates untreated waste being discharged in Kizinga river and Vingunguti oxidation pond.

Figure 6-3: Untreated industrial wastes being discharged in Kizinga valley –Mtoni and industrial wastes disposed in Vingunguti oxidation pond (Source: Fieldwork, 2008)

The major mode of treatment[13] is through oxidation and stabilization ponds. Various studies by (NEMC) suggest that industrial waste is not pre-treated before it is discharged into oxidization ponds and also the level of water pollution is high, as is evident from findings on one of Dar es Salaam's major rivers, the Msimbazi and Kizinga river. However section 125 and 126 of National Environmental Act describes that;

"The local government authorities shall designate and ensure compliance with designated disposal ponds, sewage treatment facilities and sewer points before it is finally discharged into water bodies or open land, and that it does not increase the risk of infections or ecological disturbance and environmental degradation".

In addition to that, most air pollution within residential areas is caused by human activities including industrial development, production and use of energy (for processing, heating and cooking). For example, poor community in wards like Kipawa, Vingunguti and Chang'ombe, are often confronted with problem of air pollution due high concentration of different industries in these wards that emits gases like S02, NO2, PB, Suspended particulates matters (SPM) and CO. The limited studies which have already been carried out by NEMC indicate that the World Health Organization (WHO) air pollution limits have been exceeded and therefore there could be potential impacts of air pollution on ecosystems, human and animal health.

6.2.3. Waste Stabilization Ponds

The stabilization ponds are the notable sewerage waste facility. Sewage waste is a combination of excreta, urine, and sullage and liquid wastes from homesteads, institutional, commercial and industrial processes and operations (URT, 2004).

Less than 5% of the population (of 3 million people) is connected to the sewer system; this situation imposes necessities increasing the capacity of cesspit emptying services, by both the municipalities and private operators. The Municipal councils and the Health Department operate tanker lorries to empty septic tanks and pits, usually at the request of people living in the area.

Water tables are high in most parts of Dar es Salaam, particularly during the rains, which exacerbates problems with poor sanitary conditions, as many septic tanks and pit latrines overflow into the surrounding public lands and drainage systems. As a result, surface waters in many urban areas are highly contaminated with human wastes. In areas with pit latrines, seepage into local groundwater is often a major problem, since many communities rely on shallow wells for drinking water.

Due to operational and maintenance deficiencies coupled with sub-standards construction, the utility has dilapidated. Most of stabilization ponds are located within residential area which poses serious health problems. The site suitable for oxidation pond as stipulated in Environmental Act should be adequate in size and situated away from residential area; ensure the area is fenced off and secured to prevent unauthorized persons from entering and regular treating of wastes. But most of stabilization ponds are characterized by poor environmental

[13] Change in the composition or concentration of a waste substance so as to make it less hazardous or to make it acceptable at disposal facilities

management, located close to residential houses and are not even fenced to protect children from entering.

The finding from field work indicates that wards which are closer to waste stabilization ponds are much affected by cholera diseases and malaria. The wards such as Vingunguti, Buguruni, Tabata, Kiwalani and Ilala are most affected due to frequency outbreaks of diseases like Cholera, Malaria and other water related diseases. Outbreak of cholera and other water related diseases both in dry and wet seasons is due to hazardous living environments, poor oxidation ponds and poor solid waste disposal sites.

Example in dry season cholera is caused by lack of clean and safe water as most of the residents in Vingunguti, Buguruni and Kiwalani 70-90% depend on shallow wells which are polluted by leachates from dump sites and in wet season cholera outbreak is due to flooding problems, unmanaged oxidation ponds and poor sanitation associated with poor storm drains system.

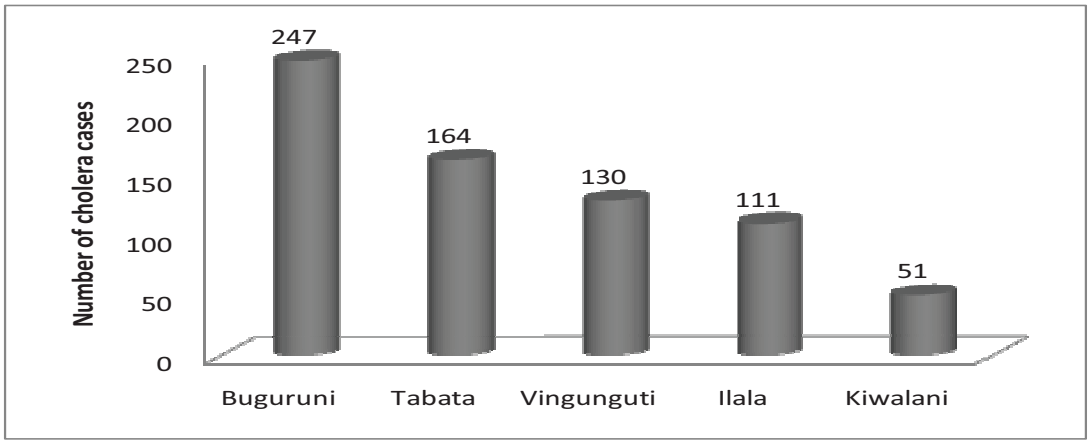


Figure 6-4: Number of cholera cases in wards surrounding oxidation ponds (Municipal profile, 2007 and Field work, 2008)

Moreover all the oxidation ponds are found in low income wards such as Vingunguti, Buguruni, Mabibo and Kurasini which are typical informal settlements and characterized by lack of physical infrastructures and open spaces. Most of the children in these areas are playing along the ponds which threaten their life. For example discussion with local leaders and famous elders in Kurasini ward – "*Shimo la Udongo*[14]" they mention that because of closeness of residents to the ponds, and no any places reserved for children to play. Until now more than three (3) children and 4 drunken people have been dropped in the ponds and died see figure 6-5 below.

[14] A sub ward area of Kurasini Ward where oxidation ponds are located

Figure 6-5: Children playing along the sides of oxidation pond in Kurasini and nature of stabilization ponds in Vingunguti ward (Fieldwork, 2008)

Table 6-1: Impacts and location of hazardous areas in Dar es Salaam city

s/no.	Hazardous material	Location	Type of effects
1.	Liquid waste oxidation ponds	Kurasini, Mabibo, Vingunguti and Buguruni	Offensive smell to Settlement surrounding oxidation ponds, Occurrence of diseases e.g. cholera, TB and typhoid and Pollution of Msimbazi river valley
2.	Karibu Textile Limited	Mbagala Mission	Untreated effluents disposed direct into Kizinga river
3.	Kurasini Liquid waste oxidation ponds	Kurasini-Shimo la Udongo	Offensive smell to Settlement surrounding oxidation ponds and Occurrence of diseases e.g. cholera, TB and typhoid
4.	Serengeti and Konyagi Breweries Ltd	Chang'ombe	Untreated affluent wastes with very high biochemical oxygen demand(BOD) which results into noxious odours' direct disposed to natural drainage system
5.	YUASA battery and Kioo limited industries	Kipawa and Kiwalani	Gas -28ton SO2/day and 63tonn/day CO
6.	Kigogo, Vingunguti, Mtoni and Pugu dump sites and disposal of solid wastes along Msimbazi and Tandale river	Kigogo, Vingunguti, Mtoni, Pugu, Tandale and Manzese wards	Emission of gases e.g. @ 1kg of wastes produces 400liters (60% methane and 40% CO2), Explosion and fires, Offensive odour caused by H2S gas, Leachates production liquid waste collected at the bottom of the dump which contain great number of inorganic and organic compounds which pollutes ground water e.g. chlorides, nitrates and Occurrence of diseases e.g. Cholera,TB and Diarrhoea
7.	Tanzania Breweries Ltd, Chibuku Breweries Ltd	Mchikichini Ubungo	Affluent wastes with very high biochemical oxygen demand(BOD) which results into noxious odours'
8.	Tanzania Portland Cement	Kawe	Gas emission e.g. 379tonne of SO2, 1146tonne CO and suspended particulates about 106069tonn/year
9.	Steel and metal cast	Tabata, Kipawa and Mabibo	Emission of gases e.g. Its emitting 2175tonnes/day Co, and 7 ton of SO2 per day

Source: National Environmental Management Council (NEMC) and Field work, 2008

6.3. Distribution of environmental hazardous areas

The distribution of environmental injustice such as oxidation ponds, dump sites and some polluting industries in Dar es Salaam city is shown in figure 6-6 below.

Dar es salaam Master Plan of 1979 aimed at directing the city's growth for the 20 years, from 1979 to 1999, through planning and development guidelines for the urban area and the surrounding region. The Master Plan proposed large industrial area in Kigamboni, but actual industrial development has been concentrated along the existing arterial roads, such as Nyerere road and Nelson Mandela road which was planned for residential and reserved hazard land (See item 2 and 7 on master plan, figure 6-7 below).

Further more Vingunguti and Buguruni oxidation ponds were constructed from 1980 – 1983 in reserved hazard areas. At the same time people were already encroaching hazard land for housing development (See item 1 and 3 on master plan, figure 6-7 below) due to rapid urbanization and inadequate institutional capacity to provide serviced land for settlements development people moved into an area known to be dangerous.

In Kurasini the area was planned for small farms especially in hazard area and harbour industrial activities, however farm areas was changed to the oxidation ponds which was constructed between 1976 – 1980 for improving sanitation in city centre. Contrary to this, labourers who were working in harbour industrial activities were already developing their houses in that area (See item 5 on master plan figure 6-7 below). In Kipawa, Vingunguti and Chang'ombe wards, people moved into an area which was planned for industrial purposes (See item 4 on figure 6-7). The story is different in Kigogo ward where people lived in an area when a facility known to be dangerous (dump site) was sited to them in 2006 which later posed health problems.

Table 6-2 below gives a summary of the process involved in the development of environmental injustices by the people themselves and by decision makers.

Table 6-2: Alternative scenarios for the creation of environmental hazardous situations in Dar es Salaam city.

	Event 1	**Event 2**	**Event 3**	**Description**
1.	Siting	Danger	People	People move into an area known to be dangerous e.g. Buguruni, Vingunguti
2.	Siting	People	Danger	People move into an area which is later determined to be dangerous Kunduchi, Vingunguti, Kipawa, Mchikichini and Chang'ombe
3.	Danger	Siting	people	A dangerous facility is sited then people move into the area Kurasini, Buguruni, Mabibo, Vingunguti wards
4.	Danger	people	Siting	People live in an area then a facility known to be dangerous is sited near them Kigogo ward
5.	People	Siting	Danger	A facility that is not known to be dangerous is sited in a region where people live and is later determined to be dangerous KTM – Mbagala

Source: Field work in Dar es Salaam, 2008

Generally the city has been developed haphazardly without effective control measures or guidelines for land use and urban development. As a result, the present urban sprawl has extended to the 30 km radius from the City Centre and it is significantly different from the original concept of the Master Plan of 1979.

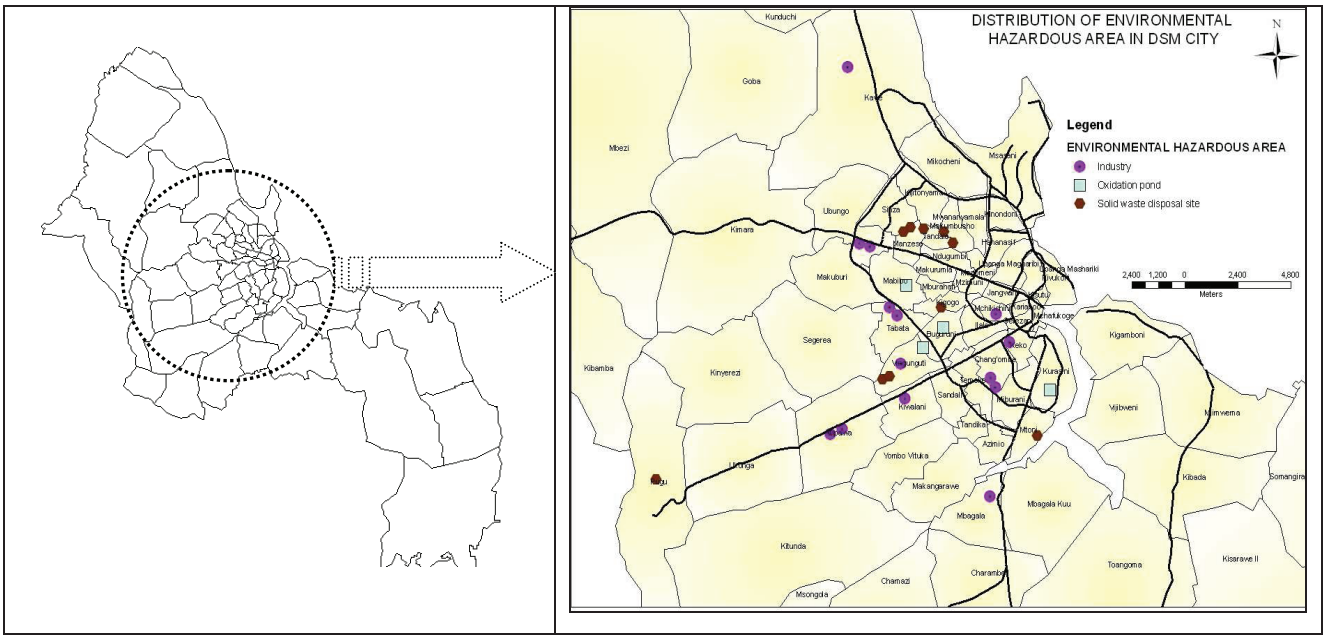


Figure 6-6 : Location of environmental hazardous areas in Dar es Salaam

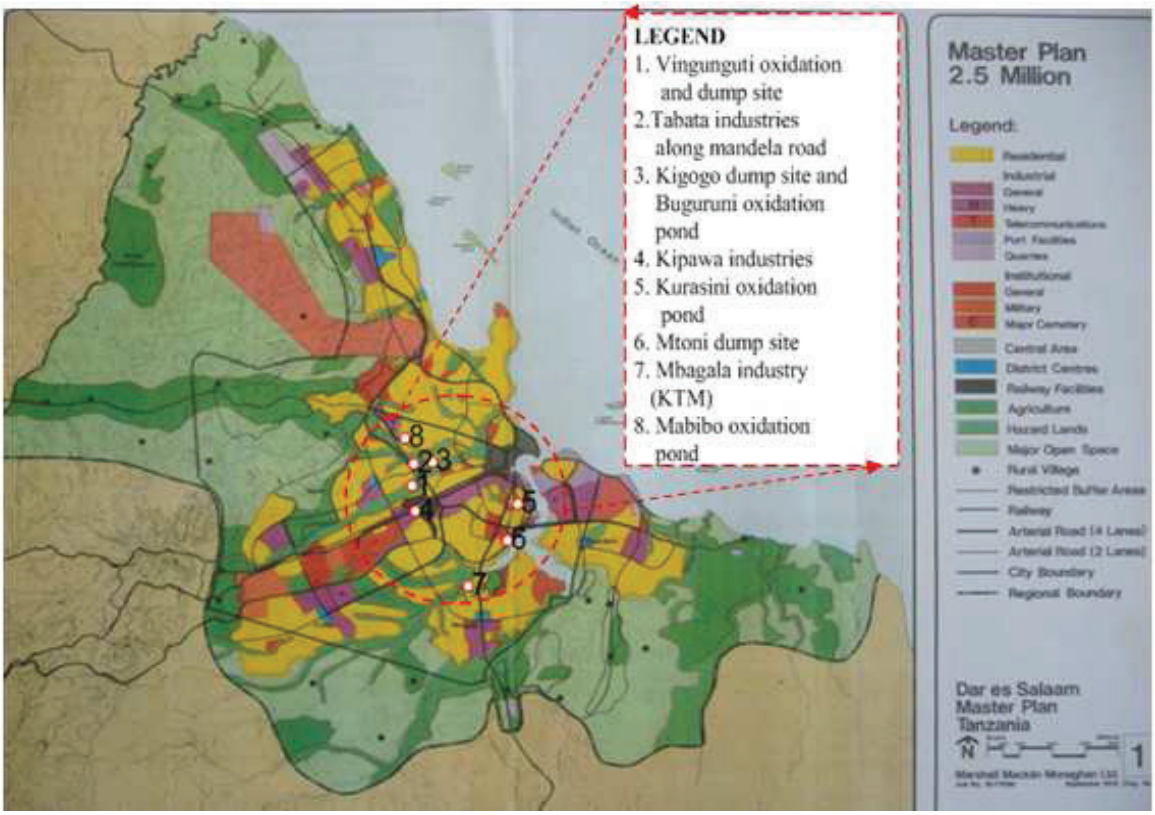


Figure 6-7: Location of Environmental hazardous area contrary to Dar es salaam master plan, 1979 (Dar es Salaam Master Plan, 1979 and Field work, 2008)

6.4. Mapping hotspot areas of multiple deprivation

Cemlyn (2002 pp. 13) described different meanings of area deprivation: a compositional meaning and collective meaning.

A compositional meaning of area deprivation is “where an area is considered to be deprived if it contains a large number or high proportion of deprivation”, in this study high

proportional of deprivation is determined using index of multiple deprivation (areas with low value of IMD are better off and areas with high value are much deprived).

A collective meaning refers to "the possible presence of `area effects' with the additional deprivation in an area which is above and beyond those attributable to the concentration of deprived people in the area" in this study the additional deprivations is based on clustering of different capitals and the extent to which the communities are exposed to environmental hazardous areas.

Proximity analysis is a useful means of analysis of determine the population potentially exposed to hazardous areas however there can be substantial differences in estimating the magnitude and characteristics of populations affected by environmental injustices. Actual estimation of health risks from a pollution sources depends on the type of facility, substances emitted, quantities emitted, and height of smokestack and hydrology of the site.

Proximity analysis in this study was done through distance proximity measure by buffering hazardous waste facilities and pollution sources basing on the standards given by NEMC, tool kit for assessing potential impacts of environmental injustices developed by US-EPA and WHO. Figure 6- 8 below indicates the results for buffered environmental injustice points.

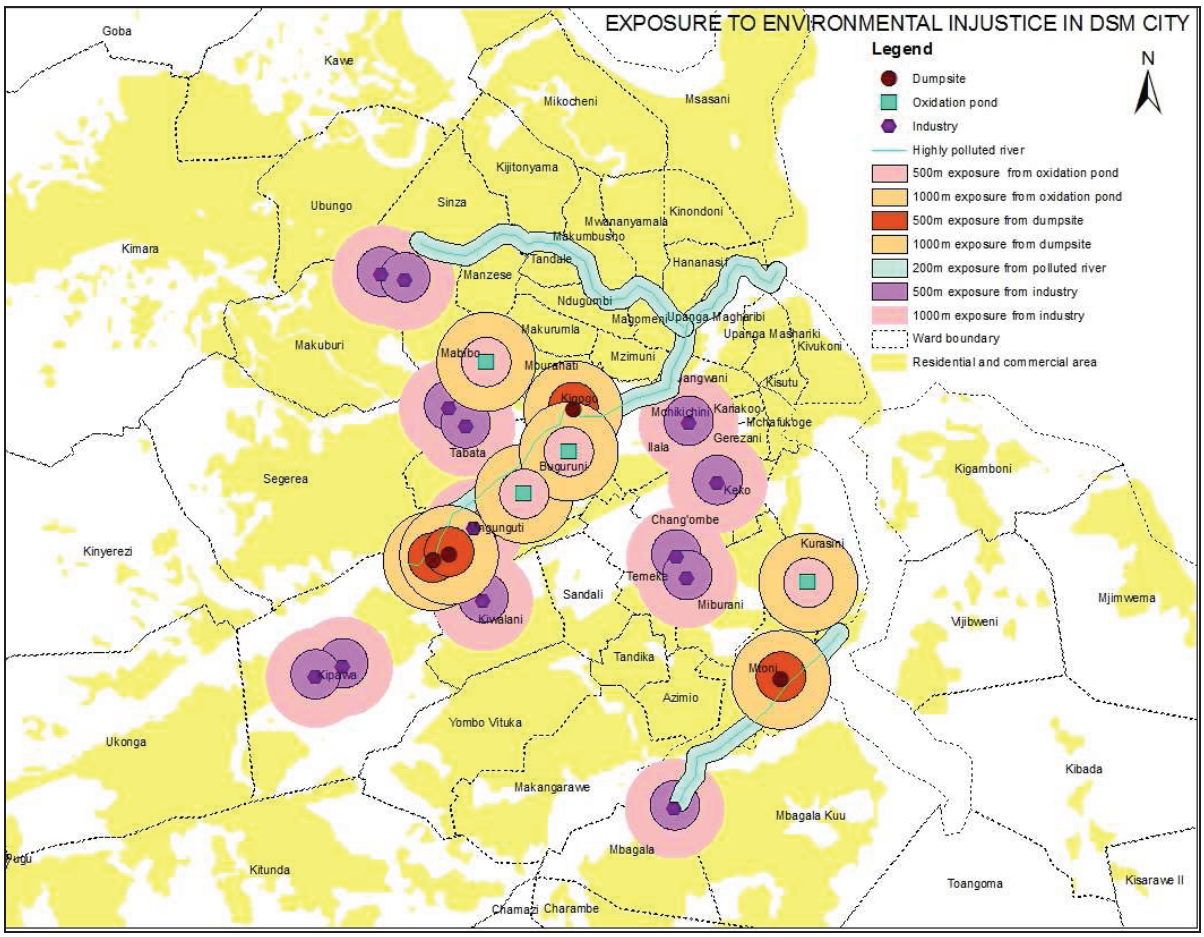


Figure 6-8: Exposure of local community to environmental hazardous area in DSM (NEMC and Fieldwork, 2008)

Analysis in this part based on this research question "*To what extents are different indicators/capital of intra-urban inequalities developed in previous chapter and environmental hazardous areas are spatially concentrated within the city, such that hotspots*[15] *of inequalities emerge?"*

Concentration of multiple deprivations in one area makes it difficult for households to find a way out of poverty because they have to deal with several deprivations at the same time.

Even policy intervention programmes would have to do the same to have a meaningful impact for poverty reduction.

The methodological approach used to answer this question, was through applying spatial GIS overlay function on the index of multiple deprivation developed in previous chapter with the buffered (distance proximity measure) of environmental hazardous areas distribution map.

The resulting figure 6- 9 below shows the spatial variation in the overlayed index of multiple deprivations (IMD) with environmental injustices

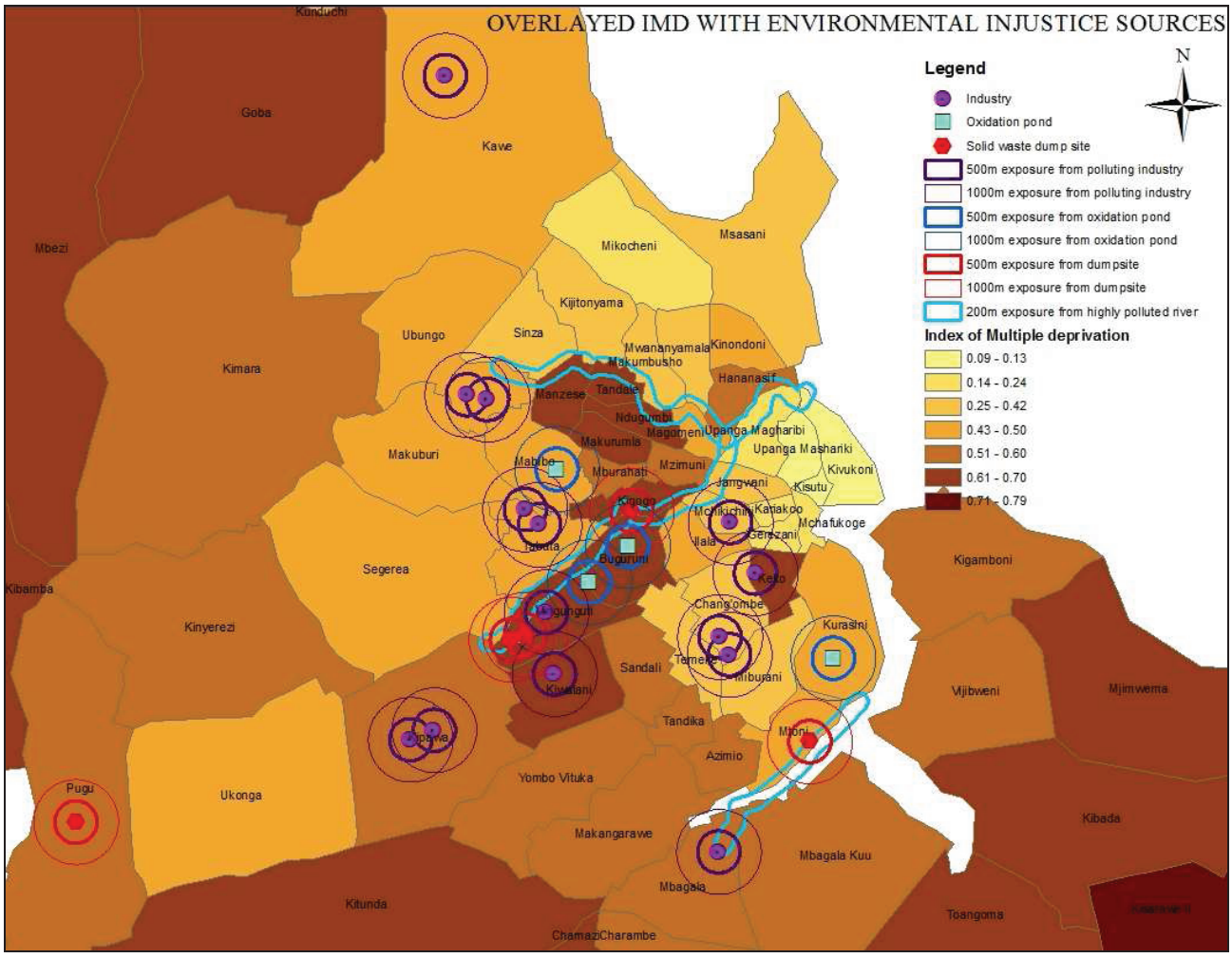


Figure 6-9: Collective area deprivation as result of overlayed of IMD and environmental hazardous area

[15] Area where the adaptation potential of environment and population is at immediate risk of being exceeded (Area suffers multiple source of deprivation)

The above figure 6-9 indicates disproportionate location of hazardous waste facilities and industries in deprived wards within the city.

This result indicates that collective deprivations are cumulative in wards which are highly deprived in overall index of multiple deprivations and are clustered to wards close to city centre. The wards close to city centre with highest levels of multiple deprivations and highly exposed to environmental hazardous area are Vingunguti, Buguruni, Kiwalani, Kigogo, Tandale, Keko and Manzese (see figure 6- 9 above). Cumulative deprivation in these ward leads to high vulnerability (hotspot) compared to other wards

6.4.1. Estimating residential area around environmental hazardous areas

In order to provide a good estimate of the residential areas highly exposed to environmental hazardous areas falling within each buffer distance. Land use map of 2007 was used; where by land uses were classified into industrial, residential, vacant/agriculture, water body and other urban areas. GIS operation tool was used to select residential and other urban areas and intersect it with ward boundary shape file. The residential and other urban areas were then converted to raster and overlayed with environmental hazardous buffered distances (see figure 6-11). Each area falling within each buffered distances was extracted using zonal statistics in order to estimate area exposed to each environmental hazardous points, figure 6-10 below provide the steps used to estimate highly exposed residential area. The results were summarized in each ward (see table 6-3 below).

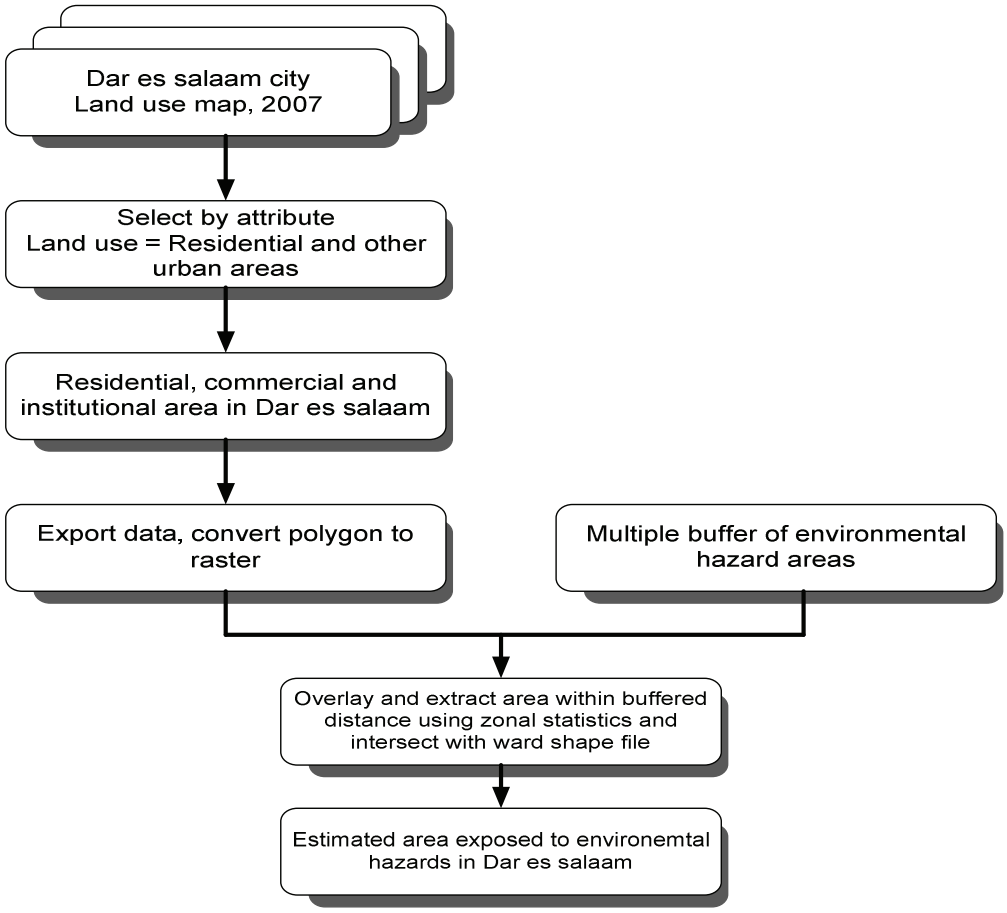


Figure 6-10: Steps used to estimate highly exposed residential area to environmental hazardous areas

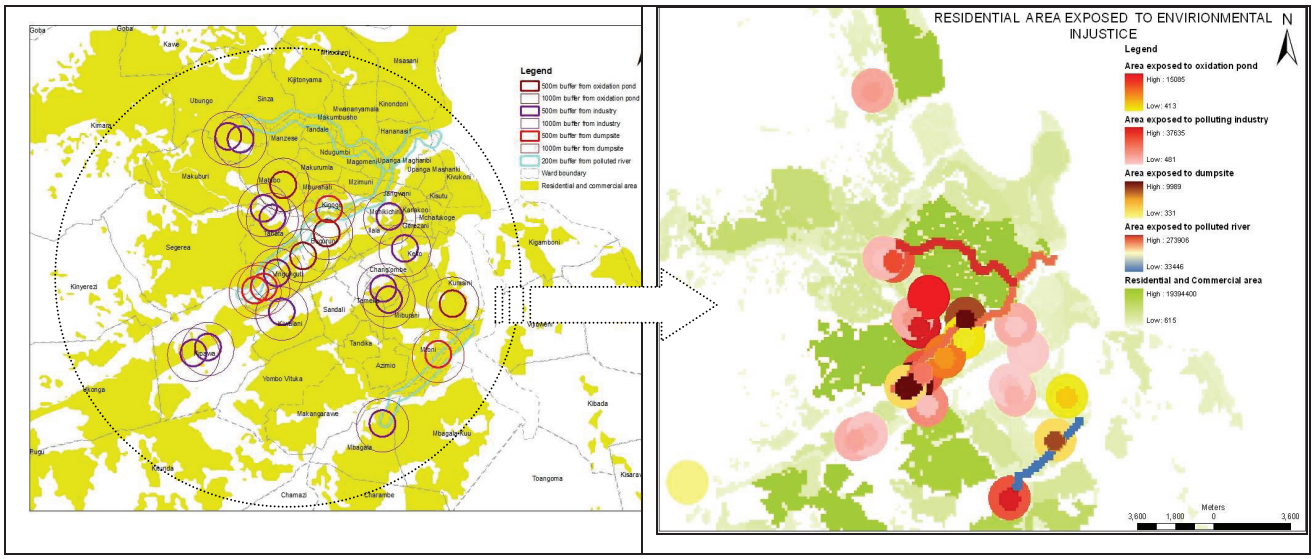


Figure 6-11: Overlayed residential area with environmental hazards buffered distances and estimated highly exposed residential area.

The estimated residential and other urban areas highly exposed to environmental injustices within a buffered distance and compared with index of multiple deprivation in hotspot wards is shown in the table 6-3 below.

Table 6-3: Estimated residential area exposed to environmental injustices in hotspot wards

Ward	Total residential area (Ha)	Residential area (Ha) exposed to dump site		Residential area (Ha) exposed to oxidation pond		Residential area (Ha) exposed to industry		Residential area (Ha) exposed to polluted river	IMD
		500m buffer	1000m buffer	500m buffer	1000m buffer	500m buffer	1000m buffer	200m @side buffer	
Vingunguti	2036	140	304	38	334	78	204	98	0.70
Buguruni	2122	27	333	118	333	0	0	62	0.64
Tabata	2145	0	323	0	381	112	281	27	0.47
Kiwalani	1749	0	176	0	0	79	274	0	0.69
Kigogo	2371	52	364	0	17	0	176	45	0.67
Kipawa	4060	1	176	0	0	157	1438	7	0.53
Segerea	2110	16	185	0	0	4	185	10	0.47
Mburahati	2337	0	108	0	9	0	109	0	0.48
Mtoni	1154	53	286	0	0	0	0	39	0.50
Mabibo	2546	0	0	78	408	0	33	0	0.47
Mbagala	1665	0	0	0	0	77	656	42	0.54
Kurasini	643	0	0	48	78	0	0	0	0.40
Chang'ombe	438	0	0	0	0	76	136	0	0.40
Mchikichini	2036	0	0	0	0	62	114	22	0.36
Ilala	340	0	0	0	0	15	21	10	0.41
Jangwani	2177	0	0	0	0	1	13	30	0.38
Tandale	1952	0	0	0	0	0	0	41	0.65
Manzese	2075	0	0	0	0	0	0	34	0.67
Keko	504	0	0	0	0	49	153	0	0.62

The above table highlights patterns of concentration of environmental hazardous areas in deprived communities in Dar es Salaam city. The results clearly prove that, wards with high level of multiple deprivations are also highly exposed to environmental hazardous areas, as provided in literature review that poor community in both developing and developed countries bare a disproportionate exposure to environmental injustices. Therefore the degree of hottest among the hotspot wards is determined based on the residential and commercial area areas exposed to environmental injustices and the value of multiple deprivations which together results into collective multiple deprivations as described below;

For the 500m and 1000m buffers from dump site, high residential area exposed is observed in Vingunguti ward, where by 140 Ha and 304 Ha respectively is exposed to dump site, followed by Kigogo ward (52 Ha and 364Ha), Buguruni (27 Ha and 333 Ha), Mtoni (53 Ha and 286 Ha), Segerea (16 Ha and 185Ha) and Kiwalani (176 Ha). Meanwhile, these wards contain high value of index of multiple deprivations of 0.70 (Vingunguti), 0.69 (Kiwalani), 0.67 (Kigogo) and 0.53 (Kipawa).

For the 500m and 1000m buffers from waste stabilization ponds, high residential area exposed is found in Buguruni ward, where by 118 Ha and 333 Ha respectively of total area is exposed to waste stabilization ponds, followed by Vingunguti ward (38Ha and 334Ha), Mabibo (78 Ha and 311 Ha) Kurasini (48 Ha and 78 Ha) and Tabata (281 Ha). Also, in other hand the wards contain high value of index of multiple deprivations such as 0.70 (Vingunguti), 0.67 (Kigogo), 0.64 (Buguruni), 0.47 (Tabata and Mabibo) and 0.40 (Kurasini).

For the 500m and 1000m buffers from polluting industry, high residential area exposed is found in Kipawa ward, where by 157 Ha and 1438 Ha respectively of the total residential and commercial area is exposed to polluting industries, followed by Mbagala ward (77 Ha and 656 Ha), Mchikichini (62 Ha and 114 Ha), Vingunguti (78 Ha and 204 Ha), Tabata (112 Ha and 281 Ha) and Chang'ombe (76 Ha and 136 Ha) of the total area is exposed to polluting industries which are causing health problems to the residents.

For the 200m buffer of each side of highly polluted rivers (Msimbazi, Kizinga and Tandale rivers), high residential area exposed is found in Vingunguti ward, where by 98 Ha of the total residential area is exposed to highly polluted river, followed by Buguruni ward (62 Ha), Kigogo (45 Ha), Mbagala (42 Ha), Tandale (41 Ha), Manzese (34 Ha), Jangwani (30 Ha) and Tabata (27 Ha). Figure 6-12 below indicate the cumulative areas exposed to environmental hazard areas overlayed with index of multiple deprivation.

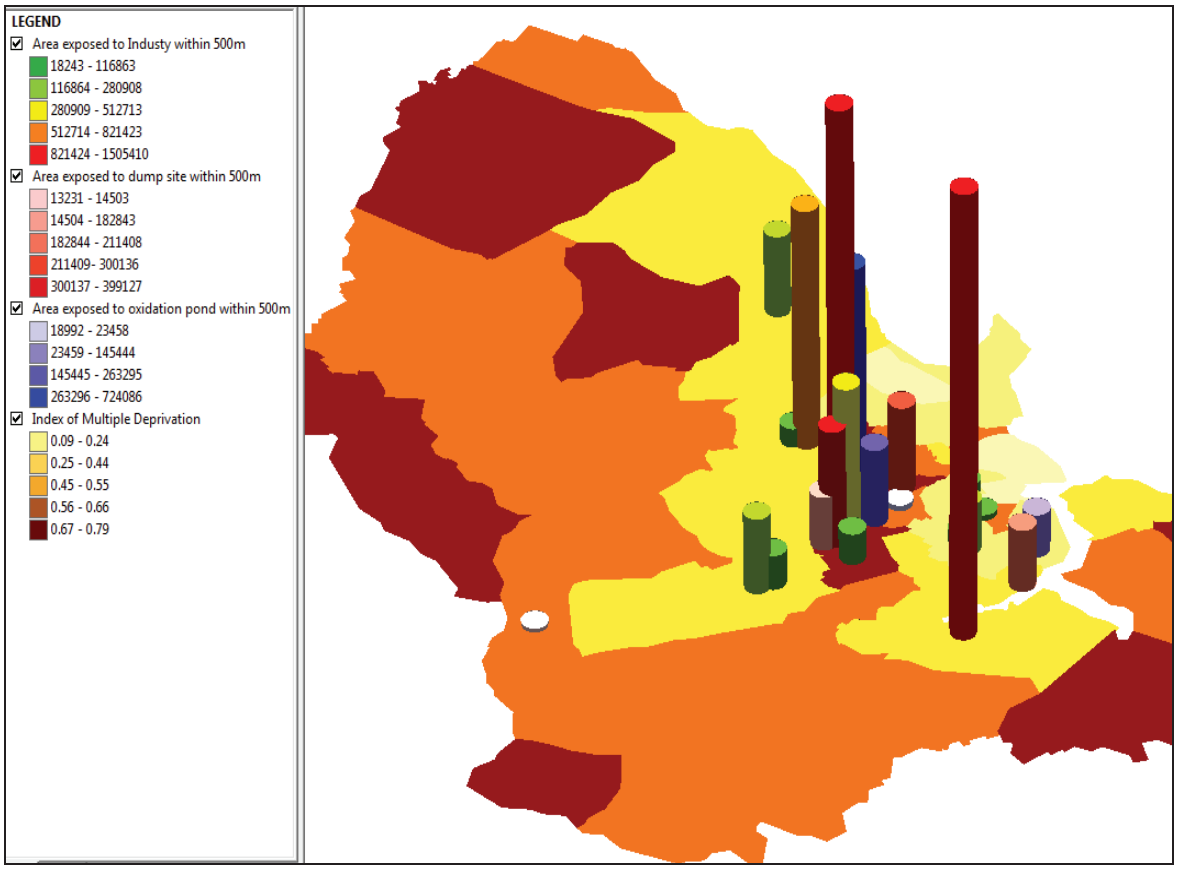


Figure 6-12: Residential and other urban areas exposed to environmental hazard areas overlayed with IMD

6.4.2. Index of Environmental injustice

Finally, the estimated residential and other urban areas exposed to hazard area was used to develop an index of environmental injustices, which can be comparable with an index of multiple deprivations derived from socio-economic indicators. Steps applied are the same as procedures used to develop index of multiple deprivation as described in Chapter 5. The result indicates clustering of deprivation in terms of environmental injustices, meaning that wards which are highly exposed to hazard area are clustered together as indicated in figure 6-13 below. This also already reflected in previous sub section above that wards such as Vingunguti, Buguruni, Tabata, Kigogo, Kipawa, Mbagala and Mburahati are highly exposed to environmental hazard area and also are highly deprived in socio-economic indicators as depicted in index of multiple deprivation.

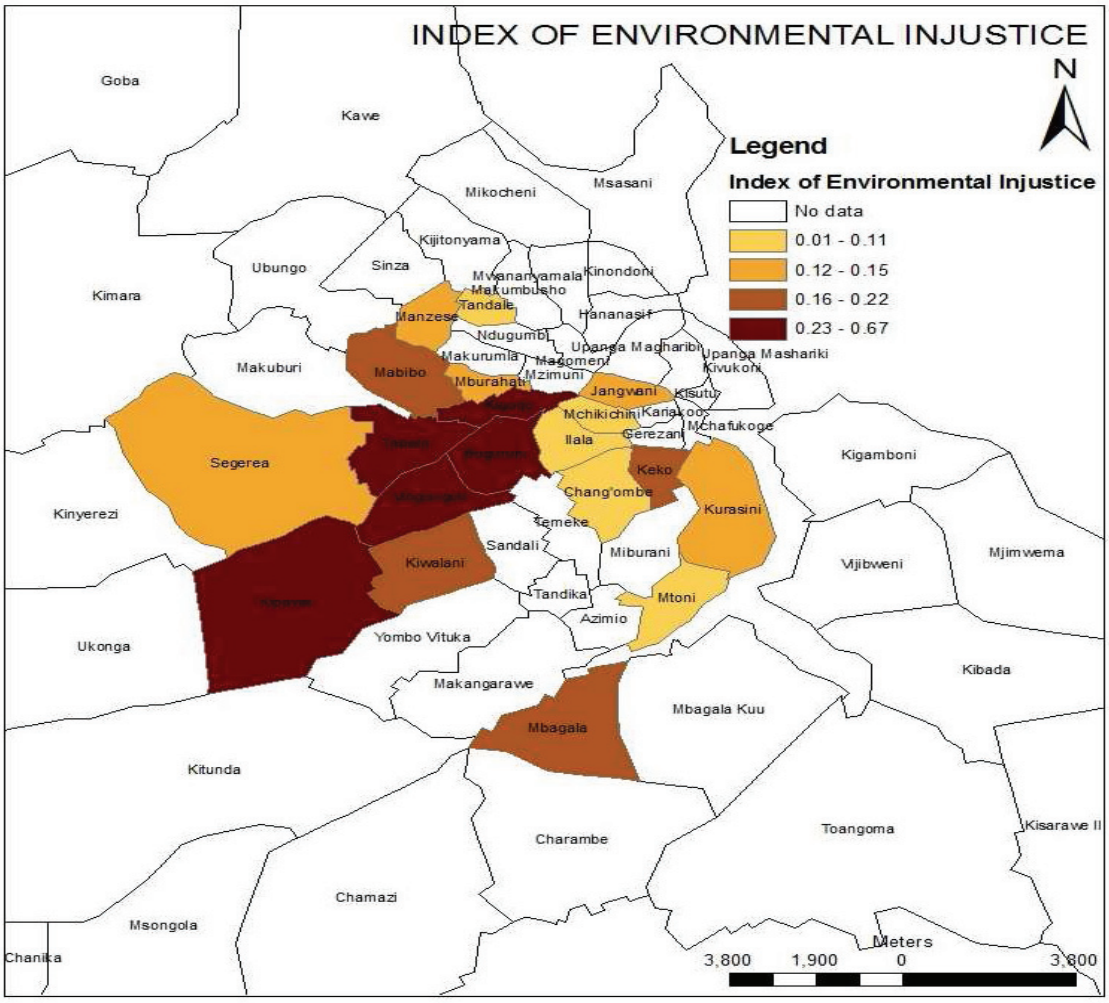


Figure 6-13: Index of environmental injustice

Table 6-4: Comparison of deprivations on hotspot wards

Ward	Physical capital	Human capital	Quality of living environment	Social capital	IMD	Index of Environmental Injustices
Vingunguti	0.91	0.70	0.65	0.49	0.70	0.67
Buguruni	0.83	0.62	0.65	0.29	0.64	0.48
Kiwalani	0.92	0.67	0.62	0.50	0.69	0.22
Kigogo	0.88	0.63	0.69	0.51	0.68	0.48
Manzese	0.85	0.62	0.68	0.57	0.68	0.13
Kipawa	0.76	0.47	0.53	0.37	0.53	0.40
Mburahati	0.69	0.47	0.59	0.55	0.58	0.14
Keko	0.79	0.59	0.70	0.39	0.62	0.19
Tandale	0.88	0.61	0.67	0.44	0.65	0.17
Tabata	0.82	0.44	0.42	0.20	0.47	0.40
Jangwani	0.50	0.37	0.48	0.18	0.38	0.13

Source: Fieldwork, 2008

Table 6-4 above reflects that, hotspot wards are highly deprived in index of multiple deprivations also have high values of index of environmental injustices.

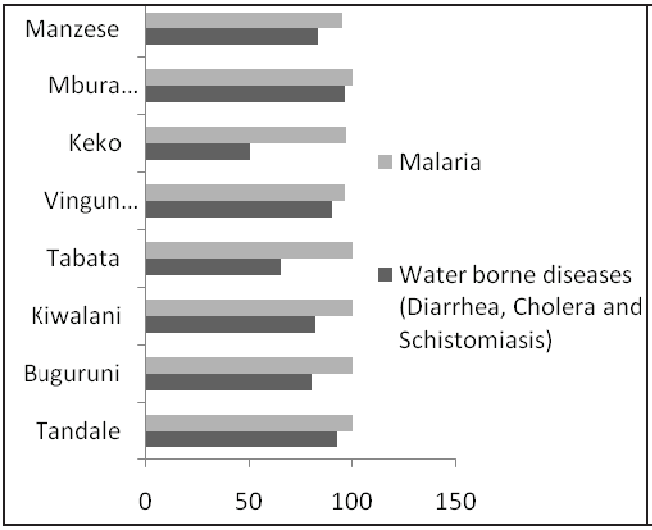
Therefore, people living in deprived areas are worse off than people living in more prosperous areas. They are less employed as reflected in human capital; they are poor and have lower life expectancy, they are living in poor housing and in unattractive local environments with high levels of antisocial behaviour such as existence of hazardous areas and poorer physical infrastructure services. People living in deprived areas experiences higher levels of health problems compared to less deprived wards.

6.4.3. Social-economic impacts of environmental injustices

6.4.3.1. Health impacts

Literature and analysis indicate that wards which are closer to waste facilities are much affected by cholera diseases and malaria. The ward such as Vingunguti, Buguruni, Tabata, Kiwalani and Ilala are most affected due to frequency outbreaks of diseases like Cholera, Malaria and other water related diseases. Outbreak of cholera and other water related diseases both in dry and wet seasons as explained in previous sections is due to hazardous living environments, poor management of oxidation ponds and poor solid waste disposal sites.

There is a clear relationship between health problems, deprivations and proximity to waste facilities as indicated in figure 6-14 below



	Index of environmental injustice	Index of multiple deprivation	Number of cholera cases
Vingunguti	0.67	0.70	130
Buguruni	0.48	0.64	247
Tabata	0.40	0.47	164
Kiwalani	0.22	0.69	111
Kigogo	0.48	0.68	51

High number of cholera cases in the first three wards is because the wards surrounds the oxidation ponds, Buguruni and Vingunguti has higher number because it is highly exposed to two oxidation ponds

Figure 6-14: Health problems associated with multiple deprivations on hotspot wards (City Alliance, 2008, Municipal Councils, 2007 and field work, 2008)

The findings from this study reflect that municipal sewage, solid wastes and industrial effluent disposal practices in Dar es Salaam city contribute to pollution of groundwater resource. The point sources include the on-site sanitation facilities (septic tanks and pit latrines), infiltration from waste stabilization ponds and solid waste dumpsites. The experiment which was done by Dar es salaam water standards and UCLAS by sampling dug wells, bore well and water along Msimbazi river inVingunguti and Buguruni areas shows high concentration of pollutants such as biodegradable oxygen demands (BOD), sulphates,

nitrates and ammonia near to the dump site and oxidation ponds as shown in figure 6-15 below;

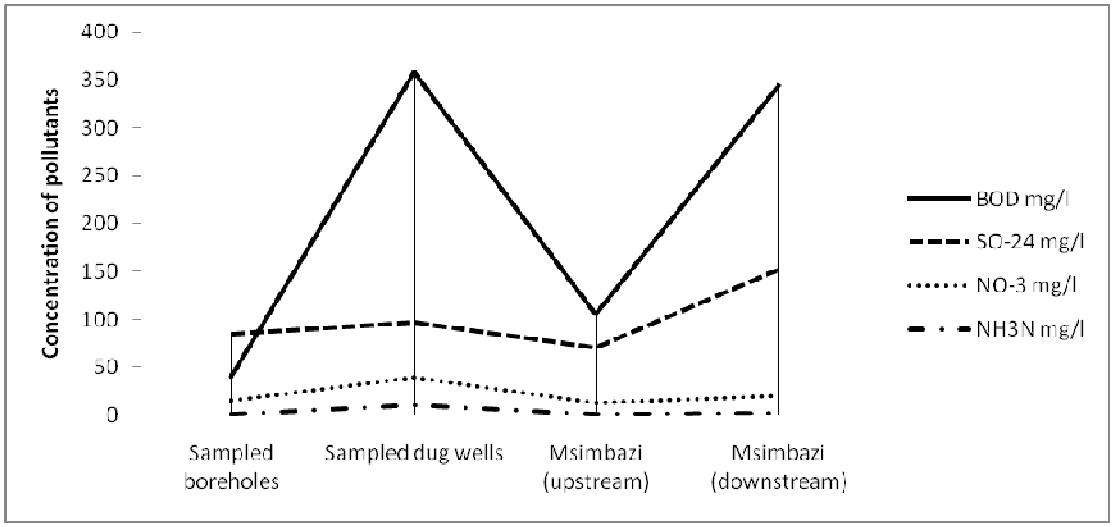


Figure 6-15: Ground water pollution around Vingunguti and Buguruni (JICA, 1997; Longdare, 2001; Mato, 2002)

6.4.3.2. Economic impacts

The economic impacts relating to the waste facilities such as dump site and liquid waste oxidation ponds is the possible negative impact on property values of land and houses. The information obtained from local people during field work in areas closer to dump site and oxidation ponds about 90% reveals that renting cost in areas closer to waste facilities is lower compared to areas which are far from waste facilities for similar houses. This results into weak local economies in highly deprived areas and strong local economies in less deprived areas especially in city centre.

Harvey (1996) argues that *"property values are lower closer to hazardous waste facilities and that economic imperatives often drive the sitting of facilities in low-income areas. This, he argues, is because the insertion of such a facility causes fewer disturbances to property values in low-income areas. Thus, an 'optimal' lower cost strategy for facility siting points to areas where poorer members of society live"*. This argument is quite true for Dar es Salaam city as has been discussed in previously sections, where most of the hazardous waste facilities are located in low income wards which increase inequalities as these areas are economically and socially excluded.

Table 6-5: Social- economic impacts of environmental injustices

Category of impact	Type of potential impact	Potential outcome
Health impacts	• Gas emissions to air, dust and chemicals bound to dust • Waste leachates to soil and groundwater • By-products of biological breakdown from composting	Respiratory impacts • Contamination of groundwater and surface water sources • Carcinogenic effects • Bioaccumulation
Nuisance (Odours and Noise)	• Smell from Hydrogen sulphide compounds • By-products of biological breakdown from composting • Transport to and from sites • Operation of dump sites	Stress-related symptoms and negative health effects
Visual impacts	Vermin, rodents, airborne dust, litter	Stress-related symptoms and negative health effects
Economic	• Reduction in housing values • Decrease in local economic investments	Social exclusion

Source: NEMC and Field work, 2008

6.4.4. The drivers of area based deprivation

6.4.4.1. Weak local economies

Deprived areas are characterized by high concentrations of income poverty and unemployment due to high rate of illiteracy. Low employment is primarily driven by problems individuals face in obtaining work, because the majority are not qualifying due to low education level.

Weak local economies perpetuate low skill levels and a lack of incentives for residents of deprived areas to be employed, which on the other hand exacerbate disincentives for employers to invest in the areas. Investors some times are discouraged from setting up business in deprived areas due to fear of crime.

As result, the area remains with high proportion of unemployed groups, low income that perpetuates high poverty level.

6.4.4.2. Poor housing, poor local environments and unstable communities

As reflected in previous subsection, poor housing condition, poor management of local environments such as solid wastes, liquid wastes, informal settlements, high population density and poor sanitation problems with antisocial behaviour such as disproportionate exposure to environmental hazardous areas, leads into unstable community.

Furthermore, because the areas are characterized by high rate of crime and disorder including drug and alcohol misuse, this results in community instability in many deprived areas. This exacerbates local economic problems as those residents who can (generally the better skilled and educated) move out, leaving behind increasing concentrations of deprivation.

6.4.4.3. Poor public services and an ineffective system for delivering support to deprived areas

Public services such as water, sewerage, storm water drainage system, road network and transport in Dar es salaam is a big problem. Chapter 5 reveals that physical infrastructure

services within the city is a challenging issue to local government, overall only 5% of the total population accessible to sewerage system and only 59% connected to water supply, while above 70% of the city area is covered by unplanned settlements. Non-provision of basic services to community forces the poor to use alternative sources normally at considerable expense from the private sector. In almost every incident the poor pay more per unit than do the better off in provided services.

A study conducted in 2002 revealed that the poor in Dar es Salaam were paying about 48% of their monthly incomes for transport costs to reach the various livelihood areas in the city and spending almost 50% of their monthly income for getting safe and clean water (Kombe et al., 2002).

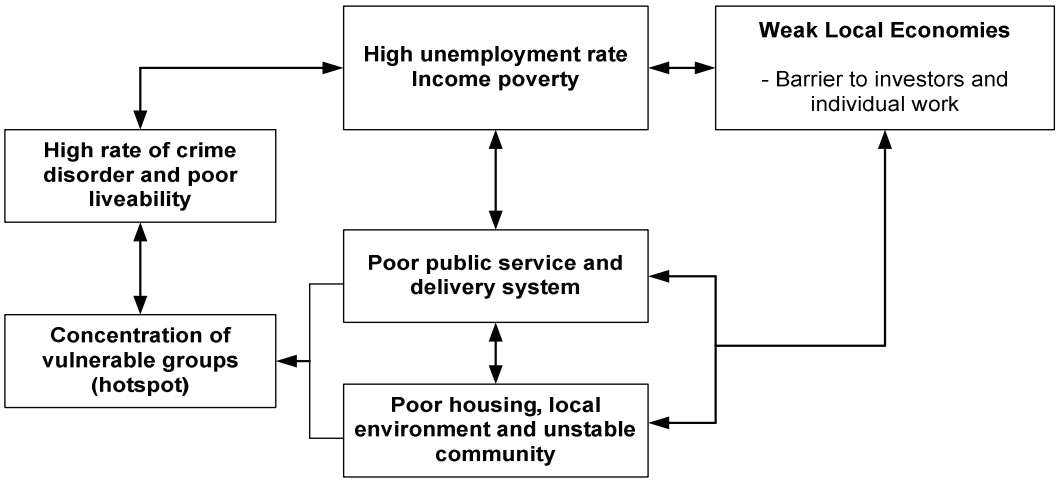


Figure 6-16: Summary overview of the drivers perpetuating area deprivation

6.5. Conclusion

Despite the growing prominence of environmental justice in policy and local action, in Tanzania, and more specifically in Dar es salaam. The results from this chapter indicate significant inequalities in the distribution of various forms of hazardous waste in lower income wards. High deprived communities face a greater environmental burden than other social groups. Disproportionate exposure of environmental hazardous areas, leads to unstable community which results in weak local economies, poor public services and high concentration of vulnerable groups (hotspot areas). Therefore, for an effective poverty alleviation strategy requires local policy makers to understand the combination of deprivations that households face, determine priorities for action; understand the relationships between deprivations and how is linked to social justice.

7. URBAN GOVERNANCE AND DEPRIVATIONS

7.1. Introduction

As African cities continued to grow in size, their declining economic situation has led to dramatic deterioration in the supply of basic infrastructure and urban services. The primary role of local government is to facilitate provision of public services.

There is a number of policies and pieces of legislation that relate to and affect good urban governance and influence informal settlement. A critical policy is the 1995 National Land Policy, which effectively prohibited the removal of informal settlements and committed the government to upgrade them instead, as stipulated in section 4.4 (URT, 1995). In addition, the Local Government Urban Councils Act of 1982 and subsequent legislation effectively restored local government as an institution responsible for service provision (URT, 1982).

7.2. The concept of Governance

Governance is defined by (Onibokun and Kumuyi, 1996) as the "*role of the state in society; the management or mismanagement of socioeconomic activities in the public, private, and community sectors; and the involvement or lack of involvement of civil society in the management of society as a whole".* Also (UN-Habitat, 2008) defined governance as "*the process of decision making and the process by which decisions are implemented or not implemented*".

The World Bank perceives governance as "the manner in which power is exercised in the management of a country's economic and social resources for development" (World Bank, 1992). Depending on the way in which that power is exercised, governance can be either good or bad. Good governance will lead to the institutionalization of appropriate policies, programs, and strategies for urban management that help to eliminate or improve the problems urban deprivation (Onibokun and Kumuyi, 1996).

Bratton and Van de Walle (1992.) argued that the "Concept of governance is crucial due to multiple factors, including a backdrop of economic depression, indignation over internal oppression, corruption, asceticism and dislike of the state's unresponsiveness to popular demands".

Since governance is the process of decision making and the process by which decisions are implemented, an analysis of governance focuses on the formal and informal actors involved in decision-making and implementing the decisions made and the structures that have been set in place to implement the decision (UN-Habitat, 2008). Government is one of the actors in governance. Other actors involved in governance are civil society such as Community based Organisation (CBOs), Non-Governmental organisation (NGOs) and private sector.

7.3. Guiding principle of Good urban Governance

(UN-Habitat, 2008) identified eight major guiding principles of good urban Governance to be followed in determining the extent in which it responds to the challenges of poverty and urban deprivation; these include:

1. **Participatory approach;** which could be either direct involvement of both men and women or through legitimate intermediate representatives. It is important to point out that representative does not necessarily mean that the concerns of the most vulnerable in society would be taken into consideration in decision making. Participation needs to be informed and organized.
2. **Consensus oriented**, good governance requires compromise/mediation of the different interests in society to reach a common or main consensus in society on the best interest of the whole community. However, this principle requires a broad and long-term dimension on how to achieve the goals for sustainable human development.
3. **Accountability** is a key requirement of good governance. Not only governmental institutions but also the private sector and civil society organizations must be accountable to the public and to their institutional stakeholders. Who is accountable to who varies depending on whether decisions or actions taken are internal or external to an organization or institution. In general an organization or an institution is accountable to those who will be affected by its decisions or actions
4. **Transparency** which means that decisions made are taken and their enforcement is done in a manner that follows rules and regulations. Meanwhile making sure information is freely available and directly accessible to those who will be affected by such decisions and their enforcement.
5. **Responsive**, good governance requires that both actor's in urban management and processes serves all stakeholders within a reasonable timeframe
6. **Effective and efficient**, meaning that processes and institutions produce results that meet the needs of society while making the best use of resources at their disposal. The concept of efficiency in the context of good governance also covers the sustainable use of natural resources and the protection of the environment.
7. **Equitable and inclusive**, this notion reveals that all groups regardless their income levels have equal chance and rights. A society's well being depends on perceptions of its members feelings that they have a stake in it and do not feel excluded from the other society. This requires consideration of all groups, but particularly the most vulnerable, have opportunities to improve or maintain their well being.
8. **Rule of law**; this requires fair legal instruments that are enforced impartially and full protection of human rights, particularly those of minorities groups. Enforcement of laws requires an incorruptible government.

The above principles assure that corruption is minimized, the views of minorities groups are taken into account and that the voices of the most vulnerable in society are heard in decision-making. Figure 7-1 below summaries the principle of good governance.

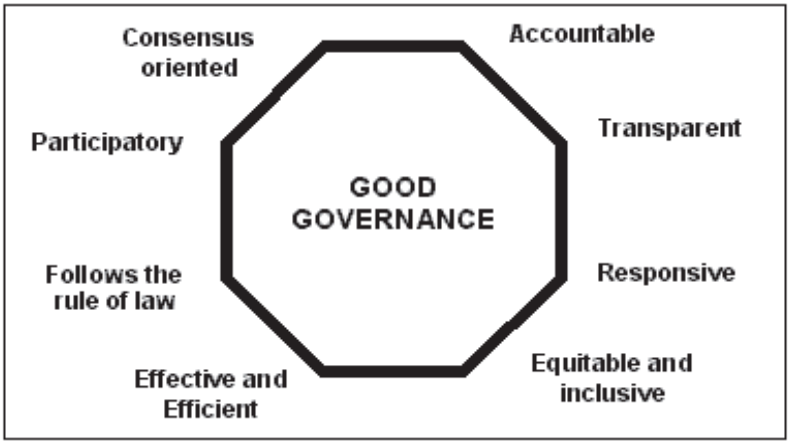


Figure 7-1: Major characteristics of good governance (Source: (UN-Habitat, 2008)

7.4. Constraints of good urban governance in Dar es salaam city

In order to understand the underlying causes of multiple urban deprivations in Dar es salaam city the following question was raised "*How has urban governance been affected by the pressing need for physical and social infrastructure service provision for sustainable urban development*[16]*?"*

7.4.1. Lack of housing policy

The current housing delivery mechanism is not adequate for provision of affordable shelter for the low income earners and the disadvantaged groups. However, the growth of informal settlement undermines the quality of living environments in urban areas, the existing policies that are related to land, human settlements development and environment do not adequately address shelter sustainability.

A study conducted by National Social Security Fund (NSSF) in (Mngoya, 2008) shows that a low income earner like a primary school teacher or even a secondary school teacher or a nurse can save for ten years to build a two rooms house. Also a study conducted by an NGO (WAT-Human Settlements Trust) in (Mngoya, 2008) which deals with credit service to low income earners shows that a low income earner saving 20,000 T-shillings per month can take 10 years or more to build a two room house. As a result majority rent in informal settlement where the cost of renting is low which results into overcrowding in these areas. This situation promotes poverty/deprivation concentrations in a certain areas.

The recent study done by UCLAS in Dar es salaam city indicates that average occupancy is 4.2 persons per room in overcrowded conditions (Kironde, 2006).

Generally the housing sector in Tanzania is faced by a lot of challenges which need immediate attention; these include high rate of urbanization, absence of housing finance ,lack of institution framework for harmonizing infrastructure provisions, building regulations and planning standards and land delivery system.

[16] Development that meets the needs of the present generation without compromising the ability of future generations to meet their needs by maintaining the carrying capacity of the supporting ecosystems WCED (1987). Our Common Future, Oxford University Press, Oxford.

The Housing Policy formulation efforts need to be supported and coordinated by all actors in shelter delivery system such as Central Government, Local government, financial institutions, research institutions, CBOs, NGOs and private sectors to improve housing service delivery system in Tanzania.

7.4.2. Informal land market system

Land delivery system in Dar es Salaam is largely practised by local people and local leaders as witnesses. This is due to fact that formal land delivery system is largely distorted and skewed towards the minority high and middle-income earners. Getting access to formal land involves long technical procedures, bureaucracies and corruption. Hence transaction costs in this system are very high, which low-income households can not afford. Only benefit those with economic and political influences.

Kironde, Kombe and Lupala (1994; 1995; 2002.), indicate that about 70% of the land developers in the city obtained their land from the alternative informal land market which is flourishing in unplanned urban lands. Many developers had lost hope of getting plots allocated in the normal channel of delivery due to bureaucratic procedures, costs and inadequate of the City Authority to cope with market forces

This means that the majority will continue to seek land from informal land market, due to restrictive building regulations, development conditions and standards in planned areas coupled with laxity in enforcing development control, majority of people resort to build their houses in unplanned areas where one is able to build a sub standard house and live without paying land rent and enjoy investment opportunities which are prohibited in planned areas (Kironde, 1994; Kombe, 1995; Lupala, 2002.).

Spontaneous development of informal settlements increases costs for provision of public goods such as necessary expansion of road or construction of new roads, open space, water supply, storm water drainage, sewerage systems, and community facilities like schools, dispensaries, shopping space, recreational facilities because it will require demolition of some houses that will need compensation.

7.4.3. Weak financial resources

The most visible manifestation of the urban crisis in Tanzania is the lack of access to physical infrastructure services such as water and sanitation by the poor. Kulaba (1989) found that the main challenge of urban social inequalities in urban areas is weak financial sources of local governments.

The available resources necessary for infrastructure provision such as roads, sewers, water systems, schools and hospitals cannot cope with the needs of the growing urban population, because local governments in Tanzania mainly generate low revenues from taxes and generally starved of funds to provide and maintain services (Kuluba, 1989). This has lead to high inequalities among the cities and within the cities.

As a result, the urban poor are highly deprived and overexposed to environmental risks and life threatening diseases associated with inadequate water provision such as diarrhoea, cholera and other water-borne diseases.

7.4.4. Lack of capacity and corruption

In Dar es Salaam city multiple deprivations is due to the lack of capacity of responsible authorities, corruption and exclusiveness in decision-making at lower levels to pursue the delegated responsibilities. This situation leads into high range of inequalities within the city.
Decentralization of decision making from higher level to local levels can improve service provision by allowing at least some decisions to be made at the local level to meet the specific needs of the citizens at lower level. Although, governments have initiated decentralization process since 1982 as indicated in local government authority 1982, but the results have been unsatisfactory. It is clear that decentralization alone is not enough to ensure equitable and efficient provision of services to the poor, because the governments have often introduced decentralization concept without capacity building and establishing the necessary institutions mechanism to make it work.

7.4.5. Lack of equality and diversity considerations in planning

In preparing development plans, local planning authorities are required to consider the relationship of planning policies and proposals to social needs and problems including their likely impact on different groups in the population such as women, the disabled, ethnic minorities, and disadvantaged people living in deprived areas. An integral part of this is to consider the extent to which issues of social exclusion can be addressed through land-use planning policies. Lack of coordination in plan preparation causes most of the plan not be implemented to deliver what was promised, because it does not reflect reality, too optimistic and resources required were not foreseen.

7.4.6. Lack of administrative structures and instruments necessary for harmonising infrastructures provision

Decision making in central and local governments tends to be organized along sectoral lines through ministries and departments that deal separately with physical and social services such as environments, lands, education, health, water, industry and sanitation etc.
These result into lack of coordination among key institutions such as different Ministries and actors in planning and implementation process and weak enforcement of existing laws and regulations on development controls.
Moreover, problems and solutions associated to these departments are closely related to each other as described in chapter 5 and problems in one sector may have solutions in another. In realities communities affected by the problems do not think in terms of sectors or ministries. Their problems are multiple cross-sectoral. In this case local planning and intervention decision programmes has to follow a holistic approach. Therefore, there is a need of administrative structures and instruments to harmonize service provision to the poor across the city.

7.5. Governance intervention measures for reducing urban deprivations

Urban deprivation, governance, and social exclusion are central challenges to sustainable urbanization at all levels. Local authorities endowed with adequate powers, resources and operational capacity, combined with empowered communities and other local partners are the key actors in managing urban growth (UN-ESCAP et al., 2007). In analysing this aspect the

following question was raised "*What actions have local government, civil society and the private sector done in the region to strengthen efforts to achieve sustainable development?"*

In order to answer this question, Government development project reports and different polices were used in line with objectives in order to determine the extent to which governance responds to the challenges of intra urban inequalities and environmental injustices which in totality leads into urban deprivation as described in sub section below:

7.5.1. Community Infrastructure Upgrading Program (CIUP)

Addressing deprivation and disadvantage groups to reduce intra-urban inequalities requires action at a number of levels by a range of public bodies and the voluntary and private sectors. This will range from tackling concentrations of multiple deprivations at the neighbourhood level to national level.

The Tanzania Government recognized the importance of the provision of shelters and basic services, especially for low-income people. In this respect, the National Land Policy of 1995 and National Human Settlements Development Policy of 2000 which indicate that "the existing squatter areas will not be cleared, but will be upgraded and provided with facilities for adequate sanitation and other basic services except for unplanned housing in hazardous areas." According to this statement, improvement of quality of living environment in unplanned settlement is one of the most critical issues in Dar es Salaam.

In order to provide basic services and improve access to infrastructure in unplanned settlements, Community Infrastructure Upgrading Program (CIUP) was introduced in 2001 to Dar es Salaam city (DCC and JICA, 2007). This programme is under Local Government Support Project (LGSP) sponsored by the World Bank and UN-Habitat. The CIUP involves the communities in all the stages, such as identification of problems, ways of solving, and prioritization of critical issues for immediate actions. It aims to address social and infrastructural problems by working directly with communities. The main objectives of the CIUP are as follows; to facilitate capacity building with the Dar es Salaam local authorities in upgrading unplanned settlements by provision of infrastructure and services; to facilitate capacity building in the respective communities to participate in planning, investment and management of infrastructure and services; and to facilitate improvement of living condition of low-income residents living in the unplanned settlements (DCC and JICA, 2007). Among 154 unplanned settlements in Dar es Salaam identified by the CIUP, 31 communities were selected as the priority target areas for the improvement of basic infrastructure. In the phase-1 (2005-2008), 16 communities have implemented. There fore about 330,000 people will be beneficiaries by the CIUP, which is approximately 20 percent of the people living in unplanned areas of Dar es Salaam (DCC and JICA, 2007).

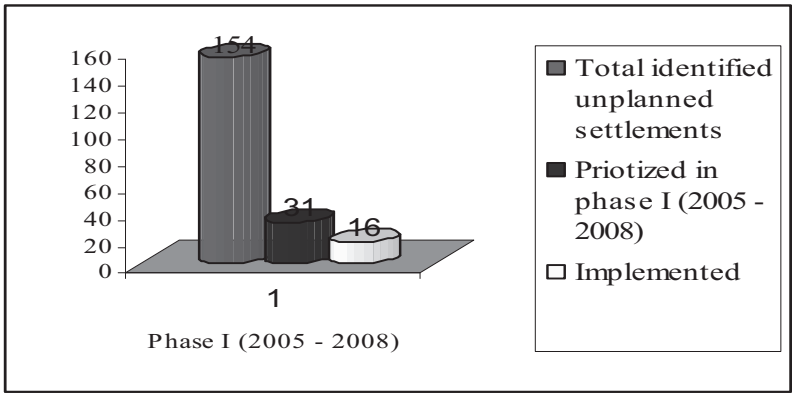


Figure 7-2: Upgraded unplanned settlements by CIUP from 2005-2008

Major outcomes of the CIUP are infrastructure upgrading, including improvement of roads, footpath, drainage, sanitation, solid waste containers, street lighting, public toilets and provision of public water taps. World Bank finances 90 percent of the total implementation cost and the communities and relevant Municipality contributes 5 percent each to the cost of community roads improvement (DCC and JICA, 2007).

7.5.2. Insuring surveyed plots available for housing development

The most effective way of preventing the escalation of informal settlements in rapidly developing cities is to ensure surveyed and serviced plots are available at affordable costs.

In the early 2000's the Tanzania Government was deeply concerned over the acute shortage of surveyed residential plots in urban centres in the country. Due to rapidly growing urban population and the inability of the local government to cope with high demands of infrastructure services and compensation in the areas earmarked for plot survey (Kombe, 1995; Kironde, 2006; MLHHSD, 2008).

In 2002 the Ministry of Lands, Housing and Human Settlements Development (MLHHSD) planned and the Government approved the project to survey 20,000 plots in Dar es Salaam city in order to cope with high land market demand for surveyed and serviced plots and to control informal land subdivision practised by local people in peri-urban areas (MLHHSD, 2008). The project involves public awareness campaigns, revision and preparation of Town Planning Layouts, compensation, surveying of plots, construction of roads, allocation of plots and the preparation of land title deeds. This project is financed by Government of Tanzania to empower local authorities to acquire funds for surveying and servicing plots, the fund is called "Plot Development Revolving funds (PDRF)

In the course of implementing the 20,000 Plots Project in Dar es Salaam, a total of 30,237 plots were surveyed and completed by December 2005 in 11 areas namely: Tuangoma, Kisota, Mbweni, Buyuni, Mbweni JKT, Mtoni Kijichi, Bunju, Mwanagati, Mivumoni, Vijibweni, Dungu Farm, Gezaulole and Mwongozo. Table indicates the status of the 20,000 Plots Project.

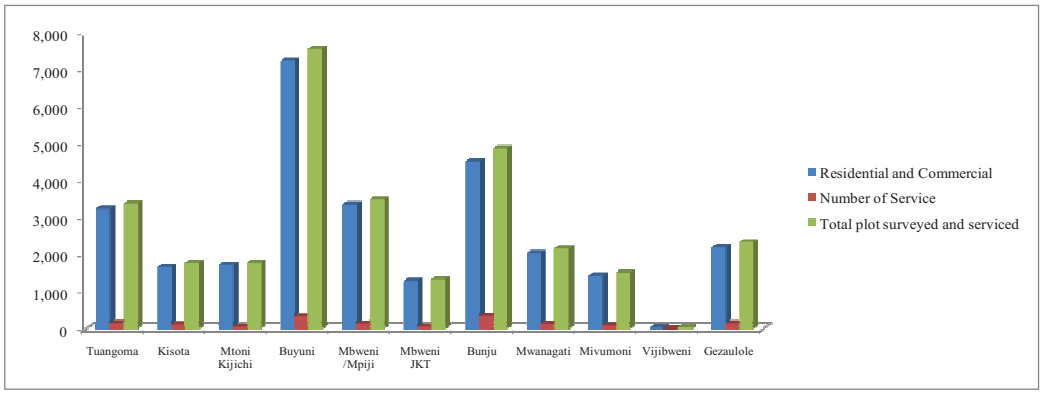


Figure 7-3: Survey and serviced Plots in the 20,000 Plots Project (MLHHSD)

To date about 40,000 plots have been surveyed and serviced in the three Municipalities of Ilala, Temeke and Kinondoni.

In line with this strategy, the National Housing Cooperation (NHC) has been involved in a Housing provisional mechanism through constructing shelter for renting and selling to residents in peri -urban areas as means of preventing the escalation of informal settlements within the city for example in Boko. The number of applicants for the NHC houses grows everyday in the construction site. One complete and serviced building costs up to TSH 15,000,000/ (Kinondoni Municipal Council, 2007). Figure 7-4 below shows an overview of the constructed houses in Boko by NHC

Figure 7-4: Housing provisional mechanism constructed by NHC in Dar es salaam city

7.5.3. Privatization of solid waste collection and management

Privatization of solid waste collection in the city involves private sector participation and decentralization of powers from Municipal Council to the private sector to collect solid waste. However, Municipality is still retains overall responsibility for provision of this service. Involvement of the private sector in solid waste collection was initiated under the Global Sustainable City Development Programme (GSCDP). Several cities, including Dar es Salaam was involved through the Sustainable Dar es salaam city Project (SDP) which started in January 1992. In 1993 the Sustainable Dar es salaam Project (SDP) introduced the Environmental Planning and Management (EPM) process with the overall aim of supporting the DSM City Council in promotion of new partnerships among public, private, and

community sectors to develop sustainable solutions to priority environmental issues. One of the priority issues was solid waste management (DCC and JICA, 2007; DCC and UN-HABITAT, 2007).

The SDP, through the EPM process, provides municipal authorities and their partners in the public, private partnership with an improved environmental planning and management capacity. Introduction of Public-private Partnership in solid waste management in Dar es salaam city improves the coverage of service from 10 wards in 1994 with a capacity of collecting 2-5% of the waste generated to 50 wards with an average level of service of 35-40% in 2007 (DCC and JICA, 2007).

7.5.4. Bio-Gas extraction and combustion from dump site

The government has started the pilot project for extracting bio-gas and combusting it in Mtoni dump site as response to environmental problems which were caused by the dump such as, gas emission, bad smell, fire explosion and frequently cholera outbreak. The project is sponsored by World Bank. The Bio-Gas extraction and Combustion Plant started from 19th October, 2007. The aim of the project is to extract bio gas and combusts it in order to reduce air pollution caused by the dump. According to their contract agreement World Bank will be paying Euro18 for every 1m3 extracted and burned. The plant extracts bio gas and combust 11447m3 per day. The future plan of the project is to use the extracted bio gas to generate electricity instead of combusting it.

Moreover, in order to solve the reported problem in Kigogo dump site, new site has been planned to develop a new sanitary landfill site at Kisopwa in Kibamba Ward, in the rural part of Kinondoni Municipal Council. The project development is expected to commence immediately after completion of the EIA. The total area of this site is estimated to be 141 hectares; this area will be divided into sections that will be developed by phases. The life span of this site estimated to be more than 30 years (Kinondoni Municipal Council, 2007).

7.5.5. Local Government Reform Programme and National Strategy for Growth and Reduction of Poverty

The government's ongoing urban sector policy reform is designed to create an institutional environment more conducive to the sustainable urban development and delivery of urban infrastructure and services. This programmes aims at improving governance structures for ensuring autonomous local authorities, services provisions, accountability, democracy and poverty reduction.

The government has recognized the importance of the urban sector in national socio-economic development. Human settlements policy and strategy have been reviewed which aims at creating sustainable development in urban centres for improving quality of living environments in informal settlements, alleviating poverty, stimulating good urban governance, economic growth and employment through regional planning and decentralization of socio-economic infrastructure to other satellite centres in the outskirt of the city. In order to promote urban growth in the peripheral area, the plan proposed five satellite centres to be developed at Bunju, Mbezi Luisi, Pugu Kajiungeni, Mbagala Kongowe, and Mji Mwema see appendix 10-1. Moreover, the capacity of the public sector to implement the sustainable human settlements program in urban areas has been improved through human

resource development under Urban Development and Environmental Management (MLHHSD, 2008).

7.5.6. Conducting of Environmental Impact Assessment (EIA) and Auditing as instrument for sustainable development

After realizing the environmental impacts caused by industries, Government of Tanzania has already conducted an environmental audit to all old industries, to check for compliance with conditions of environmental standards. Also this process used as an internal review of environmental management practices by proponents, because most of the industries were built without EIA[17]. Meanwhile EIA is already been conducted to big pollutants, like Tanzania Portland Cement Factory, TBL, Tanzania Cigarette Company and others, and is continuing to be conducted to the rest of industries as stipulated in section 98-101 of Environmental Act, 2004. A central role of EIA is being one of the instruments to achieve sustainable development, development that does not cost the earth. Environmental Impact Assessment shows how much better it would be to mitigate the harmful effects in advance, at the planning stage, or in some cases avoid the particular development altogether. In order to achieve this, EIA has been institutionalized in the project planning and implementation in order to ensure that the likely effects of new developments are fully understood taken into account before the development is allowed to go ahead. As result of EIA and Auditing[18] the environmental pollution has decreased, the research done by (WHO, 2005) shows that cement factory was emitting over 379tonne of SO2, 1146tonne CO and suspended particulates about 106069tonn/year but now has decreased over 70%. Some of the industry was given notice to stop operating due to serious environmental pollution such as Metro Still Mill in Kipawa, see the stopping order in appendix 10-2 below and others were given warning like Karibu Textile Limited in Mbagala, Serengeti Breweries Limited and Tanzania Breweries Limited to implement the mitigation measures as recommended by environmental audit (DCC, 2004; NEMC, 2006).

7.6. Conclusion

Intra-urban inequalities and environmental injustices in Dar es Salaam city are found to be fuelled by weak urban governance structures. The core of this problem is the weak financial resources, lack of housing policy, and insufficient capacity of local government to cope with high service demands. In deprived areas, without an additional intervention to pressure the government and other service providers to ensure access to basic services that can develop their capabilities, they will remain stuck in poverty for ever.

Promotion of good governance will foster the acquisition of new capacities, the establishment of new institutions, the promotion of new ways of working within existing organizations and the formulation of new rules for interaction. Good governance is an essential mechanism to make strategies for providing basic services and reducing poverty effective and sustainable.

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[17] A systematic examination conducted to determine whether or not a programme, activity or project will have any adverse impacts on the environment

[18] A period evaluation and systematic checking for compliance with conditions of environmental approval, but also as an internal review of environmental management practices in preserving the environment

8. CONCLUSION AND RECCOMMENDATION

8.1. Conclusion

Dar es Salaam city centre and the peri – urban areas are going through rapid physical and social transformations. There is an increasing inequality between the accessibility of basic services and acceptable quality of living environment. The resulting situation varies within the city. The fact remains that the urban poor are more concentrated in poor environments, which are often excluded from the supply of basic urban services.

The main findings of this research are summarized according to the research questions as described below;

- *What are the major indicators valid for describing intra-urban inequalities in Dar es salaam city?*

The study found four types of capital indicators valid in describing intra-urban inequalities; these include Physical infrastructure capital, Quality of living Environment capital, Human capital and Social infrastructure capital. The index of multiple deprivations developed makes it possible to indicate the level of deprivation concentration at the ward level, rather than using data aggregated at regional level which hides the realities. It provides information which identifies the nature and spatial pattern of deprivation at ward level.

There is also variation in the type of deprivation experienced with different capital deprivation such as in physical, human, social and quality of living environment capitals existing in several wards, but high deprivation is seen in physical deprivation with an average index of 0.70.

For each capital, the maps indicate the specific types and concentration of deprivations that occur at ward, which is useful for policy makers to identify the wards which should have priority in financial allocation. Specific intervention is an effective way to reduce existing deprivation. Therefore, spatial information dis-aggregated to the lowest level at which decisions on interventions are made within cities contributes to improving local urban governance.

- *To what extents are different indicators of inequalities are spatially concentrated within Dar es salaam city?*

The spatial patterns of inequalities found in Dar es salaam indicates that some wards experiences multiple sources of deprivation where hotspots of poverty emerge and are clustered together in some low income wards near to city centre and wards which are far away from the city centre.

A rationale for positive autocorrelation and clustering of social-economic indicators within a city reflects that multiple deprivations in highly deprived wards have cumulative and qualitatively different effects on individual's communities and to local economies than less deprived areas, forming one category of area effects (hotspots). This indicates that in any intervention to support poor communities, additional special interventions such as area-based

policy targeting is an effective way to support highly deprived communities so as to promote local economic development and reducing inequalities within the city.

- *What types of facilities should be included in determining the existence of disproportionate environmental burdens?*

The study revealed that hazardous wastes which are found from solid waste disposal sites, oxidation ponds, and some industries cumulatively create environmental burden to local communities. The findings reflect that poor communities are more exposed to environmental burden, because most of the disposal sites and industrial facilities are found in low income communities such as Vingunguti, Buguruni, Kurasini, Kipawa, Mtoni and Mabibo.

- *To what extent are intra-urban inequalities and environmental hazardous areas spatially concentrated within the city, such that hotspots of inequalities emerge?"*

Concentration of multiple deprivations in one area makes it difficult for households to find a way out of poverty because they have to deal with several deprivations at the same time.
The findings indicate significant inequalities in the distribution of various forms of hazardous waste in lower income wards. High deprived communities face a greater environmental burden than other social groups. Collective deprivations are cumulative at wards which are highly deprived in terms of physical infrastructure services, social services, human and quality of living environment. The wards between 3km and 10km from city centre with highest levels of multiple deprivations and highly exposed to environmental hazards area are Vingunguti, Buguruni, Kiwalani, Kigogo, Kipawa, Tandale, Keko and Manzese. These wards are hotspot compared to other wards due to cumulative multiple deprivations.
Existence of environmental hazardous areas, leads to unstable community which results in weak local economies, poor public services and high concentration of vulnerable groups (hotspot areas).

- *What actions have local government, civil society and the private sector done in the region to strengthen efforts to achieve sustainable development?"*

Addressing deprivation and disadvantage groups to reduce intra-urban inequalities requires action at a number of levels by a range of public bodies and private sectors. This ranges from tackling concentrations of multiple deprivations at the neighbourhood level to national level.
The research found that the Government of Tanzania has recognized the importance of multi sectoral participation in poverty reduction strategy to reduce deprivation within the city through the following interventions measures;

- Community Infrastructure Upgrading Program (CIUP) which was introduced in 2001 to Dar es Salaam city. In order to provide basic services and improve access to infrastructure in unplanned settlements, this programme is under Local Government Support Project (LGSP) sponsored by the World Bank and UN-Habitat
- Introduction of the surveyed and serviced plots project as effective way of preventing the escalation of informal settlements. To date about 40,000 plots have been surveyed in the three Municipalities of Ilala, Temeke and Kinondoni.
- The government has started the pilot project for extracting bio-gas and combusting it in Mtoni dump site in order to reduce air pollution and underground water pollution. In order to improve environmental problems caused by the dump sites.

- Introduction of Public-private Partnership in solid waste management that improves the coverage of service from 10 wards in 1994 with a capacity of collecting 2-5% to 50 wards with an average level of service of 35-40% in 2007
- Conducting an EIA to all industries and development projects as instrument to achieve sustainable development
- Creating an institutional environment more conducive for sustainable urban development and delivery of urban infrastructure and services, for improving quality of living environments in informal settlements, alleviating poverty, stimulating local economic growth and employment.

- *How has urban governance been affected by the pressing need for physical and social infrastructure service provision for sustainable urban development?"*

Intra-urban inequalities and environmental injustices in Dar es salaam city are fuelled by weak urban governance structures. The core of this problem is the weak financial resources, lack of housing policy, and insufficient capacity of local government to cope with high service demands. In deprived areas, without an additional intervention to pressure the government and other service providers will remain stuck in poverty for ever.
Promotion of good governance will foster the acquisition of new capacities, the establishment of new institutions, the promotion of new ways of working within existing organizations and the formulation of new rules for interaction. Good governance is an essential mechanism to make strategies for providing basic services and reducing poverty effective and sustainable.

8.2. Recommendation for further study

The following areas are identified for further study. Applying Remote sensing data and to incorporate with developed index from census data. The recommended parameters to be included are accessibility to green areas (vegetation), surface temperature and roof density for describing quality of living environment which can be extracted from remotely sensed imagery. Several other studies have suggested that environmental factors form an important link with urban deprivation. The environment is an element that sets the context in which the poor households live and determine their assets and vulnerabilities. Although few environment dimensions can be captured by census, advanced geo-information techniques are best suited to retrieve wide variety of urban environmental information that can be used along with the census based methods to find the most deprived areas in a city (Li and Weng, 2007)

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10. APPENDICES

Appendix 10-1: Stopping order from NEMC to Metro Steel Mills Ltd

NEMC orders steel firm to halt operations

From page 1

handled in similar fashion, Dr Ngoile said no polluter of the environment would be spared under the new law.

He appealed to players in the manufacturing sector to work with NEMC in efforts to tackle environmental pollution caused by lack of environmental friendly production methods in factories.

Dr Ngoile said many manufacturers had been advised to apply environmental audits instead of Environmental Impact Assessment (EIA) because the factories were built without EIA being carried out.

Prior to taking the decision to suspend production at Metro Steel Mills Ltd, NEMC had consulted a number of stakeholders such as the Kinondoni and Ilala municipal councils, Inspector of Factories, Attorney General, BRELA, TIRDO and Department of Environment,

Form No. NEMC/ECE/PN/01 Ref. No NEMC/01

ENVIRONMENTAL (Industrial Pollution) Prohibition Notice, 2005

Pursuant to section 113 of the Environmental Management Act of 2004, the Director General having been satisfied that the manufacturing of **Products by Metro Steel Mill** whose operations are at **Plot No. 93, Kipawa Ilala District P.O. Box 12477 Dar es Salaam, Tanzania** involves an eminent risk of serious pollution of the environment and hereby prohibits **Metro Steel Mill** from undertaking all the production processes.

Further, the environmental risks involved are:

1. **Improper engineering layout and plant installations,**
2. **Production of toxic and noxious air emissions and**
3. **Emission of polluted effluents.**

Further that the steps to be undertaken to mitigate the pollution are:

1. **Proper plant layout and installations,**
2. **Carry out a detailed environmental audit (including risk assessment) and**
3. **Implementation of all the mitigation measures recommended by the environmental audit.**

This notice comes into force at midday on the day after it has been served and shall expire when the steps enumerated hereinabove have been complied with to the satisfaction of the Director General.

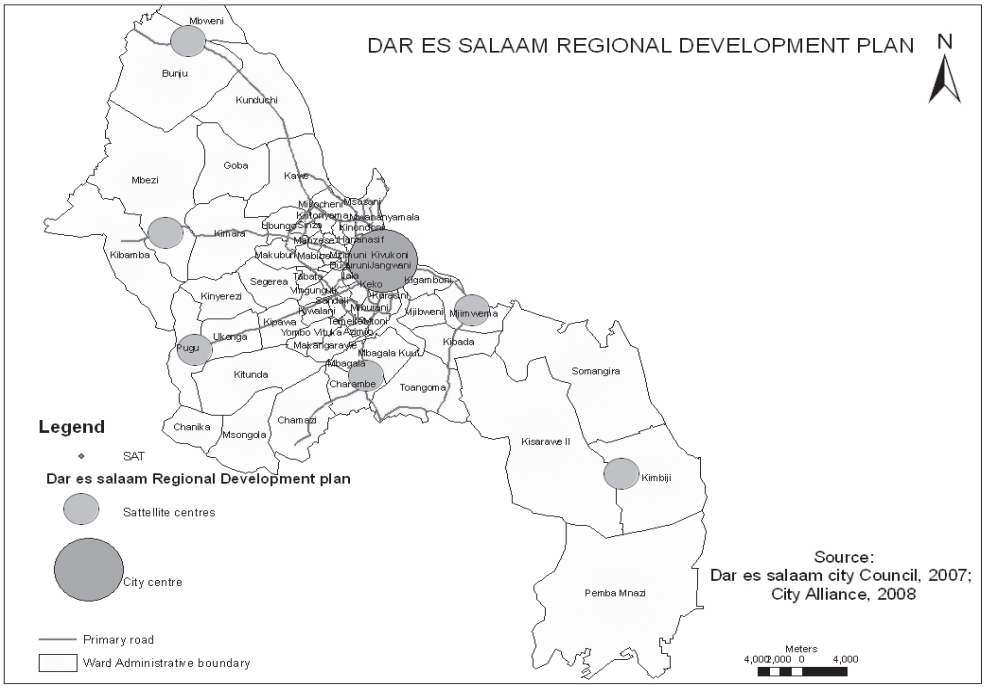
Dated at Dar es Salaam this ---------25th--------- day of July ----------, 2005

Dr. M.A.K. Ngoile
Director General

Explanatory Note

This notice is issued under the authority of the Environmental Management Act No. 20 of 2004 which become operational on the 1st day of July, 2005 in accordance with GN 170 of 17th day of June, 2005.
The notice is administered by the National Environmental Management Council (NEMC)

Appendix 10- 2: Proposed city's growth and development vision for the next 20 years.



Appendix 10-3: Values of both capital indices and overall index of multiple deprivations

OBJECTID	ID	WARD_NAME	SHAPE_LENG	SHAPE_AREA	INDEX OF PHYS	INDEX OF SOCI	INDEX OF QUAI	INDEX OF HUM	IMD
1	701112	Manzese	5808.72	1825708.27	0.85	0.57	0.68	0.62	0.68
2	702092	Kipawa	16257.30	14387639.91	0.76	0.37	0.53	0.47	0.53
3	701163	Kunduchi	39300.57	62757715.99	0.71	0.49	0.39	0.36	0.49
4	701263	Mbezi	54711.53	99972827.87	0.80	0.64	0.47	0.62	0.63
5	701141	Goba	27927.25	36280942.00	0.85	0.54	0.64	0.71	0.69
6	701152	Kawe	28460.66	38201361.75	0.68	0.48	0.46	0.37	0.50
7	701242	Kimara	31171.62	43336926.83	0.78	0.49	0.53	0.46	0.57
8	701133	Kibamba	48401.12	61341200.02	0.78	0.65	0.60	0.66	0.67
9	701181	Bunju	39044.55	83010116.59	0.86	0.59	0.63	0.66	0.69
10	702171	Mbweni	22323.45	23754133.81	0.76	0.64	0.64	0.60	0.66
11	702051	Kinyerezi	22790.13	20815076.19	0.81	0.46	0.60	0.46	0.58
12	702012	Ukonga	18276.39	20106182.87	0.76	0.31	0.46	0.44	0.49
13	702213	Kitunda	31434.18	45484899.05	0.86	0.54	0.58	0.60	0.65
14	703083	Chamazi	26832.77	35257969.26	0.95	0.50	0.59	0.68	0.63
15	702031	Msongola	27811.38	32962877.69	0.87	0.39	0.60	0.72	0.65
16	702233	Chanika	16148.22	16126356.12	0.95	0.44	0.63	0.75	0.69
17	702023	Pugu	29643.93	26837120.97	0.78	0.43	0.50	0.58	0.57
18	702202	Segerea	19523.95	18567218.04	0.85	0.21	0.44	0.36	0.47
19	702042	Tabata	10518.26	3816321.65	0.83	0.20	0.42	0.44	0.47
20	702082	Vingunguti	9764.06	4048356.26	0.91	0.49	0.69	0.70	0.70
21	701092	Kiwalani	9347.63	4740048.11	0.92	0.50	0.68	0.67	0.69
22	703222	Makangarawe	14616.98	8467093.49	0.77	0.22	0.59	0.60	0.55
23	703072	Mbagala	12491.08	6566668.48	0.80	0.30	0.49	0.58	0.54
24	703102	Charambe	18880.39	17101967.87	0.88	0.32	0.51	0.65	0.59
25	703113	Toangoma	30637.01	39632704.24	0.95	0.52	0.52	0.72	0.68
26	703041	Kisarawe II	61802.64	141797482.26	0.97	0.82	0.53	0.75	0.77
27	703051	Somangira	61527.56	103632754.29	0.97	0.77	0.61	0.79	0.79
28	703061	Kimbiji	36818.59	69584747.54	0.96	0.70	0.65	0.80	0.78
29	703231	Pemba Mnazi	80560.09	171195686.53	0.98	0.77	0.53	0.72	0.75
30	703031	Kibada	22516.00	19168587.05	0.91	0.35	0.58	0.79	0.66
31	703241	Mjimwema	20407.49	18627330.90	0.88	0.69	0.51	0.68	0.69
32	703012	Kigamboni	15180.27	10822206.72	0.78	0.20	0.60	0.52	0.53
33	703021	Vijibweni	13245.78	10146663.69	0.88	0.28	0.54	0.70	0.60
34	703212	Mbagala Kuu	17382.68	16210248.14	0.88	0.31	0.43	0.54	0.54
35	703172	Azimio	6797.26	2156955.39	0.82	0.11	0.60	0.62	0.54
36	703142	Mtoni	9576.90	2866610.11	0.62	0.32	0.50	0.57	0.50
37	703182	Tandika	5871.02	1604605.33	0.82	0.32	0.50	0.47	0.53
38	703132	Temeke	10389.70	2819208.61	0.64	0.10	0.45	0.41	0.40
39	703192	Sandali	8057.70	3055073.62	0.67	0.42	0.56	0.55	0.55
40	703202	Chang'ombe	8193.16	3296569.15	0.62	0.15	0.40	0.42	0.40
41	703122	Miburani	8903.09	3682004.15	0.78	0.11	0.38	0.39	0.42
42	703162	Kurasini	10672.81	5894485.44	0.61	0.20	0.49	0.40	0.43
43	703152	Keko	5691.06	1538188.91	0.79	0.39	0.70	0.59	0.62
44	702132	Gerezani	3957.45	792777.60	0.18	0.21	0.13	0.26	0.20
45	702152	Mchafukoge	4551.22	626617.42	0.22	0.06	0.15	0.27	0.18
46	702142	Kisutu	3018.56	409471.42	0.08	0.05	0.13	0.14	0.10
47	702182	Kivukoni	8135.55	2577341.55	0.05	0.08	0.08	0.16	0.09
48	702162	Upanga Masharil	5030.02	1356347.90	0.11	0.11	0.13	0.17	0.13
49	701172	Upanga Magharil	6945.24	2280690.54	0.13	0.15	0.18	0.26	0.18
50	702122	Jangwani	5110.31	1343888.63	0.50	0.18	0.48	0.37	0.38
51	702112	Kariakoo	3060.86	534173.80	0.19	0.16	0.20	0.34	0.22
52	702062	Ilala	6546.48	2124590.61	0.66	0.20	0.43	0.41	0.43
53	702072	Mchikichini	4586.62	1141378.39	0.44	0.15	0.52	0.33	0.36
54	702102	Buguruni	8236.92	3332085.74	0.83	0.45	0.65	0.62	0.64
55	701092	Kigogo	8132.43	1760536.72	0.88	0.51	0.69	0.63	0.68
56	701082	Mzimuni	4689.16	1111772.81	0.71	0.43	0.67	0.58	0.60
57	701202	Mburahati	5660.86	1087822.74	0.69	0.55	0.59	0.47	0.58
58	701022	Makurumla	5280.22	1448151.07	0.78	0.52	0.72	0.53	0.64
59	701032	Ndugumbi	6426.66	1418752.72	0.73	0.53	0.70	0.51	0.62
60	701012	Magomeni	5112.95	1040446.60	0.60	0.32	0.44	0.42	0.45
61	701272	Hananasif	6772.20	1899459.31	0.65	0.57	0.52	0.56	0.58
62	701072	Kinondoni	5924.54	1904937.30	0.58	0.30	0.44	0.43	0.44
63	701052	Mwananyamala	7033.01	2297784.12	0.44	0.25	0.39	0.38	0.37
64	701212	Makumbusho	6939.54	1998544.65	0.60	0.28	0.37	0.41	0.42
65	701042	Tandale	4548.67	1042726.36	0.88	0.44	0.67	0.61	0.65
66	701232	Kijitonyama	9317.03	3994407.82	0.61	0.30	0.29	0.30	0.38
67	701282	Mikocheni	11329.20	6942122.23	0.43	0.13	0.15	0.25	0.24
68	701062	Msasani	21611.41	11701497.14	0.44	0.30	0.20	0.27	0.30
69	701102	Mabibo	9314.03	4085561.53	0.64	0.35	0.45	0.43	0.47
70	701192	Makuburi	14472.03	8223040.92	0.62	0.37	0.46	0.44	0.47
71	701122	Ubungo	17827.91	10299455.14	0.72	0.33	0.47	0.33	0.46
72	701222	Sinza	8651.93	3651271.27	0.52	0.29	0.29	0.24	0.34
73	703092	Yombo Vituka	15019.86	8284562.44	0.85	0.41	0.62	0.51	0.60

Appendix 10-4: Questionnaires used during field work

1. A: Interview with Municipal Councils
2. What is the total number of wards in this Municipal Council?
3. What is the total population in each ward?
4. What is the average Household size in each ward?
5. Average number of person per room/ dwelling unit?
6. What are the Housing conditions (permanent, temporary) in each ward?
7. How many household connected to water supply system in each ward?
8. How many household connected to sanitation in each ward?
9. Total number of household connected to electricity in each ward?
10. How many people who are employed either in (public sector, private sector) in each ward?
11. What is the average income?
12. What is the total number of illiterate people in each ward?
13. What is the average walking distance to Hospital/clinic?
14. What is the average walking distance to School in each ward?
15. What is the average walking distance to market in each ward?
16. Number of solid waste collection point in each ward?
17. What is the total area covered by informal settlements in each ward?
18. What type of environmental hazardous areas available in this council e.g. polluting industries, waste disposal sites in this council and how are they distributed?
19. What type of pollution are caused from these environmental hazardous area and to what extent these effects can affect surrounding households?
20. What are the distances required from environmental hazardous area to residential area?
21. What is the possible health risks associated with these environmental hazardous areas?
22. What factors are contributing to high rate of urban deficiency in socio economic services Dar es Salaam city?
23. What initiatives or intervention measures are usually taken in addressing deficiency in socio economic services?

B: Interview with local leader /Ward Executive Officer

Name of local leader……
Ward name……

1. What is the total population in this ward?
   ……
2. How many people who are employed and what is their monthly income?
   (a) Total number of employed people per ward…….
   (b) Average monthly income……..
3. How do the people obtain land in this area and what are the costs for getting land especially in areas located near to solid waste disposal site or oxidation pond or industries?
   ……
   ……
4. Which of the following social services are found in this area?
   Piped water, sewer line, electricity, school, dispensary, market

5. How many House hold connected to piped water supply system?
   ……

6. How many Household connected to electricity?
   ……
7. How many Household connected to sewer line?
   ……
8. What are the average walking distance to school, health facility and market
   ……
9. What are the total number of solid waste collection point within this ward and how often solid wastes are collected to dump site
   ……
   ……
10. Is there any complains about the location of environmental hazardous area like industries, solid waste disposal site and liquid waste oxidation ponds? What are they?
    ……
    ……
11. When the Municipal council wants to locate environmental hazardous area e.g waste disposal or polluting industries do the people involved in decision making to give their opinions? And how?
    ……
    ……
12. What is the existing health risks associated with environmental hazardous area?
    ……
    ……
13. What are the initiatives usually taken to eliminate/reduce the mentioned risks?
    ……
    ……

C: **Interview with Dar Es Salaam Water Supply Company (DAWASCO)**

1. How many household connected to piped water supply and sewerage system in each ward within the city?

……
……

2. What are the problems encountered in the provision of water and sewerage services within the city?

……
……

3. What are the mitigation measures taken in order to increase coverage and efficiency of services

……
……

D: Interview with Household Budget Survey program manager -National Bureau of Statistics (NBS)

1. What is the Total Population in each ward in DSM city?
2. What are the totals Household in each ward?
3. What is the average Household size in each ward?
4. Average number of person per room/ dwelling unit?
5. What are the Housing conditions (permanent, temporary) in each ward?
6. How many HH connected to water supply system in each ward?
7. How many HH connected to Sanitation in each ward?
8. How many HH using traditional pit latrine?
9. How many HH owning land/ house in each ward?

10. How many people who are employed either (public sector, private sector) in each ward?
11. What is the average income?
12. What is the total number of illiterate people in each ward?
13. Average walking distance to health centre, schools and market in each ward?
14. Total number of HH connected to electricity in each ward?
15. Number of solid waste collection point in each ward?

E: Interview with NGO's (REPOA, ESRF and City Alliance)

1. What are the main indicators you use in describing poverty/deficiency in socio economic services and hotspot in Dar es Salaam city?
   ……
   ……
2. What are the factors that are contributing to high rate of deficiency in socio economic services in Dar es Salaam city?
   ……
   ……
3. What types of problems are mostly found in deprived areas e.g. Crimes and diseases and what are the possible sources of these problems?
4. What types of environmental hazardous areas e.g. waste disposal site and polluting industries available within the city of DSM and how are they distributed?
   ……
   ……
5. What is the health risks associated with environmental hazardous area within the city?
   ……
   ……
6. What are the mitigation measures usually taken to reduce these problems?
   ……
   ……

Investigating the Effects Of Intra-Urban Inequalities and Environmental injustices On Urban Deprivation in Dar Es Salaam City – Tanzania