URBAN ENVIRONMENTAL PROBLEMS: SOCIAL AND ENVIRONMENTAL INJUSTICES IN SOLID WASTE MANAGEMENT IN KINSHASA, THE DEMOCRATIC REPUBLIC OF CONGO

BY

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THESIS

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DECLARATION 1-PLAGIARISM

I, Nzalalemba Serge Kubanza, declare that this thesis (data, diagrams, graphs, tables and any other information) is my own original work, except to the extent that has been acknowledged.

This thesis does not contain other persons' writing, unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then their words have been re-written and the general information attributed to them has been referenced. Where their exact words have been used, then their writings have been placed inside quotation marks, and referenced.

The thesis is being submitted for the award of the degree of Doctor of Philosophy (PhD) to the Faculty of Science at the University of the Witwatersrand, Johannesburg, South Africa. It has not previously been submitted for examination or award of degree to any other institution of learning.

DECLARATION 2-PUBLICATIONS

I, Nzalalemba Serge Kubanza, declare that I personally undertook all the data collection, analysis, development and writing of the manuscripts and articles mentioned below. I wish to commend my co-authors for providing useful advice and comments, as well as editing the manuscripts. Sections of this work have been published or submitted as manuscripts for publication to the following peer reviewed journals:

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Signature: Nzalalemba Serge Kubanza Date: September, 2016

As the candidate's supervisor, I certify the above statement and have approved this thesis for submission. I certify that the above statement is correct:

Signature: Prof. Danny Simatele Date: September, 2016

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EXECUTIVE SUMMARY

The purpose of this research was to investigate the concepts of social and environmental justice in the context of solid waste management in Kinshasa and the critical factors accounting for injustice in this context. The investigation followed an examination of the relevant theoretical framework(s) and mechanisms that would facilitate the attainment of social and environmental justice in the city of Kinshasa, DRC. It was argued that social justice and environmental justice are a global challenge, and that efforts to address these challenges are usually biased towards employing eurocentric frameworks that are unfit to deal with the reality of environmental problems in a developing country scenario. The use of eurocentric urban development and planning approaches, which in most cases are outdated, have significantly propagated issues of spatial inequality in the distribution of solid waste burdens and have contributed to worsening justice concerns in many cities in developing countries, particularly in sub-Saharan Africa.

It has been illustrated in this study that social justice and environmental justice in the context of solid waste management must be seen as intrinsically connected, as both concepts emphasise the need for empirical understandings grounded in local contexts. Social and environmental justices play fundamental roles in the theoretical construction of principles that can contribute to a sustainable community, thereby ensuring that the rights and needs of individuals in a society are met. In the context of solid waste, the concepts of social justice and environmental justice are compelling because of their focus on ensuring equal service delivery in solid waste collection and disposal, while simultaneously redressing previous imbalances. Walker (2009) argues that the principles of environmental and social justice and sustainable development are more generally in their infancy in sub-Saharan Africa, and few implementing agencies and practitioners have a clear understanding of how to translate these

global principles into practice. It is not surprising, therefore, that unresolved issues around sustainable development and environmental justice have emerged in a period during which implementation and the real implications of following a justice pathway have overwhelmed many urban managers in sub-Saharan African cities (Patel 2009).

Using both qualitative and quantitative research methods together with system thinking and system dynamics modelling principles as integral frameworks in understanding the complexity in solid waste management, it has been demonstrated that solid waste management in Kinshasa, like in many Congolese cities, is a duty entrusted to publicly-funded municipal authorities. There is a clear divide and evidence in the manner by which solid waste is managed between the rich and poor neighborhoods of the city. The rich neighbourhoods seem to enjoy well-formulated systems of service delivery, in contrast with high-density areas, where almost 80% of the population in Kinshasa resides. This state of affairs is a result of inequalities that exist between the more powerful wealthy class and the disempowered poor people of the urban society in Kinshasa. Furthermore, cultural theory paradigms and conceptual System Dynamics (SD) modelling principles were employed to establish how the stakeholders in the form of four social solidarities (fatalist, hierarchist, individualist and egalitarian) influence solid waste management in the city and how they interact with each other dynamically. Based on this inter-linkage, interaction and causal feedback relations, a politico-cultural mechanism was evolved to enable changes to social and environmental injustices in solid waste management in Kinshasa, DRC. It was argued that a cultural theory inspired participative and collaborative mechanisms could result in the incorporation of a majority of the stakeholders in the decision making and implementation of solid waste management, adoption of technologies and innovative ways of managing solid

waste, which could prompt social and environmental justice in solid waste management in Kinshasa, DRC.

The findings of the study have both theoretical and practical implications. They provide a thorough discourse on environmental justice in solid waste management and how cultural theory paradigm can offer a new dimension to the theories behind stakeholder's participation in local development and management matters, particularly with respect to social and environmental injustice in solid waste management in sub-Saharan African cities. They also explicitly show how the various social solidarities could work dynamically in an integrated manner, and enable development of policy intervention mechanisms to resolve the solid waste management challenges and attain social and environmental justice through their effective collaboration, and participation, although this may be through compromises and tradeoffs in place of consensus. This paradigm could assist government agencies like municipalities to develop appropriate policy interventions and implementation strategies to resolve solid waste management challenges in sub-Saharan African cities in general and in the Democratic Republic of Congo in particular.

Keywords: *Cultural theory, environmental justice, social justice, solid waste management, urban environmental problem, Kinshasa*

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LIST OF ABBREVIATIONS

AIDS	Acquired immunodeficiency syndrome
B	Balancing
CBOs	Community based organisations
CEO	Chief Executive Officer
CLDA	Causal Loop Diagram Analysis
CODESRIA	Council for the Development of Social Science Research in Africa
CSOs	Civil society organisations
CT	Cultural Theory
DRC	Democratic Republic of Congo
EJ	Environmental injustice
EP	Environmental pollution
EU	European Union
HBEs	Home-based enterprises
HH	Human health
ISWM	Integrated solid waste management
MDGs	Millennium Development Goals
MSW	Municipal solid waste
MVA	multivariate data analysis
NGOs	non-governmental organizations
NIHSS	National Institute for the Humanities and Social Sciences
PDA	Pollution Dispersion Assessments
PSA	Proximity Site Assessments
R	Reinforcing
RA	Recovery Act
RC	Resource Conservation
SD	System Dynamics
SSA	Sub-Saharan Africa
SW	Solid waste

SWM	Solid Waste Management
UEJ	Urban environmental justice
UK	United Kingdom
UNCED	United Nations Conference on Environment and Development
US	United States
USA	United States of America

CHAPTER 1:

GENERAL INTRODUCTION

1.1. Overview of the research

The urban environmental justice (UEJ) discourse began in the late 1970s in the United States of America (USA), where the distribution of negative urban environmental burdens was highly uneven and driven on racial lines (Pollock and Vittes, 1996). As a result, solid waste gradually started to receive governmental attention in the USA when the Resource Conservation (RC) and Recovery Act (RA) was launched (Cointreau-Levine, 1994). The principle behind this law was the upgrade of solid and hazardous waste management technologies and practices in the USA (Cointreau-Levine, 1994). Since then, a gradual development in technology has contributed to the refinement of the procedures necessary to lessen environmental pollution (EP) and the human health (HH) effects related to solid waste (Cointreau-Levine, 1994). Yet, as early as the eighteen century, human beings have exploited the resources of the earth in order to survive (see, Filemon and Uriarte, 2008). At the same time, they have utilised the natural environment for the disposal of solid waste generated by their activities. The amount of solid waste generated was relatively small and the available space for the assimilation of solid waste was large, thus, during that time, the disposal of human and other waste presented no problem (Filemon and Uriarte, 2008). Solid waste management (SWM) started to become a problem only when people began living together in communities, groups, tribes, and villages (Filemon and Uriarte, 2008). As communities grew and expanded, the land surrounding them could no longer assimilate the solid waste generated by their activities and serious environmental and health problems began to appear.

In this respect, the need to manage the accumulating solid waste became apparent and different communities started to find various ways and means to dispose of their solid waste in a manner acceptable to the affected environment (Filemon and Uriarte, 2008).

Solid waste (SW) is seen as one of the most conspicuous environmental problems facing the urbanising world. It has been argued that solid waste is an issue that continues to haunt civilisation by increasingly threatening both the environment as well as the social order (Diaz, 1993). The longer it takes to effectively address the problem, the greater and more challenging it becomes (Noel, 2006). Diaz, (1993:3) argues that "nature is not affected by rationalisations". Therefore, decisive and comprehensive actions need to be taken in order to avoid irreversible environmental damage. It is generally accepted that the natural assimilative capacity of the environment to absorb solid waste has considerably diminished over time, while solid waste production is increasing exponentially (Noel, 2006). The belief that "the biosphere has the capacity to transform many wastes over time, either into harmless products or nutrients which can be reused" is being vigorously challenged (Wilson, 1981:1). Moreover, as a result of globalisation, which advocates individualism, marketization, capitalism and expansion of goods and services between nations, solid waste similarly breaks down all geographical boundaries to defy the proximity principle that ties together waste generation and waste disposal (see, Blumberg and Gottieb, 1989; Barr, 2002; Buclet, 2002). Solid waste should therefore be disposed of where it is produced. Otherwise, it is unfair to make a whole community pay for products enjoyed by only a few. The United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992 provided an excellent international forum to debate the issue of waste management. The outcomes of this forum have provided a framework for environmentally sound policy by setting out waste as a key problem to deal with in the pursuit of worldwide sustainable

development (UNCED, 1992; Barr, 2002). Solid waste management becomes a major issue that should be addressed in order to maintain the quality of the earth's environment and to achieve environmentally sound sustainable development (Grover, 2000).

Most of the analysis and studies of environmental injustice (EJ) have centered on locations for toxic waste, solid waste, and pollution (see, Pollock and Vittes, 1996). Thus, discussions and debates around environmental injustice grew out of the realisation and anger that some communities were purposely subjected to routine poisoning where urban authorities were either unable or neglected to take appropriate actions in order to tackle environmental problems faced by poor and most marginalised communities (Agyeman *et al.*, 2003; Byrne *et al.*, 2002). The ideas, meanings, aspirations and boundaries of the social and environmental justice movement were constructed in ways that reflected the context of US politics at the time, in particular the coming together of previously separate traditions of civil rights, anti-toxic community and occupational health politics (Walker, 2009). The kindred labels "environmental racism" and "environmental discrimination" are now often used to capture biased racial and socio-economic effects in the management of solid waste, and one finds apposite analyses in the unbalanced enforcement of environmental laws, regulations on industrial location, and possible avenues of equal representation of communities in constitutional and statutory redress (see, Godsil, 1991; Gelobter, 1992; Cole, 1992; Lavelle and Coyle, 1992). In social movement research, there is also a growing interest in "environmental justice" as an evocative symbol or interpretive framework for understanding environmental governance issues (Capek, 1993). The use of the term "environmental justice" has now extended far beyond its original context of focusing only on spaces in the United States of America. Environmental justice discussions, for example, have been taken up in rural contexts in India, Latin America, and sub-Saharan Africa (Myers, 2008).

Bullard, (2005) is of the view that waste disposal facilities, which are usually poorly maintained, are frequently cited in poorer neighbourhoods as well as other vulnerable population groups, which imply the shifting of environmental burdens onto the poor. This situation illustrates the vulnerability of the urban poor who are increasingly subjected to different vulnerability markers among which social and environmental injustices are paramount. Furthermore, existing studies on solid waste management, for example, have used political ecology, sustainable waste management, and good governance as theoretical frameworks, but social and environmental justice have received less attention in these approaches (Schubeller *et al*., 1996). There is a need to examine the social and environmental injustices inflicted in poor countries generally, and in the Democratic Republic of Congo more specifically. It has been argued that the Congolese cities are grappling with mounting solid waste and other environmental problems with socio-spatial inequalities in the distribution of the waste burden (Dougall and McGahey, 2003). These issues invite research attention.

1.2. Thematic considerations

The Millennium Development Goals (MDGs) set a series of targets for poverty reduction: achieving universal primary education and gender equality, reduction of infant mortality, and combating AIDS, malaria, and other diseases (Dill and Crow, 2014). The MGDs set a target of halving the proportion of the population without sustainable access to basic sanitation (Dill and Crow, 2014). Although the world as a whole reached this target five years ahead of schedule, the Democratic Republic of Congo was not on track to do so by 2015 (UN-MDG, 2012). Urban dwellers tend to have better access to basic sanitation than their rural

counterparts, but the most vulnerable residents of DR-Congo's burgeoning urban informal settlements have fared particularly poorly. The generally poor waste situations and the perpetuation of social and environmental injustices against the poor remain a critical challenge in Kinshasa. Social and environmental injustices are increasingly deviating from the country's aspiration to achieve the Millennium Development Goals (MDGs), Agenda 21, and other moves to address Brown Agenda problems in order to improve the living conditions of the poor. This situation of social and environmental injustices in the distribution of the waste burden has resulted in the urban poor residents in Kinshasa living closer to potential pollution sources, thereby exposing them to different health risks.

Furthermore, the Democratic Republic of Congo has been documented as one of the poorest countries in the world in terms of living standards (Iyenda, 2005). It is a country that has experienced significant civil wars, which have had severe knock-on effects on the country's economy and citizens' quality of life. More recently, greater emphasis has been placed on the social, political, and economic crises, which have been mutually reinforcing and have created instability and poverty throughout the country. Political instability has led to state bankruptcy, and has created concerns about social and environmental injustices resulting from solid waste management in a country that has never known peace since its political independence from Belgium in 1960 (Kihangi, 2012). Given the demographic pressure, coupled with rapid urbanisation, the authorities in Kinshasa find themselves unable to provide adequate and equitable service delivery in solid waste management. Coupled with this is lack of public awareness and environmental ethics that result in uncontrolled solid waste disposal. The financial factor remains the main constraint as well as lack of sufficient awareness at the grassroots level that generate solid waste.

Some scholars argue that the collection of solid waste actually falls on non-governmental or private sector initiatives and the numerous households in Kinshasa constitute a major source of environmental pollution (Dougall and McGahey, 2003). Garbage and faecal sludge are regularly disposed of in any location without concern for the possible impacts on the environment and the population's health (Dougall and McGahey, 2003). The current household waste collection is only undertaken in a few residential areas (Kubanza and Simatele, 2015, Hardoy. *et al,* 1992). The resulting problems are obvious and almost always given low priority by government. It is also the poorer areas of the city, which generally have the least adequate garbage collection service (Kubanza and Simatele, 2015). Residents and industries discharge wastewater straight into storm drains that directly connect to canals or waterways, which threatens the quality of urban life by causing chronic diseases (Nsokimieno, 2010).

This research focused on social and environmental injustices in solid waste management in Kinshasa. It is argued that disparities in the quality of solid waste management for the different socio-economic groups translate into enormous spatial variations in environmental sanitation across Kinshasa. Among the many problems that confront Kinshasa, solid waste management is a challenge that seems to overwhelm the local authorities. The prevailing solid waste management situation in Kinshasa can be regarded as a phenomenon amounting to social and environmental injustices. This study was undertaken in order to gain an understanding of the institutional challenges and barriers involved in social and environmental justices in solid waste management in Kinshasa to pave a way towards finding a sustainable solution to solid waste problem. In view of the above observations, this study was guided by the following research questions:

I. To what extent is solid waste management a problem of social and environmental injustices in Kinshasa?
II. In what ways do social and environmental injustices manifest themselves in solid waste management in Kinshasa?
III. What barriers exist in solid waste management in Kinshasa?
IV. How can sustainable solid waste management be achieved in Kinshasa?
V. What are the implications of the findings of this study in a wider context, particularly in sub-Saharan Africa?

1.3. Research aims and objectives

The aim of this research was to investigate social and environmental injustices in solid waste management in Kinshasa and the factors accounting for institutional failures in the management of solid waste. It was also to undertake a comprehensive and analytical research study on social and environmental injustices in solid waste management in Kinshasa. In doing so, this study will at the same time serve to increase the scientific body of knowledge on urban environmental problems. The specific objectives of the study were to:

I. assess variations in the quality of solid waste management service provided for residents in different socio-economic communities in Kinshasa;
II. identify the main barriers that exist against creation of an efficient solid waste management system in Kinshasa;
III. examine the socio-political, economic, environmental, and technological factors accounting for institutional failure in solid waste management in Kinshasa;
IV. propose a socio-political and governance mechanism for efficient and sustainable solid waste management in Kinshasa.

1.4. Some theoretical perspectives on environmental justice

Environmental justice (EJ) has become a major concern in environmental discourses and discussions (Dominelli, 2014). The calls for environmental equity and justice are now part of major environmental negotiations like the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, to cite but a few (Dominelli, 2014; Melamed and Samman, 2013). Schlosberg and Carruthers, (2010) for example, observe that environmental justice should be seen and discussed within the broader framework of environmental sustainability and the contemporary debates about issues of equality and equity in resource management, access and distribution. The concept of EJ has its origins in the USA and emerged as a reaction to increased inequalities in the burden of environmental consequences (Schlosberg and Carruthers, 2010; Bullard, 2000). The poor people increasingly found themselves exposed to poor environmental conditions which were not a result of their actions but those of the elite people in society. Thus, EJ as a conceptual framework is anchored on questions of equality and equity in the distribution of the burden of environmental consequences (Kubanza 2015; Dominelli, 2014). It is important to note that concerns about equity in EJ emanates from the idea of moral equality, and the appreciation that people in a community, regardless of their social, political and economic status should be treated as equals (Melamed and Samman 2013; Cheru, 2002).

Thinking about equity in the distribution of the environmental burden can facilitate an understanding of how environmental costs to a community can be fairly distributed across a society, while holding those that are mandated for environmental management responsible and accountable to the community (Kubanza and Simatele, 2016). Melamed and Samman (2013) and supported by Facio and Morgan, (2009) observe that applying equity and equality

in the context of justice and in specific country context can involve hard choices, as the two aspects are usually embedded in both domestic political and policy debates which are central to national development. Edifying this observation, Samman, *et al.*, (2011), are of the view that equality and even more fundamentally, equity-is integral to human development. As theoretical frameworks, equity and equality as observed by Dominelli, (2014) provide a basis for understanding how people in a community can be empowered and given real freedom that encompasses multiple dimensions of well-being and development.

It has been observed by scholars such as Kaswan, (1997) and supported by Taylor, (2000) that environmental justice as a framework has facilitated the comprehension of how the burden of environmental consequences are distributed across a community and the challenges that exist in the management of environmental processes. Building on this observation, Kubanza and Simatele, (2015) observe that environmental justice as an analytical and operational framework has been able to bring to the fore the inequalities that exist in the burden of the environmental cost between the elite and the poor people whose voices are usually muted. Raworth, (2012) further argues that EJ has been able to create a consensus in three interrelated aspects; the need to create equal life chances for all people, equal concern for all people, and the need to ensure that one person in a society does not subject him/her to poor environmental conditions that are harmful to life (see Kubanza and Simatele, 2015).

Environmental justice as a conceptual framework is rooted to some extent in the capability approach which is grounded in the notion of freedom (Dominelli, 2014). According to Sen (1987), capabilities are notions of freedom in the positive sense. Thus, the approach revolves around understanding issues of how inequality can be addressed in order to bring about equity with respect to society wellbeing, a remit that environmental justice is also premised

on. Unfortunately, in many countries of the developing south, inequity is part of the landscape and a considerable number of poor people in these countries have no or limited access to quality environmental conditions that would otherwise contribute to their wellbeing. Furthermore, Fakuda-Parr, (2010) argues that the interaction of the poor people with key institutions are shaped by power balances in the political, economic and social spheres, and this state of affairs often lead to adverse incorporation and social exclusion of those individuals whose voices are muted (Dominelli, 2014; Walker, 2009).

1.5. Justification and significance of the study

Scholarly research on solid waste management in the Democratic Republic of Congo (DRC) is limited. Many academics are privately engaged in consultancies (Tearfund, 2007). There are several structural collaborations between Belgian universities and NGOs in DRC, which have expressed concerns about the deplorable solid waste situation in the cities while communities keep complaining to the authorities about waste that is engulfing their neighbourhoods and the health implications for their members. The perpetuation of social and environmental injustice in the organisation of waste management in the Democratic Republic of Congo seems to attract no attention in the country. It is obvious that the solid waste situation in the Democratic Republic of Congo requires research attention to shed more light on the issue and pave the way for a solution. Nevertheless, academic research in the area includes an MSc thesis (Longondjo, 2010) submitted to the University of the Witwatersrand in 2010. This research report examined the challenges faced by the authorities of Kinshasa in solid waste management. Apart from this, there are a few studies that have slightly investigated issues related to the urban solid waste problems in the Democratic Republic of Congo, including Freund's, (2011) article on Kinshasa: "An urban elite considers city, nation and state, Journal of Contemporary African Studies"; Lateef *et al.*, (2010)'s article on

"Geographical Constraints on Urban Sustainability, Kinshasa City, Democratic Republic of Congo, Environmental Geosciences"; Misilu *et al.,* (2010) article on Sustainable Urbanisation's Challenge in the Democratic Republic of Congo, Journal of Sustainable development; Trefon, (2009) article on Public Service Provision in a Failed State: Looking Beyond Predation in the Democratic Republic of Congo, Review of African Political Economy.

However, none of the above studies have investigated solid waste disposal in any clear and sufficient detail to create adequate understanding of the problem. The solid waste challenge remains one of the most visible and nerve-racking problems in the urban areas in the Democratic Republic of Congo. The solid waste situation in Kinshasa remains under-researched and, hence, poorly understood. Much research is small-scale, methodologically unclear, and based on small sample sizes, restricted to NGO's thematic or geographical areas. This means that broader issues remain under-researched. Thus, the weak domestic research capacity, combined with the externally driven research agenda, lead to a situation where research is not based on internal demand. Much research is development-oriented and people-oriented, but the extent to which it coincides with domestic demands remains questionable. The solid waste sector is still lacking data. Research in DRC is a challenge due to many reasons, including political instability, limited access to infrastructure and Internet access. Libraries are poor and composed of only dissertations, research reports and some old books published in between 1960s and 1980. This situation has created a knowledge gap and makes it difficult to find solutions to the worsening solid waste situation in the country. This study will provide a useful starting point for addressing an otherwise intractable problem. The study will also contribute to both the theory and practice of urban solid waste management in poor countries generally.

1.6. Methodological approach

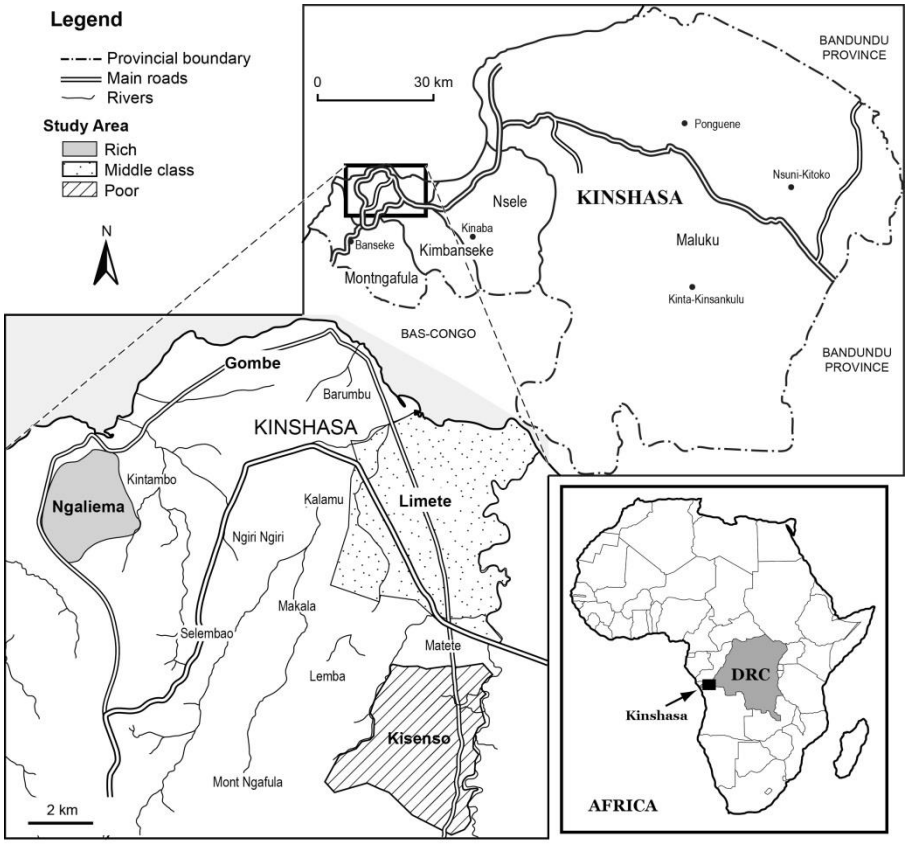
The philosophical positionality underlying this research comes from the interpretive tradition. This implies a subjective epistemology and the ontological belief that reality is socially constructed. Based on the philosophical assumptions adopted, research can be classified as positivist, interpretive and critical (Venkatesh *et al.*, 2013). The epistemological stance on interpretive approaches is that knowledge of reality is gained only through social constructions (Walsham, 2006). In an interpretive research project there are no predefined dependent and independent variables, but a focus on the complexity of human sense-making as the situation emerges (Kaplan and Maxwell, 1994). Those who espouse the interpretive approach claim that social phenomena must be understood in the social contexts in which they are constructed and reproduced through their activities. In other words, the understanding of social action must include the meaning that social actors give to their deeds (performance/actions). The research strategy adopted in this study was to conduct a comparative case study research based on social and environmental injustices in solid waste management in Kinshasa.

Using the interpretive perspectives enabled us to increase our understanding about the issues related to social and environmental injustices in solid waste management in Kinshasa. The interpretive approach has its philosophical base in hermeneutics and phenomenology. The choice of this position was justified by the fact that the researcher was a local and more familiar with the study site (Kinshasa). His proven knowledge of the topic (which became clear to participants during the interviews) influenced stakeholders in the waste sector (such as the staff of the waste management departments, public officials and managers of the waste companies) to regard him as an insider with regard to the issue of waste management. This led the researcher to describe the urban environmental problems of Kinshasa and to

understand the extent to which waste management operates in the city. The researcher assumes that the social and environmental injustices in solid waste management in Kinshasa remain a subjective reality that needs to be investigated, discovered and constructed through engagements with different SWM stakeholders as well as individuals' minds such as those from different cultures and sectors.

This study also used system thinking and system dynamics analysis approaches to evaluate the causal relationships observed within solid waste management in sub-Saharan Africa in general and the Democratic Republic of Congo in particular. In approaching the causal relationships existing in solid waste management in Kinshasa, three main frames of reference were adopted and they include the socio-economic, environmental, and technological contexts. These contexts were adopted in order to avoid the use of infer-ration in the measurement of covariance of presumed cause and effect dialectics in solid waste management. In addition to the above approaches, critical review of literature, case study analyses were used to conduct the investigation. Furthermore, cultural theory paradigms and conceptual System Thinking and System Dynamics (SD) modelling principles were employed to establish how the stakeholders in the form of four social solidarities (fatalist, hierarchist, individualist and egalitarian) influence SWM in the city and how they interact with each other dynamically.

Ideally and practically, this study would have interviewed the samples of the population of Kinshasa scattered throughout the 24 local municipalities, but given the constraints of time, material and financial resources, it was difficult for the researcher to follow such a procedure. Therefore, the study was carried out with the local community members of the three selected municipalities (*Ngaliema, Limete and Kisenso*) (see Figure 1).



Source: Cartography Unit (2015), University of Witwatersrand, School of Geography and Environmental Studies, South Africa.

Figure 1: Location of the Study Area

The choice for these municipalities was justified by the observations that the urban poor in Kinshasa face many complex barriers to access social and environmental justices and they live in unhealthy and harmful urban environments as opposed to those living in urban wealthy and high-income communities. Prior to conducting the survey with the households of the selected municipalities, the researcher visited the local municipality offices to gather demographic information, community characteristics, and households' statistics to determine the number of households to be interviewed in each selected residential class group. Once the communities to be surveyed were selected, and the number of questionnaires to be administered was determined, the next stage was to select the participated households in each of the selected communities. Considering the fact that some households were unwilling to

participate in the survey, a convenient way of selecting the sample was to combine the willingness of households with a roughly even spatial selection of households in each community. From the list obtained in each local municipal office, the households were randomly drawn from each residential class group. The survey involved both males and females, and sought their opinions in relation to several critical issues such as their level of education, occupation, and cultural background which were critically analysed.

With regards to the heterogeneity of the above-targeted population, stratified and systematic random sampling methods were employed to obtain a greater degree of representativeness. With the help of this form of probability sampling procedure, it became possible to control the relative size of each selected local municipality and their varied characteristics. After the general stratification of the selected three municipalities, a total number of ***210 questionnaires*** was administered to the grassroots communities; formal and informal institutions and other key SWM stakeholders were included in the study between August 2014 and November 2015. Within the grassroots communities, 130 out of 210 questionnaires were administered as follows: At the local municipality of Ngaliema, which is known as one of the highest-income urban neighbourhoods in Kinshasa where most of the politicians, businessmen, and artists live, 30 households were randomly interviewed. Before conducting the interview with the households, demographic data, community characteristics, and household's statistics were collected from the local municipality offices of Ngaliema. The number of households was randomly drawn from 6 streets and a stratified sampling method was employed to select the households as key respondents. One out of every three households was interviewed in the six streets selected.

At the local municipality of Limete, a middle-income neighbourhood, 30 households were also interviewed. Demographic information, community characteristics, and household's statistics from the local municipality offices of Limete were collected. The households were drawn from 6 streets and a systematic random sampling method was employed in this regard. The process went as follows: One out of every three households was interviewed in the six streets selected. At the local municipality of Kisenso, the lowest-income urban neighbourhood in Kinshasa, 70 households were interviewed using the same systematic random sampling method. Prior to the interview with the households at Kisenso, the researcher gathered demographic information, community characteristics, and household's statistics from the local municipality offices of Kisenso. The households were drawn from 10 streets using systematic random sampling method. One out of every three households was interviewed in the ten streets selected.

A total number of 80 questionnaires was administered to key SWM stakeholders including public and private institutions whose functions affect waste management. The 80 questionnaires were distributed as follows: 20 questionnaires were administered to the urban authorities of the Department of Environmental Affairs/City Governance using a random sampling method; 20 questionnaires were administered to those from the informal sector. Finally, 40 questionnaires were distributed to Non-Governmental Organisations and other community-based organisations whose activities involve SWM using a combination of the stratified and random sampling methods. Generally, the choice of these stakeholders was influenced by their activities and the roles they play in the SWM schemes in Kinshasa. The use of the above sampling methods was not only to ensure that everyone in the study area had an equal opportunity to be included in the study sample, but also to ensure that an accurate result was obtainable.

1.7. Structure of the study

This thesis is by publication. The first chapter is a frame of reference which starts with the introduction, the thematic consideration, the research aim and objectives, the justification and significance of the study. It also presents the methodology and the structure of the study. The second chapter is a literature review. It presents the paper that was published based on social and environmental injustices in solid waste management in sub-Saharan Africa, a study of Kinshasa. It reviews existing literature in social and environmental injustices in the context of solid waste management from the global and local (Kinshasa, the Democratic Republic of Congo) perspectives. The third chapter presents the methodology used in the study. It focuses on the application of system thinking and system dynamic modelling principles as methodological imperatives to improve social and environmental injustices in solid waste management in Kinshasa, the Democratic Republic of Congo. The fourth chapter presents the results of the study. It provides mechanisms and stakeholder engagements necessary to improve solid waste management in Kinshasa, the Democratic Republic of Congo. The fifth chapter focuses on case studies and alternative solutions. It explores and examines the relevant theoretical framework(s) and mechanisms that would facilitate the attainment of social and environmental justices in solid waste management in Kinshasa. The sixth chapter draws synthesis and conclusions of the study followed by recommendations. It indicates that the objectives of the study have been achieved even though some limitations linked with the used raw data have been raised.

CHAPTER 2:

Social and environmental injustices in solid waste management in sub-Saharan Africa: a study of Kinshasa, the Democratic Republic of Congo[1]

ABSTRACT

This paper investigates social and environmental injustices in solid waste management in Kinshasa, the capital of the Democratic Republic of Congo. The urban poor in most parts of Kinshasa bear a huge encumbrance of the solid waste burden and face multiple challenges associated with poor management of solid waste. This situation has resulted in poor and unhealthy living conditions for the majority of the urban residents. The problem of solid waste management in Kinshasa has further been compounded by rapid urbanisation which has occurred in the face of poor urban governance, civil conflict and weak institutional set-up. The combination of these challenges has resulted in increased overcrowding, poor sanitary conditions, lack of water and an unprecedented accumulation of solid waste which have triggered a myriad of urban problems. The worst affected are the urban poor who reside in locations that receive little or no socio-economic services from the Kinshasa Municipal authority. Using secondary data collected through a desk study, this paper argues that the poor solid waste situation in Kinshasa is not only a health risk, but also presents issues of both social and environmental injustices. These issues are analysed within the context of evolving arguments that focus on the need to develop a pro-poor approach in solid waste management that may present an opportunity for achieving both social and environmental justice for the urban poor in Kinshasa.

***Keywords**: urban environmental problems; social justice; environmental justice; solid waste management*

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2.1. Introduction

The urban environmental justice (EJ) discourse began in the late 1970s in the USA, where the distribution of negative urban environmental burdens was highly uneven and driven on racial lines (Pollock and Vittes, 1996; Massey, 2004). Most studies and analyses revolving around environmental injustice during this period tended to focus on issues relating to the management of toxic waste, solid waste and pollution in the developed north where civil rights movement inevitably confronted environmental laws and institutions (Myers, 2008, Taylor, 2002). Thus, discussions and debates around environmental injustice grew out of the realisation and anger that poor communities, particularly those without overt and covert powers, were either purposely or implicitly subjected to routine poisoning in the face of inadequate institutional capabilities to effectively manage solid waste which had been generated through various anthropogenic activities (Byrne *et al.,* 2002, Agyeman *et al.,* 2003). It is within this context that ideas, meanings, aspirations and boundaries of the EJ movement were constructed as a way of finding avenues through which individuals and groups of individuals or communities responsible for generating solid waste, regardless of racial, social or economic orientation, could be held accountable for their actions (Walker, 2009).

Over the past decades, the EJ paradigm has shifted the locus of the arguments to include the current unsustainable models of development, the unequal power dynamics within and across communities and national states, as well as the unequal distribution of resources, which are central to the current global socio-economic systems of neo-liberalism (see Dominelli, 2013). These attributes combine to exacerbate structural inequalities and marginalities that affect most of the poor people and low-income households, thereby reducing their capacity to

mitigate and deter any risk arising from internal or external stressors. Thus, as a way to capture the new locus of debates within the EJ discourse, kindred labels of "environmental racism" and "environmental discrimination" have become increasingly popular and are used to reflect the highly socio-economic status and power-based systems manifested in contemporary urban governance and the provision of socio-economic facilities (Godsil, 1991; Cole, 1992; Gelobter, 1992; Lavelle and Coyle, 1992, Capek, 1993).

Although EJ as a discourse is rooted in the USA, the use of the term "EJ" has now extended far beyond its original context. EJ discussions have, for example, been taken up to illustrate the lack of or uneven distribution and access as well as use of natural resources of poor households in rural areas of India, Latin America, and to some extent in sub-Saharan Africa (Myers, 2008). Banegas *et al.,* (2012) and Binns *et al.,* (2012), for example, observe that under colonial rule, thousands of black Africans were forcibly removed from their ancestral lands to make way for game parks, and a lot of money was spent on preserving wildlife and protecting wild flowers, while native people lived without adequate food, shelter, and clean water. Furthermore, Cheru, (2002) argues that, while external actors have contributed enormously to the resource marginalisation of the African people through governance deficits African governments themselves bear a significant portion of the blame for successfully suppressing the avenues of democratic expression, participation and self-governance of their citizens.

From an urban area perspective, particularly with reference to healthy living conditions, environmental injustices seem to be more exacerbated in urban contexts of the developing world where the majority of the urban dwellers have taken up residence in unplanned settlements with little or no access to basic socio-economic services such as adequate

housing, clean water and sanitation facilities (Abuzeid, 2009; Binns *et al.,* 2012; Hove *et al.,* 2013). With an inadequate urban infrastructure that was inherited and retained at independence, and which has remained unmodified to suit the new political, economic and social realities in many of these countries, the poor, powerless and voiceless continue to be subjected and to live in deplorable environments and conditions where socio-economic facilities and services such as solid waste management are virtually non-existent (see Myers, 2005; Couth and Trois, 2012). The poor continue to be denied, through inadequate urban and planning policies, appropriate and healthy living environments in which they can articulate, redefine themselves and realise their potential and contribute significantly to both urban economic growth and development. The urban development and planning policy, particularly in sub-Saharan African cities, hardly raises and addresses questions of urban EJ (see Meyers, 2008; Patel, 2009 ; Otang-Ababio *et al.*, 2013).

This situation is rather strange considering the starkly intertwined social and environmental injustices evident in many sub-Saharan African cities. In the quest to address these challenges, sustainable urban development, focusing on meeting the needs of the poor and ensuring ecological health, has been argued and presented as the environmental lens through which to promote EJ and address some of the issues that have permeated urban environments, through neo-liberal ecological modernisation, wherein marketisation and technological innovations and developments are sometimes falsely advanced as the panacea that will rescue African cities from environmental calamity, and magically reduce poverty and institute democracy (Myers, 2008; Couth and Trois, 2012).

Despite the emphasis on economic and social reforms, with marketisation playing a pivotal role in societal and economic stabilisation, most cities that have implemented sustainable urban development programmes in sub-Saharan Africa seem to do little or nothing to address the ever-increasing inequalities in spatial distribution of negative social and environmental costs (Myers, 2008; Din and Cohen, 2013). Discourses on urban social justice and EJ are comparatively rare in African cities, with notable exceptions from South Africa (Myers, 2008; Binns *et al.,* 2012). Existing studies on solid waste managements, for example, have used political ecology, sustainable waste management and good governance as theoretical frameworks to understand urban processes, but EJ has received no attention in these approaches (see Schubeller *et al.,* 1996; Binns *et al.,* 2012). In light of these observations, this paper discusses social and environmental injustice in solid waste management in Kinshasa, the Democratic Republic of Congo (DRC). It explores the extent to which environmental injustices manifest themselves and the factors accounting for this state of affairs. This paper traces the development of the social justice and EJ discourses and how the two aspects manifest themselves at a range of scales in Kinshasa. The discussion ends with a synthesises and critical engagement with issues of social and environmental injustices in solid waste management in Kinshasa before drawing out policy recommendations.

2.2. Methodological consideration

This paper is based on a desk study conducted between February and April 2014 and involved a review of different pieces of the literature obtained from various sources. Data collection was carried out through a rapid evaluation and appraisal of various survey reports at global, regional and national levels. The first stage in the search of the literature involved an internet search using various search engines such as Google. Keywords such as EJ and solid waste management were entered in the search engine and several pieces of the literature

on the topics were realised. These were rapidly scanned and only those articles that focused on EJ and solid waste management in a developing context were reviewed.

The second phase involved entering the same keywords in the search engines, but limiting the search to articles on solid waste and EJ in sub-Saharan Africa. This action resulted in 68 different articles and reports and these were rapidly appraised and evaluated. A third phase involved checking for additional and relevant articles to the topic under discussion and this was carried out through reviewing the bibliographies of each article. Once the relevant and appropriate references were identified, a library search was embarked on and this was executed through visiting different libraries at the University of the Witwatersrand, the University of Johannesburg and the University of Pretoria. Other sources of information included libraries at the universities of Sussex, St. Andrews and Manchester.

In total, 26 peer-reviewed articles focusing on environmental issues and waste management in the global north were selected, reviewed and included as the basis for discussion. An additional 18 journal articles focusing on the global south, particularly in the context of sub-Saharan Africa, were selected, reviewed and included as the locus of discussion for this paper. Finally, 12 articles focusing on the national level (DRC) were identified, selected and included in the literature review. This brought a total number of 56 articles and reports that were selected, reviewed and informed the discussion and analysis contained in this paper.

As part of the data collection process, these sources were critically examined for information relating to social and environmental injustices. A number of studies were also available that had investigated aspects of the urban environment including sanitation, water and waste disposal. These were reviewed to draw relevant data for this paper. The print media also provided a rich source of information about the state of solid waste management in the city of Kinshasa. These included reports of workshops and press conferences on issues around the urban environment including sanitation, water pollution and waste disposal.

2.3. Contextualising social and environmental injustices in the context of solid waste management in developing countries

Recent years have seen a re-emergence of interest relating to issues surrounding social justice and EJ, with the two increasingly becoming considered closely inter-linked (Coughlin, 1996; Kindornay and Ron, 2012; Ako *et al.,* 2013). A community that is subjected to different levels of social marginalities is most likely going to experience different levels of environmental injustices, and this situation owes much to the power structures and relationships that exist within a community (Chambers, 2003). Couth and Trois, (2012), for example, observe that decisions regarding solid waste management in most developing countries are usually driven by a top-down governance system which usually is disguised in the form of promoting community participation. However, in principle and practice, the participation of local people in managing issues that impact their lives often simply lends credibility to decisions that have already been made by the powerful members of the community and local government officials, who in most cases are out of touch with contemporary challenges faced by the poor people. Thus, the strong embrace of participation as a supposed avenue for community empowerment only tends to serve the interest of the rich and most powerful members of the community (see Taylor, 2000; Hove *et al.*, 2013).

It must be noted, however, that social justice as a discourse is a well-developed and long-debated body of knowledge that addresses issues around relative deprivation and fairness (Scott and Oelofse, 2005). It addresses issues of inequity through social redistribution of the benefits of society (Dominelli, 2013). It challenges the status quo by proposing changes in economic and social relations that may help prevent continued environmental deterioration and social crisis (Scott and Oelofse, 2005). This discourse is proposed as an appropriate normative framework for measuring the advance of democratisation. Some theorists and philosophers, such as Coninck *et al.,* (2013), argue that as a concept, social justice can be abstractionist in that it focuses attention on an idealised state of what a society should be. Yet another strand of thought argues that discourses on social justice cannot be delinked from the contextual realities in which people live (Nussbaum and Sen, 1993; Mabbett, 2005).

Despite the above observations, some principles are common across most discourses on the various conceptions of social or EJ. These include principles of equality, distribution and redistribution, solidarity, subsidiarity, inclusion, fairness, equity, equality and nation building (Coninck *et al.,* 2013). However, these principles are rather complex to attain using the current model of urban governance which has developed as a system of management using the top-down approach as noted above. In essence the top-down solid waste management approach adopted by many local authorities in developing countries considers the poor urban residents as having no role to play in the management and development of city processes (see Cheru, 2002; Christens and Speer, 2006). It is intrinsically assumed that urban residents, particularly the poor, have no knowledge and capacity to identify, define and design systems and processes which can be used to address urban problems and challenges as well as contribute to the sustainable development and management of urban spaces and processes

(Binns *et al.,* 2012; Otang-Ababio *et al.,* 2013). The urban poor who in most cases live in poor environments, are often and frequently excluded from actively engaging and participating in urban processes that have a direct influence on their lives (see Hove *et al.,* 2013). Lack of political and economic power, as observed by Simatele *et al.,* (2012a), plays a key role in subjecting the poor to situations where powerful members of society either implicitly or explicitly deny the poor people an appropriate podium with which they can genuinely express their frustrations and aspirations.

In view of the above sentiments, it would not be an exaggeration to argue that both social justice and EJ discourses provide useful and valuable analytical and operational frameworks, within which to discuss solid waste management in urban areas of the developing world, particularly in sub-Saharan Africa. This is because a key tenet in both social justice and EJ is the need for equality in the distribution of a society's resources or challenges (see Taylor, 2000; Dominelli, 2013). Thus, to obtain a fair distribution of resources within a community as observed by Otang-Ababio *et al.,* (2013), there is a need to promote a strong and genuine grassroots grown community participation in solid waste management decision making. They argue that public participation is at the heart of democracy because it facilitates and promotes a sense of ownership in any decision-making and social development issues of a society (Otang-Ababio *et al.,* 2013).

Participation is at the core of promoting a sense of belonging and ownership of any development process and is cardinal to ensuring that issues relating to social and environmental marginalisation are addressed in a more equitable manner. Christen and Speer, (2006), for example, observe that public participation in the identification of priorities and in the formulation of policies and programmes is critical to the development of sustainable

human settlement. This position is supported by Lowry, (2013), who is of the view that public participation and the empowerment of the most vulnerable groups of people in society have been touted as key to redressing social justice and EJ issues and can contribute to sustainable development. This perspective is based on the idea that revolves around the notion that considers social justice and EJ issues to be highly technical problems that affect traditionally disempowered communities and in which citizens may have different goals and aspirations.

In order to address social justice and EJ issues, particularly in sub-Saharan Africa, there is an urgent need for government authorities and other collaborating partners to adopt a rights-based approach to development. A rights-based approach to EJ is based on the belief that individuals and groups are a means to an end, and should be given a certain degree of dignity. They should have, according to Onstad, (1997, p. 7), "basic rights to a decent living environment and must be in a position to claim justice when these rights are abused or left unfulfilled". A rights-based approach has advantages of providing a means of mobilisation of the poor and their supporters by offering a podium for lobbying and for insisting that groups, states and companies behave in a certain way (Kindornay and Ron, 2012). It also has the advantage of bringing in an unpredictable group of actors into the development equation and it is this transdisciplinary approach that will foster the development of sustainable urban communities (Mabbett, 2005).

2.4. Sub-Saharan African exceptionism: solid waste management, social justice and environmental justice (EJ)?

In many sub-Saharan African countries, there is an increase in the demand for urban services due to augmented rates of urbanisation driven largely by rural–urban migration. In most suburbs of African cities, the supply of basic services such as social economic, waste removal and clean piped water supply has largely not kept pace with the increasing demand for urban services (Cheru 2002; Okot-Okumu and Nyenje, 2011). This situation has been a result of a number of factors which include weak institutional frameworks, lack of skilled labour which has impacted on urban governance, and economic deteriorations. The combination of these factors, as argued by Abuzeid, (2009), has resulted in municipal solid waste management, constituting one of the most crucial management challenges and environmental problems facing many governments of African cities. Although many of these cities are using between 20% and 50% of their budget on solid waste management, only an estimated 20–40% of the waste is collected (see Binns *et al.*, 2012, Otang-Ababio *et al.*, 2013). The uncollected and usually illegally dumped solid waste is now increasingly becoming a disaster for human health and environmental degradation, especially in poor and marginalised areas of these cities (Okot-Okumu and Nyenje, 2011).

Solid waste collection and management in many sub-Saharan African cities is a duty entrusted to public-funded municipal authorities and should, therefore, be extended to all areas of the city (Schubeller *et al.*, 1996). However, this facility in many African cities tends to be restricted to wealthy and rich neighbourhoods where groups of individuals with control of either state or national and economic power reside. Poor and deprived neighbourhoods, which normally house the majority of the urban poor in these cities, usually tend to receive no or little services, and the little is normally provided on a very erratic basis (Simatele *et al.*,

2012b). In order to promote social justice and EJ in the context of sustainable waste management, it becomes important to ensure that urban services for waste removal are fairly and equitably provided for all residents in a city, irrespective of such variables as socio-economic class, ethnicity or culture (Schubeller *et al.,* 1996, Kindornay and Ron, 2012; Ako *et al.,* 2013).

Equality in the distribution of the solid waste burden in African cities requires that urban managers in these cities ensure fairness in the provision of solid waste collection and disposal services. It is only through the use of a rights-based approach that incorporates the voices of the poor people in the development of solid waste management strategies that social justice, in its different facets would be pursued and guaranteed. In other words, municipal authorities responsible for the organisation of solid waste disposal have a social duty to ensure that all residents of a city receive impartial and adequate services for solid waste removal and disposal in order to protect them from the nuisances associated with solid waste.

On the contrary, EJ is about the fair treatment and meaningful involvement of all people regardless of race, colour, national origin, or income status in the development, implementation, and enforcement of environmental laws, regulations and policies. It is about social transformation directed towards ensuring that environmental resources contribute in a meaningful way to meeting the basic human needs and enhancing the quality of mankind. Taylor, (2000), for example, observes that EJ (in the context of sub-Saharan African solid waste management) can only be achieved when everyone enjoys the same degree of protection from environmental and solid waste-related health hazards, and equal access to the decision-making process to have a healthy environment in which to live, learn and work (see also Patel, 2009).

Exposure to solid waste-related disasters remain a major source of health risk throughout the world, though risks are generally higher in developing countries, particularly in sub- Saharan Africa where high levels of poverty, low or lack of investment in modern technology and weak environmental legislation combine to cause high levels of environmental degradation (Potter *et al.,* 2008). Although several African countries, as argued by Patel, (2009), have made some significant progress in formulating environmental legislation, the lack of legislative implementation and community participation has impeded the pursuance of an environmentally just sub-Saharan Africa (see also Venot and Floriane, 2013). The top-down system in urban governance that is employed by many city authorities in African cities continues to ignore the needs of the poor people and to erode their confidence in urban managers (Binns *et al.,* 2012). It is the lack of community participation in urban processes that continue to subject the poor people in African cities to living in conditions that are not conducive for human habitation, as well as for the non development of an effective environmental management framework, within which EJ issues could be pursued.

Existing literature on environmental management and sustainability, for example, suggests that there is no integrated approach to urban environmental management in many African countries (Kotze, 2007; Faure and Du Plessis, 2011; Kihangi, 2012). In the absence of an integrated approach to urban environmental management, one would therefore argue that many urban dwellers in African cities are still subjected to high levels of environmental injustices (Mzidzornu, 2004; Leonard, 2013). In order to address this issue, there is an urgent need to implement a process of enacting the environmental legislation, particularly in relation to solid waste management. This should take the form of consultative engagement and enlisting the participation of communities, NGOs, associations of solid waste pickers, local

authorities and the private sector. Once legislation is enacted, local authorities in collaboration with their agencies should have the institutional capacity and budget to enforce the law.

Table 1 shows countries that have adopted and used the term, "EJ" in their policies on a global level. It is suggested in the table that only 9 out of 53 African countries are cognisant of the importance of incorporating EJ in their development and planning policies. We can also speculate from the information in Table 1 that the discourse on urban EJ is comparatively rare in African cities and is thus not a priority policy. This situation may be a result of the fact that urban authorities in many sub-Saharan African cities are concerned with more urgent issues such as addressing poverty and are therefore unable to provide adequate waste disposal and other environmental services within their jurisdictions.

Table 1: Countries in which the term environmental justice has been incorporated in planning policies: 1990-2012.

Region	Countries
Africa	Nigeria, Ghana, South Africa, Tanzania, Cameroon, Zambia, Angola, Mozambique, Uganda
Asia	Taiwan, Israel, India, Singapore, Philippines
Australasia	Australia, New Zealand
Europe	United Kingdom, Germany, Sweden, France, Spain, Belarus, Bulgaria, Hungary, Macedonia, Romania, Slovakia, Czech Republic, Latvia, Ireland, Finland, Holland, Norway, Scotland
North America	United States, Canada
South and Central America	Brazil, Peru, Nicaragua, Ecuador, Columbia, Mexico.

Source: Binns et al., (2012); Walker, 2009; Fan 2006; Hillman, 2006; Pearce et al., 2006; Chaix et al., 2006

Studies by a number of scholars suggest that municipal authorities in African countries tend to concentrate their waste collection efforts in wealthy areas, while the poorer areas receive little or no service even though waste collection operations are usually funded by public resources (Schubeller *et al.,* 1996; Cheru, 2002; Lohse, 2003; Binns *et al.,* 2012). Okot-Okumu and Nyenje, (2011) as well as Bullard, (2005) are of the view that waste disposal facilities in sub-Saharan Africa are usually poorly maintained, and are frequently located in the neighbourhoods of the poor and other vulnerable members of society. In practice, this state of affairs implies a situation where the more powerful members of society shift the environmental burden to the poor people. This status quo illustrates the vulnerability of the urban poor in Africa who are increasingly becoming subjected to different vulnerability markers among which social and environmental injustices are cardinal. Until the poor people in sub-Saharan Africa become involved in decision-making on issues that affect their lives, social and environmental injustices will remain part of the urban landscape among the poor in African cities.

2.5. Solid waste, social justice and EJ in Kinshasa

Despite the civil war that has ravaged the country and many lives in the DRC, there has been a concerted effort by government to include environmental issues and natural resource management in development and planning policies. However, Kihangi, (2012) is of the view that environmental provisions within the national development policies and constitution have been incorporated with different motivations and largely revolve around benefiting selected powerful political and economic actors. As a result, a fundamental concern with regard to environmental management in Kinshasa and DRC as a whole, revolves around the complexity of the implementation and enforcement of environmental legislation which, if appropriately implemented, can contribute to unpacking the balance of all interested parties

and contribute to promoting an urban environment in which all the needs of all urban residents including the poor are met (Kihangi, 2012).

During colonial rule, the management of the environment and natural resources was one of the issues that Belgium had to contend with in the DRC (Kihangi, 2012). The Belgian colonial government was interested in the protection of the environment for exploitative reasons, and not out of any great concern for the welfare of the Congolese people, who were treated as subjects without rights (Mzidzornu, 2004). For this reason and among others, the care of the environment was managed through various treaties and royal decrees (Kihangi, 2012). The effect of this system of management left significant scars in the sense that the colonial government failed to facilitate a situation where the local people were able to meet their livelihood needs from using and accessing natural resources and environmental services (Dougall and McGahey, 2003). Thus, social and environmental injustices in terms of local people's access to environmental resources have a long history in the Congo and have therefore become a common concern, particularly with questions of resource access and distribution as well as power relations in decision-making processes.

The lack of community participation in decision-making and development processes in the DRC has contributed significantly to civic disorder and conflict in the country. The brutal exploitation of the country's resources at the expense of the poor people and staring in the colonial period (since King Leopold II rule) and filtering through the post-independent period, have fuelled such violent and devastating conflicts (Pole Institute and International Alert, 2014). The Pole Institute and International Alert, (2014), for example, are of the view that if a greater proportion of the benefit from the exploitation of the DRC's resources is retained within the country, and there is more equitable distribution of this benefit to

communities, there would be significant progress made towards achieving peace and sustainable development of the country.

However, the absence of working institutions and frameworks through which effective and equitable distributions of the country's wealth and resources could be harnessed, has in a large share resulted in discontentment by the general populace. This has in turn given rise to public discussions in the form of "parlement de´bout" (i.e. stand-up parliaments on streets) and such gatherings have often generated social tensions and fuelled continued civil unrest in the country (Bane´gas *et al.,* 2012). It is important to note that "parlement de´bout" discussions play a key role in transmitting information and rallying up new partisan paradigms through which the new recruits assert themselves as citizens and claim certain entitlements and rights. Failure to obtain some of these entitlements has often resulted into violent episodes and this is true for the case of resource management in the DRC (Banegas *et al.,* 2012).

Thus, the context of resource use and management in the DRC has been a source of conflict and has attracted considerable attention in political debates. Depending on the respective theoretical premises, some scholars have argued that scarcity of renewable natural resources inevitably leads to violence not only in the DRC, but also in other countries of the global south. The abundance of natural resources, for example, in the context of a country with absent sound and effective legislative and governing structures, often tend to create enormous challenges in the distributions of a country's wealth and this often generates injustices at different scales (Krummenacher, 2008). This is more so in economies with centralised systems of governance, the case of the DRC (Cheru, 2002; Binns *et al.,* 2012; Simatele and Simatele, 2014).

The alternative to centralising the state, as was the case in the Mobutu regime, is to move the power of control and to endow local populations with greater decision-making power. Such an approach would remove the burden of resource management to local communities which in the context of the DRC as a whole, exhibit and expend tremendous energy and vitality in changing the course of their future. Shifting the control of resource management to local people and communities would ensure that where national governments and local municipal authorities have failed to articulate new visions or provide necessary services, citizens' groups can organise and reorganise themselves to meet their solid waste management, shelter needs, mobilise funds to build roads and clinics, etc. (Simatele and Simatele, 2014). Simatele and Simatele, (2015) further observe that a major feature of a centralised state such as the DRC is the preoccupation with bureaucracy and planning systems which tend to emphasise the concentration of governance structures rather than adopting institutions and planning policies that emphasise grassroots empowerment of the people. This situation has often meant that powerful individuals and elite groups of people have taken control of political and economic power and this has encouraged a top down approach to the management of public affairs such as solid waste, even when decentralised structures were created and established. Administrative structures in Kinshasa lack adequate resources and discretionary authority and this state of affairs has hampered the efficient deliverance and provision of socio-economic services in the city. As the city has remained the principal industry for patronage, it has become burdened as more and more resources have been required to maintain city processes. And in the face of political instability, weak institutional frameworks and economic deterioration, solid waste collection and management has become one of the greatest challenges facing local government authorities in Kinshasa (Din and Cohen, 2013).

The increasing amount of uncollected solid waste threatens the survival of urban residents, especially the poor, who in most cases are resident in locations that receive little or no support from government. They are thus, vulnerable to communicable diseases and this situation undermines any of their efforts to contribute to the sustainable development of the metropolitan centres in the Congo (Medina, 1997; Rapten, 1998; Din and Cohen, 2013). The generally poor waste situations in Kinshasa and the perpetuation of social and environmental injustices against the poor remain a critical challenge in a country that has never known peace since its political independence from Belgium in 1960. Social and environmental injustices are increasingly deviating the country's aspiration to achieve the Millennium Development Goals, Agenda 21 and other moves to address the Brown Agenda problems in order to improve the living condition of the poor (Din and Cohen, 2013). The city of Kinshasa is grappling with mounting solid waste and associated environmental problems with socio-spatial inequalities in the distribution of the waste with the poor bearing the largest burden (Schubeller *et al.,* 1996; Din and Cohen, 2013). This situation has further subjected the urban poor in Kinshasa to living in locations that are more close to potential pollution sources, thereby exposing them to different health risks.

In additional to biological and plastic waste, a particular feature of the solid waste challenge in Kinshasa is imported second hand goods: old computers and other technological associated materials from the developed north, and which normally end up being dumped within city spaces, if not used or sold (Lateef *et al.,* 2010). If not collected and managed properly, these materials not only become a health hazard, but end up blocking most of the anaerobic canals and waterways leading to recurrent flood episodes. According to Din and Cohen, (2013) and supported by Lateef *et al.,* (2010), Kinshasa's city is increasingly becoming a city that is overcrowded with solid waste and this situation poses a number of risks which include fire

and health hazards, especially for children playing on or near waste dumps (see Hardoy *et al.*, 1992).Thus, children from poor households in Kinshasa are considered as the most at risk to waste that has not been disposed of in a safe and scientific manner. Other high-risk groups include waste workers, and workers in facilities producing toxic and infectious material, population living close to a waste dump and those whose water supply has become contaminated either due to waste dumping or leakage from landfill sites. Uncollected solid waste also increases risk of injury, and infection particularly for poor households who often times burn their waste as a common practice of waste disposal. This is because these households have the least adequate garbage collection services (Hardoy *et al.*, 1992; Nsokimieno, 2010).

It is important to note that the solid waste problem in Kinshasa has been made worse by the increase in the urban population. The population has increased from 400,000 in the 1990s to more than 6 million people in 2008 and it is now estimated to have reached 10 million in 2010 (Nsokimieno, 2010). The urban growth does not correspond to the provision of socio-economic facilities in the city. The growth in population is rapidly pushing the city's growth in the form of outward expansion but resulting in large-scale uncontrolled urban sprawl and affecting land use changes. Nsokimieno, (2010), for example, contends that Kinshasa lost progressively its ecological heritage and identity due to enormous environmental problems and its weak and non existent solid waste management and disposal mechanism and strategy. A coherent broad-based approach to solid waste management does not exist because of insufficient funds and poor management. In the face of these challenges, the municipal government in Kinshasa cannot begin to meet the demands of waste evacuation and sanitation.

Although poor urban communities might understand the need for elementary hygiene, they lack the means to procure basic services either on their own or from failing national or municipal services (Dougall and McGahey, 2003). On the contrary, wealthy residential areas are often given preferential treatment over the poor in the delivery of solid waste disposal service. This situation is however, unfair and unjust, and a breach of social justice. The supply of refuse bags and waste bins in poorer neighbourhoods is usually erratic, as the residents of these locations usually have no voice to challenge city managers (Samson, 2008). The refuse rounds, although planned for collection, are usually based on a system of loading from the service point directly to the refuse collection vehicle. The worker allocation varies from area to area but in poor neighbourhoods, it is generally between 6 and 8 workers per refuse round, with 2 people loading the vehicle and 4 people bringing the bins or bags to the side of the road for collection. This system in many cases increases spillage of refuse in the loading process, thus adding to the cost of street-cleaning (Samson, 2008). In most cases, the service to the informal settlements has usually been rendered on an emergency basis. A 5.5 m^3 bulk-refuse container is allocated to every 200 households or shacks. In theory, this system has not worked effectively in these locations as shack dwellers usually tend to deposit their refuse outside the refuse containers and the refuse that ends up in the containers is often set on fire, thereby, triggering other health and safety hazards (Onibokun, 1999).

Solid waste management in Kinshasa has further been complicated by increased rural– urban migration, and this situation has overwhelmed city authorities, who in most cases are operating under huge budget deficits on one hand, and on the other, are implementing urban development approaches that appear to be out of touch with reality on the ground. Increased civil unrest, coupled with dramatic deterioration in the supply of basic infrastructure and urban services, as well as the declining economic situation, have left the urban authorities in

Kinshasa stunned by the demands for solid waste management services (Misilu *et al.*, 2010). With narrow revenue bases, increased civil conflict and limited technical capacities, the municipal authorities in Kinshasa have thus been unwilling or unable to effectively deliver on their mandate such as provision of refuse collection, road maintenance and water supply to mention but a few.

The solid waste management challenge in Kinshasa is not only a question of the scale of population growth, but also the weaknesses and deficiencies in both national and local government institutions in the face of rapid urban change. Longondjo, (2010), for example, observes that at the city level of Kinshasa, a lack of resources and knowledge prevent not only people from solving their solid waste problems, but also institutions from managing change in a much more coordinated manner. Institutions that are mandated with urban management in Kinshasa usually do not coordinate their activities because urban governance has been developed as a system of procedures imposed from above. Din and Cohen, (2013) observe that in Kinshasa, there is a multiplicity of agencies that may deliver urban services, but there is no coordination among them. Mbuyi, (1989) further argues that the lack of effective management systems and lack of financial resources have led to conditions that are deleterious to the environment and continue to subject the urban poor to meagre living conditions. The current economic turmoil, coupled with the perpetuation of the civil war, as well as high levels of corruption have combined to exacerbate problems of solid waste management and push the poor into living miserable lives. Financial resources are central to the effective and efficient management of solid waste management because they determine the level or quality of services that can be provided. Thus, financial availability and sound management systems are key elements to determining the nature of solid waste management in a city, particularly in low-income cities such as Kinshasa (Musandu-Nyamayaro, 1991).

2.6. Summary and conclusion

The discussion in this paper has revealed that social justice and EJ are a global challenge. There are, however, differences between environmental problems faced by developed countries and developing countries. In developed countries, the problems are generally related to high growth and economic development, which generates problems such as air pollution, traffic congestion, water contamination and disposal of radioactive waste (Onstad, 1997). In developing countries, on the contrary and especially in sub-Saharan Africa, the reverse is true as environmental problems reflect the very lack of economic development and poverty (Binns *et al.,* 2012). Hardoy *et al.,* (1992), further observe that interest to redress urban environmental problems in developing countries is overwhelmingly based on Northern perceptions and precedents. Efforts to address these urban environmental challenges are usually biased towards employing eurocentric frameworks that are unfit to deal with the reality of environmental problems in a developing country scenario (Onstad, 1997). The use of eurocentric urban development and planning approaches which in most cases are outdated, have significantly propagated issues of spatial inequality in the distribution of resources and have contributed to worsening justice issues in many cities of the developing countries, particularly in sub-Saharan Africa (Onstad, 1997; Bullard, 2005; Patel, 2009; Kindornay and Ron, 2012; Ako *et al.,* 2013).

It has been illustrated in this paper that social justice and EJ in the context of solid waste management must be seen as intrinsically connected as both concepts emphasise the need for empirical understandings, grounded in local contexts (see Patel, 2009). They play fundamental roles in the theoretical construction of principles that can contribute to a sustainable community, one that ensures that the rights and needs of individuals in a society

are met (Kindornay and Ron, 2012). In the context of solid waste, the concepts of social justice and EJ are compelling, because of their focus on ensuring equal service delivery in solid waste collection and disposal, while simultaneously redressing previous imbalances. Walker, (2009), however, argues that the principles of environmental and social justice as well as sustainable development are more generally in their infancy in sub- Saharan Africa, and few implementing agencies and practitioners have a clear understanding of how to translate these global principles into practice. It is not surprising, therefore, that unresolved issues around sustainable development and EJ have emerged in a period during which implementation and the real implications of following a justice pathway have overwhelmed many urban managers in sub-Saharan African cities (Patel, 2009).

There is now growing evidence of the links between environmental problems and social injustices and this is because both social justice and EJ works are sensitive to power issues (i.e. who causes pollution and who suffers from pollution), and tend to focus on communities or groups, rather than on individuals. Both social justice and EJ have tended to adopt a holistic approach to analysing and addressing problems and reforms, and as such the two elements cannot be addressed in isolation of each other. EJ, as argued above, attempts to establish linkages between environmental and social injustices, and it would thus be no exaggeration to argue that tackling both social exclusion and environmental problems through integrated policies and development would be the most appropriate and viable option to address issues of inequality that arise from solid waste management in Kinshasa (Stephens *et al.*, 2001). Seeing social justice through an environmental lens, and analysing environmental issues more clearly in terms of social justice, would provide new and more effective ways of dealing with problems associated with solid waste management challenges (Stephens *et al.*, 2001, Venot and Floriane, 2013). A key element to note here is that the EJ

framework, if implemented properly, would be a valuable tool for addressing different aspects of social justices in a community.

In conclusion, it has been illustrated in this paper that urban social justice and EJ issues are comparatively rare in African cities, with notable exceptions in a few selected countries (Myers, 2008). The urban poor in sub-Saharan African cities face many and complex barriers that make it difficult or impossible for their legal, moral and political human rights to be respected (Onstad, 1997). Barriers of access to social justice and EJ that the poor face can be dealt with under stable political regimes and effective legislation and governance systems that not only engage communities, but encourage public participation in local politics and policy formulation and implementation (Onstad, 1997; Binns *et al.*, 2012; Couth and Trois, 2012). Therefore, access to social justice and EJ implies a situation where the poor are afforded to live in homes, neighbourhoods and work environments that are clean, healthy and secure. The often implicit denial of the poor people's rights to good living standards is usually a result of lack of political will on the part of government officials who often give a higher priority to service delivery in more rich neighbourhoods.

In order to have a sustainable solid waste management system that ensures that the solid waste burden is equally shared, there is need for local government authorities in Kinshasa and other developing countries to adopt the rights-based approach to urban development. The right of access to relevant information and participation in the decision-making process by all interested and affected parties are key components of the EJ discourse at all levels. The rights of every citizen, and each individual in a city and country, must be enshrined in a city's development and planning policies, and must be embedded in various local and national legislative articles. A rights-based approach to urban development places greater emphasis on

community participation and systematic empowerment of the poor and disadvantaged groups to enable them to gain self-confidence in articulating themselves, gaining information on available resources and determining their future and that of their children.

If the poor and the powerless in society are given an opportunity to challenge decisions made by more powerful actors, they would demand that their rights are respected and when contravened, gain effective redress and increase their bundle of endowments. This is only possible through the creation of pro-poor institutions that will not only focus on promoting pro-market government agendas, but also the welfare and well-being of the more marginalised and disenfranchised groups of people in society. Pro-poor institutions will not only facilitate the participation of the urban poor in decision-making, but will also enable them to get involved in the implementation of strategies and systems that will promote sustainable solid waste management. Thus, developing a civic centred governance approach to development in Kinshasa may present an opportunity for achieving both social justice and EJ for the poor.

CHAPTER 3:

Sustainable solid waste management in sub-Saharan African cities: application of system thinking and system dynamic as methodological imperatives in Kinshasa, the Democratic Republic of Congo[2]

Abstract

This paper is based on a review of the methodological approaches associated with solid waste management (SWM) in an urban context of sub-Saharan African cities. Using Kinshasa, the capital of the Democratic Republic of the Congo (DRC) as a case study, the paper proposes a new way of looking at solid waste in the bid to come up with alternative methods to improve the plight of SWM. A combination of qualitative research methods and system analysis have been employed to evaluate the causal relationships observed in contemporary solid waste management systems in Kinshasa. This paper argues that there is an absence of coherent and broad-based approaches to SWM in Kinshasa as is common in other sub-Saharan African countries. Empirical evidence suggests that contemporary SWM strategies and approaches developed on a global scale which have increasingly been adopted by the Congolese national and local government authorities have proven inadequate to address the SWM realities on a local level. Using system thinking and system dynamics, this paper attempts to develop a feasible methodological framework focusing on the formulation of an appropriate approach to improve SWM in Kinshasa. It is argued that new ways of approaching the complexity that exists in SWM will facilitate the adoption of technologies and innovative ways of thinking and managing solid waste in a more sustainable, socially and environmentally accepted manner.

***Keywords**: environmental justice, solid waste management, system thinking and system dynamic*

[2] This chapter has been submitted for publication in its current form: Kubanza, NS and Simatele, D. (2016). Sustainable Solid Waste Management in sub-Saharan African Cities: Application of System Thinking and System Dynamic as Methodological Imperatives in Kinshasa, the Democratic Republic of Congo (DRC). Habitat International Journal (second revision is done and the paper is currently under consideration).

3.1. Introduction

The socio-economic disparities in the distribution of solid waste and environmentally hazardous sites have been central in the environmental justice discourse; hence numerous approaches have been applied to assess such disparities (Hamilton and Viscusi, 1999). These approaches have tended to be of two types: (1) Pollution Dispersion Assessments (PDA) and (2) Proximity Site Assessments (PSA). PDAs have tended to involve the collection of data regarding a number of measurements which include the volume and toxicity levels of pollutants in the air and water, the timing of pollutant emission releases, stack heights measurements, wind direction and speed to mention but a few (Ash and Fetter, 2004; Chakraborty and Armstrong, 1997). The principle objective of PDAs is to estimate the geographic dispersion and deposition of the toxic emissions. Hamilton and Viscusi, (1999), for example, have employed census data to determine the demographic characteristics of those most likely to live where pollution and toxicity levels are concentrated. They observed that some pollution dispersion studies have gone as far as attempting to conduct risk assessments to estimate the extent to which human exposure and vulnerability to hazardous solid waste can trigger diseases such as cancer and respiratory complications (Hamilton and Viscusi, 1999). It is however, important to note that there are few environmental inequality studies that have attempted to use pollution dispersion or risk assessment as a method to measure the implications of solid waste on human health and well-being. By far, the most frequently employed approach for conducting quantitative environmental inequality analyses of hazardous or solid waste of any kind has been the Proximity Site Assessment (PSA). PSA as a method is dedicated to measuring the implications of solid waste on human populations based on their proximity to solid waste. Studies that have employed PSA as an analytical and

operational framework have been very influential in spurring policy development and further research in the areas of social and environmental justice.

Against this background, landfills have been documented as the dominant option and approach for waste management/disposal in many parts of the world (Brunner and Fellner, 2007). Brunner and Helmut, (2014), for example, argue that the comparatively high costs of treatment and disposal alternatives are a major reason for the heavy reliance on municipal solid waste (MSW) landfills, particularly in cities of the developing world (Brunner and Fellner, 2007). Furthermore, Helmut, (2014) and supported by Kubanza and Simatele, (2015) argue that the practice of landfilling is also prevalent in more industrialised and economically developed countries such as the US, Australia, the UK and Finland. Medina, (2010) for example, argues that about 70% of MSW has been directed to landfills without pre-treatment in Australia. On the other hand, Brunner and Helmut, (2014) observe that direct disposal of municipal solid waste accounted for less than 30% of waste generation in 2000 with high incineration rates during the last decades due to the historic scarcity of land in Japan. In the same context, Greece, the United Kingdom and Finland have also been documented as being among countries in Europe that are dependent on direct landfilling as a means of waste management (Eurostat, 2010). It is argued that a fraction of MSW that was generated in the three countries in 2008 was landfilled with Greece accounting for 77%, 55% in the UK, and 51% in Finland (Eurostat, 2010). In contrast, landfilling in the same year accounted for less than 5% of municipal solid waste management in Germany, the Netherlands, Sweden, Denmark, and Austria (Eurostat, 2010).

Another common practice of SWM is dumping which has become a common method of waste disposal in many cities of the developing world (see Simatele and Etambakonga, (2015). Medina, (2010) for example, is of the view that dumping has become an indiscriminate form

of solid waste disposal in Asian cities, resulting in solid waste becoming a common feature of the urban landscape that is visible along roadsides, rivers, open spaces as well as public spaces. Tascione and Raggi, (2011) are of the view that this situation owes much to the lack of effective and efficient SWM policies and institutional framework which is preventing people from solving problems and challenges that affect them (see Kubanza and Simatele, 2015). Despite this state of affairs, a new and unofficial trend in solid waste dumping in many cities of the developing world has emerged and involves the dumping of waste in unofficially designated locations. Weiner and Matthews, (2003) and supported by Otang-Ababio, (2012) for example, observe that a significant number of household waste is increasingly becoming dumped in undesignated locations, placed in plastic bags, stored and then collected by different actors (e.g. the local authority or solid waste scavengers). In some cases, community containers have been haphazardly placed in arbitrary places in an attempt to discourage dumping and promote a more organised form of solid waste disposal.

In the context of sub-Saharan African (SSA) cities open dumps have become the most common disposal method for solid waste. While the causes of open dumps as a form of SWM are similar to those occurring in Asian cities, the risks are differentiated. Cointreau, (2008) for example is of the view that the decomposition of organic materials produces methane, which in the case of open dumps can cause fire and potent gas explosions. The biological and chemical processes that occur in open dumps often produce strong leachates which have the potential to pollute surface and groundwater (Medina, 2010). In addition to these natural consequences, open dumps have other financial implications; collection, transportation, and disposal of municipal solid waste represent a large financial expenditure for many local government authorities in sub-Saharan African (SSA) cities (Kubanza and Simatele, 2015). Maluleke, (2014), Simatele and Etambakonga, (2015) for example, observe that waste

management in SSA accounts for between 30 to 50% of the municipal operational budgets in SAA cities (Maluleke, 2014). Despite these high expenses, these cities collect only 50 to 80% of the refuse generated. In Cairo, for instance, about 50% of the refuse generated is collected. Disposal receives less attention because 90% of the municipal solid waste collected in African cities ends up in open dumps (Ako *et, al*., 2013; Cointreau, 2008). In view of the above observations, it can be argued that there are several approaches that are implemented in managing solid waste in SSA. Many of these approaches namely: landfills, burning or incineration, recycling or reuse are mainly driven by economic instruments or motives.

Furthermore, research and existing literature on SWM seems not to have come up with more innovative methodological paradigms of how to approach SWM challenges in urban contexts, particularly in cities facing increased civil conflicts. Instead, existing literature has continued to engage with traditional methods, practices and analyses of waste management (landfilling, composting and incineration) as the basis on which to improve the perception and management of solid waste. Thus, a gap in how best to effectively and efficiently manage increased solid waste generation in the context of rapid urbanization has remained a challenge for many urban authorities in developing countries, particularly in SSA. This paper, using system thinking and system dynamic analyses as conceptual and operational frameworks, engages in a comprehensive review of existing SWM methodological approaches, in an attempt to suggest other ways of knowing of and thinking about urban SWM and necessitates the formulation of alternative methodological considerations for developing systems and strategies for sustainable SWM in SSA cities, using the Democratic Republic of Congo as a case study.

3.2. Solid waste management in a sub-Saharan African context

The siting and distribution of waste facilities is one of the earliest key issues that gave rise to the environmental justice discourse. In 1970, most analyses of the spatial distribution of solid waste disposal sites in the USA revealed race as the determinant in siting (Bullard, 2005). Bullard, (2005) argues that three-quarters of commercial hazardous waste landfills in eight southern states were predominantly housed by African-American neighborhoods (see also US General Accounting Office, 1983). Petts, (2005) further contends that the situation sparked a lot of controversy in issues relating to waste management and played a significant role in influencing reforms in the policy arena aimed at mainstreaming environmental justice in development and planning policies across the globe. In spite of these accomplishments, waste-related injustices and their relationships with marginalised communities remain an environmental justice topic of concern.

Cordioli *et al.,* (2013) have reviewed 41 studies on incinerators and classified them on the basis of the exposure assessment approach. They have performed a simulation study to explore how the different exposure metrics may influence the exposure levels used in epidemiological studies. The results of this study have proven that most studies have used linear distance as a measure of exposure to incinerators. They argue that the characterization of exposure can be significantly improved by using more detailed data for population residency and better simulation models. All these aspects of exposure assessment are particularly relevant as most of the environmental conflicts usually arise from the evaluation of the contribution of the various pollution sources to the overall contamination (Cordioli *et al.*, 2013; Zaman and Lehmann, 2011a).

Against this background, waste prevention, recycling, reuse and the optimization of final disposal and monitoring have been documented as the most preferred principles by the EU (Del Borghi *et al.*, 2009). They further argue that the waste hierarchy is the basis for selecting priorities in waste management because it gives top priority to prevention, reuse, recycling, recovery and disposal to landfills. On the other hand, Kirkeby, (2005) contends that the waste hierarchy does not attempt to assess the environmental impacts of a specific waste management system, but it provides guidelines for the preferred strategy for waste management. He further argues that waste can be subjected to various processes, which include landfilling, incineration with energy recovering, recycling and composting. He highlights that each of these options has specific consequences in terms of environmental impacts.

Furthermore, Staniškis, (2005:22), for example, has described a system approach to waste management. He has defined an integrated waste management system as "the selection and application of suitable techniques, technologies and management programs to achieve specific waste management objectives and goals". McDougall *et al.*, (2003) on the contrary define the integrated waste management system as a system of waste that has control over all types and sources of solid waste materials: materials recycling, biological treatment, thermal treatment and landfilling. Today, the concept of integrated waste management is broader and it includes the use of different treatment technologies depending on the situation and the overall approach being taken with respect to the analysis, optimization and management of the whole system of SWM (Staniškis, 2005).

Although, a number of studies have considered the integrated approach as the analytical or methodological framework for approaching SWM investigations, there is an increased recognition and appreciation of the complexity that exists in studies of a similar nature. This

is because every region has its own unique profile regarding SWM practices and dynamics (Laner *et al*., 2012). Chung and Poon, (1996) and Laner *et al*., (2012) for instance, observe that the attitudes of people in different municipalities of each region vary regarding waste management practices. This observation, according to Simatele and Etambakonga, (2015) is embedded in the fact that perceptions and social behavior of individuals and groups of communities are shaped by the nature and effectiveness of institutions within their locales. It should be noted that the nature of legislation and the extent to which legislation is implemented can either facilitate or impede the adoption of pro-community waste management strategies and approaches (Cheru, 2002; Obeng, *et al*., 2009).

It has also been observed by Hayes *et al.,* (2014) that, since there is no preferred method, municipalities should create their own best way of dealing with waste in many SSA cities (Maluleke, 2014). However, the most commonly employed approach for SWM in SSA has been identified as the integrated solid waste management (ISWM) approach (Gutberlet *et al.,* 2013). Integrated waste management refers to the complementary use of a variety of practices to safely and effectively handle MSW (Staniškis, 2005). The strategy used to develop an (ISWM) system was based on the need to identify the levels at which the highest values of individual and collective materials can be recovered (Hayes *et al.,* 2014; Tascione and Raggi, 2011; Maluleke, 2014). The most favorable method within the ISWM approach is reduction, which suggests using less to begin with and reusing more, thereby saving material production, resource cost and energy. In view of this, landfilling is thus, considered as the least desirable approach for SWM (Laner *et al.,* 2012; Maluleke, 2014). The ISWM approach not only aims at maximizing recovery of reusable and recyclable materials, but also contributing towards the reduction of air and water pollution as well as protecting human health and environmental wellness (Laner *et al.,* 2012; Maluleke, 2014).

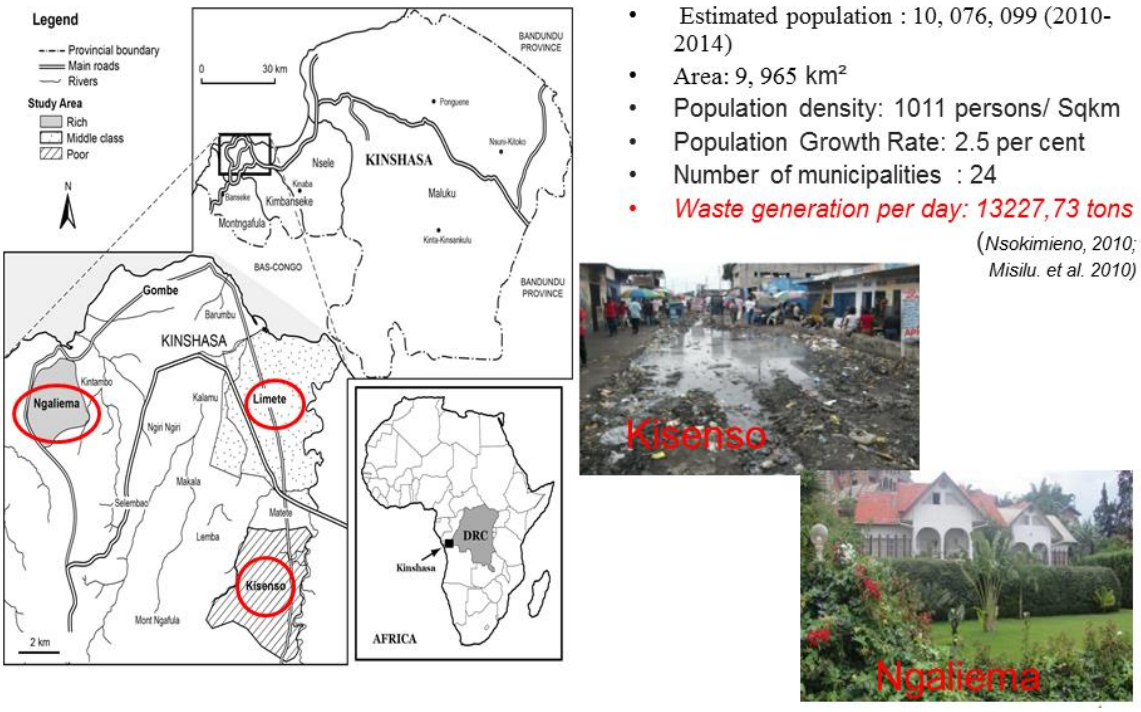
A major challenge in SWM in SSA cities is the need to minimize the amount of point source waste generation (households, community and business levels). It has been argued by Maluleke, (2014) that a successful waste reduction strategy at the starting point would be the most effective and promising way of dealing with SWM as the amount of waste for disposal is minimized and kept in check (Maluleke, 2014; Simatele and Etambakonga, 2015). But waste reduction also involves an aspect of culture on people's behavior and attitudes (Tascione and Raggi, 2011). As argued above, institutions play a key role in shaping any form of societal culture and behavior. In the context of this paper, such behavior would be in relation to people's attitudes towards and perceptions of reusable and recyclable materials such as plastic bags, glass, plastics bottles, paper, cans and cardboards which may be recovered for domestic or even commercial use (Maluleke, 2014). It is important to note that solid waste recycling has several benefits, both environmental and socio-economical. Simatele and Etambakonga, (2015) argue that solid waste collection, especially by informal solid waste actors, do not only contribute to the collection of the waste in the cities, but it is also a form of employment contributing significantly to the livelihoods of many poor households, as well as the economic growth of the urban landscape.

3.3. Methodological issues

The methodological positionality underlying this paper is interpretative in nature, and bases its operational framework on qualitative research. It uses system thinking and system analysis to evaluate the *causal relationships* observed within SWM in SSA, using Kinshasa, the Democratic Republic of Congo as a case study. Maxwell, (2004a), for example, using realism as a research approach, establishes a credible philosophical standing in explaining processes and mechanisms that give rise to an observed social phenomenon (see also Sayer, 1992; Huberman and Miles, 1985). He argues that realism allows individuals and groups of

individuals to explain social processes from their own perspectives and can result in one observable event conveying different meanings to different groups of people (Maxwell, 2004a). It is important to note that realism bears in itself much of the Marxist work and its existence is based on the separation of three domains namely: i) the domain of the empirical, which is concerned solely with experiences, with the world, as it is perceived; ii) the domain of the actual which is concerned with events as well as experiences, accepting that an event (human behaviour for example) may be interpreted in different ways by individuals (i.e those actors experiencing it), and iii) the domain of the real, which is concerned with structures that cannot be apprehended directly, but which contain the mechanisms, that lead to the events and their empirical perception (Bhaskar, 1978:214).

In approaching the causal relationships existing in SWM in Kinshasa, three main frames of reference were adopted and they include the socio-economic, environmental and technological contexts. These contexts were adopted in order to avoid the use of infer-ration in the measurement of covariance of presumed cause and effect dialectics in SWM. In view of this, data collection was carried out between October 2014 and May 2015 in three study locations within the city of Kinshasa: Ngaliema, Limete and Kisenso (see Figure 2).



Source: Cartography Unit (2015), School of Geography and Environmental Studies, University of Witwatersrand, South Africa

Figure 2: Location and neighbourhoods

It was purposely decided to draw three population lists, each consisting of 210 research participants from each of the study sites shown in Figure 2. After scrutinising the three population lists, it was deliberately determined that a study sample consisting of 70 research participants for each of the three intra-city sites be selected for inclusion in the study. In order to perform this exercise, the following equation was employed for determining the absolute interval ratio at which research participants were selected for inclusion in the study.

$$\mathbf{K} = \frac{N}{n} = \left\{ \frac{\text{size of population}}{\text{size of sample}} \right\}. \quad \text{Thus: } \mathbf{K} = \frac{210}{70} = 3.$$

Where **K** is the interval ratio **K = 3.**

Thus, using the above calculation, it was decided that every 3rd house in all the three study sites was to be considered, selected and included in the study sample. The selection of the first research participant or household was purposely chosen and then the interval of 3 was applied. This sequencing was followed throughout the research sites.

In addition to the primary data collected at the grassroots, semi-structured interviews were conducted with different officials from different local and national governments responsible for urban management. Using the snowball technique, a total of 15 officials drawn from the city of Kinshasa Municipality, the Ministry of Local Government and Housing, as well as the Environment Management Unit were identified. The purpose of these interviews was to have a comprehensive understanding of the challenges faced by authorities in SWM, as well as the policy and institutional frameworks within which the management of solid waste is being pursued. Furthermore, a rapid appraisal of existing literature on solid waste methodologies was extensively reviewed in order to assess the effectiveness of these methods in SWM.

In total fourty (40) peer reviewed journal articles focusing on both global and local processes in SWM were reviewed. These were obtained from various sources including internet searches and different libraries in South Africa and the Democratic Republic of Congo. The conceptual model focused on the formulation of alternative solutions for SWM through system thinking and system analysis and the development of Causal Loops in order to have a clear understanding of the processes and systems that underly the solid waste crisis in the city of Kinshasa.

3.4. Results and discussions

Existing SWM infrastructure and institutional arrangement in the DRC and Kinshasa in particular leave much to be desired. Part of this inadequacy in the institutional arrangement and infrastructure owes much to the political and economic instabilities that the country has faced over the past five decades. This situation has resulted in the destruction of physical infrastructure and other logistical arrangements necessary for effective garbage collection and disposal and the overall management of waste (Nsokimieno, 2010; Din and Cohen, 2013). The current state of affairs in Kinshasa has left local authorities and community organisations unable to respond to the increase in solid waste generation vis-à-vis SWM. Furthermore, the collection of solid waste is usually confined to wealthy neighbourhoods, the urban glamour zone, and spaces of high commercial agglomeration where political and economic power are at the realm of political, societal and economic control. Consequently, low-income areas of the city and where the majority of the poor people reside, rarely receive any form of SWM, services, thereby forcing them to adopt radical forms of waste management; burning, and/or dumping waste haphazardly on any available spaces within and on the fringes of the city. A female resident of Kisenso aged between 30 and 35 years, for example commented:

> *"The state bankruptcy has led to massive differences in the quality of service delivery between the rich and poor areas in Kinshasa. We in Kisenso are a group of forgotten people. The city authorities don't seem to know about our existence. Yes they do see us when we go to clean their expensive houses, do their laundry and clean their cars and dishes. But they really don't want to know where we live and that is why they are not concerned about our surroundings. To be honest, they don't care about us at all" (Pers.com 2015a).*

Another female resident of Kisenso aged between 40 and 45 years commented:

> *"I am not sure if I am a citizen of the DRC. If I was, don't you think that the same benefits that are enjoyed by the people in Limete and Ngaliema should accrue to me? I am not saying that I should live in an expensive house and drive a nice car. I can't surely have those things because I didn't really do well in school. But at least the local authority can clean up the surroundings and take the waste away. I think this is a service I deserve because I pay my tax. Don't you think so sir?" (Pers.com 2015b).*

The residents of Limete, a middle income area, also share similar sentiments with the residents of Kisenso and feel that urban governance systems and structures in Kinshasa are increasingly disenfranchising them in the way social-economic services are distributed across the city, particularly in relation to waste management. Figure 3 for example shows the prevalence of solid waste in the city of Kinshasa. It is obvious that solid waste has become part of the landscape in Kinshasa and has become a major management challenge for the urban authorities.

Source: photo by Serge Kubanza 2015

Figure 3: Solid waste management challenges in Kinshasa

Table 2 shows the research participants' perceptions regarding the type of waste generated across the three study locations. It is suggested that 42% of rubbish commonly found in household waste is food waste, while paper and plastic accounted for 23% and 21% respectively. Items such as razors, and pieces of iron bar were also found in the household waste.

Table 2: Perceptions of research participants regarding the type of waste generated in households.

Nature of Responses	No. of Citations	%
Food waste	75	42
Paper	42	23
Plastic	37	21
Others	25	14
Total	**180**	**100**

Despite the fact that food waste is prevalent among the type of household wastes in Kinshasa, paper, plastic and other types of waste accounted for 58%. An ethnographic observation revealed that solid waste is not only generated by households but also by informal activities such as roadside trading and market places. Din and Cohen, (2013) argue that the current

poor status in SWM in Kinshasa is partly due to mediocre urban governance which has been characterised by corruption, bureaucratic harassment of the systems and lack of check and balances. The combination of the aforementioned, not only impedes economic growth, but also negatively impacts upon the everyday lives of the urban poor.

Ground-truthing exercises revealed that poor neighbourhoods in Kinshasa had limited or no access to SWM facilities, and where available, these were erratic and delivered on very rare occasions. A significant number of peripheral communities in Kinshasa had no services, compelling them to dump their waste in any available space (see also Dougall and McGahey, 2003; Din and Cohen, 2013). A male research participant, aged between 35 and 40 years and working in the private sector stated:

> *"The solid waste removal arrangement in the city of Kinshasa favours the rich people in areas like Ngaliema. It is not for the poor people in places like Kisenso or even here where I live in Limete. We are a bit lucky here however, because the waste is collected on a very irregular basis, but it does get collected. In the rich neighbourhoods, waste is collected come rain or sunshine. It's not fair that in other places, the council doesn't care to provide a similar service" (Pers.com 2015c).*

Table 3 shows some of the perceptions of research participants regarding the nuisances associated with illegal landfills and dumping sites.

Table 3: Perceptions of research participants regarding the nuisances associated with illegal landfills and dumping sites.

Nature of Responses	No. of citations	%
Odour	60	29
Flies	55	27
Rats	45	21
Diseases	40	19
Others	10	4
Total	**210**	**100**

An estimated 29% of the respondents were of the view that they suffered from odour emanating from illegal landfills and dumpsites, while 27% felt bothered by flies, 21% were disturbed by rats and, 19% argued that they suffered from diseases caused by illegal landfills and dumpsites. The types of diseases they suffered from include: malaria, typhoid fever, cholera and tuberculosis.

The prevailing illegal landfills and open dump sites stemmed from a scenario where most of the waste was not adequately removed by the responsible agencies in tandem with its generation. Lack of resources, incomprehensive urban policies and lack of infrastructures were the main factors for the ineptitude in SWM in Kinshasa. This has now resulted in an out of control spiral of the solid waste crisis within the city. A research participant from the Department of Environmental Affairs commented:

> *"Only four landfill sites are official and legally controlled from the study sites. This represents a meagre 10% of the total landfill sites present in the study areas. This state of affairs reveals major challenges in solid waste management practices in Kinshasa and it would not be an exaggeration to argue that the city of Kinshasa, like many other sub-Saharan African cities, does not have a comprehensive and coherent broad based-approach to solid waste management"(Pers.com 2015d).*

A careful scrutiny of solid waste disposal in Kinshasa revealed that a significant number of the landfills and dump sites are located in poor residential areas. Other studies of a similar nature have also reported that most landfills in Kinshasa are located in residential areas where the poor people live, along riverbanks, and vacant open spaces (Mangenda, *et al.*, 2014; Misilu. *et al.*, 2010). However, in order to develop an effective and sustainable SWM system in Kinshasa, there is an urgent need for the city authorities to devolve the power structure from central government to local communities and must be accompanied by clear guidelines and strategies to strengthen local management processes. Table 4 presents the research participants' perceptions regarding the quality of their urban environment.

Table 4: Participants' perceptions regarding solid waste management in Kinshasa.

Nature of Responses	No. of Citations	%
Poor	60	29
Very poor	55	27
satisfactory	45	22
Very satisfactory	25	10
Others	25	10
Total	**210**	**100**

It is suggested in Table 4 that 29% of the research participants were not satisfied with the quality of their urban environment, describing it as poor and dirty. They argued that waste management practices in their communities are poor and that the environment is not conducive for human wellbeing. They noted that there is no waste collection public service in their neighborhood and they described this situation as unfair and unjust. About 27% of the respondents were of the view that the overall situation of waste in their neighborhoods is very poor and alarming, even though an estimated 22% of the respondents were satisfied with the quality of their urban environment, but this was the view of those who live in urban high-

income neighbourhoods. Table 5 presents the research participants' perceptions regarding the environmental problems related to SWM in Kinshasa.

Table 5: Environmental problems related to mismanagement of solid waste.

Nature of Responses	No. of Citations	%
Air pollution	60	28
Water pollution	60	28
Diseases	40	20
Vegetation damages	30	14
Others	20	10
Total	**210**	**100**

It is suggested from Table 5 that 56% of the respondents were of the view that air and water pollution are among the major environmental problems associated with mismanagement of solid waste disposal systems in Kinshasa. About 20% of respondents reported that diseases such as typhoid fever, tuberculosis, malaria are associated with mismanagement of solid waste. As pointed out above, the problem with SWM lies in the quality of urban governance in Kinshasa, which has so far lacked the appropriate ingredients in local and national development (Ako *et al*., 2013; Kindormay and Ron, 2012). Table 6 presents the perceptions of research participants regarding SWM responsibilities in Kinshasa.

Table 6: Perceptions of research participants on solid waste management responsibilities in Kinshasa.

Nature of Responses	No. of Citations	%
Municipal authorities	50	23
Private companies	40	19
households	35	17
others	35	17
NGOs/CBOs	25	12
Churches	25	12
Total	**210**	**100**

From the information in table 6, it is suggested that 23% of the research participants believe that effective SWM in Kinshasa should be the responsibility of the municipal authorities. They argue that the municipal authorities have the responsibility to design and develop adequate policies for SWM. They further argue that the municipal authorities also have a duty to educate the public to be involved in the management of solid waste in the city. About 17 % of the research participants consider households to be responsible for SWM. This perception is informed by the fact that waste is generated by households and therefore, every household is responsible for managing its waste.

From the above observations, one can argue that the current approach to urban planning and SWM based on central government, places very little emphasis on the importance of private entities and citizen groups to effectively participate in the management and mitigating of issues that affect them. However, the system allows the vested interests of political and economic elite to unduly influence, or even to buy, the urban policies, regulations, and laws of the local authority. In order to develop an effective and sustainable SWM system in Kinshasa, there is an urgent need for the city authorities to devolve the power structure from central government and empower local communities that must be accompanied by clear

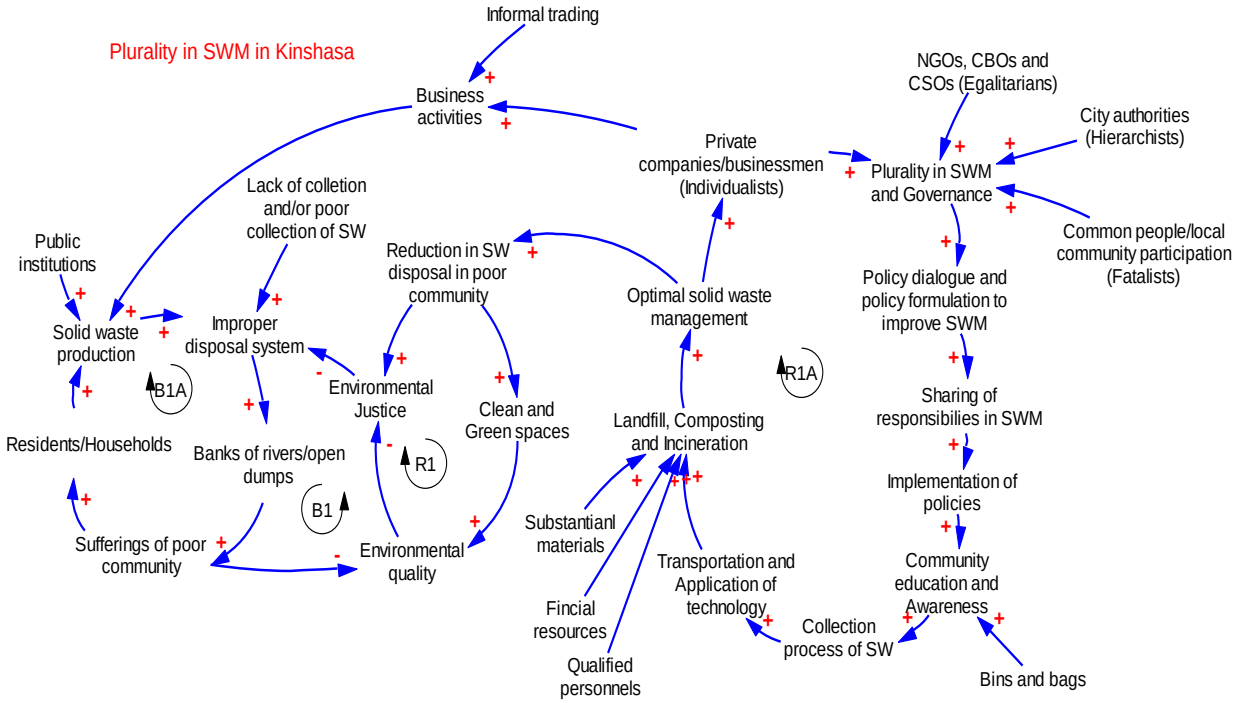
guidelines and a strategy to strengthen local management processes. Simatele and Simatele, (2014), for example observe that, although government must retain the role of planner and investor in some sectors, it should aim at building flexible structures in its organisational framework in the areas of community participation and decision making, regulation, competition and decentralisation, among others. This argument is premised on the basis that the engagement of civil society as well as grass-root communities in fair and transparent decision-making in partnership with local authorities and the private sector, can make the difference between well-governed and misgoverned solid waste systems in a city. The authorities in the city of Kinshasa need to create mechanisms which will give voice to the people and force elected city officials to listen to the people, and impose sanctions on city representatives for wrong doing. Such a framework, we would argue, should be the basis of a model for good urban governance and sustainable SWM.

3. 5. Towards a sustainable solid waste management framework

In order to develop more sustainable forms of SWM, particularly in SSA cities, the case of Kinshasa, it is imperative to rethink contemporary approaches that have played a key role in informing current management policies and practices. There is a need to go beyond existing analytical and operational frameworks that seek to examine ordinary and everyday systems, processes and structures of solid waste and adopt methodologies that examine the embedded complexity in SWM. The Causal Loop Diagram Analysis (CLDA) for example, is a tool for systems analysis, and illustrates the complex relationships in an observable social, economic or environmental event. CLDA analysis is beneficial in understanding and communicating complex systems involving variables of both qualitative and quantitative measurement (Maxwell, 2004a).

In the context of this paper, CLDA enabled the researchers to gasp and organise the multifarious causal aspects of SWM in Kinshasa. Causal relationships between variables as shown in Figure 4, were visualised by mono-directional arrows connecting the variables. The (+, plus) sign at the head of the arrow indicates that the preceding variable is having an "increasing" positive effect on the variable to which the arrows is connected. The (-, minus) sign on the contrary indicates that the preceding variable is having a "decreasing" effect on the variable to which the arrows is connected. Two or more arrows connecting two or more variables create a loop which has either a reinforcing (R) or balancing (B) effect on a given variable within the loop. In the middle of the loop, (R) indicates that the variables are reinforcing each other over time and (B) indicates that the variables are balancing each other over time (Haraldsson, 2004; Kirkwood, 1998).

In addition to the universal CLDA notations, the researchers developed other cyphers to better fit the contextual realities revealed in the three sites included in the study. Coded coloration of mono-directional causal arrows was used to clearly separate and identify different forms of causal relationships within the complex system of solid waste in Kinshasa. Figure 4 shows the current state of SWM and stakeholders' engagement necessary to improve SWM in the city of Kinshasa as well as contribute towards improving environmental justice in a plurality governance approach.



Source: Based on field-work materials, (2015)

Figure 4: Causal feedback mechanisms in SWM and stakeholders' engagement in plurality governance approach in Kinshasa.

Figure 4 suggests that there is a clear causal loop mechanism showing the current plight of SWM in Kinshasa, and the ways in which this state of affairs can be improved through plurality governance mechanisms. It is revealed for example in B1A that households (residents), public institutions and business entities seem to generate high volumes of solid waste across the city of Kinshasa. The inability of the urban authorities in Kinshasa to effectively collect and handle waste has resulted in improper disposal systems which affects the city ecosystem and human health. This state of affairs has resulted in illegal and open dumps as shown in B1A. Consequently, it is the urban poor and those living in poor neighbourhoods who are more affected by this development. This is because these spaces do not receive any or adequate waste collection services and continue to suffer from indiscrimination through a balancing feedback (see Figure 4: B1A).

It is suggested in Figure 4 that the net effect of uncollected solid waste in the poor neighbourhoods is significantly contributing to deteriorations in the quality of environmental and social wellbeing and is implicitly creating situations where the majority of the urban poor are subjected to environmental injustices. This state of affairs is illustrated in Figure 4 through the balancing feedback loop B1. Thus, the operating mechanism is the B1A loop feedback which strengthens the B1 loop feedback, and contributes toward the formation of environmental injustice in the context of SWM in the city. However, as illustrated further in Figure 4:R1A, SWM approaches and practices can be enhanced and improved by employing the hierarchical (city authorities), individualism (private companies), egalitarianism (NGOs, CBOs, CSOs), and fatalism (common people) framework. Such a framework would incorporate in its management structure and systems, processes and dynamics taking place, both on a vertical and horizontal scale, and would involve the participation of key actors at all levels of society, civil organisation, government and the corporate world. All four strategies would be necessary in producing or formulating effective, efficient and socially acceptable solutions and systems to improve SWM in the city of Kinshasa through a plurality governance coordination and develop adequate and significant environmental policies (Figure4:R1A) that would be pro-poor, environment and development. It is important to state here that if such a framework is employed in the management of solid waste in Kinshasa, it would ensure that all the stakeholders would share the responsibility and promote sound management systems and approaches of solid waste principles, focussing on the need to *recover, re-use and recycle* – the Three (3) Rs (see Figure 4: R1A).

To achieve efficiency, management should go to the source of solid waste production: namely households and businesses. It should examine the processes of waste collection, storage and transport to the landfills. These processes imply substantial material and financial resources as well as qualified personnel (Figure4:R1A). The state should provide other services such as bins and bags for preparation of waste collection by municipalities in Kinshasa (Figure4:R1A). At a municipal level, local authorities should establish a brigade of road workers with the mission to collect and bring garbage to landfills where it will be transferred to the final processing sites. Another team would be responsible for sorting recyclable waste such as glass, aluminium, copper and paper. The rest should be incinerated.

Furthermore, given that residential and commercial buildings are large producers of solid waste, pollution maintenance charges or levies should be introduced to negate the financial burden of sustainable SWM. This approach would result in the adoption of optimal management strategies to ensure that solid waste generation is kept at a minimum and the three (3) Rs are maximised (Figure4:R1A). The revenue from sales of recyclable products, for example, could be applied for the maintenance of solid waste infrastructures (e.g. road network, transport and machinery etc.). Such an approach would also ensure that major polluters, such as factories and markets pay commensurate taxes to alleviate the consequences caused on the environment.

Apart from the treatment of waste, an awareness raising campaign should be initiated to foster behavioural change in the populace of Kinshasa as well as a sense of individual and societal/or corporate responsibility towards the environment (see Figure4: R1A). This strategy should be pursued within the broader context of the relationship between a healthy environment as an indicator contributing significantly to society's health including human and national development. This process should work through a reinforcing feedback

mechanism as illustrated in the R1A in Figure 4. Furthermore, the adoption of optimal SWM strategies would result in the reduction of solid waste disposal in poor suburbs because mechanism R1A would be able to restrict the misuse of open spaces as dump sites. Community sanitation would contribute to enhancing the quality of the environment, which consequently would augment environmental justice in the city through a reinforcing feedback mechanism loop R1.

Although it is envisaged that a plurality approach of governance in collaboration with the four influential stakeholders would bring about environmental justice in solid waste management in Kinshasa, it is also necessary to evaluate and recommend feasible alternative disposal systems of solid waste in the city. This is because solid waste disposal has traditionally been a key to SWM and if appropriate, socially and environmentally friendly, mechanisms and approaches are developed, they would implicitly or explicitly enhance environmental quality, and essentially promote environmental justice. Table 7 presents the evaluation of the various solid waste disposal systems, which can be employed in SWM in Kinshasa and contribute to the propagation of justice in solid waste.

Table 7: Evaluation of alternative solid waste disposal systems for Kinshasa.

Conditions	Factors	Evaluation Parameters	DRC	Implication of Alternative solutions for SWM in Kinshasa			Most Feasible Alternatives	Adapted from
			Current situation	Landfill	Composting	Incineration		
Environmental	Human health	Infectious diseases	High	Increase (-)	Possibly decrease (+/-)	Decrease (+)	Incineration	Kubanza, (2006); Kubanza, (2010)
		Chronical diseases	High	Increase (-)	Possibly decrease (+/-)	Decrease (+)	Incineration	Kubanza, (2006); Kubanza, (2010)
	Ecological impacts	Biodegradation	High	Increase (-)	Possibly decrease (+/-)	Decrease (+)	Incineration	Morrissey and Browne, (2004)
		Natural habitat degradation	Medium	Increase (-)	Increase (-)	Decrease (+)	Incineration	Hung, *et al.*, (2007); Klang, (2006)
		Water contamination	High	Possibly increase (-)	Increase (-)	Decrease (+)	Incineration	Hung, *et al.*, (2007); Klang, (2006)
		Pollution	High	Increase (-)	Decrease (+)	Increase (-)	Composting	Kubanza, (2006); Kubanza, (2010)
		Carbon emission	Low	Possibly increase (-)	Decrease (+)	Increase (-)	Composting	Morrissey and Browne, (2004)
Economic	Costs and benefits of SWM process	Disposal costs	Absent	Relatively low (+)	Low (-)	High (-)	Landfill	Brunner, and Helmut, (2014)
		Collection/sorting costs	Low	Decrease (+)	Increase (-)	Increase (-)	Landfill	Hung, *et al.*, (2007); Klang, (2006)
		Employment generation	Absent	Low (-)	High (+)	Low (-)	Composting	Brunner, and Helmut, (2014)
	Marketing potential for by-product	Generating energy	Absent	No influence (-)	Increase (+)	Decrease (-)	Composting	Brunner, and Helmut, (2014)
		Income	Low	No influence (-)	Increase (+)	Possibly increase (-)	Composting	Hung, *et al.*, (2007); Klang, (2006)
Social	Social acceptability	Participation	Absent	Decrease (-)	Increase (+)	Possibly increase (-)	Composting	Schubeler, 1996; Petts, 2005
		Behaviour upgrading	Absent	Decrease (-)	Increase (+)	Possibly increase (-)	Composting	Schubeler, 1996; Petts, 2005
	Social welfare	People's life quality	Absent	Decrease (-)	Possibly increase (-)	Increase (+)	Incineration	Schubeler, 1996; Petts, 2005
		Health and safety	Absent	Decrease (-)	Possibly increase (-)	Increase (+)	Incineration	Schubeler, 1996; Petts, 2005
	Social justice	SWM equitability	Absent	Decrease (-)	Increase (+)	Possibly increase (-)	Composting	Hung, *et al.*, (2007); Klang, (2006)
Technological	Land	Availability	Available	Decrease (-)	Decrease (-)	Increase (+)	Incineration	Hung, *et al.*, (2007); Klang, (2006)
		Cost	Cheap	Decrease (-)	Decrease (-)	Increase (+)	Incineration	Hung, *et al.*, (2007); Klang, (2006)
	Application of technology	Knowhow	Absent	High (+)	Possibly high (+/-)	Low (-)	Landfill	Hung, *et al.*, (2007); Klang, (2006)
		Investment	Absent	Most suitable (+)	Relatively suitable (+/-)	Least suitable (-)	Landfill	Hung, *et al.*, (2007); Klang, (2006)

From the information in Table 7, it is suggested that incineration would probably be the most appropriate and effective method of SWM in Kinshasa to promote environmental, human health and ecological wellbeing. Incineration would potentially reduce the current high rates of infectious and chronical diseases resulting from poor SWM in Kinshasa. Brunner, and Helmut, (2014), for example, have observed that, incineration may also decrease high rates of ecological impacts on biodiversity (water contamination and natural habitat degradation), other than other forms of technological mechanisms to be applied in SWM in Kinshasa. However, Table 7 also reveals that incineration is not a cost effective method as it needs large initial investment and is thus, unsuitable from an economic point of view in a poor country like the DRC.

In view of the above observation, composting as a solid waste disposal, becomes the most viable and effective strategy for the city of Kinshasa. Ground-truthing exercises and discussions with three (3) key informants in Kisenso for example, revealed that composting of solid waste was the most commonly used and accepted approach among grass-root communities. A male research participant for example commented:

> *"Composting bio-degradable waste is very useful to me. I compost the waste and then sell the good soil/manure to household gardeners and the city of Kinshasa itself. This business has enabled me to generate some income for paying hospital bills and also school fees for my children. Where others see dirty, I see bread and butter. I wish the local authorities can see the value in the waste and help us with machines and transport to do even a good job" (Pers.com 2015e).*

From the above argument, one would add that if composting as a SWM approach is integrated into urban development and planning policy, it would be a useful resource contributing to the generation of energy in the form of biogas. Thus, if properly managed, composting as observed in Table 7, would be an alternative solid waste disposal system and it would increase the participation of different stakeholders including the poor people. The net effect of this situation would result in the reduction of solid waste generation, and an increase in innovative ways of thinking about waste: e.g. generation of energy and manure as the case may be.

Figure 5 provides a causal feedback mechanism showing the environmental, socio-economic and technological impacts associated with the current status of SWM in Kinshasa, as well as the costs and benefits of solid waste disposal by using landfill, composting and incineration approaches. It is suggested in the figure that there is a strong and clear causal loop relationship between the status of technological development in SWM, as well as the conditions in wellbeing of the environment and social aspects including economic attributes. From an environmental condition perspective, it is also clear that the current plight of SWM negatively affects the natural habitat (i.e. vegetation damage) which has resulted in air and water pollution in Kinshasa (Figure5:B1A). Furthermore, poor management of solid waste spreads outbreaks of both endemic and epidemic diseases. Diseases such as malaria, polio, cholera, tuberculosis and typhoid fever threaten the health of people in Kinshasa (Figure5: B1A). Kubanza and Simatele, (2015) and supported by Simatele and Etambakonga, (2015), for example, observe that the prevalence of solid waste in Kinshasa has significantly contributed to disease within the city. The bacteria (i.e. vibrio cholera) which cause cholera, for example, are prevalent in contaminated

water and food systems, and the prevalence of solid waste is a major contributor to this state of affairs (Brunner, and Helmut, 2014).

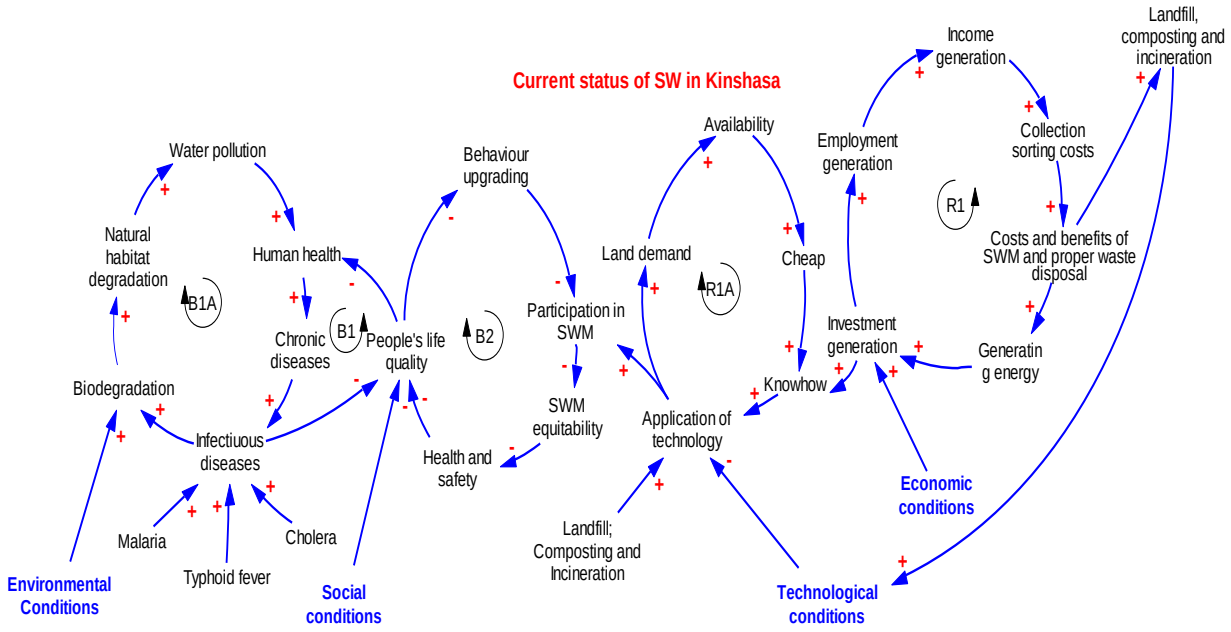


Figure 5: Causal feedback mechanisms showing the environmental, socio-economic and technological conditions associated with the current status of SWM in Kinshasa, as well as the costs and benefits of SW disposal by using landfill, composting and incineration.

The on-going high number of dysentery cases in Kinshasa for example, point particularly to the lack of urban sanitation and proper SWM disposal system. The Ministry of Public Health's Statistical Report for 2005 for Epidemic Diseases recorded 55,000 cases of dysentery, and round worms in 42% of children under the age of three (Ministère de la Santé Publique, 2005). Thus, it is apparent that the mechanism represented by feedback loop (B1A) strengthens the feedback loop (B1), and consequently creates a situation where the majority of the urban poor people are subjected to a poor quality of life (see Figure5:B2).

While the failures of governmental institutions are reflected in the inefficiency and fragility of the legal and regulatory frameworks, societal failures are revealed in the attitudes and behaviours of the urban residents towards solid waste production and disposal (Figure5:B2). In addition, it appears that most of the waste generated is being indiscriminately dumped on the streets and it can be argued that this state of affairs is contributing to the poor state in health indicators of the city (Figure5:B2). Therefore, developing appropriate and effective SWM disposal systems in Kinshasa would contribute significantly towards improving the health of city dwellers as well as energy generation, employment creation and income generation (see Figure5: R1). This situation will result in attracting investment in the industry of solid waste, thereby creating economic opportunities, not only at the household level but also at city level (Figure5: R1). Thus, application of technologies will require land demand which might be available and cheap in the context of Kinshasa. This process will be successful through reinforcing feedback mechanisms (R1A) and (R1).

3.6. Conclusion

Although a number of studies have considered the integrated approach as an analytical or methodological framework for approaching SWM investigations, this paper has highlighted the importance of system thinking and system dynamics as integral frameworks in understanding the complexity in SWM. This is because every region has its own unique profile regarding SWM practices and dynamics and cannot be understood from a single perspective. Laner *et, al*., (2012), and Chung and Poon, (1996) for example, observe that different attitudes, cultural orientations

and values of people in different municipalities across the globe have different implications and influences on waste management practices. This observation is further edified by Simatele and Etambakonga, (2015) who are of the view that SWM is embedded in a city's culture and the values of city authorities, which in turn shape perceptions and social behavior of individuals and groups of individuals in a community. Thus, city institutions and the associated nature of legislation, urban development and planning policies can either facilitate or impede the adoption of pro-community waste management strategies and approaches (Obeng, *et al*., 2009; Cheru, 2002). This is because the policy and institutional framework in Kinshasa and DRC in general has remained weak and in most cases inhospitable. The increasing inappropriate legal and regulatory environment and inadequate SWM infrastructure have stifling impact on the overall social-economic performance of the city. Consequently, the economic and social transformation potential of Kinshasa remains untapped.

In view of the above observations, there is an urgent need for greater recognition of the importance of investment in the development of urban solid waste infrastructure in Kinshasa. Decrepit road and communications systems, lack of sanitation, frequent interruptions of electric power and an unnecessary, complicated and non-functioning legal and regulatory environment all add to the failures of developing a comprehensive and effective SWM system in Kinshasa. There is, therefore, an urgent need to strengthen the capacity of the local authority to plan, invest wisely and manage scarce urban resources in a manner that is efficient for SWM to trigger urban productivity and economic opportunities. Furthermore, urban laws and regulations which either block or hinder the efficient provision of services, particularly those that discriminate against non-traditional systems of SWM, should be amended. The legal system in Kinshasa and the DRC

in general, should concentrate on promoting issues of equity and the removal of obstacles that prevent the urban poor people from receiving basic services and infrastructure as well as determining their own future.

Finally, urban authorities in Kinshasa need to review and re-orientate their development control regulations in favor of home-based enterprises (HBEs), while ensuring that their operation meets health and safety requirements. It is important to note that one of the challenges that urban authorities face in Kinshasa and in SSA cities in general, is how to align urban development priorities and policies with reducing urban poverty. This is because the complexity of urban poverty and the heterogeneity of local culture in Kinshasa make it difficult to define a uniform strategy for poverty reduction. However, city authorities need to develop city specific poverty reduction programmes which would identify innovative ways of how SWM can contribute to employment creation and income generation for the majority of the urban poor households and individuals. It is important to note that many urban problems such as poverty, unemployment, and lack of adequate shelter and urban services are interrelated, and should be addressed through an all embedding approach of SWM. It is in this context that this paper proposes system thinking and system dynamics as two approaches that would facilitate the development of both analytical and operational frameworks for SWM in sub-Saharan African cities, and Kinshasa in particular.

CHAPTER 4:

When the poor don't matter: solid waste management and environmental justice in Kinshasa, the Democratic Republic of Congo[3]

ABSTRACT

This paper discusses urban environmental problems and the associated consequences on the urban poor in Kinshasa, the capital of the Democratic Republic of Congo (DRC) from a solid waste and environmental justice perspective. It is argued that poor neighborhoods within the city of Kinshasa are often neglected and ignored by local authorities and as a result tend to be the most affected by irregularities in solid waste collection and management. Using a mix of secondary and primary data collected through a rapid appraisal of existing literature and methods inspired by the tradition of participatory research, it is suggested in the paper that solid waste in Kinshasa, is not only a health risk, but generates socio-spatial inequalities in the distribution of the solid waste burden. In view of this assertion, it is observed that local government authorities and other stakeholders need to rethink current solid waste management strategies and adopt pro-poor frameworks which will encourage the participation of the poor in issues that affect them. These findings have been discussed within contemporary and evolving theoretical and policy discussions on sustainable solid waste management in countries of the developing south.

Keywords*: environmental justice, solid waste management, urban environmental problems, when the poor don't matter, Kinshasa*

[3] This chapter has been submitted for publication in its current form: Kubanza, NS; Simatele, D and Das, DK. (2015). When the poor don't matter: solid waste management and environmental justice in Kinshasa, the Democratic Republic of Congo (DRC). Journal of Social Justice Research (second revision is done and the paper is currently under consideration).

4.1. Introduction

Solid waste management (SWM) and environmental justice (EJ) have long been studied (Walker, 2009; Fan, 2006; Hillman, 2006; Pearce *et al.,* 2006; Chaix *et al.,* 2006). Increasing attention has been paid to the issue of inequalities in the distribution of environmental quality in the city. Social inequalities in the distribution of environmental quality, their causes and consequences and the potential remedies have spread rapidly in the past decade (Patel, 2009; Meyers, 2008). Attempts to formulate policies to lessen environmental injustice have been significant. The rise of environmental justice discourse as a social issue and its implications in the current debates has received considerable attention (Chaix *et al.,* 2006). Environmental justice is used to frame waste-related injustice. This has been evidenced by the Global North's practice of using the Global South as a dumping ground (Thompson 2008; Pollock and Vittes, 1996). The urban poor in many cities of the developing world continue to be subjected to environmental injustice despite that one of the principles for environmental justice is that public policy be based on mutual respect and justice for all peoples, and free from any form of discrimination. It demands the right of individuals to participate in national and local development projects as equal partners at every level of decision-making, including assessment, planning, implementation, enforcement and evaluation (Cheru, 2002; Binns *et al.,* 2012).

In sub-Saharan Africa, the above principles, as observed by Binns *et al.,* (2012), and Cheru, (2002) are evident only on paper and political speeches; they are seldom implemented in urban planning and development policy. This lack of inclusion often results in poor communities being subjected to various vulnerabilities, among which include the denial of appropriate physical environments in which to live and contribute meaningfully to national development and

economic growth. In this context, the Rio Declaration on Environment and Development, (1992) under principle 10, states that:

> *"Environmental issues are best handled with participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities. The state shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceeding, including redress and remedy, shall be provided".*

This principle has provided the framework for a contemporary human rights revolution, with the first major step in its propagation being manifested in the emergence of European Environmental non-governmental organisations (NGOs) working closely with governments to formulate and enact environmental legislation that ensures ecological and social wellbeing. This aspiration is articulated in the Aarhus Convention (UNECE, 1998) under article 1, which states that:

> *"In order to contribute to the protection of the right of every person of present and future generations to live in an environment adequate to his or her health and well-being, each party shall generate the rights of access to information, public participation in decision making, and access to justice in environmental matters in accordance with the provision of this convention".*

Although regional in scope, the significance of the Aarhus Convention is global. It is by far the most notable elaboration of principle 10 of the Rio Declaration and, as such, it is the most ambitious venture in the area of environmental justice (*Koffi Annan, United Nations Secretary General, 1997-2008).* Furthermore, studies focusing on solid waste management have mostly used Public Participation (PP) and Integrated Solid Waste Management (ISWM) as Theoretical Frameworks whereas Environmental Justice and Pro-Poor Frameworks receive less attention in analysing solid waste management in urban contexts (Kubanza and Simatele 2015; Simatele and Etambakonga 2015).

In view of the above observations, this paper uses secondary and fieldwork based data to explore the extent to which environmental injustice is reflected in solid waste management within Kinshasa, the Democratic Republic of Congo (DRC). The paper provides possible steps that stakeholders' can adopt and mechanisms to lessen environmental injustice in solid waste management (SWM) in Kinshasa, the Democratic Republic of Congo. Observations reveal that the lack of community participation in solid waste management activities is a result of a number of factors with the most pertinent being the continued top-down policy and strategy implementation. These policies and strategies not only disenfranchise the poor but also subject them to different vulnerabilities. A more decentralised community organisation system in this instance would, however, possibly result in the adoption of pro-poor strategies that would shift the locus of power from the elite members of society to the poor. Until the urban poor are allowed to articulate their views and carve their own future, urban processes such as solid waste management and designing more inclusive development agendas will always elude urban managers.

Furthermore, the objective of the investigation is to discuss urban environmental problems and the associated consequences on the urban poor in Kinshasa, the capital of the Democratic Republic of Congo (DRC) from a solid waste and environmental justice perspective. It is also to suggest to the urban managers to adopt pro-poor frameworks which will encourage the participation of the poor in issues that affect them. The paper starts with an introduction and provides a literature review on environmental justice and solid waste management both, from the global and local perspectives. Following this, is the methodology used in the study which

introduces the results of the investigation. The paper then discusses the results and concludes with a recommendation.

4.2. Environmental justice and solid waste management: A literature review

Concern for environmental justice (EJ) is a relatively recent development and has its origins in the USA (Venot and Floriane, 2013; Walker, 2009; Fan, 2006; Hillman, 2006). As a concept, EJ is difficult to define as it is often used to describe processes that have little concern with what it really means. However, Kidd, (2011) is of the view that environmental justice can be seen as one of the several principles of environmental law which should be understood within a spectrum of environmental racism. Environmental racism encompasses the view that poor and vulnerable groups of people are often exposed to a disproportionate degree of environmental risks compared to the rich and elite (Bullard and Johnson, 2000). This perception is premised on the assumption and understanding that the poor people often lack the voice and the resources with which to challenge the status quo and are therefore, vulnerable to the manipulation of the more powerful people in society. This situation results in the poor people being subjected and exposed to different environmental risks, which have serious implications on human health (Kidd, 2011).

The lack of basic sanitation services faced by the poor people often reduces the quality of life and their productive capacity to optimally perform different tasks. Obeng-Odoom, (2014) for example, is of the view that access to basic supply and sanitation services plays an important role in enabling people to attain a certain degree of productivity (also see Adelekan, 2009). However, public service provision in most developing countries has proved to be insufficient, especially in

poor communities due to increased and dramatic deterioration in the supply of basic infrastructure and urban services (Obeng-Odoom, 2014). Improving public service provisions as observed by Simatele and Etambakonga (2015) may reduce the vulnerability of the poor against internal and external stressors and may further enhance their living conditions (Cheru, 2002). In view of this, Leonard, (2013) advocates for policy intervention programmes which are tailored towards promoting public-private partnerships in the provision of urban services. Too much government intervention in the provision of basic urban services has ruled out a significant contribution by the private sector and has resulted in government failing to meet the basic sanitation needs of the community.

It must also be acknowledged that many government programs in the developing world have tended to incorporate mechanisms for local oversight to ensure inclusivity, but some studies have argued that these programs have proved to be ineffective and not implemented on the ground (Obeng-Odoom, 2014, Adelekan, 2009). The poor and less powerful members of society are generally not consulted on decisions that the elite and more powerful members of society make and which have significant implications on the lives of the poor and the environment (Venot and Floriane, 2013; Adelekan, 2009). Kubanza and Simatele, (2015) for example, are of the view that the urban poor in many cities of the developing world are often ignored in policy dialogues and yet they seem to bear the multiple burdens associated with unhealthy living conditions resulting from environmental degradation.

The failure to provide basic urban services, particularly in the context of sub-Saharan Africa, has not been a result of the scale of population growth, but weakness in both the national and local government institutions in the face of rapid urban change. Simatele and Etambakonga, (2015) for

example, observe that at all levels of the government system in African countries, a lack of resources, knowledge, leadership and political will have not only prevented people and institutions from solving basic sanitation and solid waste challenges, but have also created a situation where public servants are unable and not willing to foster constructive change. Tukahirwa *et al*., (2013) are of the view that across many African cities, central government interventions in the provision of basic services have paid little attention to the critical responsibilities of local institutions, the private sector, and local communities in the operation and maintenance of urban infrastructure, and the provision of incentives required for effective solid waste management.

In view of the above observations, there is now recognition and increased effort, especially in developed countries, to develop systems and processes aimed at empowering communities, especially the poor people, to address environmental issues that have direct implications on their wellbeing (Kubanza and Simatele, 2015; Coughlin, 1996). It is assumed that when the poor people are empowered to take responsibility of their own affairs, they will be able to influence processes that affect them and trigger the identification of strategies that are suited to their needs (Simatele, 2012). Chambers, (2003:131), for example, argues that "local people have capabilities of which outsiders have been largely, or [are] totally unaware". He further observes that local people, if empowered have a greater ability to map, model, observe, list, count, estimate, compare, rank, score, and diagram the challenges that they face than outsiders (Chambers, 2003).

In view of these observations, it would not be an exaggeration to argue that in order for African cities to develop pro-poor solid waste management strategies, there is an urgent need for a paradigm shift from the current top-down model to one that will focus; *firstly*, on enhancing the

vibrancy of the urban communities, realizing that the urban poor in Africa expend tremendous energy and vitality and are capable of changing their miserable situations if afforded an opportunity to do so. And *secondly*; there is a need to strategically reposition the informal sector within the wider urban development and policy plan in order to address some of the contemporary challenges. It is important to realize that while urbanization in many cities of Africa is growing at a very fast pace, the growth of the urban economy and its capacity to generate and provide urban services has been limited. If African countries are to achieve, for example, the Sustainable Development Goals (SDGs), improving urban governance and expanding the participation of communities, non-governmental (NGOs) and community-based organisation (CBOs) is imperative. This process will however, require strengthening the institutions at the local level that provide public services and enhance economic opportunities not only around capital cities and other metropolitan centres but also in more remote and less privileged communities.

Nthunya, (2002) for example, argues that effective environmental management and governance requires knowledge and understanding of environmental laws and citizens' involvement in environmental issues, which is relevant in the context of current environmental justice challenge faced by the poor people. Citizens' involvement in issues that affect them will significantly result in their contributions to the formulation of comprehensive environmental laws, policies and regulations and a resultant consequence will be good governance and management of urban processes (Tukahirwa *et al*., 2013).

4.2.1. A snap shot of environmental injustice in solid waste management in the Democratic Republic of Congo

The urban crisis that the Democratic Republic of Congo (DRC) is experiencing is a classic example of the scars left by the colonial empire and the fresh wounds caused by the failure of the post-colonial state to meet the minimum environmental needs of its citizens (Kihangi, 2012). After more than a century of European colonial exploitation, and fifty six (56) years of post-independence era, the official approach to national development and urban management appears to be out of touch with the reality on the ground. Simatele and Emtabokonga, (2015) for example, observe that a number of urban indicators in the Congo reveal the inability of national and local governments to guide sustainable urban development. There is an obtrusive inability and indisposition by urban managers to harness efforts from different social actors towards developing sustainable mechanisms for urban development. A natural consequence of this state of affairs has been the subjection of a large proportion of the urban residents, especially the poor, sinking further into poverty and urban deprivation (Kihangi, 2012; Dougall and McGahey, 2003).

Despite the prevalence of urban poverty and political instability, cities such as Kinshasa have continued to lure people into its parameters in spite of the fact that the current civil conflict has resulted in weakening institutional frameworks and the destruction of physical infrastructure (Kubanza and Simatele, 2015). Venot and Floriane, (2013) for example, observe that regardless of the unhealthy living conditions in the urban areas of the Congo, cities continue to be the favorite destination for many of the Congolese people. This situation owes much to the fact that urban areas in the Congo, as is the case in many countries of the developing world, are better

placed in terms of the provision of social-economic amenities compared to their rural counterparts (Dougall and McGahey, 2003).

It must be noted that, although urban areas in the Congo are better placed than rural areas, the plight of the urban poor continues to get worse (Venot and Floriane, 2013). High levels of corruption, bureaucratic harassment and a lack of checks and balances have continued to harm growth and subject the urban poor in Kinshasa to different social deprivation markers and environmental issues. Kihangi, (2012) and Mzidzornu, (2004) for example, observe that the current approach to urban development, planning and management, based on central government, has tended to place very little emphasis on the importance of environmental wellness and its contribution to the health of the urban residents. Simatele, (2012), and supported by Massey, (2004), observe that the victims of this policy direction are usually the poor who in most cases are geographically located in urban environments which bear a disproportionate share of the environmental costs.

Writing in the context of the Congo, Bindu, (2006:10) is of the view that the "current entrenchment of environmental rights in many bills of rights remains a much-debated point. It is an issue that is prominent in people's minds and deserves a higher priority on political agendas. It can be argued that constitutional environmental clauses offer ample opportunities for development and the enjoyment of basic human rights, such as the right to life. A fully fledged right to environment establishes an individual right of action to conserve the environment, and the right for the public to be informed of, and indeed to participate in decisions relating to the environment". Although the Congolese constitutional provisions provide a powerful instrument

for both environmental protection and the protection of the people against environmental hazards, Simatele and Emtabakonga, (2015) and edified by Kubanza and Simatele, (2015) are of the view that practical observations suggest that environmental provisions within the Congolese constitutional are rarely implemented, and when employed, they have been underutilized (see also Bindu, 2006; Dougall and McGahey, 2003*)*.

A major contributing factor for this state of affairs is the existence of a weak institutional framework which is not only incapable of providing municipal services, but also unable to articulate efficient and effective policies guiding urban processes (Kubanza and Simatele 2015, Agyeman *et al.,* 2003, Dobson, 1998). Simatele and Emtabakonga, (2015), as well as Kihangi, (2012), for example, are of the view that the misdirection and long term misuse of government resources with respect to finances, delivery of infrastructure services and government regulation have led to the poor performance by municipal institutions in terms of ensuring environmental sustainability and the fair distribution of the environmental burden among urban residents in the Congo. While the reasons for this development can certainly be subscribed to historical events, contemporary political processes have played a pivotal role in propagating the colonial legacy, whose laws, institutions, and structures were completely inappropriate for the resolution of environmental challenges that are currently faced by the urban poor (Otang-Ababio *et al.,* 2013; Ako *et al.,* 2013). The inequitable distribution of resources has by and large facilitated a process where the urban poor neighborhoods have an appearance of a lunar landscape, with potholes, plugged drains and mountains of solid waste. Regular refuse collection has in many cases ceased, and the basic maintenance of infrastructure in these poor neighborhoods has become a distant memory.

The uncollected waste according to Nsokimieno, (2010) has become not only a threat to the health of the poor and less powerful people in the Congo, but it also reveals major environmental injustices (see Kubanza and Simatele, 2015; Rapten, 1998; Medina, 1997). It reveals deep theoretical and practical issues pertaining to the right to good health and the right to urban citizenry. It also reveals the challenges that solid waste management presents to urban managers as well as the perpetuation of environmental injustice against the poor, an aspect that remains a critical challenge for policy intervention and development (Nsokimieno, 2010; Petts, 2005).

4.3. Research approach

This paper is based on information collected through two research processes: namely an extensive review of archival records, and peer reviewed journal articles on urban environmental injustice in solid waste management both in a global and local context; and through a qualitative field-based survey conducted in the city of Kinshasa in three distinct locations; Kisenso, Ngaliema and Limete. The review process of archival records and existing literature involved a search of literature using the library database of different Universities in South Africa (i.e. Witwatersrand, Pretoria, Johannesburg, Cape Town, KwaZulu Natal and Stellenbosch). In addition to this, web-based search engines such as Google, Yahoo and Google Scholar were employed to search for recent journal articles on the topic.

Both library and internet searches yielded an estimated 120 journal articles and 8 text books focusing on environmental justice and solid waste management in a global and regional context. A rapid appraisal and meta-analysis of these pieces of literature resulted in the selection of a total number of 40 peer-reviewed articles focusing on environmental issues in the global north and 15 in the global south being selected for inclusion in informing the argument presented in this paper.

Other grey literature from the print media (newspaper articles, reports of workshops and press conferences) were also engaged with in order to have a comprehensive understanding of local issues about the state of solid waste management in the city of Kinshasa.

Field-based data were collected through methods inspired by the tradition of participatory research. In order to identify the research participants, three (3) population lists for each of the study sites were constructed: Kisenso comprised a total of 200 participants; Ngaliema had 100, while Limete comprised 150 research participants. After scrutinising the three population lists, it was purposely decided to interview 30% of the research participants across the three sites. This resulted into a sample population of 60 participants drawn from Kisenso, 30 participants from Ngaliema and 45 from Limete. In total, a sample of 135 research participants was drawn from across the three sites. In the process of selecting the research participants and to ensure that each participant had an equal probability of being selected, the following equation was employed:

$$\mathbf{K} = \frac{N}{n} = \{\frac{\text{size of population}}{\text{size of sample}}\}$$

- **K** = the interval ratio at which participants were selected.

In view of the above equation an interval ratio of 3 was used to select the research participants across the three sites. This process entailed that every third participant was selected for inclusion in the study with the first participant being purposively selected. In additional to this, 10 officials drawn from the central and local government institutions mandated with urban governance in Kinshasa were identified and included in the study using a snowball sampling technique. Semi-structured interviews were the main data collection instrument used to collect information from government officials. Because of the nature of the data collected, *multivariate data analysis*

(MVA) was performed in order to model the reality of solid waste and its multiple facets on urban populations and the environment.

4.4. Results

Existing literature evidence on solid waste in Kinshasa suggests that this phenomenon has become one of the major urban challenges faced by city authorities (see Din and Cohen, 2013). In the face of political instability, city officials not only lack financial resources, but also the physical infrastructure for waste management which, due to civil conflict has been destroyed. Mangenda, *et al.,* (2014) for example, are of the view that due to inadequate solid waste infrastructure, over 80 percent of the population in the city does not have home collection services. They further observe that the majority of the urban households in Kinshasa tend to store their waste either in open containers, plastic bags, or dug-out dumps at the back of their residential units because of the absence of solid waste management infrastructure.

Kubanza and Simatele, (2015) writing in the context of Kinshasa, contend that city authorities have over the years struggled to provide the most basic services for waste management within their jurisdictions (see also Nsokimieno, 2010; Thompson, 1998). As a result, the uncollected waste, which often is mixed with other forms of waste such as human and animal pathogens, is usually dumped indiscriminately on the streets, drains, and open spaces thereby, contributing to blockages of drainage systems and eventual flooding of the city, especially in poor neighborhoods (Mangenda, *et al.*, 2014; Nsokimieno, 2010).

Simatele and Etambakonga, (2015) further observe that much of the urban waste in Kinshasa is geographically located in areas where the poor people live. This is because the poor people are

powerless and lack the voice loud enough to be heard by the authorities who in most cases are from the elite group in society (Achankeng, 2003). Nsokimieno, (2010) and supported by Kubanza and Simatele, (2015) argue that the burden of solid waste in Kinshasa seems to weigh heavily on the poor… this is partly because the poor people are usually invisible or not represented in policy making.

A discussion with research participants from all the three sites revealed that waste collection by the authorities seem to be a peripheral issue. They argued that waste is rarely collected in their respective locations. Table 8 for example, illustrates the perceptions of the research participants on the frequency of solid waste collection by the local authority in Kinshasa.

Table 8: Perceptions of research participants on solid waste collection in the study sites

No. times of solid waste collection	Total No. Citations	%
Never	20	50
Once monthly	10	25
Fortnightly	5	12
Weekly	3	8
Occasionally	2	5
Total	40	100

Source: Fieldbased materials, 2015.

From the information in table 8, it is suggested that 50% of the respondents argued that solid waste is never collected from their suburbs, 25% argued that waste was only collected once a month, while 5% said, their waste is occasionally collected. The overall picture is suggestive of the fact that the majority of the people have no access to solid waste management services. In view of the above findings it was important to engage with the participants in order to find out

who they considered to be responsible for solid waste collection and management. These views are presented in Table 9.

Table 9: Perceptions of research participants on solid waste collection responsibilities

Who is responsible for SW	No. citations	%
The city council/government	35	47
The community	21	28
Households	11	15
Individuals	7	10
Total	**74**	**100**

Source: Field-based material 2015

Table 9 suggests that 47% of the research participants stated that the city council in Kinshasa was responsible for collecting waste while 28% considered the community as being responsible for waste collection and management. What is interesting in Table 9 is that only 10% of the respondents felt that waste management was a responsibility of individuals. Thus, the overall picture in Table 9 is indicative of the fact that many participants did not feel a sense of responsibility but shifted the solid waste obligation to government.

A senior solid waste management official from the local authority in Kinshasa however, revealed that the collection of solid waste in Kinshasa has unofficially become a responsibility of non-governmental or the private sector as they execute the bulk of the work in solid waste collection and management. He stated:

> "*We must come to accept the reality on the ground. Yes on paper it is our responsibility to collect and manage waste. But the truth is that we have been failing for a long time now. We do not have resources and things are going to get worse. Everybody must just now accept the fact that solid waste is now a responsibility for NGOs and the private sector. As government, we will provide an enabling environment so that together, we come up with an effective system of waste management" (Pers.com, 2015a).*

From the above argument, it is obvious that government and its local agencies are absent in the management of solid waste and this state of affairs is reason enough to worry about justice issues in solid waste management in the city of Kinshasa. If government is absent, a pertinent question to ask is, "who then is responsible for the protection of the most vulnerable groups of people in society against environmental hazards"? The absence of formal institutions essentially entails that the urban poor are at the mercy of the most powerful groups of people who have the power to dispose of waste indiscriminately. A senior town planner for example, pointed out that:

> *"City planning and service delivery in Kinshasa, have become elements that are highly influenced by the most powerful and rich people. The city as it is right now reflects the needs and aspirations of the elite. We as planners, have tried to include the aspirations of the poor people into urban development and planning policy, but money, and plenty of it, determines whose voice is to be heard and where the services are directed" (Pers.com, 2015b).*

Thus, the inability by the city authorities to provide adequate solid waste management as well as to regulate private operators has resulted in a situation where the poor people have had to pay a

lot of money to access solid waste services. Table 10 shows the cost of solid waste as charged by private solid waste collectors in the three study sites.

Table 10: Selected solid waste and associated cost for collection.

Type of waste	Weight in kilogram	Cost in Congolese Francs	Cost in US $
Household waste	10kg	500	0.54
Carton boxes/plastics	10kg	300	0.32
Tins and bottles	10kg	600	0.65
Grass cuttings /shrubs and tree trunks	10kg	1000	1.1
• Figures obtained from the research participants during interviews			

Source: Fieldwork based materials, 2015.

Although the cost of solid waste by private actors may seem affordable (see Table 10) when examined in a global context, the cost is quite significant when scrutinised in the context of an economy where the majority of people live on less than a dollar and twenty-five cents ($ 1.25) per day (see Simatele and Etambakonga, 2015). In view of this, we can argue that the cost of US 54 cents for a 10kg bag of household waste may have significant implications on the ability of poor households to obtain other essential services that they may require (e.g. food, health and education). Mangenda, *et al*., (2014) argue that the lack of solid waste management facilities and sometimes the cost associated with them, has contributed significantly to the increase in waste dumping in Kinshasa. A female respondent aged between 35 and 40 years from Limete stated:

"I am one of the culprits responsible for dumping waste in my neighbourhood. I don't like doing it but what choice have I got? The council does not come to collect the waste. Then you have private companies whose costs for collecting waste are not cheap. So I end up dumping. It is the cheaper option for me" (Pers.com, 2015c).

Extensive discussions with different research participants especially in Kisenso and Limete revealed that the majority of the people in Kinshasa are not in a position to pay for solid waste collection services. Table 11 for example, reflects this state of affairs.

Table 11: Ability of the research participants to pay for solid waste collection by location

Nature of response	Study Locations					
	Kisenso		Ngaliema		Limete	
	Number	%	Number	%	Number	%
Yes I can afford to pay	10	17	42	93	5	17
No I can't afford to pay	45	75	3	7	18	60
I am not sure if I can pay	5	8	0	0	7	23
Total number of participants	60	100	45	100	30	100

Source: Field-based materials, 2015

It is suggested in Table 11 that 75% and 60% of the research participants in Kisenso and Limete, respectively are not able to pay for solid waste collection, while 93% of the respondents in Ngaliema said they are able to pay. What is interesting about the information in Table 11 is that both Kisenso and Limete are low income areas, while Ngaliema is a high income residential area. The overall picture presented in Table 12 is indicative of the fact that solid waste management is a major challenge for the poor in Kinshasa as they have no resources or access to

infrastructure through which they can effectively and efficiently dispose of their waste in order to address the likely of waterborne or vector diseases.

With the inability to effectively manage their waste, or to have waste removed by the local authority or private actors, research participants were asked to identify and rank some challenges that are associated to uncollected waste and these are presented in Table 12.

Table 12: Environmental challenges associated with solid waste in the three research sites.

Nature of Responses	**No. respondents**	**%**	**Rank ***
Increased cases of disease (Diarrhoea, cholera and malaria)	54	49	1
Bad smells (air pollution)	26	24	3
Danger to children	17	15	2
Water contamination	8	7	3
Destruction of vegetation	5	5	3
Total	**110**	**100**	**-**
NB: * the smaller the number, the most important factor			

Source: Field based material, 2015

From the information in Table 12, it is evident that the research participants were of the view that uncollected waste had health implications and was a danger to the children represented at 49% and 15% and ranked 1 and 2 respectively. Although air pollution is represented at 24%, it is ranked third, as is the case with water contamination and vegetation destruction. These views are similar to the findings suggested in the work of Mangenda, *et al*., (2014); Din and Cohen, (2013) and Achankeng, (2003).

The overall picture presented in this section suggests that solid waste in Kinshasa has become one of the urban development challenges. Policy development and waste management strategies

for the city of Kinshasa seem to be out of touch with the reality on the ground. As a consequence, the urban poor have been subjected to live in conditions where solid waste and other forms of waste have become part of the landscape and a norm.

4.5. Discussions

The urban environmental problems in the Democratic Republic of Congo are multi-dimensional. They can be associated with the colonial antecedents of Congolese cities and issues that come with developmental challenges, consumption patterns and psychological orientation of urban residents as well as institutional failures (Onstad, 1997). These problems pose serious environmental, economic and social challenges towards achieving sustainable development in the country. It appears that the DR-Congo's poor environmental conditions increase poverty and negatively affect the livelihood opportunities of the inhabitants (Onstad, 1997). Coupled with this, are high rates of tuberculosis, diarrhoea, malaria, typhoid fever, dysentery, and cholera, which have been recorded in recent years as diseases resulting from mismanagement of the urban environment in the country.

According to Dougall and McGahey, (2003), only 30% of the population has access to improved sanitation in DR-Congo and this access to improved and adequate quality sanitation is of utmost importance for improving public health, reducing poverty, and achieving many of the Sustainable Development Goals (SDGs. It is also observed that most development indicators are low in DR-Congo and poverty has increased during the years of conflicts (Dougall and McGahey, 2003). For the past 30 years, as a result of lack of maintenance, the state of urban roads and drainage has been continuously deteriorating in the cities in the DR-Congo. The drains

are blocked and the roadways are heaped with garbage in Kinshasa. Nsokimieno, (2010) reports that the surface water drainage networks constructed in the residential areas do not function. This is due to the absence of maintenance facilities and meaningful sanctions against people who block the drains by disposing their solid waste in the drains. While the solid waste situation generally improves in the rainy season, the consequent erosion and flooding experienced leads to other health hazards, the loss of human lives and the destruction of important structures (Nsokimieno 2010). All of this occurs as a result of the absence of a coherent urbanisation plan and minimal direction regarding the drainage system. Although efforts are being made to clean out drainage channels, the solid waste from these channels is very wet and ultimately difficult to handle.

As a result of the unstable situation in the country, there has not been an effective garbage collection system in place over many years (Nsokimieno, 2010). This situation has left Kinshasa with an abundance of solid waste that has not been disposed of. At many dumping sites, for example, huge amounts of plastic, often 5 metres high, are buried and yet, every year more than 25.000 tons of polyethylene plastic bags alone are imported from Asia and Europe (Dougall and McGahey, 2003). Imported polyethylene mostly consists of plastic bags and everything purchased in Kinshasa is packed in a plastic bag. As a result, Kinshasa continuously suffers from poorly planned and inadequate environmental management infrastructure. This can be casually noted by the reliance on hand-carts to collect waste and transport it to temporary transit sites. The public health issues in Kinshasa are enormous as evidenced by poor waste management, lack of clean water, lack of sewerage system and lack of access to health care. At another level, it appears that there is no reliable information on the history of solid waste management in

Kinshasa. DRC historians and archaeologists have not yet been motivated to investigate this issue (Dougall and McGahey, 2003). Therefore, a good quality waste disposal service and clean environment is a societal benefit or public good that all its members desire and equally deserve. This can be termed social and environmental justice in urban service delivery.

From the information presented in the previous section, it is obvious that Kinshasa, like many other cities in sub-Saharan Africa, continues to grow under conditions of economic stagnation and institutional collapse, due in part to political instabilities that the country has experienced since its independence in 1960. As the city has grown in the face of increased civil conflicts, new urban challenges such as the management of solid waste have emerged. Furthermore, more and more people have taken up urban residence in an economy that is not able to adequately meet their social and economic needs and aspirations (see Mangenda, *et al.,* 2014). As a result, the majority of the poor, especially the youth, women and children, have been left to fend for themselves and frequently live in unplanned settlements with no or little basic services such as solid waste collection.

A major urban crisis in Kinshasa and urban Congo in general has been one of poor governance which has triggered a number of institutional failures in the delivery of basic services. This is because as pointed out, urban governance in the Democratic Republic of Congo has been developed as a system of procedures imposed from the above and has left no room for the participation of the poor in decision making on issues that affect their lives. The current system does not facilitate or place significant emphasis on the public and the private sector as agents of change and transformations in urban processes. Instead, the current system tends to allow the

vested interests of an economically rich elites to exercise undue influence on city processes and even to buy the policies, regulations and laws of the local authority.

In order to improve the manner in which solid waste is managed and improve access to solid waste infrastructure, there is a need to develop more integrative strategies and systems of urban governance. The process of improving governance will require the redefinition of the principles that underpin local government statutes as well as the simplification of systems of urban management. This process will make it easy for ordinary citizens to understand the operations of the local government in Kinshasa and create avenues through which local people can participate in decision making. It is only through a process of creating a climate of equity and cooperation among all stakeholders, as well as accountability, that a forum in which the talents of all urban residents will be captured and applied to solving a myriad of challenges faced by both the authorizes and the urban poor in Kinshasa.

In order to address a number of issues discussed in the previous section, there is an urgent need for the city authorities in Kinshasa to reform most of the government systems and structures in order to facilitate a process of community engagement in problem identification, policy dialogues, formulation and implementation. As observed by Simatele and Simatele, (2014), and supported by Kindormay and Ron, (2012), the engagement of civil society in fair and transparent decision-making and in partnership with local authorities and the private sector can make a significant difference between well-governed and miss-governed cities, between a stagnant and thriving urban economy.

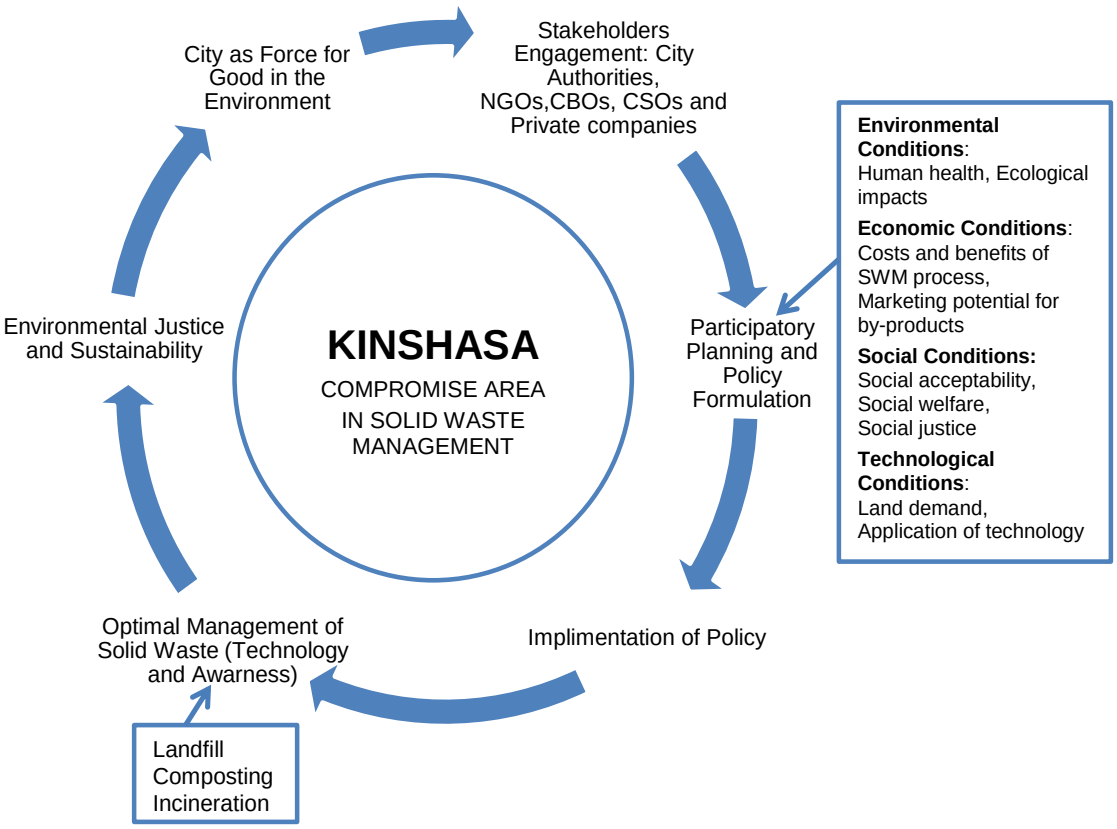
There is also an urgent need for the city authorities in Kinshasa to design a comprehensive and effective strategy to tackle urban poverty. As long as the majority of the urban poor remain trapped in the deprivational cycle, they will lack the power and voice to articulate themselves and influence the direction of urban development and planning policy. Their lack of participation in urban process, for example, will entail that, urban challenges, such as solid waste management will remain a permanent feature of the urban landscape. It is however, important to remember that the complexity of poverty and the heterogeneity of the culture in Kinshasa make it rather difficult to define an undeviating strategy for poverty reduction (Simatele and Etambakonga, 2015). This is more so difficult if the objective is to approach the problem integrally and not through small-scale projects (see Hadi, *et al*, 2013; Simatele and Binns, 2008). Thus, it is important that any poverty-reduction strategies that are developed respond to a city and community specific context and tailored to the unambiguous needs of the respective households, failure to which any intervention effort will be futile.

The common characteristics of urban poverty in Kinshasa: unemployment, underemployment, lack of adequate basic infrastructure and solid waste facilities, reliance on the informal sector to provide employment; make it difficult to identify pivotal areas of policy intervention and suggest guidelines for support strategies. Despite these challenges, the local government in Kinshasa, need to review and reorient their development control regulations in favor of home-based enterprises (HBEs), while ensuring that their operations meet health and safety requirements. They must also develop a strategy of small-enterprise development, in which they will provide advice and guidance, small loans for development and relocation opportunities, where appropriate, for HBEs. It is only when the poor people get empowered that long term solutions

which are organic to respective communities will be employed in effective solid waste management and address issues of environmental justice.

Finally, the city authorities in Kinshasa need to urgently improve the quality of urban environmental management through the formulation of comprehensive legislation vis-à-vis institutionalization of preventive policies and programmes instead of reactionary and mitigative measures. It is not enough to develop environmental legislation, but to enforce it in order to hold accountable those that are responsible for environmental degradation. It must be noted that the process of enacting environmental legislation should be consultative, enlisting the participation of communities, NGOs, associations of waste pickers, local authorities and the private sector. The strong sense of community responsibility can facilitate a process of ensuring long-term sustainability of intervention programmes.

It is thus, important that the local authority in Kinshasa should recognize the important role that community organisations can play in community mobilization in order to address challenges associated with solid waste. It is therefore, important that local government authorities expand the scope for greater participation of NGOs, community-based organisations (CBOs) and stakeholders. Figure 6 presents an illustration of how participation of all stakeholders can be harnessed for the purpose of promoting effective solid waste management in Kinshasa.



Source: Field based material and discussion with stakeholders in solid waste management in Kinshasa

Figure 6: Mechanism and stakeholders' engagement necessary to improve SWM in Kinshasa

It is suggested in Figure 6 that solid waste management problems require the consideration of numerous factors; environmental, economic, social, and technological aspects. Morrissey and Browne, (2004) for example observe that a sustainable solid waste management system must be environmentally effective, economically affordable and socially acceptable because the social, economic, ecological and institutional development of a city is increasingly interrelated. The use of innovative, sophisticated planning tools that can assist in monitoring current conditions and projecting future development has become a multifarious system in the management of urban affairs (Mangenda, *et al.*, 2014). Furthermore, Wilson *et al.*, (2001), are also of the view that including different public groups in the process from the very beginning can help

avoid the high levels of controversy and public opposition that have surrounded many municipal solid waste management projects. One can argue that stakeholders' engagement in solid waste management is a vital element in achieving effective and sustainable solid waste management systems.

4. 6. Summary and conclusion

It has been argued in this paper that solid waste management in Kinshasa is one of the urban management challenges faced by local authorities. The lack of financial resources, stagnations in the urban economy, deteriorations in the overall urban physical infrastructure, weak institutional and policy frameworks, political instability and the lack of political-will are among many of the aspects that have been identified as attributing to the absence of a basic service delivery infrastructure in the Republic of Congo. The combination of these factors, has not only resulted in the inability and the failure by city authorities in Kinshasa to deliver the most basic services (e.g. solid waste collection) to the urban dwellers but has left them in a muddled situation without any clear vision of the future. The worst affected are the urban poor, who not only bear a huge burden of the consequences of environmental degradation, but also lack the financial resources and a voice loud enough to be heard and to influence their own future and that of their children.

It has been argued that the urban poor in Kinshasa are deliberately ignored and systematically excluded in any policy dialogues, formulation and implementation and this state of affairs has ensured their subjection to living in very deprived conditions and environments. As a result social inequalities and the distribution of environmental burdens have become features associated with poor neighbourhoods where the majority of the urban residents live and work. Thus, any attempts to address the complexity and the current plight of the urban poor in

Kinshasa will require flexibility and keen interest on the part of local authorities to intensify support for horizontal poor communities. Local authorities must move away from narrowly focussed sectoral perspectives towards more inclusive multidisciplinary approaches and which foster the full participation of all urban residents in urban processes.

With a greater level of mutual understanding between different actors, the present situation of the urban poor in Kinshasa and contradictory official responses in basic service delivery which favours rich neighbourhoods might be replaced with a more positive, sensitive, and nuanced approach to urban solid waste management, adding value to individuals, households, and the city as a whole (Walker, 2009; Fan, 2006; Hillman, 2006). It is important to note that the extent to which innovative approaches to solid waste management in Kinshasa will translate into tangible results will depend largely on their openness to widen the participation of all stakeholders in urban processes.

CHAPTER 5:

Some happy, others sad: exploring environmental justice in solid waste management in Kinshasa, the Democratic Republic of Congo[4]

Abstract

The idea of "some happy, others sad" can be articulated in environmental justice discourse as the reaction to perceived inequities in service delivery, and the undue placement of environmental burdens on the poor. Environmental injustice occurs in many poor cities, particularly in sub-Saharan Africa. This paper explores the concept of environmental justice in the context of SWM in Kinshasa, the capital of the Democratic Republic of Congo. It evaluates the extent to which environmental injustice is occurring in SWM and discusses the critical factors accounting for this state of affairs. Furthermore, the paper examines the relevant theoretical framework(s) and mechanisms that would facilitate the attainment of environmental justice in the city. A qualitative survey research methodology, which includes exhaustive critical review of literature, system analysis, reflections from best practices through case studies, and discussion with stakeholders, was used for this study. Findings revealed that SWM in Kinshasa, like in many Congolese cities is a duty entrusted to public funded municipal authorities. There are evidences of a clear divide between the rich and poor neighbourhoods of the city in the manner solid waste is managed in the city. This is an inequality that has only recently begun to be recognised as injustice in SWM. In view of this, it is argued in this paper that a politico-cultural mechanism for remedying SWM inequities could enable changes that will address environmental justice in Kinshasa. Such a solution, will go directly against the prevailing notions of "some happy, others sad" with respect to environmental justice in SWM in Kinshasa.

Keywords: *Cultural theory; environmental justice; some happy and others sad; Social solidarities; Solid waste management*

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5.1. Introduction

The idea of "some happy, others sad" can be articulated in environmental justice discourse as the reaction to perceived inequities in service delivery, and the undue placement of environmental burdens on the poor. Environmental injustice occurs in many poor cities, particularly in sub-Saharan Africa. The urban solid waste management (SWM) system in the cities of the *Democratic Republic of Congo (DRC),* particularly in Kinshasa was regulated by the country's health code over the past few decades (Mbumba, 1982; Maximy, 1984). This code was later supported by an interdepartmental decree, which set the standards of protection of urban sanitation and SWM in Kinshasa. These policies were intended to contain the spread of endemic diseases and other communicable diseases in Kinshasa; witnesses suggested that some diseases were actually eradicated because of such interventions (Mbumba, 1982; Maximy, 1984; Pain, 1984; Kubanza, 2006). However, it is apparent that a decline in environmental standards in the city was observed after the responsibility for urban solid waste management was conferred on the Ministry in charge of Environmental Affairs (Pain, 1984; Tshishimbi, 2006 and Kubanza, 2006) in 1975. Subsequently, Kinshasa experienced accelerated environmental deterioration particularly since 1990s (Tshishimbi, 2006). Several factors including civil wars, armed conflicts and more importantly the 1991 and 1993 looting that disrupted social, political and economic functioning of the country came into play (Tshishimbi, 2006 and Kubanza, 2006). These factors combined with demographic pressures in the inner city of Kinshasa and the illegal occupation of the geographic areas under the helpless gaze of public authority, if not in its complicity, further exacerbated the declining environmental standard and SWM in the city (Tshishimbi, 2006; Wemby, 2002; BEAU, 1996). This failure of the sanitation policy and SWM standard has had ripple effects on the pollution of the urban environment in Kinshasa.

Most of the people in urban low-income neighbourhoods are apparently living with garbage and piles of refuse although an operation called "Kinshasa-bopeto" (i.e. Kinshasa-cleaned up), was announced in 2005 with aplomb and briskly. All this is to the chagrin of urban and municipal authorities, which many believe have an almost naive complicity of the population (Tshishimbi, 2006; Kubanza, 2010). However, a scholar like Tshishimbi, (2006) denounced the operation and reported that although, the operation was presented as a plausible alternative solution to the state of unhealthiness and unplanned urbanization (i.e. uncontrolled construction); it eventually ended up failing dismally. Despite its good intent, the practice of the demolition of some unlawful homes built along the streets or public places under the cleaning up operation may have resulted in more unhealthy conditions in the city ([5]). The reason for this condition might be attributed to the absence of a rational approach to the management of the problem, if not the fact that this problem was attacked upstream and not downstream.

It is also important to note that the solid waste problem in Kinshasa has been made worse by an increase in the urban population. The population has increased from 400,000 in the 1990s to more than 6.0 million people in 2008 and it is now estimated to have reached 10 million in 2014 (Nsokimieno, 2010; Kubanza and Simatele, 2015). This demographic pressure (with a population density of about 1011 persons/sqkm) produces a huge amount of solid waste per day (13227.73 tons/day) in the city. Besides, there is an issue of uncontrolled construction without permits or respect of urban standards, which generates additional solid wastes which remain indisposed of adequately. Consequently, solid waste litters the roads, sometimes

[5] Opinions of the residents of Kisenso and Ngaliema, local municipalities of Kinshasa during the semi-structured interviews conducted in summer 2013-2014

piling as high as the plot level, which at times causes the obstruction of the water drainage system where the community members also dispose of garbage illegally (Kubanza, 2010; Kubanza, 2006 and Tshishimbi, 2006). Further, according to Kubanza and Simatele, (2015) and supported by Simatele and Etambakonga, (2015) solid waste management in Kinshasa has further been complicated by the increased rural-urban migration and operation of most of the city councils under huge financial constraints. Thus, the disposal and management system to maintain a healthy environment in the city appears to be a challenge in the current scenario, which in essence threatens the healthy existence of the city (Kubanza, 2010; Kubanza, 2006 and Tshishimbi, 2006). In other words, this situation has led Kinshasa to lose its ecological heritage and identity due to enormous environmental problems and inappropriate (effectively non-existent) solid waste management and disposal mechanism as evidenced from the contrasting environment depicted in Figure 7.

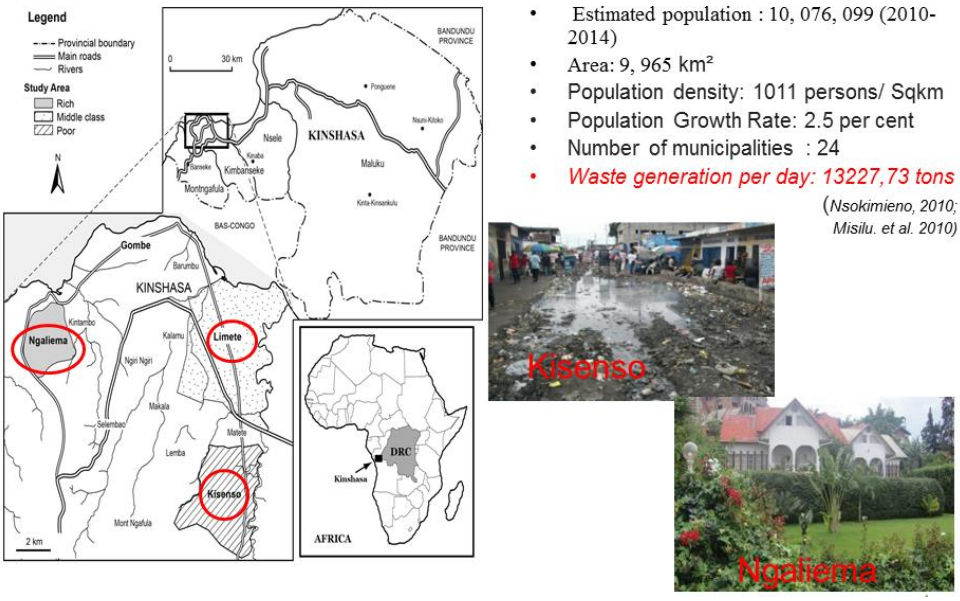
In addition to the mounting solid waste and related environmental problems, the city also grapples with socio-spatial inequalities in the distribution of the waste burdens as evidenced from Figure 7 (Schubeler, 1996; Petts, 2001; Petts, 2005). In an unequal society like in Kinshasa, undesirable wastes often end up in the poorest and least powerful communities. Consequently, the urban poor residents of the city live closer to potential solid waste induced pollution sources thereby making them susceptible to various health hazards, while the rich people enjoy relatively better garbage free neighbourhoods. This practice as observed by Petts, (2001 and 2005) seem to be unfair, unjust and a breach of social and environmental justice. He argued that services for waste removal need to be fairly and equitably provided for all residents of the cities, irrespective of class, ethnicity or culture (Petts, 2001; 2005). Furthermore, social and environmental justice in its different manifestations would require the organisers (i.e. urban managers) of solid waste disposal service to ensure fairness and

equity in providing the service to the various segments of the populations. In other words, municipal authorities responsible for the organisation of solid waste disposal have a social responsibility to ensure that all residents of a city, irrespective of social class, ethnicity or gender, receive fair, equitable and adequate service for waste removal and disposal to protect them from the nuisances associated with solid waste.

However, due to weak local government institutions, lack of political will and financial difficulties faced by many local government authorities, solid waste management has increasingly become a remit of non-governmental organisations (NGOs), community-based organisations (CBOs) and private companies who have taken on the urban challenges (Tukahirwa *et al.*, 2010). Although, the involvement of NGOs, CBOs, and other stakeholders in solid waste management in Congolese cities is not coordinated by local governments, the participation of these stakeholders is important (Tukahirwa *et al.*, 2010) for the constructive engagement, collaboration and cooperative management to meet the challenge and attain environmentally justifiable and sustainable SWM in the city. Thus, under this premise the objective of the investigation was to explore the concept of environmental justice in the context of solid waste management in Kinshasa, DRC; to examine the relevant theoretical framework(s) and mechanism(s) that would facilitate the attainment of environmental justice in Kinshasa; and to offer alternative solutions based on socio-political and governance mechanisms drawing upon the application of cultural theory, system thinking and system dynamics (SD) modelling principles.

The paper starts with an introduction that elucidates the scenario of SWM and environmental justice in SWM, followed by the research approach or method used for the study. The remaining sections provide a brief explanation of the theories of environmental injustice, including solid waste management challenges in Kinshasa, discourses from two case studies

(Kampala and Yaoundé) as a response to lessen environmental injustice and SWM challenges in Kinshasa and cultural theory inspired diagnosis and framing of environmental injustice in Kinshasa. Finally the paper analyses the Kinshasa case study and generates perspectives of future scenarios based on systems analysis inspired by SD mechanisms to elucidate plausible scenarios to attain environmental justice in SWM in Kinshasa. The conclusion highlighted that a politico-cultural mechanism for remedying SWM inequities could foster changes that will address environmental justice in Kinshasa.



Source: *Cartography Unit (2015), School of Geography and Environmental Studies, University of Witwatersrand, South Africa and field survey (2015)*

Figure 7: Location and neighbourhoods

5.2. Research approach

A qualitative research approach was followed in this study. Critical review of literature, appraisal of two comparative case studies (Kampala-Uganda and Yaoundé-Cameroon) and in-depth analysis of archival information were conducted to develop a framework for environmental justice in SWM. Stakeholders' discussion was conducted through a field survey. After initial filtration and evaluations of literature on solid waste management and environmental justice related issues, a total number of 110 peer reviewed published research articles was comprehensively reviewed and analysed. Archived documents from the municipal councils in the Kinshasa and authentic organisations at the national level and newspapers stories were analysed during the period from January 2013 to September 2015. To complement the literature review, a field survey was conducted among the stakeholders in the city between the 4th November 2013 and 15th September 2014 through semi structured qualitative discussions. Discussions with the city officials, such as the councillors, city planners, and solid waste managers in a reflexive manner were conducted through non structured interviews during the same period. A total of 20 local government officials and 60 residents were interviewed in important areas such as Ngaliema, Limete and Kisenso (see Figure 7) in the city.

The interviewees were selected purposively through snowballing approach in order to get a wide range of opinions and perspectives. They provided a forum to analyse the severity of the current solid waste management crisis, and to engage in discourses about the plausible strategies that should be put in place to regulate the system and address the problem. The discussions were narrowed to the policies that should be enacted and the necessary steps that should be taken in order to design a comprehensive and integrated solid waste management

system in Kinshasa. They shed light on several issues such as governance, the politicisation of the solid waste management sector, the role of the private companies, financial constraints, community behavioural patterns and involvement in solid waste management. Furthermore, the investigation was underpinned by the cultural theory framework and SD inspired causal feedback principles to develop policy intervention mechanisms. The cultural theory framework is observed to be particularly suited to the analysis of environmental justice in solid waste management and contending ideas of fairness (Thomson, *et al.*, 2013). The system thinking and SD principle, have the ability to elicit causal feedback relationships among the controlling variables, which enable policy interventions (Stermann, 2000), and thus found to be relevant for a complex phenomenon like solid waste management in Kinshasa. Three main frames of reference were adopted in approaching the causal relationships existing in solid waste management in the city that include the socio-economic, environmental and technological contexts for larger inclusivity and to avoid variations and isolated cases in the cause and effect relationships.

5.3. Theoretical discourse on EJ in SWM and lessons from case studies

5.3.1. Theoretical perspectives on environmental justice

The academic reflections on the concept "environmental justice" initially concentrated on the existence of inequity in the distribution of environmental bads in society (Schlosberg and Carruthers, 2010). Dominelli, (2014) argues that the term "environmental justice" was used to illustrate that some communities received more environmental risks than others. Mebane, (2013) and Seymour, (2012) are of the view that those environmental bads were simply another example of social injustice in the city. According to Bullard, (1990, 2000) exposure to such risks and bads are not limited to only poor communities rather both under privileged class and race are affected by it. Moreover, equity was a key element in the initial

consideration of environmental injustice (Bullard, 2000). However, the early focus on inequity quickly expanded to include a variety of issues that range from the generally unequal nature of environmental protection to the distribution of an array of environmental goods as well as bads. Besides, some scholars argue that despite all the focus on the reality of the inequities, environmental justice was never only about such mal-distributions (Mebane, 2013, Seymour, 2012). Thus, the study and theorising of environmental justice encompass three key areas: the definition of "environment", the factors behind the production of environmental injustice, and the pluralist conception of the "justice" of environmental justice (Mebane, 2013; Seymour, 2012).

From its initial concept of being a wilderness and the "big outside", environment has been shifted to much more broadly defined concept as "where we live, work, and play" (Bullard, 2000; Schlosberg and Carruthers, 2010). The importance of this shift cannot be understated as this aspect was woefully under emphasized by the major environmental organizations, particularly in the United States (Dominelli, 2014). Environmental justice although may have been originally focused on the inequity of the distribution of toxics and hazardous waste in the United States, it has currently moved far beyond its original context (USA). It advocates bringing attention to the environmental conditions in which people are immersed in their everyday lives (Walker, 2009).

According to Leonard and Pelling, (2010) the shift is a long standing characteristic of the environmental justice movement. The various tributaries of this movement included the civil rights and anti-toxics movements, indigenous rights movements, the labour movement (including farm labour, occupational health and safety, and some industrial unions), and traditional environmentalists (Bullard, 2000; Dodds and Hopwood, 2006). Schlosberg and Carruthers, (2010) added the solidarity movement and the more general social and economic

justice movements to it. Further, immigrant rights groups and urban environmental and smart growth movements, climate justice as well as local foods and food justice movements can also be easily added to the list.

Thus, it is no exaggeration to argue that there has been a push to globalise environmental justice as an explanatory discourse. There are two distinct moments to the expansion of environmental justice discourse: the application of the frame to movements in a variety of countries, and the examination of the globalised and transnational nature of environmental justice movements and discourse. Such developments have brought both horizontal diffusion of environmental justice ideas, meanings, and framings, and the vertical extension of an environmental justice frame beyond borders, and into relations between countries and truly global issues (Walker, 2009; Leonard and Pelling, 2010). However, based on the experiences from different countries, such as waste management in the United Kingdom, postcolonial environmental justice in India, agrarian change in Sumatra, nuclear waste in Taiwan, salmon farming in Canada, gold mining in Ghana, oil politics in Ecuador, indigenous water rights in Australia, wind farm development in Wales, pesticide drift in California, energy politics in Mexico, and many more (Leonard and Pelling, 2010, Schlosberg and Carruthers, 2010; Walker, 2009), arguments have emerged that the applications of the theoretical framework of environmental justice have been more broad than the way it is perceived. A plethora of environmental justice focused issues and movements are found in Latin America, South Africa, Canada, and the ex-Soviet Union. Clearly, the discourse of environmental justice has expanded horizontally and vertically, and has been engaged by both activists and academics involved in issues across the globe.

Although, the environmental justice discourse has expanded across the globe, only a limited number of countries in Africa such as Angola, Cameroon, Ghana, Mozambique, Nigeria, South Africa, Tanzania, and Zambia have adopted the term "environmental justice" in their policies (Walker, 2009; Fan, 2006; and Hillman, 2006). Environmental justice is yet to become a policy priority for most of the sub-Saharan African countries (Myers, 2008; Scott and Oelofse, 2005). Many barriers such as the precarious plight of the socio-cultural, political and economic environments in which civil society operates, lack of public participation in national and local development initiatives, unequal distribution of power, intimidation of the civil society activists, and ruling of elites are found against the creation of a strong environmental justice discourse in sub-Saharan African countries (Myers, 2008; Scott and Oelofse, 2005). However, political will and poor institutional setup remain as the paramount. The urban development and planning policy, particularly in sub-Saharan African cities hardly raises and addresses the challenges of urban environmental justice (Kubanza and Simatele, 2015; Patel, 2009). The Democratic Republic of Congo is no exception to the above reality.

5.3.2. Environmental injustices in DRC and Kinshasa

Two fundamental aspects of sustainable development can be considered as the starting point to conceptualise environmental justice suitable for the DRC in general and Kinshasa in particular. First, the basic needs of humanity (food, clothing, shelter and employment) must be met. The other is that the limits to development are not absolute but are imposed by present states of technology and social organisation and by their impacts upon environmental resources and upon the biosphere's ability to absorb the effect of human activities (Bindu, 2006). The first aspect, which is crucial for the DRC's people and for its environment, should inform the meaning of environmental justice in Kinshasa. Equity is at the heart of such a concept (Field, 2006). It includes the notions of transformation and redress because basic

needs cannot be met if there is no transformation in the sense of addressing the deep fault line that divides human society between rich and poor or redress of the harm that has already been caused, the cost of which is being borne unequally (Field, 2006).

The Democratic Republic of Congo has been documented as one of the countries that has experienced instability since its political independence in 1960 from Belgium. Although, concerted efforts have been made by the government to include environmental issues and natural resource management in development and planning policies, environmental provisions have been incorporated on the basis of motivations that largely revolve around benefiting selected and powerful political and economic actors (Kihangi, 2012). So, an argument has lately emerged that only if the biases stemming from these motivations are eliminated, environmental management in Kinshasa and in the DRC as a whole will come in line with the principles of environmental justice. However, some argue that the stubborn persistence of the state, presence of state agents and the institutionalization of negotiation processes remain as barriers to ease the challenge (Trefon, 2009; Kihangi, 2012).

5.3.2.1 Environmental injustice in the context of solid waste management in Kinshasa

Kinshasa is considered as one of the dirtiest cities on the planet. It seems that the city is emerging in two contrasting ways. On one side, it offers an image of a city built respecting the urban standards. On the other side, it illustrates an example of pseudo-urbanization with poorly designed avenues, streets and built infrastructure. For example, streets, sidewalks, green spaces and gutters do exist but have been transformed into dumpsites. The basic infrastructure for solid waste management is poorly maintained (Kubanza and Simatele, 2015; Tshishimbi, 2006 and Kubanza, 2006).

Solid waste has been observed to be central in polluting the air and water, and the major cause of the outbreak and spreading of both endemic and epidemic diseases in the city (Kubanza and Simatele, 2015; Wemby, 2002; BEAU, 1996). Diseases such as, malaria, polio, cholera, and tuberculosis, once considered to be under control or eradicated, have resurfaced and threaten the health of people, specifically, the poor (Kubanza, 2010; Kubanza, 2006 and Tshishimbi, 2006). As a result the statement of pride "Kinshasa the beautiful" used by the Congolese seems to become a fairy tale for the present generation (Tshishimbi, 2006 and Kubanza, 2006). Furthermore, the uncontrolled urban growth and rapid increase in human activities have exacerbated the solid waste generation, disposal and management challenges in the city. A senior specialist aged between 30-35 years in the department of solid waste management, for example, commented:

> *"The city currently generates large amounts of solid waste (13227.79 tons/day), which go beyond the management capabilities of the existing waste management system. We have limited budget and equipment to provide adequate and equitable service to the entire community" (Pers.com, 2015).*

From the above comment, it can be argued that, since many municipal authorities are struggling to provide the most basic services within their jurisdictions, over 80 percent of the population does not have home collection services in the city (Mangenda, *et al.*, 2014). The majority of the households store their waste in open containers and plastic bags. Apparently one to two thirds of the solid waste generated remains uncollected (Nsokimieno, 2010; Dougall and McGahey, 2003). The uncollected waste, often mixed with human and animal excreta, is dumped indiscriminately in the streets. Consequently, the clogged drains and infested streets contribute to flooding, breeding of insects and pathogenic organisms, and rodent vectors, which spread infectious diseases (Din and Cohen, 2013; Dougall and

McGahey, 2003; Nsokimieno, 2010). Thus, such poor handling and disposal of the solid wastes pose public health risks and have become major causes of the environmental pollution in the city. Also, inadequate provision of solid waste management facilities has resulted in indiscriminate disposal and unsanitary environments. Thus, two local leaders from the municipalities of Kisenso and Limete aged between 40-45 years, for instance, commented:

> *"We have been living in Kisenso and Limete over the last 30 years and have never seen municipal services pick up the wastes generated in our locality, except some local NGOs that try to keep some main street clean. They work every last Saturday of the month from 7h00am to 10h00am. We also realise that most wastes collected in the city are dumped on available land in low-income urban neighbourhoods in an uncontrolled manner, although majority of solid waste is generated by the rich". Why? (Pers.com 2015).*

It is observed and asserted by local residents that most of the solid wastes collected in the city are dumped on land in low-income urban neighbourhoods in an uncontrolled manner ([6]), although the majority of the solid wastes are perceived to be generated by the rich([7]). The poor neighbourhoods either do not have access to any solid waste service or receive very little services on erratic basis if at all offered by the municipalities, although the majority of people in the city live in those areas (Simatele *et, al*., 2012b; Kindormay and Ron, 2012; Ako *et al*., 2013). However, most of the solid waste services available tend to be restricted to wealthy and rich neighbourhoods (those where groups of individuals with control of either

[6] Opinions of the people of the local municipalities of Kinshasa during the semi-structured interviews conducted in summer 2013-2014
[7] Opinions of local leaders of Kisenso and Ngaliema of Kinshasa during the semi-structured interviews conducted in summer 2013-2014

state/or national and economic power reside) ([8]). Another resident of Kisenso aged between 35-38 years added:

> *"We do not understand why the municipal authorities do not provide dustbins to the residents and why they don't collect the wastes generated in the city? Why do most solid waste services available tend to be restricted only to wealthy and rich neighbourhoods (those where groups of individuals with control of either state/or national and economic power reside)? We found ourselves abandoned from solid waste management and suffer from all kind of infectious diseases" (Pers.com 2015).*

Thus, a clear injustice and inequality is observed between the urban rich and poor neighbourhoods in Kinshasa. Most of the poor people live in an unhealthy urban environment infested with solid wastes and consequent diseases, which has already been exacerbated by challenges such as poverty, hunger, social exclusion, poor housing conditions, conflicts and civil wars (Kubanza, 2010; Kubanza, 2006; Tshishimbi, 2006). However, they do not have any say or effective involvement in the decision making processes to alleviate the problems. Paradoxically, the rich urban neighbourhoods have a significant say in decision-making processes ([9]). They enjoy a cleaner environment, better health and sanitation facilities than those in urban poor neighbourhoods ([10]). This situation occurs despite the fact that solid waste collection and management is a responsibility entrusted to the publicly funded municipal authorities, which should extend the services and facilities to all areas of Kinshasa in a just and equitable manner.

[8] Outcome of the discussions with various stakeholders in SWM during the field survey conducted in Kinshasa 2013-2014.
[9] Opinion of local leaders, obtained during field survey the discussion with stakeholders in Kinshasa, 2013-2014.
[10] Outcome of the discussions with various stakeholders in SWM during field survey Kinshasa 2013-2014

5.4. Two case studies for best practices: Kampala and Yaoundé

Solid waste management is being carried out by using different practices in different cities of the world and across Africa. However, two cities Kampala in Uganda and Yaoundé in Cameroon, offer illustrations of best practices to deal with the challenge. These case studies illustrate how context based best practices in terms of participatory governance systems could bring equitable and sustainable solutions in solid waste management, which could become bench marks for developing strategies to deal with environmental justice in solid waste management in Kinshasa.

5.4.1 Kampala, a case of successful stakeholder partnerships

Kampala is the political capital of Uganda with an estimated population of about 1,659,600 of inhabitants, which has seen appreciable growth in the last two decades (Tukahirwa et al., 2010). About 1500 tonnes of solid waste is generated daily, and of this, only less than half is collected and taken to the dumping sites (Tukahirwa et al., 2010). The solid waste generated in the city includes 170 tonnes of plastic waste, of which only 2% is collected for recycling (Tukahirwa et al., 2010). So, there is a huge quantity of general and recyclable waste that remains uncollected and indisposed. However, the overwhelming quantity of uncollected waste has attracted a number of stakeholders, such as NGOs and CBOs that seek to improve the situation through better collection rates and more recycling. Having recognised the weakness of public authorities in sanitation and solid waste service delivery, the Kampala City Council (KCC) resolved to design policy programs aimed at involving private sector, community-based and non-governmental organisations (CBOs and NGOs) in partnerships in solid waste and sanitation services. Although the partnerships and the

forms of collaboration and the level of formalization vary, they have increased the access of the urban poor to basic services such as sanitation and solid waste, improved solid waste and sanitation services as well as created employment for community organizations. The NGOs and CBOs act as new modernising agents, working together with governmental agencies and private companies in upgrading the solid waste management systems. For example, some NGOs and CBOs are involved in garbage collection; Kampala City Council (KCC) provided transportation facilities to transport the garbage to the dump site. Similarly, international NGOs (local branches) collaborated with KCC in the provision of toilets to poor communities. Some NGOs and CBOs made formal contracts with KCC to sweep parts of the city to keep it clean, which generated some form of employment. Private companies although not fully successful, are involved in garbage collection, provide funding for purchase of equipments and construction of recycling sites.

Consequently, an ease in communication among the actors in the decision-making processes as well as better service delivery in solid waste management are experienced.

This experience proves that one single actor cannot achieve successful solid waste management, and that local businesses, NGOs, CBOs and city council together with minimal direct government involvement can successfully meet the challenge. So, there is a need to bring all actors together in the form of partnerships to ensure that adequate and equitable service in solid waste management is being provided. This partnership paradigm offers a useful framework to understand and study how various

actors collaborate and partner in the provisioning of goods and services in urban areas (Tukahirwa et al., 2010).

5.4.2. Yaoundé, a story of Hygiene and Sanitation in Cameroon (Hygiène et Salubrité du Cameroun):

Yaoundé is the political capital of Cameroon with a population of about 2,440,462 (Parrot et al., 2009). The Yaoundé's story with regards to solid waste is no different from other cities in Africa (Parrot et al., 2009). Population growth is considered as the prime reason for the domestic waste generation rate in Yaoundé (INS, 2004) as the solid waste generation probably follows the same trend. The solid waste is composed of standard components of domestic waste, garden refuse, commercial waste, dry industrial waste, and construction and demolition waste besides the waste generated by farming activities. Garbage bins are considered as the primary infrastructure needed for waste collection and they play a crucial role in the solid waste management in the city as the wastes collected from the garbage bins were dumped in allotted dump sites in Yaoundé (Parrot et al., 2009).

Despite the financial, institutional and physical obstacles the city was not able to achieve significant success in the solid waste management. It is evident from the fact that the city could be able to achieve 40% collection rate that is equal to that of Senegal at about two fold less funding (with US $5million). Yaoundé's success is apparently due to the strong presence of public private partnerships. Several CBOs have been in charge of collection activities in various quarters of the city. The local operator called "Hygiène et Salubrité du Cameroun'" (i.e. Hygiene and Sanitation in Cameroon) played a prime role in developing partnerships with some NGOs and

CBOs and is instrumental in clarifying the respective responsibilities of each stakeholder. Complementary tasks, such as pre-collection and recycling, are conducted by informal operators or associations in partnership with Hygiène et Salubrité du Cameroun. Local municipalities being aware of the challenges facing the city in terms of solid waste management work closely with Hygiène et Salubrité du Cameroun (Parrot et al., 2009). In addition, households are involved in informal waste management where poor infrastructure hampers regular waste collection. Thus, Yaoundé presents a mature model of using NGOs and CBOs in partnerships with the private companies and public sector to effectively handle their urban solid waste.

5.4.3 Lessons learned from the case studies

The two case studies provide evidence that collaboration and partnerships with different stakeholders can assist to resolve the solid waste challenges and may produce a distinctive form of innovation as well (Tukahirwa *et al.,* 2010). Local authority's capacity to enliven the role of stakeholders, such as local community organizations like NGOs and CBOs, international NGOs, private companies, and business and to develop useful partnerships among them are crucial in urban service delivery, in this case in solid waste management and achievement of environmental justice. Such a framework could be of relevance to Kinshasa. For example, collaboration between governmental authorities and other concerned agencies, including the private sector, NGOs and CBOs, international organisations, could assist in effective solid waste management in Kinshasa through collaborative decision-making, implementation and sharing of environmental burden as against the adoption of western models of highly centralised, advanced technological, costly, and fully privatised systems. Also, such collaborations and partnerships are expected to bring ideas to develop and

implement intelligent, context-dependent combinations of western systems and local practices. Consequently, it could lead the city to environmental partnerships among the stakeholders to attain environmental justice in solid waste management.

However, there are challenges in implementing such a framework in Kinshasa. For example, the involvement of NGOs and CBOs, has been hampered by, among others, shortage of resources, donor dependencies, central policies that favour the formal large-scale private companies, and lack of government recognition in the country. Therefore, for the stakeholders to successfully become partners in the implementation and development of solid waste services in Kinshasa, a reform of the policy-making process, policies, and policy enforcement is necessary. This in turn, necessitates for a further rethinking, which could effectively create a useful collaboration among the various stakeholders to handle the challenges of solid waste management and attain environmental justice. Therefore, a Cultural Theory inspired mechanism has been argued to suffice the challenge, which is discussed in the following sections.

5.5. A cultural theory diagnosis and framing of environmental injustice

Cultural theory- or "the theory of plural rationality"-has been well documented in literature (Beck *et al.*, 2011; Thompson, 2008; Verweij and Thompson, 2006; Thompson *et al.*, 1990; Schwarz and Thompson, 1990 and Douglas and Wildavsky, 1982). It offers an approach for understanding and resolving the conflicts and disputes that characterise social and environmental policy. Its fourfold forms of social solidarity are able to elucidate different social constructions of nature, physical and human, on which environmental debate is premised. In here cultural theory is applied to the policy stories around solid waste management and environmental injustice. In this context the cultural theory refers to "a

series of demands or challenges to power-holders in the name of social category that lacks an established political position" (Tilly, 1985: 735-6, cited in Strutt, 1987:39). It makes the case for clumsy institutional arrangements that forgo elegance to accommodate the diversity of social solidarities, harnessing contestation to constructive, may be noisy argumentation but compromises and trade-offs (Thompson, 2003). Furthermore, it has the ability to underpin the fundamental socio-cultural nature of the complex problem and can help the poor and vulnerable groups in the DR-Congo deepen their understanding of their reality. It is argued that changes with regards to the social and environmental challenges can occur through individuals' involvement by means of direct actions, and lobbying of the international community and advocating for the affected communities with less opportunity to voice their concern at local, regional, international and transnational levels (Beck *et al.*, 2011; Thompson, 2008 and Wignaraja, 1993). These changes also need the contributions of a wide range of activists (NGOs, CSOs), the private sector, policy makers, and the opposition both from inside and outside the country (Thompson, 2008).

The society can be grouped into four solidarities-individuals (market forces), hierarchy (the authorities-government), egalitarian (social organisations) and fatalist (common individuals). With respect to SWM and environmental injustice in Kinshasa these four solidarities can develop their own storylines independent of each other, however, as we will see from the case studies and best practices, at least three solidarities leaving the fatalist out can combine together (Figure 8) and develop a storyline of mutual interest without compromising much of their own interests. Besides, each solidarity in creating a context that is shaped by its distinctive premises generates a storyline that inevitably contradicts those that are generated by the other solidarities. Yet, since each distils certain elements of experience and wisdom that are missed by the others, and since each provides a clear expression of the way in which

a significant portion of the populace feels we should live with one another and with nature, it is important that they all be taken some sort of account of in the policy process.

5.5.1. The role of stakeholders in the form of social solidarities

The two case studies of Kampala and Yaoundé explicate how different people came to different perceptions of the solid waste challenges and how they came together to resolve these issues, which in essence underpins the use of the framework of cultural theory (CT) and its social solidarities (Thompson *et al.*,1990; and Douglas and Ney, 1998). The perceptions of all stakeholders (NGOs, CBOs, private companies, Government, academicians, CSOs, etc.) involved in solid waste discussions in Kampala and Yaoundé can be explained by what social scientist Thompson, (1990) has called the "myths of nature", arguing that one perception veers towards exuberance is that of the market (individualists). It sees nature as a source of rich opportunities. Opposite to this view is the view of egalitarians. They see nature as fragile and suggest that those who see nature as an opportunity must reconsider their view. In the cases of Kampala and Yaoundé, those who see nature as fragile, though vocal in expressing critical views, have not come up with any way forward. They maintain that the solid waste, which is spread out all over Kampala and Yaoundé, will seriously deteriorate the cities. Managerial, hierarchical and governmental sectors have adopted an attitude in between the two extremes. They argue that nature is vulnerable, but only when pushed beyond certain limits and that good planning and expert management can address problems effectively (Figure 8).

Fatalism Apathetic Doldrums: Local community: Lack of trust and confidence in the new policy programs-unchanged institutional landscape self-focused approach of the past, media focus individual benefit.	**Hierarchy** Dog in the Managers: Urban authorities in both, Kampala and Yaoundé: designed policy programs and shifted SWM activities to the private sector, CBOs and NGOs.
Individualism Private companies. Limited services only in urban high-income areas. Don't care about urban poor areas and high rate of taxation	**Egalitarianism** CSOs, CBOs and NGOs: hampered by shortage of resources, donor dependencies, and central policies favour private companies-more SWM is needed.

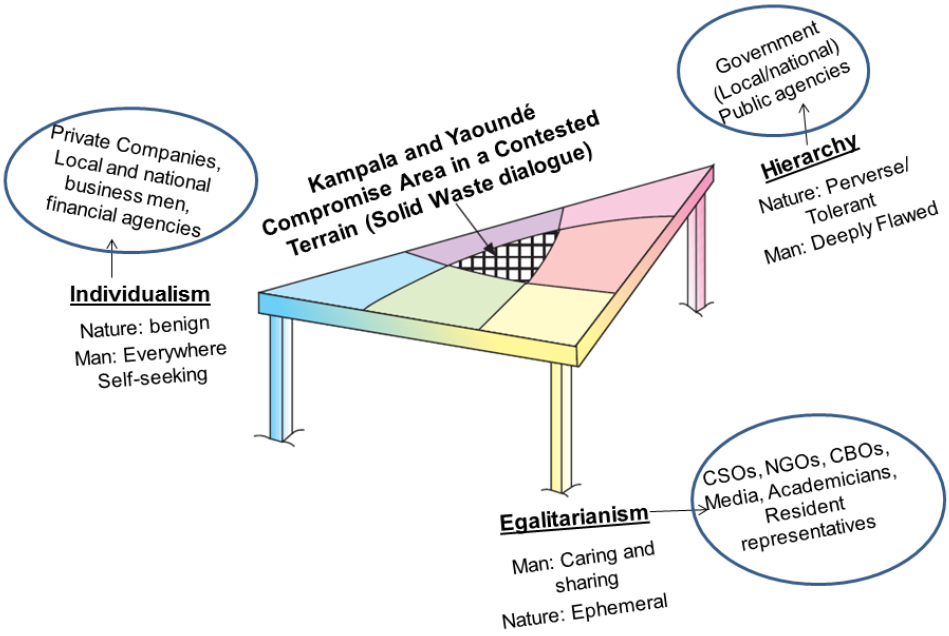
Adapted from: Tukahirwa et al., (2010) and Parrot et al., (2009)

Figure 8: Plural perceptions

Summarising these styles of response, Douglas, (1999) suggests that they refer to different perceptions, definitions of physical reality; they shift evidence through different sorting processes arguing from different premises, and employing different styles of discourse, which cultural theory maps in terms of a fourfold typology of forms of social solidarity. Two of the forms of solidarity, individualism and hierarchy, have long been familiar to social scientists (Thompson, 1990). The theory's novelty lies in its addition of the other two solidarities and in making explicit the different sets of premises-different myths of nature. The term social solidarity, originally from the sociologist Durkheim (1893), is now defined as the different ways in which we bind ourselves to others and, in doing so, define our relationship with nature (Thompson, 1990). Similarly, the practice of solid waste management can be much improved by bringing the important social solidarities–hierarchy (decision making authorities), individualism (market forces) and egalitarianism (community forces) together (Figure 9) (Gyawali, 2001). The arguments and trade-offs among the three solidarities are necessary to produce effective and socially acceptable solutions. However, as shown in (Figure 8), like the apathetic residents of Kampala and Yaoundé sit there waiting for solid

waste management to be improved or not, the fatalists will have no or limited voices and responses to resolve the challenges in the contemporary socio-political scenario.

Therefore, on the contested terrain of solid waste management (Figure 9) basically three solidarities, hierarchy, individuals and egalitarian have a say in developing the policy measures, (three, because the fatalist solidarity has no voice; if it had it would not be fatalistic). The reason of the exclusion of the fatalists is being that they are those who find themselves squeezed out to the margins of all three organisations live in a world where, if you poke something, you never get a consistent response. Life, for fatalists, is a lottery. There is nothing to learn, but plenty to cope with. They produce no policies for the management of hazardous wastes, but they are by no means irrelevant to it. They are the great risk-absorbers, enduring with dignity and ignorance whatever comes their way: a social sponge that the active policy makers, in their different ways, publicly write their hands over and privately makes good use of. Therefore, as seen from both, Kampala and Yaoundé, the only solution for them was to reduce the number of common people (exclusion of the fatalists in the compromise area) in their efforts to improve solid waste management (Gyawali, 2001). Thus, these three solidarities retained, form the three apexes of a triangle as shown in Figure 9 and develop their own storylines independent of each other with respect to solid waste management.



Adapted from: Gyawali, (2001) and Thompson, (1990)

Figure 9: Plurality in solid waste management

As in the case of Kampala and Yaoundé many stakeholders believe that the unplanned development to improve municipal solid waste exacerbate the degradation of the built environment (Tukahirwa *et al.*, 2010; Parrot *et al.*, 2009); it was argued that the only way for action to be effective is to bring various actors of these three solidarities-government, NGOs, CBOs, CSOs members and private companies together (Tukahirwa *et al.*, 2010; Parrot *et al.*, 2009). However, the challenge is, since, each of the above solidarity's problem is comprised, in large part, by the other two solidarities' solutions, this triangular "policy space" is irreducible (Thompson, 1990). Notwithstanding, the Kampala and Yaoundé case studies revealed that alliances, are possible between government, NGOs, CBOs, CSOs and private companies, for instance, to come together to discuss the solid waste challenges faced by the urban managers and the outcomes can be further improved by exposing them to the criticism from egalitarian actors. Besides, each story sets out a glorious future, one in which, the prevailing solid waste challenge arrangements are significantly redressed. In the hierarchist's

story, it is the public services that deliver the sustainability that neither markets nor grassroots community can provide; in the individualist's story, it is the expansion and involvement of the private sector services that can resolve and improve solid waste management in the city; and in the egalitarian's story, it is the rediscovery of the common that, by distancing them from both top-down imposition, brings them back into harmony with the natural world can solve the problem. Thus, in this context, as evident from the case studies the three solidarities can come together compromising with each other and bair positive influence for effective solid waste management in cities.

However, cultural theory has its intrinsic limitations. It would be worrying if cultural theory was not the subject of criticism because this would imply that it was not considered a serious enough contribution to social theory to merit review. Douglas (1982) designed the fourfold (grid-group) "gently to push what is known into an explicit typology that captures the wisdom of a hundred years of sociology, anthropology and psychology" (Douglas 1982: 1). Douglas (1982) recognised the limitations of typologies and identified a number of caveats to which we add the cautions of Ostrander (1982). The first is that the typology makes no claim to understanding the nature of individual free will and hence is not wholly deterministic. Secondly, the typology is static, and so is not designed to illustrate the processes of change. Thirdly, the typology is a relative rather than an absolute analytical tool, and so is primarily of heuristic value. Finally, Ostrander (1982) emphasises that the typology should be applied to social environments rather than to societies and hence is technically incapable of distinguishing whole social systems. Cultural theory typology can be used to analyse the building blocks of nations, or spatially more diffuse regimes (Rayner 1993).

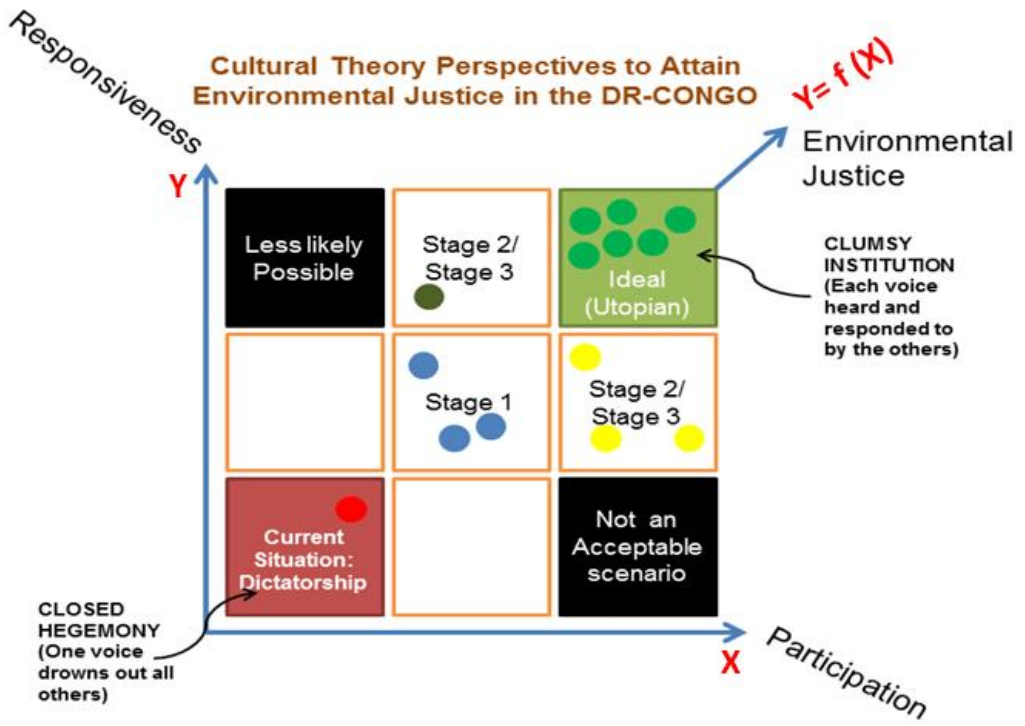
In the context of SWM in Kinshasa, although it may be difficult to absolutely demarcate, it is possible to map the four solidarities from the various stakeholders based on their responsibilities, activities, contributions and demands. Besides, the mobility of stakeholders from one solidarity to the other social solidarities based on context and change in their aspirations and demands as suggested by Rayner (1992) may not do much harm. The delineation of four solidarities, flexibility among them

and delineation of their individual and combined storylines will be easier to deal with than a plethora of stakeholders having numerous conflicting and contrasting opinions, aspirations and demands. The social solidarities while trying to push their storylines and demands for realisations will be aware and mindful of the demands and constraints of the other solidarities during their engagements. Consequently, the combined scenario that instead of trying to achieve what is most ideal for each solidarity or consensus a compromise or concessions may be arrived at.

5.6. The Kinshasa case study analysis

5.6.1. Cultural theory induced participation and responsiveness perspectives for SWM

Built upon the arguments of cultural theory and fruitful interaction among the various social solidarities, a cultural theory perspective necessary to attain environmental justice in Kinshasa is preferred. As argued by Beck *et al.* (2011) and Thompson, (2008), Dahl's classic theory of pluralist democracy provides a simplified dualistic scheme involving participation and responsiveness as shown in Figure 10. In a nine province framework, it ranges between two extremes of closed hegemony and utopian. With regards to the four social solidarities, closed hegemony means there is neither access nor responsiveness, where one voice (hierarchy)drowns the other three (the egalitarians, individualists and fatalists). Utopian means each voice is heard and responded to by the others. Participation and responsiveness are equitably framed at the highest standards. Each gradation along the two axes of participation and responsiveness (X and Y) marks the addition of another voice to the debate whether it be a hierarchical, individualist or egalitarian-in any order. What sets it apart from the conventional governance or management system is the distinction between these three such voices-as opposed to just the two that are generally acknowledged (Beck *et al.*, 2011 and Thompson, 2008).



Adapted from: Beck et al., (2011) and Thompson, (2008)

Figure 10: Cultural theory in perspective to attain environmental justice in SWM in Kinshasa

Environmental justice (pluralist democracy) means that both access (participation) and responsiveness are facilitated. In this regard, environmental justice is a function of government responsiveness, individualistic engagement and community participation (egalitarians: NGOs, CBOs and CSOs). Placing environmental justice in the 9-province framework with its various transitional pathways between where to set out (closed hegemony) and at where to be (environmental justice) a "middle ground" may be achieved (Figure 10). For example, the shifting of activities to NGOs, CBOs and CSOs was important for Kampala and Yaoundé in the efforts to improve solid waste management. As it has happened in both cases, affairs have become more subtle, richer, and more complex, as they moved away from the closed hegemony along either axis to stage 1 of democracy or environmental justice (Figure 10) with a little more participation and responsiveness, where,

more voices have responded to the debate, despite the fact that some may have no access to it.

Focusing on Kinshasa, in the current socio-political scenario, only two voices-the hierarchy and the individualist enjoy access. Apparently, the bureaucracy, the bourgeoisie and elite class have turned the city into a "club good" through the exclusion of the egalitarian (the civil society activists) voice ([11]). These people enjoy a cleaner environment and better sanitation facilities than those who are living in poor urban neighbourhoods ([12]). However, as seen from the case studies, if the government (hierarchists) could be able to adapt best practices to increase participation by shifting SWM services to NGOs, CBOs and CSOs, one could argue that there will be more responsiveness leading to better and more equitable SWM in Kinshasa. This means that the more the government will be able to grant responsiveness (less likely possibility) and participation (also not likely), the scenario will move away from current closed hegemony to higher equitable participation and responsiveness (stage 1 in Figure 10) and then gradually move towards higher environmental justice in SWM through stage 2/ stage 3 and perhaps to the ultimate acceptable stage (close to utopian) as the case may be depending on the socio-political scenario in the governance system of the country and in Kinshasa. There could be arguments and criticism about this form of idealism, abstract philosophy, and utopianism; however as Marx, (1948) believed, the future belongs to the egalitarians in which all class divisions, exacerbated by the evils of the individualists (capitalists), would eventually disappear through an international egalitarians (socialistic) revolution with time. In fact emergence of such scenarios have been evidenced from the

[11] Discussions with the residents of Ngaliema, Kisenso and Limete in Kinshasa. A semi-structured interview conducted in summer, 2013

[12] Opinion of local leaders and residents obtained during field survey the discussion with stakeholders in Kinshasa, 2013-2014.

recent citizen movement, such as the Arab spring and the occupy movement, which reflect a legitimacy crisis for national governments and the questioning of current models of governance in the contemporary society as people are building new channels to express their voices and demand participation.

Therefore, arguments emerge that increasing collaboration and may be concessions or trade-offs among the three social solidarities proposed in cultural theory may engender distinctive results and will further improve the current plight of solid waste management in Kinshasa. However, a close cooperation would be required among the egalitarians, individualists and hierarchists to increase the coverage and effectiveness of participation and responsiveness, particularly for the solid waste collection system and proper disposal of solid waste in Kinshasa. For, this purpose, the hierarchists (government) will have to be in continuous dialogue with the three other solidarities, particularly the two influential ones- the individualist and egalitarian to introduce appropriate regulations, which can help bring the required improvements in solid waste management systems in Kinshasa.

5.6.2. Future perspectives and scenario analysis

The solid waste management challenge in Kinshasa particularly, which has become a public concern for its huge complexity, has engendered several issues, such as uncontrolled population growth, unorganized settlement, improper sanitary and sewage system, low environmental awareness, and inappropriate solid waste management system. It is seen that these variables have causal relations among each other. In other words, the system comprising of these variables work through causal feedback mechanisms and develop a chain of actions. Therefore, there is a need to comprehend the causal feedback relations and the mechanisms they work on, which perhaps would provide avenues for developing plausible

policy interventions. To understand the inter-linkages among the variables, causal feedback relations were developed by using System Dynamics modelling principles (Forrester, 1968; Sterman, 2000) based on the systems thinking process (Sterman, 2000). Although, solid waste management is seen as a subsystem in the city of Kinshasa, it is considered as a system in the context of this study. The causal relationships among the variables within and across the major variables of the system and their positive and negative polarities and consequent influences on the related variables were developed based on the evidences observed from the literature, and discussions and experiences of the stakeholders surveyed. This information was also used to conduct a scenario analysis through the causal loop diagrams, because they are the dynamic hypotheses, which leverage a system and offer plausible policy interventions or scenarios to attain efficient and sustainable solid waste management systems. Thus, in the context of SWM in Kinshasa causal feedback relationships for each of the four solidarities were developed separately based on their individual storylines and responses of other solidarities and then synthesized to evolve scenarios for policy interventions.

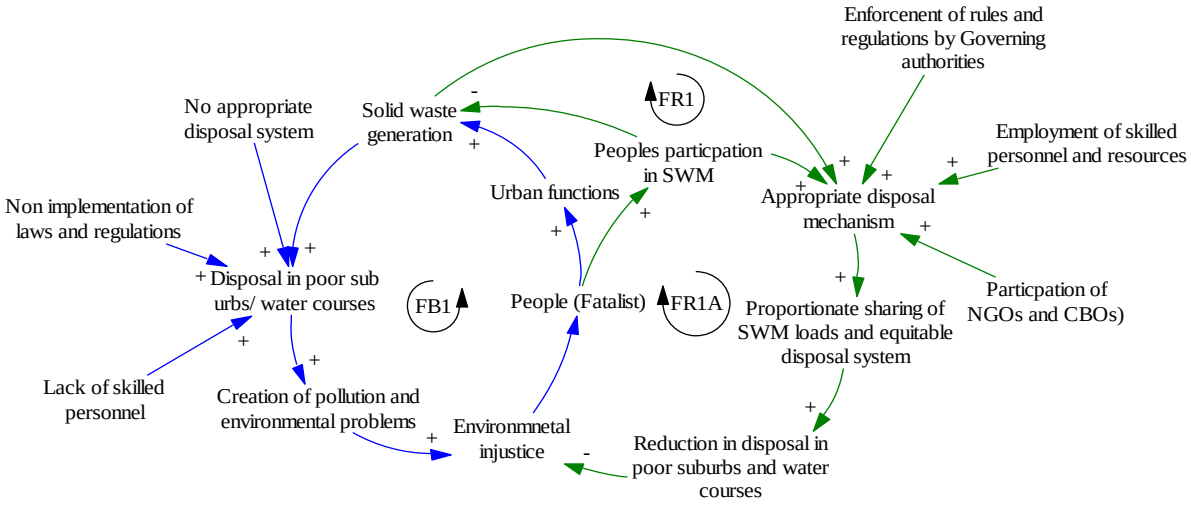
5.6.2.1. Fatalists' scenario

Figure 11 presents the fatalistic scenario on SWM and EJ in Kinshasa. It is revealed that people and urban activities generate solid wastes. Due to lack of appropriate disposal systems, non-implementation of regulations and laws and absence of skilled personnel and resources, most of the solid wastes as seen in the current scenario are disposed off in poor suburbs as landfills or water courses causing pollution and environmental problems. This situation leads to environmental injustice in the city ([13]) through a disturbing causal feedback mechanism FB1. This causal feedback relationship is disruptive and disturbs the solid waste management system in the city. However, as envisaged by the fatalist solidarity, the

[13] Professional involved in urban development in Kinshasa

participation of people in SWM will possibly reduce the solid waste generation to a certain extent as well as assist in devising appropriate disposal mechanisms in Kinshasa. Furthermore, reduction in solid waste generation coupled with the enforcement of laws and regulations and employment of skilled personnel by the governance authorities (as expected by people), and participation of NGOs and CBOs are expected to strengthen the appropriate disposal mechanisms in Kinshasa ([14]). Consequently, there shall be proportionate sharing of SWM loads and equitable distribution of disposal of solid waste. This situation would lead to reduction of solid waste disposal in poor suburbs and water courses, which in turn will lessen the environmental injustice in the city through the reinforcing mechanism FR1. Similarly, participation of people in devising an appropriate disposal mechanism will enable reduction of environmental injustice in the city (through proportionate sharing of SWM loads and reduction of disposal of solid wastes in poor suburbs and water courses) as shown by the causal feedback sub loop FR1A. Thus, mechanisms developed by FR1A will strengthen the mechanism developed by FR1. Thus, mechanism FR1 will be able to balance the disruptive mechanism created by FB1, which eventually will assist to attain environmental justice in SWM in Kinshasa.

[14] Professional involved in urban development and social activists in Kinshasa



Source: Result of system dynamic analysis (2015) and field-based materials, 2013-2014

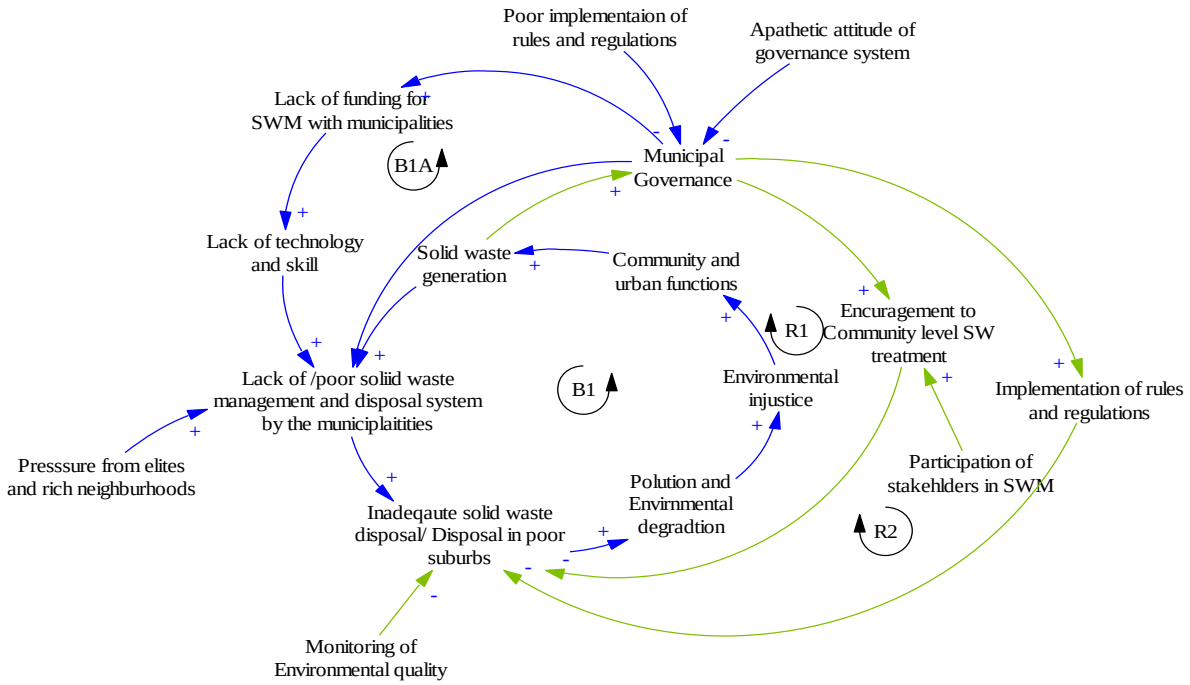
Figure 11: Fatalistic view on the causal feedback mechanism for SWM and EJ

5.6.2.2. Hierarchists' scenario

The hierarchical scenario on solid waste management and environmental justice in Kinshasa is presented in Figure 12. As discussed in the fatalists scenario, the lack of or poor SWM and disposal system in the city by the municipalities aided by the pressure from the elite and rich neighbourhoods degenerate the **e**nvironment, particularly the water courses and poor suburbs, resulting in environmental injustice in the city (causal feedback mechanism B1). This disruptive mechanism gets strengthened by poor municipal governance system, which fails to mobilise adequate funding, appropriate technology and skill (through causal feedback meachanism B1A). Besides, the apathetic attitude of the municpal officials and poor implementation of the rules and regulations adds to distubing SWM in the city([15]). Howerver, the scenario is expected to be alleviated in terms of reduction in disposal of wastes in poor suburbs, consequent reduction in environmental degradation and injustice if (1)

[15] Opinion of NGOs and residents surveyed

Community level SW treatment and disposal is encouraged through participation of stakeholders in the SWM augmented by Muncipal authorities (through feedback mechanism R1)([16]); and (2) Muncipal authorities take strict measures to implement the rules and regulations (through deedback loop R2) ([17]). The participation of communities in SWM and implementation of rules and regulations will assist in the monitoring of the environmental quality of the city and will also strengthen the two reinforcing mechanisms, which is expected to balance the disruptive mechanism to alleviate the envirnmental injustice in the city.



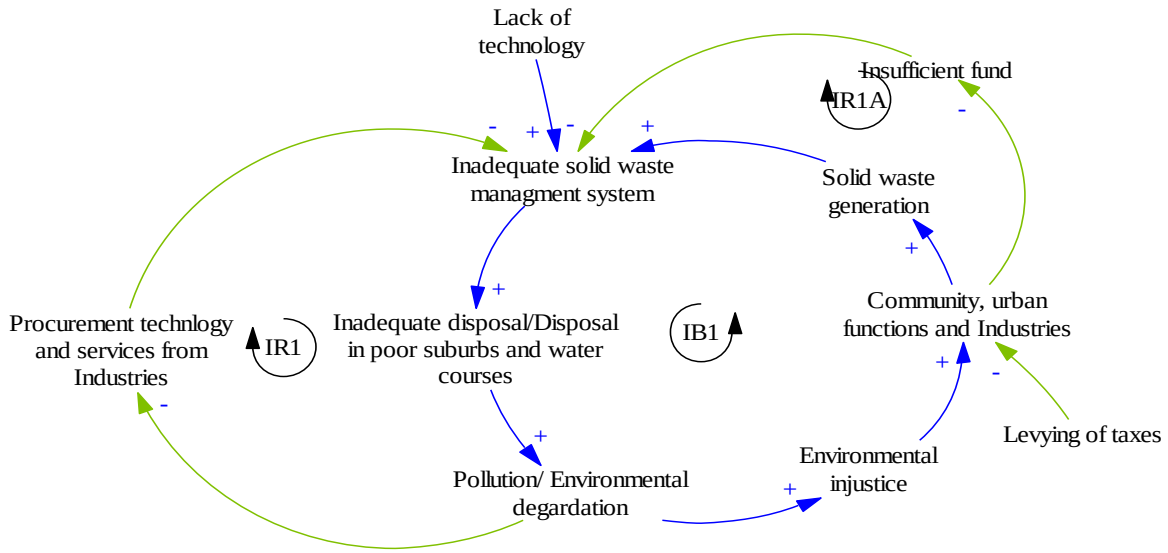
Source: Result of system dynamic analysis (2015) and field-based materials, 2013-2014

Figure 12: Hierarchists view on the causal feedback mechanism for SWM and EJ

[16] Arguments proffered by NGOs and other community based organisations
[17] Arguments proffered by NGOs and other community based organisations

5.6.2.3. Individualistic Scenario

The individualist (market forces) view on the causes of poor disposal/ disposal of SW in poor suburbs and water courses is not different from the other solidarities as shown through mechanism in IB1 (Figure 13). However, they view that availability of technology and services would allow reduction of SW and assist in proper disposal, which can be availed from the industry or market or from the partnership between private and public sector ([18]) (feedback loop IR1). Besides, they also believe in levying taxes on communities and industry to ease the financial issue of municipalities that would assist in procurement of technology and services ([19]) through mechanism IR1A.



Source: Result of system dynamic analysis (2015) and field-based materials, 2013-2014

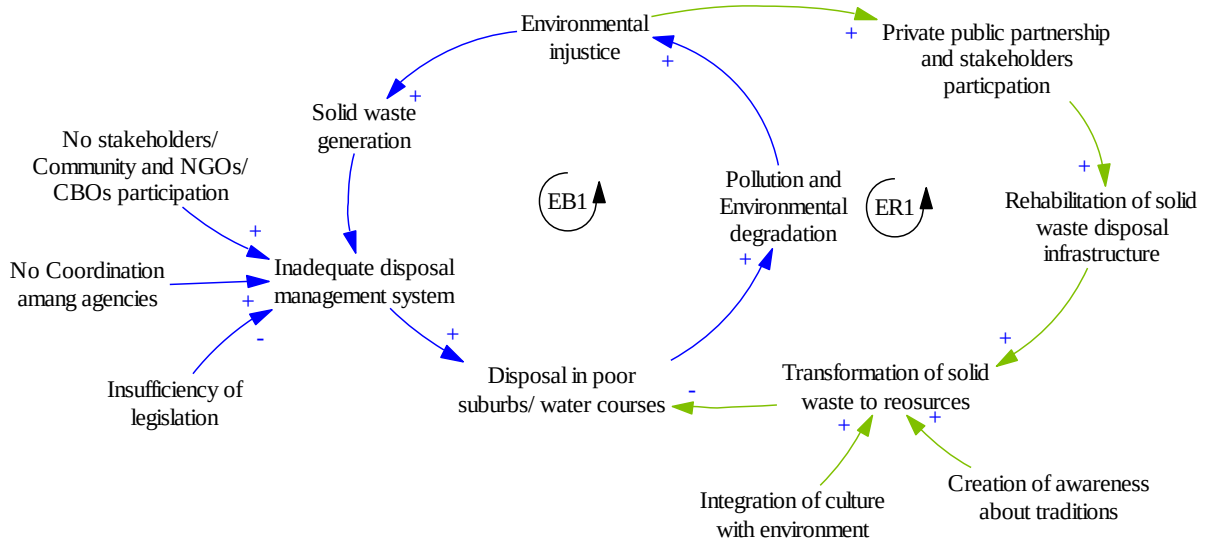
Figure 13: Individualists view on the causal feedback mechanism for SWM and EJ

[18] Opinions of private companies involved in providing services to Municipalities in Kinshasa
[19] Opinions of private companies involved in providing services to Municipalities in Kinshasa and municipal authorities

5.6.2.4. Egalitarian scenario

As seen in Figure 14, the egalitarian actors, although they have similar views on the causes of environmental injustice in the city (EB1), they view that the situation is aggravated because of lack of coordination among the various agencies involved in the process of SWM as well as lack of stakeholders particularly NGOs/ CBOs participation and insufficiency of legislation ([20]). However, according to them public-private and stakeholders participation will lead to rehabilitation of SWM infrastructure in the city, that may transform the solid wastes to resources; consequently reducing the disposal of wastes in the water courses and poor suburbs in Kinshasa ([21]). Such a mechanism will further reduce the pollution and environmental degradation and is expected to lessen the environmental injustice in the city through mechanism ER1 (Figure 14). The participation of egalitarian actors would also assist in integration of culture with environment and creation of awareness about traditions, which will also assist in transformation of solid waste to resources ([22]) that essentially will reinforce the mechanism ER1 and balance the disruptive SWM mechanism EB1.

[20] Responses from NGOs and CBOs in Kinshasa surveyed
[21] Arguments of NGOs and CBOs in Kinshasa surveyed
[22] View of an NGO official in Kinshasa



Source: Result of system dynamic analysis (2015) and field-based materials, 2013-2014

Figure 14: Egalitarians view on the causal feedback mechanism for SWM and EJ

5.6.2.5. Scenario of plausible collaboration, compromise and trade offs

A plausible scenario is devised by considering the constructive engagements and trade-offs among the various solidarities and synthesis of their individual storylines. Figure 15(a), presents the inter-linkage and causal feedback relationships among the various socio-economic, environmental governance variables influencing solid waste management, and the influence of the three important social solidarities in the city. There are clear causal feedback relations among the variables (as seen from different scenarios discussed above), which contribute to the current plight of solid waste management. However, an inappropriate solid waste disposal system on account of lack of appropriate and equitable disposal system leads to dumping of the generated solid wastes in the poor suburbs through a balancing or disruptive feedback loop B1 A. As a result, the quality of the environment in the poor suburbs

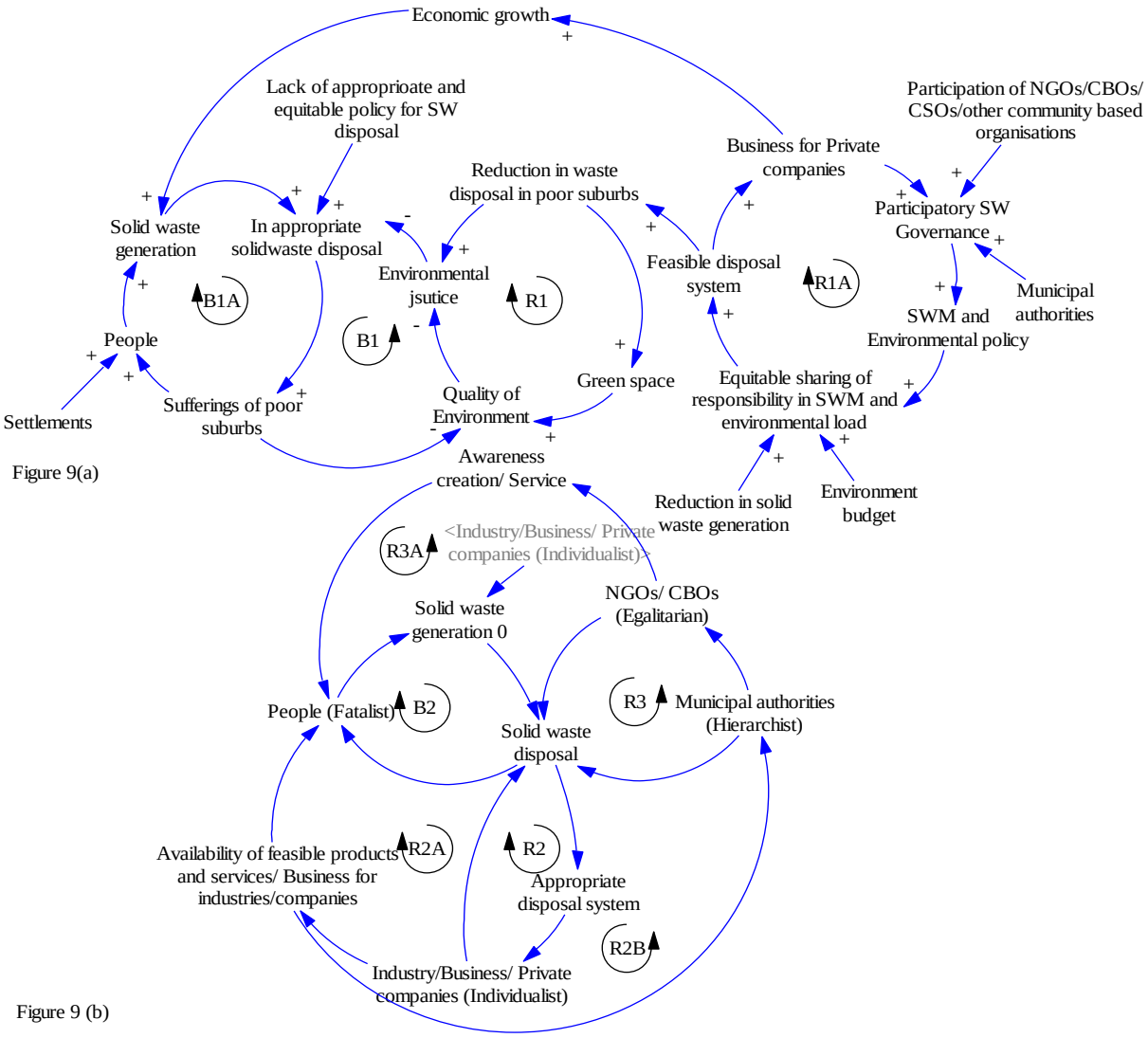
is degraded, which creates environmental injustice in the city through the balancing feedback loop B1. Thus, it is apparent that the mechanism being in operation by feedback mechanism B1A strengthens the feedback mechanism B1, and consequently creates environmental injustice in the city with regards to solid waste management. However, as discussed above if all the three influential solidarities, i.e. Municipal authorities (hierachist), Private companies (Individualist), and, NGOs/CBOs/CSOs/ other community and social organisations (Egalitarian) come together through productive engagement, there is a possibility of participatory governance for solid waste management, which would lead to evolve appropriate solid waste management system and environmental policy. The constructive engagement, trade-offs and collaboration will work in the following ways as shown in Figure 15(b). People and industry in general are responsible for solid waste generation (B2), which requires appropriate disposal system. The industry or private companies will enable availability of the feasible products and services, which people and municipality (hierarchist actors) will buy and use (R2A). In return, the industry or individualist actors will gain business for their companies and will make profits or benefits. The municipalities with aid of appropriate products and services together with the help of NGOs/ CBOs (egalitarian actors) will assist in developing appropriate and efficient solid waste management system in the city (R3). Besides, the egalitarian actors with the assistance of Municipalities will create awareness among the people, which in turn will reduce waste generation and also assist in their disposal at the source (R3A). In other words, people, Municipal authorities, Industry and NGOs/CBOs, i.e., all the stakeholders will become responsible for solid waste disposal directly or in collaboration. Municipal authorities will collaborate with NGOs/CBOs for disposal and creation of awareness among people; and Industry will develop appropriate products/ services and make it available for disposal of the wastes. As a consequence, solid waste will be appropriately disposed off and it will also reduce environmental load in the city,

particularly in the poor suburbs. Sharing of responsibilities among all the solidarities, i.e., participatory governance in solid waste management system will be attained. Relationships between Municipalities (Hierarchist), NGOs (egalitarian) and people (fatalist) indirectly through egalitarian actors, and interaction between Industry (individualist), Municipalities (Hierarchist), and people will be enhanced. The egalitarians will have a pivotal role to play in governance of solid waste, which will also benefit common people (fatalists). Moreover, industry (individualist) will receive economic benefits through the creation of new businesses such as demand for products and services require for solid waste management.

Such a collaboration or concessions will enable development of a locally suitable environmental policy, which with the assistance of availability of budget (possibly from the contributions from government and private companies) will engender reduction in generation of solid wastes because of the awareness created by community and social organisations, encourage for disposal at the source with acceptance of the people, and also prompt appropriate and justifiable disposal systems with all the stakeholders sharing the responsibility and burden. Consequently, a most feasible disposal system as against the current system is expected to be developed, with two consequences (1) it will reduce the waste disposal in the poor suburbs and (2) it will provide business opportunities to the private companies/ businessmen. The whole process will work through a reinforcing feedback mechanism (R1A) as shown in Figure 15 (a). Further, reduction in the disposal of solid wastes in poor suburbs because of mechanism R1A will be able to restrict the misuse or wastage of green and open spaces and make them available in the suburbs. This process will contribute to enhancing the quality of the environment, which consequently will augment environmental justice in the city through a reinforcing feedback mechanism R1. Thus, R1A

reinforces the feedback mechanism R1, which in turn will negate or balance the outcomes of the feedback mechanism B1currently in place (Figure 15(a).

Therefore, it is envisaged that the participatory governance approach with participation of three important solidarities of the society, i.e. Municipal authorities (hierachist), Private companies (Individualist), and, NGOs/CBOs/CSOs/ other community and social organisations (Egalitarian) in collaborative way will bring about an appropriate waste management system with feasible disposal systems, which essentially will augment environmental justice in SWM in Kinshasa. While it will become mutually beneficial to all the three solidarities, i.e., assist in governance and generation of funds for Municipal authorities; creates business for private companies; and aid in advancing the cause of community for community based organisations; it will also save the other solidarity- the fatalist (common people) from the sufferings of a poor environment in Kinshasa. Although the presence of fatalist is not seen, still they are important and their voices will be heard, perhaps through their indirect representations with egalitarian actors.



Source: Result of system dynamic analysis (2015) and field-based materials, 2013-2014

Figure 15(a) 15(b): Causal feedback mechanisms showing the current status of SWM and EJ in Kinshasa and collaboration and trade-offs among social solidarities.

5.7. Summary and Conclusion

Environmental justice, particularly in SWM, is a challenge all over the world; however it is more prominent in the cities of sub-Saharan Africa. The scenario in the cities of DR-Congo, especially in Kinshasa is no exception and is likely to become graver if adequate measures are not taken. Many studies have revealed that Kinshasa is grappling with mounting solid waste with socio-spatial inequalities in the distribution of the waste burdens. Most of the solid wastes generated in the city are disposed in the poor neighbourhoods, which has forced and made the urban poor residents in Kinshasa to live closer to such pollution sources susceptible to various health hazards, engendering environmental injustice in the city. With narrow revenue bases, increased civil conflict and limited technical capacities, the municipal authorities in Kinshasa have thus been unwilling or unable to effectively deliver an appropriate solid waste management system. Therefore, this investigation was conducted in an attempt to find an apposite solution to attain environmental justice in solid waste management suitable to Kinshasa. The paper engages in a critical review of literature and appraisal of two comparative case studies, as well as in-depth analysis of archival information and stakeholders' discussion conducted through a field study. It was found that solid waste management in Kinshasa, like in many sub-Saharan African cities, is a responsibility entrusted to publicly-funded municipal authorities. However, evidence suggests that solid waste management in Kinshasa is highly driven by issues relating to the political power, economic and social status of the residents in respective locations of the city. The rich neighbourhoods seem to enjoy well-formulated systems of service delivery than high-density areas where almost 80 % of the population in Kinshasa resides. There is a clear divide in the solid waste management between the rich and poor neighborhoods of the city. This state of

affairs can be argued as a result of inequalities that exist between the more powerful and poor people of the urban society in Kinshasa.

However, findings of this investigation suggest that increased collaboration among the government, private companies and NGOs, CSOs and community based organisations in solid waste management would facilitate the development of more effective and efficient integrated systems and approaches in solid waste management as evidenced from the cities such as Kampala and Yaoundé. This development could result in the incorporation of a majority of stakeholders in the decision making and implementation of solid waste management system, and adoption of technologies and innovative ways of managing solid waste, which would promote social and environmental justice in Kinshasa.

Furthermore, the causal feedback mechanism prompted from the current scenario vis-a vis plausible envisaged scenario underpinned by the principles of Cultural Theory prompted that the disruptive mechanisms causing environmental degeneration and consequent environmental injustice will be thwarted by the reinforcing mechanisms that would engender from the constructive engagement, collaboration and in cases compromises among the various social solidarities- stakeholders without significantly undermining the individual storylines to arrive at the solution. This premise encourages effective participation of egalitarian actors in devising solutions as against the more widely recognised two most influential solidarities- the markets and hierarchies-both of which have not produced desired results as evident from the current plight of the city. Significant attention has been given to the egalitarian solution because the solidarity despite its meaningful presence is at present being excluded in the development of the city. It is envisaged that inclusion of egalitarian approach would decrease the attractiveness of policy options that only favour one group within the community (rich urban neighbourhood) and localise their solid waste burden onto

the poor. However, the purpose of introducing such as paradigm is not to sweep away the market and hierarchy solutions and replace them with the egalitarian one; rather; to ensure that all three solidarities of the society are granted legitimacy and given due consideration in the policy and decision making process, which would influence the common people (the fatalist) directly or indirectly. Moreover, solutions premised on such paradigm would have the added attraction of comporting with, rather than going directly against, widely held ideas of what is fair and unfair (some happy, others sad). Thus, it is manifested through this investigation that a politico-cultural mechanism for remedying solid waste management inequities could enable changes that will address environmental justice in Kinshasa.

CHAPTER 6:

GENERAL CONCLUSION AND RECOMMENDATIONS

6.1. Introduction

Sustainable solid waste management (SWM) in many cities of the developing world is a challenge facing urban managers. Disparities in the SWM system amongst different locations were found to be vogue, engendering social and environmental injustices in the major cities of the developing world. This warrants careful interventions to alleviate its noxious effects. Inequities in service delivery and the undue placement of environmental burdens onto the poor of cities have been significant and deplorable over the past few decades. It is apparent that social and environmental injustices are inflicted on the poor in many such cities, particularly in sub-Saharan Africa. Using the case study of Kinshasa, Democratic Republic of Congo, this study investigated the concepts of social and environmental injustices in the context of solid waste management. The study also explored the extent to which social and environmental injustices are occurring in solid waste management in Kinshasa and the critical factors accounting for this. Furthermore, the investigation followed an examination of the relevant theoretical framework(s) and mechanisms that would facilitate the attainment of social and environmental justices in solid waste management in the city of Kinshasa, DRC.

It has been argued that social justice and environmental justice are a global challenge. Efforts to address these challenges are usually biased towards employing eurocentric frameworks that are unfit to deal with the reality of environmental problems in a developing country scenario. The use of eurocentric urban development and planning approaches, which in most cases are outdated, have significantly propagated issues of spatial inequality in the distribution of solid waste burdens and have contributed to worsening justice issues in many

cities in developing countries, particularly in sub-Saharan Africa. It has been illustrated in this study that social justice and environmental justice in the context of solid waste management are intrinsically connected, as both concepts emphasise the need for empirical understandings, grounded in local contexts (see Patel, 2009). They play fundamental roles in the theoretical construction of principles that can contribute to a sustainable community, one that ensures the rights and needs of individuals in a society are met (Kindornay and Ron, 2012).

In the context of solid waste, the concepts of social justice and environmental justice are compelling because of their focus on ensuring equal service delivery in solid waste collection and disposal, while simultaneously redressing previous imbalances. Walker, (2009), however, argues that the principles of environmental and social justice–as well as sustainable development–are more generally in their infancy in sub-Saharan Africa, and few implementing agencies and practitioners have a clear understanding of how to translate these global principles into practice. It is not surprising, therefore, that unresolved issues around sustainable development and environmental justice have emerged in a period in which the implementation and the real implications of following a justice pathway have overwhelmed many urban managers in sub-Saharan African cities (Patel, 2009).

There has been growing evidence of the links between environmental problems and social injustice and this is because both social justice and environmental justice are sensitive to power issues (i.e. who causes pollution and who suffers from pollution). Current evidence tends to focus on communities or groups, rather than on individuals. Both social justice and environmental justice adopt a holistic approach to analysing and addressing problems and reforms, and as such the two elements cannot be addressed in isolation. Environmental justice, as argued above, attempts to establish linkages between environmental and social

injustices, and it would thus be no exaggeration to argue that tackling both social exclusion and environmental problems through integrated development policies would be the most appropriate and viable option to address issues of inequality that arise from solid waste management in Kinshasa (Stephens *et al.,* 2001). Seeing social justice through an environmental lens, and analysing environmental issues more clearly in terms of social justice would provide new and more effective ways of dealing with problems associated with solid waste management challenges (Stephens *et al.,* 2001; Venot and Floriane, 2013). The environmental justice framework, if implemented properly, would be a valuable tool for addressing different aspects of social justice in a community.

This study has also illustrated that urban social justice and environmental justice issues are comparatively rare in African cities, with notable exceptions in a few selected countries (Myers, 2008). The urban poor in sub-Saharan African cities face many complex barriers that make it difficult or impossible for their legal, moral and political human rights to be respected (Onstad, 1997). Barriers of access to social justice and environmental justice that the poor face can be dealt with under stable political regimes and effective legislation. Governance systems that not only engage communities, but encourage public participation in local politics and policy formulation and implementation will help in dealing with access barriers (Onstad, 1997; Binns *et al.,* 2012; Couth and Trois, 2012). Therefore, access to social justice and environmental justice implies a situation where the poor are afforded homes to live in a as well as neighbourhoods and work environments that are clean, healthy and secure. The often implicit denial of poor people's rights to good living standards is usually a result of a lack of political will on the part of government officials who often give a higher priority to service delivery in wealthier neighbourhoods.

6.2. Key findings

Using both qualitative and quantitative research methods together with system thinking and system dynamics modelling principles as integral frameworks in understanding the complexity in solid waste management, it has been demonstrated that solid waste management in Kinshasa, like many Congolese cities, is a duty entrusted to publicly-funded municipal authorities. There is a clear divide and evidence in the manner in which solid waste is managed between rich and poor neighborhoods in the city. This state of affairs is a result of inequalities that exist between the more powerful and poor people of the urban society in Kinshasa. Many studies have revealed that Kinshasa is grappling with mounting solid waste with socio-spatial inequalities in the distribution of the waste burdens. Most of the solid waste generated in the city is disposed of in the poor neighbourhoods, which has resulted in the urban poor residents in Kinshasa living closer to pollution sources. The urban poor are therefore, more susceptible to various health hazards engendering environmental injustice in the city. The rich neighbourhoods enjoy well-formulated systems of service delivery, in contrast to high-density areas where almost 80 % of the population in Kinshasa resides. With narrow revenue bases, increased civil conflict and limited technical capacities, the municipal authorities in Kinshasa have thus been unwilling or unable to effectively deliver an appropriate solid waste management system. This investigation was conducted in an attempt to find an apposite solution to attain social and environmental justice in solid waste management suitable to Kinshasa.

Cultural theory paradigms and conceptual System Dynamics (SD) modelling principles have been employed to establish how the stakeholders in the form of four social solidarities (fatalist, hierarchist, individualist and egalitarian) influence solid waste management in the city and how they interact with each other. Based on the inter-linkage, interaction and causal

feedback relations, a politico-cultural mechanism was evolved to enable changes to social and environmental injustices in solid waste management in Kinshasa. It has been argued that a cultural theory inspired participative and collaborative mechanism could result in the incorporation of a majority of stakeholders in the decision making and implementation of solid waste management, adoption of technologies and innovative ways of managing solid waste. This could ultimately prompt social and environmental justice in solid waste management in Kinshasa. The findings of the study have both theoretical and practical implications. They provide a thorough discourse on social and environmental justice in SWM and on how the cultural theory paradigm can offer a new dimension to the theories behind stakeholder participation in local development and management matters, particularly with respect to social and environmental justice in SWM in sub-Saharan African cities. They also explicitly show how the various social solidarities could work dynamically in an integrated manner, and enable development of policy intervention mechanisms to resolve the SWM challenges and attain social and environmental justice through their effective collaboration, and participation, although this may be through compromises and tradeoffs in place of consensus. This paradigm could assist government agencies like municipalities to develop appropriate policy interventions and implementation strategies to resolve SWM challenges in Sub-Saharan African cities in general and the Democratic Republic of Congo in particular.

6.3. Recommendations

It is important to note that in order to have a sustainable solid waste management system that ensures that the solid waste burden is equally shared; local government authorities in Kinshasa and in other developing countries need to adopt a rights-based approach to urban development. The right of access to relevant information and participation in decision-making processes by all interested and affected parties are key components of the social and environmental justice discourse at all levels. The rights of every citizen, and each individual in a city and country, must be enshrined in a city's development and planning policies, and must be embedded in various local and national legislative articles. A rights-based approach to urban development places greater emphasis on community participation and systematic empowerment of the poor and disadvantaged groups to enable them to gain self-confidence in articulating themselves, gaining information on available resources and determining their future and that of their children.

If the poor and the powerless in society are given an opportunity to challenge decisions made by more powerful actors, they would demand respect of their rights and gain effective redress when their rights are contravened and ultimately increase their bundle of endowments. This is only possible through the creation of pro-poor institutions that not only focus on promoting pro-market government agendas, but also the welfare and well-being of the more marginalised and disenfranchised groups of people in society. Pro-poor institutions would not only facilitate the participation of the urban poor in decision-making, but would also enable them to get involved in the implementation of strategies and systems that would promote sustainable solid waste management. Thus, developing a civic-centred governance approach to development in Kinshasa may present an opportunity for achieving both social justice and environmental justice for the poor.

There is also an urgent need for greater recognition of the importance of investment in the development of urban solid waste infrastructure in Kinshasa. Decrepit road and communications systems, lack of sanitation, frequent interruptions of electric power, and an unnecessary, complicated and non-functioning legal and regulatory environment, all add to the failures of developing a comprehensive and effective solid waste management system in Kinshasa. Therefore, there is an urgent need to strengthen the capacity of the local authority to plan, invest wisely and manage scarce urban resources in a manner that is efficient for solid waste management and trigger urban productivity and economic opportunities. Urban laws and regulations, which block or hinder the efficient provision of services, particularly those that discriminate against non-traditional systems of solid waste management, should be amended. The legal system in Kinshasa, and the DRC in general, should concentrate on promoting issues of equity and the removal of obstacles that prevent the urban poor from receiving basic services and infrastructure as well as determining their own future.

It has also been recommended that urban authorities in Kinshasa need to review and re-orientate their development control regulations in favour of home-based enterprises (HBEs) whilst ensuring that their operation meets health and safety requirements. One of the challenges that urban authorities face in Kinshasa and in sub-Saharan African cities in general, is how to align urban development priorities and policies with reducing urban poverty. This is because the complexity of urban poverty and the heterogeneity of local culture in Kinshasa make it difficult to define a uniform strategy for poverty reduction. However, city authorities need to develop city-specific poverty reduction programmes which would identify innovative ways of deriving contributions from solid waste management towards employment creation and income generation for the majority of the urban poor households and individuals. It is important to note that many urban problems such as poverty,

unemployment, lack of adequate shelter and urban services are interrelated, and should be addressed through an all encompassing approach to solid waste management. It is in this context that this study proposes system thinking and system dynamics modelling principles as two approaches that can facilitate the development of both analytical and operational frameworks for solid waste management in sub-Saharan African cities, and Kinshasa in particular.

The causal feedback mechanism prompted from the current scenario vis-a-vis plausible envisaged scenario underpinned by the principles of Cultural Theory prompted that the disruptive mechanisms, causing environmental degeneration and consequent environmental injustice will be thwarted by reinforcing mechanisms that would engender from the constructive engagement, collaboration, and in cases compromises amongst the various social solidarities and stakeholders without significantly undermining the individual storylines to arrive at the solution. This premise encourages effective participation of egalitarian actors in devising solutions against the more widely recognised two most influential solidarities–the markets and hierarchies–both of which have not produced desired results as evident from the current plight of the city. Significant attention has been given to the egalitarian solution because the solidarity, despite its meaningful presence, is at present being excluded in the development of the city. It is envisaged that the inclusion of the egalitarian approach would decrease the attractiveness of policy options that only favour one group within the community (rich urban neighbourhood) and localise their solid waste burden onto the poor. However, the purpose of introducing such a paradigm is not to sweep away the market and hierarchy solutions and replace them with the egalitarian one; rather; to ensure that all three solidarities of the society are granted legitimacy and given due consideration in the policy

and decision-making process, which would influence the common people (the fatalist) directly or indirectly.

6.4. Recommendation for future research

There are almost no existing studies in social and environmental injustice in the context of solid waste management in sub-Saharan Africa in general and the Democratic Republic of Congo in particular. There is no study that has considered the use of system thinking and system dynamics modelling principles in solid waste management and the cultural theory framework to develop policy intervention mechanism in the context of sub-Saharan Africa. The cultural theory framework is observed to be particularly suited to the analysis of social and environmental justice in solid waste management and contending ideas of fairness. More investigations need to be conducted in social and environmental justice in the context of solid waste management, water, and electricity in the cities of sub-Saharan Africa in general and Kinshasa in particular.

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APPENDICE 1

SOLID WASTE MANAGEMENT STUDY: QUESTIONNAIRE

Confidentiel

Interviewer		
Coordinator		

Enumerator :

Date of interview	**d**	**d**	**m**	**m**	**y**	**y**	**Starting time**	**Finishing time**
Date								

Response Codes:

1	completed	**(√)**
2	No respondent available	
3	postponed	
4	refused	
5	Other (specify)	

1. Questionnaire for household survey

This survey is in partial fulfilment of the requirements for a PhD degree with the University of the Witwatersrand, South Africa. It aims at investigating social and environmental injustice in solid waste management in Kinshasa and the factors accounting for institutional failure in the management of solid waste. Your responses are completely confidential to the maximum extent allowed by law. Your co-operation will be highly appreciated.

Section 1: Identification of household

1. What is your gender?

No	Gender	**(√)**
1	Male	
2	Female	

2. What is your age group?

No	Ages	**(√)**
1	25 years or younger	
2	26 to 30 years	
3	31 to 35 years	
4	36 to 40 years	
5	41 to 45 years	
6	46 to 50 years	
7	51 to 60 years	
8	61 years and above	

3. What is your marital status?

No	1	2	3	4	5	6	7
(tick) (√)	Single	Married	Widowed	Divorced	Cohabiting	Separated	Others

4. Where do you currently stay?

No	Areas	(√)
1	Ngaliema	
2	Ngaba	
3	kisenso	
4	Limete	
5	Lemba	
6	Others (specify)	

5. How long have you been living in this area?

No	Number of years	(√)
1	2 years	
2	Under ten years	
3	Between 10 to 20 years	
4	More than 20 years	
5	Others (specify)	

6. Are you staying with your family?

No	1	2
(tick) (√)	Yes	No

7. How many people live in your household (including yourself)?

No	Sizes	(√)
1	0-5	
2	6-10	
3	10-15	

NB: please complete one line per person in the table below for each person living in your home, whether members of your family or not (e.g include lodgers). Instructions are below.

Household member	C Gender		D Age							E Employment	F Occupation	H Travel to Work
	M	F	0-10	11 To 15	16 To 24	25 To 44	45 To 59	60 To 74	75			
Self												
Spouse/partner												
Child 1												
Child 2												
Child 3												
Child 4												
Partner of child												
Grandchild 1												
Grandchild 2												

Parent 1												
Parent 2												
Lodger 1												
Lodger 2												
Other												

Take note of the following:

Column E (Employment)

No	Employment	(√)
1	Full time employees (30 hours)	
2	Part-time employees (up to hours)	
3	Self-employed	
4	On government training scheme	
5	Full time education	
6	Unemployed and available for work	
7	Permanently sick/disable	
8	Wholly retired from work	
9	Looking after the home	

Column F (occupation) please writes the number which best describes each member's occupation type from the following list:

No	**1**	**2**	**3**	**4**	**5**	**6**
(tick) **(√)**	Professional	Managerial and technical	Skilled, non-manual	Skilled-manual	Unskilled	Others

Column H. (travel to work) please writes the number, which best describes how each member of the household travels to work/college from the following list.

No:	1	2	3	4	5	6	7
(tick) **(√)**	Car	Bus	Train	Bicycle	Walk	Taxi	Others

8. Is any member of the household in formal employment?

No	Answers	Tick **(√)**
1	Yes	
2	No	

8A. if yes, in which of the following departments does he/she work?

No	Departments	(tick) **(√)**
1	Agriculture and rural development	
2	Environmental affairs	
3	Human settlements	
4	Social development	
5	Roads public works	
6	Local Government	
7	Others (specify)	

8B. If no, what is the major source of the household's livelihood?

No	Sectors	Tick **(√)**
1	Formal sector	
2	Informal sector	
3	Both	

9. What is the highest level of education attained by the head of the household?

No	Education level	(tick)(√)
1	Primary	
2	Post-primary	
3	Tertiary	
4	Non	
5	Others (specify)	

10. What is the highest level of education attained by the most educated person in the household?

No	Highest Education	(tick)(√)
1	Primary	
2	Post-primary	
3	Tertiary	
4	Non	
5	Others (specify)	

.

Section B. Household waste generation and disposal practices

11. Please indicate the items commonly found in your household waste and how often you generate them?

11.A. Common household waste items

N0	1	2	3	4
(tick) (√)	Food waste	Paper	Plastic	Others (specify)

11.B. How often do you generate solid waste?

N0	1	2	3	4	5
(tick) (√)	Daily	Weekly	Monthly	Occasionally	Others

12. How do you store your waste before disposal? Please tick

No	Answers	Tick (√)
1	In a closed container	
2	In an open container	
3	In a polythene bag or sack	
4	0ther (please indicate…….)	

13. In the table below, please indicate with a tick (√) the type of waste collection service available to your household.

No	**Waste collection service**	**(√)**	**Question to proceed to**
1	Home collection		
2	Roadside collection		
3	Truck visit		
4	Communal container		Proceed to Q. 6
5	Waste dump		Proceed to Q. 10
6	Other (please indicate)……		Proceed to Q. 14

14. In the table below, please indicate your service provider and frequency of the service.

No	Service provider (please write)	No	Frequency of service	(√)
1		1	Once per week	
2		2	Twice per week	
3		3	Others	

15. Is your service provider able to keep to the agreed schedule for waste collection?

N0	1	2
(tick) (√)	yes	No

15. A. If no, what do you do with your solid waste then? .....Proceed to Q. 22

16. Is the waste container close to your home or other homes in the neighbourhood?

No	1	2
(tick) (√)	yes	no

16. A. If yes, how close is it?

No	1	2	3	4
(tick)(√)	Less than 50m	50-100m	100-200m	others

17. Is the waste container emptied regularly?

No	1	2
(tick) (√)	yes	no

17. A. If yes, how regularly is it emptied?

no	answers	(√)
1	Once per week	
2	Twice per week	
3	Others (specify……)	

17. B. If no, do you know why? Please state reasons……..

18. How will you describe the sanitation situation around the waste container?

No	Sanitation situation	(√)
1	Very satisfactory	
2	Satisfactory	
3	Poor	
4	Very poor	
5	Others	

19. Do you suffer any nuisance from the waste container site?

No	1	2
(tick) (√)	yes	No…. Proceed to Q. 22

19. A. If yes, what do you suffer from?

No	answers	(√)
1	orders	
2	Flies	
3	Rates	
4	Diseases (typhoid fever, malaria, cholera)	
5	Others (specify)……..	

20. Is the waste dump closed to your home or other homes? And is it maintained?

No	1	2
(tick) (√)	Yes	No

20. A. If yes, who maintains it?

No	answers	(√)
1	City governors	
2	scavengers	
3	Private sector workers	
4	No one	
5	Others (specify)……	

21. Do you suffer any nuisance associated with the waste dump?

No	1	2
(tick) (√)	yes	No…. Proceed to Q. 22

21. A. If yes, what do you suffer from?

No	answers	(√)
1	orders	
2	Flies	
3	Rates	
4	Diseases (typhoid fever, malaria, cholera)	
5	Others (specify)……..	

22. How will you describe the sanitation situation at the waste dump?

No	Sanitation situation	(√)
1	Very satisfactory	
2	Satisfactory	
3	Poor	
4	Very poor	
5	Others	

23. Please indicate how you dispose of your waste?

No	answers	(√)
1	burning	
2	In the bush/ roadside/ drain (specify)	
3	Burying	
4	Other method (…) specify	

24. Why do you dispose of your waste by this method?

No	answers	(√)
1	I have no waste collection service	
2	I cannot afford service fee	
3	Other reason (please indicate)	

25. Do you know of any environmental problems associated with your method of waste disposal?

No	1	2
(tick)(√)	yes	No

25. A. If yes, what are they?

No	answers	(√)
1	Air pollution	
2	Water pollution	
3	diseases	
4	Vegetation damage	
5	Others (specify)……	

26. Do you find your waste disposal arrangement convenient?

No	1	2
(tick) (√)	yes	No

26. A. If no, why is it not convenient?

No	answers	(√)
1	The service takes too long to dispose the waste	
2	The environment is deteriorated	
3	Mosquitoes and flies infest the neighbourhood	
4	Others (please specify)……	

27. How will you describe the general waste situation in your neighbourhood?

No	Sanitation situation	(√)
1	Very satisfactory	0,476
2	Satisfactory	4,7
3	Poor	71
4	Very poor	19
5	Others	4, 285

28. Do you pay for your waste disposal service?

No	1	2
(tick) (√)	yes	No

28. A. If no, are you willing to pay for your waste disposal service?

No	1	2
(tick) (√)	Yes, why……..	No, why……

29. In the table below, please indicate how you pay for your waste collection service?

29 a			29b			29c			29d		
How often do you pay			How much do you pay			Who do you pay to			Is it affordable?		
1	Once per month	(√)	1	FC. 200	(√)	1	municipality	(√)	1	Yes	(√)
2	Twice per month		2	FC. 300		2	scavengers		2	no	
3	After two months		3	More than FC 300		3	Waste collectors				
4	others		4	0thers		4	others				

30. Are you willing to pay for waste disposal services?

No	1	2
(tick) (√)	yes	No

31. How much are you willing to pay each month for the following types of service?

Weekly home collection			Weekly roadside collection			Regular block or communal container service		
1	FC. 100	(√)	1	FC. 200	(√)	1	FC. 100	(√)
2	FC. 200		2	FC. 300		2	FC. 200	
3	Others		3	Others		3	Others	

32. Do you think all households/businesses in this city should pay for waste disposal?

No	1	2
(tick) (√)	yes	No

32a. If yes, why do you think so?.....
32b. If no, why do you think so?.....

- ✓ Who should pay?.....
- ✓ Who should not pay? .....

33. How will you describe the quality of waste disposal service you receive?

No	SW disposal situation	(√)
1	Very satisfactory	
2	Satisfactory	
3	Poor	
4	Very poor	
5	Others	

34. Do you and your neighbours ever discuss the waste situation in this neighbourhood?

No	1	2
(tick) (√)	yes	No

34a. If yes, what have you discussed? .....
34b. if no, why don't you? .....

35. If you were to compare with other communities or suburbs in this city, would you say your community

receives a fair share of resources for waste disposal?

No	1	2
Answers (tick)	yes	No

35a. If no, why?.....

36. How would you rank environmental sanitation in your community in relation to others in the city?

No	Answers	(√)
1	One of the cleanest neighbourhoods	
2	Averagely clean	
3	dirty	
4	One of the dirtiest communities in the city	
5	Others (specify)…….	

37. In your view, how can waste disposal be improved in your community? .....
…….....

34. Would you like to ask any question or make some further comments with regard to what we have just discussed?.....
……..…….....

Thank you for your time and assistance

2. QUESTIONNAIRE FOR THE COMMUNITY AROUND WASTE DISPOSAL FACILITIES

This survey is in partial fulfilment of the requirements for a PhD degree with the University of the Witwatersrand, South Africa. It aims at investigating social and environmental injustice in solid waste management in Kinshasa and the factors accounting for institutional failure in the management of solid waste. Your responses are completely confidential to the maximum extent allowed by law. Your co-operation will be highly appreciated.

Confidentiel

Interviewer		
Coordinator		

Enumerator :

Date of interview	**d**	**d**	**m**	**m**	**y**	**y**	**Starting time**	**Finishing time**
Date								

Response Codes:

1	completed	**(√)**
2	No respondent available	
3	postponed	
4	refused	
5	Other (specify)	

Section 1: Identification

9. What is your gender?

No	Gender	**(√)**
1	Male	
2	Female	

10. What is your age group?

No	Ages	**(√)**
1	25 years or younger	
2	26 to 30 years	
3	31 to 35 years	
4	36 to 40 years	
5	41 to 45 years	
6	46 to 50 years	
7	51 to 60 years	
8	61 years and above	

11. What is your marital status?

No	1	2	3	4	5	6	7
(tick) **(√)**	Single	Married	Widowed	Divorced	Cohabiting	Separated	Others

12. Where do you currently stay?

No	Areas	(√)
1	Ngaliema	
2	Ngaba	
3	kisenso	
4	Limete	
5	Lemba	
6	Others (specify)	

13. How long have you been living in this area?

No	Number of years	(√)
1	2 years	
2	Under ten years	
3	Between 10 to 20 years	
4	More than 20 years	
5	Others (specify)	

14. Are you staying with your family?

No	1	2
(tick) (√)	Yes	No

15. How many people live in your household (including yourself)?

No	Sizes	(√)
1	0-5	
2	6-10	
3	10-15	

NB: please complete one line per person in the table below for each person living in your home, whether members of your family or not (e.g include lodgers). Instructions are below.

Household member	C Gender		D Age							E Employment	F Occupation	H Travel to Work
	M	F	0-10	11 To 15	16 To 24	25 To 44	45 To 59	60 To 74	75			
Self												
Spouse/partner												
Child 1												
Child 2												
Child 3												
Child 4												
Partner of child												
Grandchild 1												
Grandchild 2												
Parent 1												
Parent 2												
Lodger 1												
Lodger 2												
Other												

Take note of the following:

Column E (Employment)

No	Employment	(√)
1	Full time employees (30 hours)	
2	Part-time employees (up to hours)	
3	Self-employed	
4	On government training scheme	
5	Full time education	
6	Unemployed and available for work	
7	Permanently sick/disable	
8	Wholly retired from work	
9	Looking after the home	

Column F (occupation) please writes the number which best describes each member's occupation type from the following list:

No	**1**	**2**	**3**	**4**	**5**	**6**
(tick) **(√)**	Professional	Managerial and technical	Skilled, non-manual	Skilled-manual	Unskilled	Others

Column H. (travel to work) please writes the number, which best describes how each member of the household travels to work/college from the following list.

No:	1	2	3	4	5	6	7
(tick) **(√)**	Car	Bus	Train	Bicycle	Walk	Taxi	Others

16. Is any member of the household in formal employment?

No	Answers	Tick **(√)**
1	Yes	
2	No	

8A. if yes, in which of the following departments does he/she work?

No	Departments	(tick) **(√)**
1	Agriculture and rural development	
2	Environmental affairs	
3	Human settlements	
4	Social development	
5	Roads public works	
6	Local Government	
7	Others (specify)	

8B. If no, what is the major source of the household's livelihood?

No	Sectors	Tick **(√)**
1	Formal sector	
2	Informal sector	
3	Both	

9. What is the highest level of education attained by the head of the household?

No	Education level	(tick)(√)
1	Primary	
2	Post-primary	
3	Tertiary	
4	Non	
5	Others (specify)	

12. What is the highest level of education attained by the most educated person in the household?

No	Highest Education	(tick)(√)
1	Primary	
2	Post-primary	
3	Tertiary	
4	Non	
5	Others (specify)	

.

Section 2. Community opinions

13. What do you consider to be the major problems affecting this community?

No	answers	(tick)(√)
1	Poor management of activities	
2	littering	
3	Open dumping	
4	Pollution	
5	Injustice	
5	Others (please specify)	

14. Do you have any concerns about the siting and maintenance of the waste disposal facility in your community?

No	Answers	Tick (√)
1	Yes	
2	No	

14. A. If yes, what are your concerns?

No	answers	Tick (√)
1	Waste is poorly sited in this area	
2	Poorly managed	
3	Vegetation damaged	
4	Illegally dumped	
5	Public health in danger	
6	Other, please specify…….	

15. Which nuisance does the waste disposal facility pose to the residents of this community?

No	answers	(√)
1	Poor sanitary conditions	
2	Flies	
3	Rates	
4	Diseases	
5	Others (specify)……..	

16. How does the nuisance(s) affect the community?

No	Answers	(√)
1	Increase diseases bearing pests	
2	orders	
3	typhoid fever	
4	Malaria, cholera	
5	Others specify….	

17. As residents, have you collectively complained about conditions at the facility to the municipal authorities?

No	Answers	Tick (√)
1	Yes	
2	No	

17a. if yes, what was the complaint about?

No	Answers	Tick (√)
1	We wrote a report to the authority	
2	We protested	
3	We asked them to resolve the problem	
4	Others specify……..	

18. How did the authorities respond to your concerns?

No	Answers	Tick (√)
1	They haven't responded yet	
2	They have promised but not realized	
3	They will provide facilities	
4	Others specify…….	

19. What do you think should be done about the waste disposal facility?

…….

……

20. Do you have any other comments or questions with regard to what we have discussed?.....

Thank you for your time and assistance

3. INTERVIEW WITH OFFICIAL OF SOME PUBLIC INSTITUTIONS

This survey is in partial fulfilment of the requirements for a PhD degree with the University of the Witwatersrand, South Africa. It aims at investigating social and environmental injustice in solid waste management in Kinshasa and the factors accounting for institutional failure in the management of solid waste. Your responses are completely confidential to the maximum extent allowed by law. Your co-operation will be highly appreciated.

Confidentiel

Interviewer		
Coordinator		

Enumerator :

Date of interview	**d**	**d**	**m**	**m**	**y**	**y**	**Starting time**	**Finishing time**
Date								

Response Codes:

1	completed	**(√)**
2	No respondent available	
3	postponed	
4	refused	
5	Other (specify)	

Name of suburb:

No	suburb	Tick **(√)**
1	Kisenso	
2	Ngaliema	
3	Limete	
4	Metropolitan centre	
5	Others	

1. What is your gender?

No	Gender	**(√)**
1	Male	
2	Female	

2. What is your highest level of education attained?

No	Highest Education	(tick)**(√)**
1	Primary	
2	Post-primary	
3	Tertiary	
4	Non	
5	Others (specify)	

1 What is your job history?.....

3. When was your office/department established in this city?

2. What is the mandate of your office/department? .....

3. Are you adequately resourced to discharge your functions with regard to funds, logistics and personnel?

I. Yes…….
II. No……..what do you lack?.....

4. How do your functions affect waste management in this city? .....
...

5. Do you regulate the siting and maintenance of waste disposal facilities?

I. Yes…….
II. No……..

6. Are you able to enforce the regulations on waste disposal? .....

7. What considerations qualify a place as site for a waste disposal facility? .....

8. Have you approved the siting of any waste disposal facilities in this city?

I. Yes […] which ones have you approved?.....
II. No […] why: .....

9. Are you satisfied with the maintenance of waste disposal facilities in this city?

I. Yes……..
II. No…….why?.....
...

10. Is your department involved in the siting of waste disposal facilities?

I. Yes [….] how are you involved? .....
II. No [….] stop interview

11. What factors do you consider when siting a waste disposal facility? .....

12. Do the existing waste disposal facilities meet the siting requirement?

I. Yes……
II. No……..

13. Which parts of the city do you consider to have?

I. Good roads?:.....
II. Bad roads?:.....

14. Why is the road quality poor in some parts of the city? .....

15. How does road quality affect the organization of waste management in the city? .....
.....
.....

16. What do you consider to be the cause of the poor solid waste situation in this city? .....
.....
.....

17. What barriers exist in solid waste management in Kinshasa.....

18. How can sustainable solid waste management be achieved in Kinshasa?

19. Would you like to make any further comments or ask a question with regard to what we have just discussed?
.....……
…….....
.....
.....

Thank you very much for your assistance

4. Interview with staff at waste disposal facilities

1. When did waste disposal start at this facility? .....
2. Which agency is responsible for maintenance of the disposal site?.....
3. Who bring waste here for disposal? .....
4. About how much waste is brought here in a day? .....
5. What types of waste are brought here? (e.g. household, commercial) .....
6. What do you do with the waste you receive? (e.g. composting, recycling, land filling) .....

7. What equipment do you have here for operations? (Use table)

Equipment type	Number required	Number available	Number operational

8. Do you consider the equipment adequate for your operations?

I. Yes…….
II. No……...

9. How many people work at this facility? (Use table)

Categories of staff	No. Required at site	No. Employed at site

10. Do you charge those who bring waste here for disposal?

I. Yes……
II. No……why not?.....(proceed to Q.14).

11. How do you charge them/ how do you determine the charge? (e.g. by weight or per trip) ....

12. Do you consider environmental conditions at the facility to be satisfactory?

I. Yes……..
II. No……why not? .....

13. Do you know of any nuisances or environmental problems associated with this facility?

I. Yes…….what are they? .....

II. No……

14. Have residents of the host communities ever complained of any nuisance from the facilities?

I. Yes……..what about? .....
II. No……

15. How do you respond to their complaints? .....

16. Do you have any problems or difficulties in managing this facility?

I. Yes……..what are they?.....
II. No……

17. Do you have any further comments or questions regarding this discussion? .....

Thank you for your time and assistance

Section D: Stakeholders in waste management <u>(state agencies and private companies)</u>

1. Which institutions are involved in the organization of waste management in this city and what are their respective roles?

Institutions	**Role in waste management**
.....	
.....	.....
.....	

2. Do you find the institutional arrangement for waste management effective?

I. Yes……
II. No……..Why.....

3. Is there adequate capacity for waste management in this city?

I. Yes …… …..

II. No …….
III. Reason for answer:.....

4. What is your own department's role in waste management?.....

1. The waste situation in the city

5. How would you describe the solid waste situation in this city?.....

6**.** Has there been a recent study of the waste situation in this city?

I. Yes (…) when was this done? .....Who did it .....
II. No (…) why? .....

7**.** Are you able to determine the following?

I. Per capita waste output in the city? .....
II. Total daily waste output for the city? .....
III. Rate of increase in waste output .....

8. Has the city's waste output been increasing in recent years?

I. Yes (…) what could be causing the increase? .....
II. No (…)

9**.** Have you made any projections for waste output in the next few years?

I. Yes (…) what are your projections?.....
II. No (…)

10. Do you think you will be able to cope with the waste situation in the future?

I. Yes (…..) how are you preparing for this? .....
II. No (…...) why not? .....

11. Can you briefly describe the arrangements for solid waste collection in this city? .....
.....

12. Are you able to provide waste collection services in all areas of the city?

I. Yes (…) (proceed to Q.16)
II. No (…) why are you unable to do this?.....

13. Please indicate:

I. Which areas are served?..... ……
II. Which areas are not service? ……

14. What considerations influence your decisions to serve or not to serve an area?
.....
.....
.....
.....

15. How do communities without waste collection service dispose of their waste?
.....
.....
.....

16. What are the arrangements for waste collection in the following areas?

Areas	**Methods of collection**	**Freq. of collection**	**Service provider**
High-income areas Middle-income areas Low-income areas Commercial areas Institutional premises			

17. What considerations influence the level or quality of service to provide in an area?
.....
.....

18. Is littering a major problem in this city?

I. Yes (….) can you please elaborate? .....
II. No (…..) (proceed to Q.19)

19. What do you consider to be the reason for littering in the city?
.....
.....
.....

20. Do you have any by-law against littering/indiscriminate disposal of waste?

I. Yes (…) what are its provisions?.....
II. No (…) (proceed to Q.21)

20. Are you able to enforce the by-law on waste disposal?

I. Yes (…) how is it enforced? .....
II. No (…) why are you unable to enforce it? .....

21. Are you able to provide enough litterbins in public places?

I. Yes (…)
II. No (…) why?.....(Proceed to Q. 24)

22. How regularly are the litterbins scheduled to be emptied? .....

23. Are you able to meet this schedule?

I. Yes (…)
II. No (…) why not? .....

24. How will you describe public attitude towards waste disposal in this city?
.....
..... …….....

25. Do you carry out public education on waste disposal?

I. Yes (…) how is it done? .....
II. No (…)

26. Please indicate how the following public places are cleaned

Place	Schedule for cleaning	Who does the cleaning	Are you able to meet schedule? Yes/No
Open-air markets Lorry stations Major streets Drains and gutters Other public place			

27. Are you able to determine the quantity of solid waste collected for disposal in a day?

I. Yes (…) what quantity is collected daily?.....
II. No (…) why not? .....

28. What waste treatment/disposal facilities are operated in the city?

Type of disposal facility	Location (s)	Number operated

29. What considerations influence the siting of waste disposal facilities?
.....
....

30. Are all the waste disposal sites/facilities approved by the ministry of environment?

I. Yes (…)
II. No (…) how many are approved?.....

31. Who maintain(s) the waste disposal facilities? .....

32. Are you aware of any environmental problems associated with the disposal sites?

I. Yes (…) what are they? ..... ……
II. No (…)

33. Have communities around the disposal facilities complained of any nuisances?

I. Yes (…) what have they complained about?.....
II. No (…)

34. Do you have any other comments or questions with regard to what we have discussed?.....

Thank you for your time and assistance

APPENDICE 2

PICTURES ON THE STATE OF SOLID WASTE IN KINSHANSA

The above pictures show how solid waste is poorly dumped along the street in Kinshasa.

The above pictures show the plight of solid waste in Kinshasa.

The above pictures show how solid waste is poorly managed in Kinshasa.

The above picture show the urban rich and poor neighbourhoods in Kinshasa and the inequalities in the distribution of solid waste collection in the city.

Serge Kubanza trained his research assistants on solid waste management data collection in Kinshasa.