

**SUSTAINABLE GOVERNANCE FOR ARTISANAL SAND MINING -
CASE OF KANGONDE LOCATION, MASINGA DISTRICT**

Research Project

By:

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Research Project presented to the Department of Geography and Environmental studies, University of Nairobi, in partial fulfillment of the requirements for the Award of the Degree of Masters of Arts in Environmental Planning and Management.

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Declaration

This Research Project is my original work and has not been presented by any other person in any university

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C50/63046/2010

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This Research Project Report has been submitted for examination with our approval as the university supervisors

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Abstract

Artisanal and small-scale miners (ASM) contribute significantly to the creation of mineral wealth. The activity is very significant, in job creation and poverty alleviation in the rural areas, though this come with a number of social and environmental consequences. In most Nations where this practice is prevalent, the industry is considered as informal and hence is not mainstreamed as a major National economic activity. The operations of ASM are therefore wrought with social, environmental, legislative and structural challenges, which this research project has tended to identify, measure and recommend a governance structure which strives to reduce the negative impacts of this rather silent but important sector in Kenya's economy.

The study set out (i) to examine the existing regulatory, institutional and policy framework systems in place that governs sand harvesting in Kenya; (ii) to establish the impact of the existing governance structures in the study area, (iii) to determine the performance indicators that explicate the performance levels of the existing regulatory, institutional and policy frameworks that govern sand harvesting in the study area; (iv) To suggest a sustainable regulatory, institutional and policy framework that improves sand harvesting activities in the study area.

Two major dimensions on artisanal sand harvesting were considered, namely governance and sustainability; and this was conceptualized around sand harvesting regulators/and actors, and sand harvesting performance indicators (including socio-demographic profiles, economic profiles, physical and environmental profiles). This was correlated to the sand harvesting activity and was ultimately used to analyze the benefits/non benefits of sand harvesting, hence

the weaknesses/strengths of governance structures and the level of sustainability of the resource. These results informed recommendations outlined in this study.

Primary data collection sources/units were households, institutions and individuals, where information was derived through direct interviews, discussions, recording, structured questionnaires, and checklists. Photography and field observations provided information on the environmental status and the physical characteristics of the study area, including the sand mining sites. Respondents were household representative (above 18 years of age) and key informants. Secondary data sources were basically done through desk reviews from existing literature on sand harvesting, scholarly internet sources, existing legislative, institutional and policy frameworks, after which contextual analysis and synthesis of findings was done particularly to furnish study with information for objective one and four.

Results indicate that artisanal sand mining requires multi-sectoral governance approach structure. The study proposes a central body of governance for artisanal sand mining against the existing disjointed regulatory structures. This should constitute four tiers each with different mandates. The social arm of governance shall deal with issues of social sustainability, the economic arm will deal with issues of economic sustainability, and so will be the environmental arm. A special arm should be set up to oversee activities of the other three arms and deal with overall formulation of rules and regulations governing sand mining.

Dedication

This research project is dedicated to Michelle Arwa and Jermaine Arwa; they are the greatest children a parent could ever dream of having.

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Acronyms

ASAL	Arid and Semi-Arid Lands
ASM	Artisanal and Small-scale Mining
CBOS	Community Based Organizations
DEC	District Environment Committee
EA	Environmental Assessment
ILO	International Labour Organization
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
IEBC	Independent Elections and Boundaries Commission
NEC	National Environment Commission
NEMA	National Environment management Authority
NGOS	Non-Governmental Organizations
PEN	Poverty Eradication Network
RRMA	Riparian Resource Management Associations
RCMRD	The Regional Centre for Mapping of Resources for Development
SAM	Sustainable Artisanal Mining
SADC	Southern African Development Community
SDC	Swiss Agency for Development and Cooperation
TARDA	Tana and Athi River Development Authority
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
WARMA	Water Resources Management Authority

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Chapter One: Introduction

1.1 Background to Problem Statement

Over the past few decades, artisanal mining, also referred to as small scale mining, and for the purpose of this study, has increased international attention due to many reasons, more predominantly the economic gains associated with this ‘subsistence’ sector. Shen and Gunson (2006), assert that there has been the unprecedented growth of small-scale mining especially in developing countries. Artisanal mining, defined by Hentschel et al. (2002) as extraction of minerals by individuals, groups, families or cooperatives with minimal or no mechanization often in the informal sector, is practiced all over the world more often, done through rudimentary processes (Shen & Gunson, 2006).

Different sources, give varied statistical estimates of the total number of people involved in artisanal mining; United Nations Department of Economic and Social Affairs (2003) estimated that in Africa alone, 20 million people depend on artisanal mining for their subsistence; Fairtrade Foundation (2011), place the figure at 100 million people worldwide, who depend on artisanal and small-scale mining for survival; the International Labour Organization (ILO) (1999a) estimates that there are about 13 million miners worldwide in about 30 countries, with another 80 to 100 million dependent on the sector for their livelihood (Thomas et al., 2003).

Artisanal mining therefore provides an important source of employment and revenue generation for governments, and as Shen and Gunson (2006) say, it is an essential activity in many developing countries, particularly in the rural regions with limited economic opportunities. It is a well-known fact according to Hilson (2005) that small-scale mining plays a pivotal socio-economic role in developing countries. Of importance is the recognition of the fact that small-scale mining can make a significant contribution to developmental objectives, which has been one of the principal motives for this persistent interest (Noetstaller, 1994). According to K'Akumu (2009), artisanal mining can foster local economic multipliers and contribute to local/rural development. In many places, especially the developing world, this sector is associated with poverty alleviations and significant contribution to development of the rural areas. Apart from providing employment opportunities to thousands of rural inhabitants, the operations has greatly contributed to the

provision of financial support to local agriculture, construction of roads and bridges, education, and rural collective welfare projects. In India, for instance, Ghose and Roy (2007) affirm that the employment provided by artisanal mining has helped lower crime and suicide rates in rural areas, assisted in raising living standards, and minimized rural urban migration in artisanal mining areas. In other places though, the remoteness of the practice has remained unchanged, and the rural mining landscape has continued to prevail. Artisanal mining has long been perceived as an informal sector industry, and Hilson (2005) asserts that formalization of this sector has remained a big challenge.

Legal and statutory set-ups of the artisanal mining sector, remain unconventional in many countries, and especially so in the developing world. It was established in the third meeting of the committee on sustainable development, UN (Economic Commission for Africa) (2003), that artisanal mining continues to be an activity beset with problems of sustainability, which largely stems from an overall inadequate legal and regulatory framework and low productivity, exacerbated by the application of rudimentary and inappropriate technology. Hilson (2002), admits that for decades, this subsistence sector of the mining industry has been largely dismissed by regulators, who for the most part permit operations to flourish alongside state-owned mining projects. Statutory organs and governments response to the small-scale mining phenomenon, however, is a crucial component for safer mining, (International Labour Organization (ILO), 1999b) .Governments and other statutory organs have made attempts to regularize and formalize the operations of small scale mining, through setting up regulations and licensing procedures (Hilson, 2002); but they have not been successful due to complexities and constrains of these procedures, thus, little or no impact is achieved in improvement of the sector. Hilson (2005), further acknowledges that most support services offered to the artisanal miners are often ineffective. Like many authors in this sector, Hilson (2002) agrees that most governments have failed the small-scale miners by providing unrealistic regulatory structures that do not offer the much-needed assistance, to improve the efficiency of operations and stabilize the sector. Although several governments continue to express a need to provide increased assistance to resident small-scale miners, the fact remains that few de facto commitments have been made to deliver badly needed support (Bridge, 2004). Given that the legal and regulatory inadequacies of small-scale mining are widely recognized, the purpose of this study is not only to further underscore one of the serious inadequacies-sustainable governance in one of small-scale mining practices in Kenya, sand

harvesting, but to also provide sound recommendations for improving the delivery and quality of the sector.

1.2 Research Problem

Kangonde is one of the renowned areas in Machakos County, Masinga District, with extensive commercial artisanal sand mining. It is a commercial activity that has continued to be practised and as Mutisya (2006) says, the rapidly growing populations in urban areas have contributed to an unprecedented demand for sand to meet the ever-rising needs of the building and construction industry. Just like many other parts practising artisanal mining in Kenya, artisanal sand mining in Kangonde is expected to be governed by the existing blanket policies, guidelines and regulations on exploitation of natural resources including National Sand Harvesting Guidelines, 2007; Environmental Management and Coordination Act; The Constitution of Kenya, 2010; Kenya's Vision 2030; The Mining Act cap 306; among others and as such, the activity has been associated with many social, economic and environmental problems. The existing policy and regulatory frameworks are largely meant for large scale mining; they are barely cut for small-scale artisanal mining. They have unclear and confusing mandates that generally lack coordination hence falling short of execution in the areas they are much required. These policy and regulatory frameworks are also not case/location specific and are not in sync with the customary conditions in specific areas and as such, miners continue with the so referenced 'illegal mining activities'. For these reasons, implementation of these governance structures often remains ineffective. Lack of clear governance structures in this industry necessitated this study, which sought to examine the "governance structures" under which artisanal sand mining operates in Kangonde, with a view of recommending a sustainable policy and regulatory framework.

There is limited research undertaken in the sector of sand mining in Kenya, particularly artisanal sand harvesting hence the more reason why this study was necessary. The study focussed on an aspect of artisanal sand mining that has received little research attention that is, governance structures to ensure sustainability in resource exploitation.

The impact and functionality of these multifaceted and blanket governance structures in artisanal sand mining was not known in Kangonde. Just how well did the existing governance structures work in the study area and what were their setbacks? It was also not known what would be an appropriate and sustainable governance structure in the study area. These gaps prompted this study. Two main aspects that were examined in this research included

governance structures (both the existing and proposed) in artisanal sand mining and *sustainability* of resource exploitation. In relation to these two main aspects, this study sought to find out the impact and functionality of these governance structures in the study area. This was determined by examining the performance levels of the existing legal, institutional and policy framework, while sustainability was measured through the social, economic and environmental indicators within the area. This would then be instrumental in defining a sustainable governance structure for artisanal sand mining.

1.3 Research Objectives and Research Questions

The main objective of the study is to examine the impact of governance structure on sustainable artisanal sand mining in Kangonde. The following are the specific research objectives and research questions for the study.

Table 1 1: Research Objectives and Research Questions

Research Objectives	Research Questions
1. To examine the existing regulatory, institutional and policy frameworks that govern sand harvesting in Kenya.	1. What are the regulatory, institutional and policy frameworks that govern sand harvesting in Kenya?
2. To establish the impact of the existing governance structures in the study area.	2. What are the impacts of the existing governance structures in the study area?
3. To determine the performance indicators that explicate the performance levels of the existing regulatory, institutional and policy frameworks that govern sand harvesting in the study area.	3. What are the performance indicators that explain the performance levels of the existing regulatory, institutional and policy frameworks that govern sand harvesting in the study area?
4. To suggest a sustainable regulatory, institutional and policy framework that improves sand harvesting activities in the study area.	4. How can the existing regulatory, institutional and policy frameworks be improved to minimize the challenges that exist in the sand harvesting activities in the study area?

1.4 Research Hypothesis

This research was an in depth study of how poor or inadequate governance structures results in unsustainable exploitation of natural resource by artisans. Since this area of study has not received a lot of research attention, few theories and models exist on which to anchor hypotheses. Therefore the study did not formulate any hypothesis.

1.5 Justification of the Study

Legal and statutory set-ups of the artisanal mining sector, remain unconventional in many countries, and especially so in the developing world. It was established in the third meeting of the committee on sustainable development, (UN (Economic Commission for Africa) (2003) that artisanal mining continues to be an activity beset with problems of sustainability, which largely stems from an overall inadequate legal and regulatory framework and low productivity, exacerbated by the application of rudimentary and inappropriate technology. Hilson (2005), admits that for decades, this subsistence sector of the mining industry has been largely dismissed by regulators, who for the most part permit operations to flourish alongside state-owned mining projects

Kangonde is one of the renowned areas in Masinga district where commercial sand mining is being practiced, thus an appropriate study location. There exists several blanket policies, guidelines and regulations on exploitation of resources in Kenya, including National Sand Harvesting Guidelines, 2007; Environmental Management and Coordination Act; The Constitution of Kenya, 2010; Kenya's Vision 2030; The Mining cap 306; among others; it is expected that these regulatory frameworks apply also in exploitation of sand in the study area. However, there exists a big gap on implementation, partly because the defined policy and regulatory frameworks are not case/location specific, and therefore not coordinated with the customary conditions in the study area.

Despite the functional disposition of the various (artisanal) mining activities, it is regrettable that the blue print policy and regulatory frameworks are expected to be practical in attempt to formalize these activities, ignoring the appropriateness of the frameworks for the various mine areas. Often, implementation remains ineffective and miners continue with the referenced 'illegal mining activities'. Secondly, implementation of the existing policy and regulatory structures has become difficult because of the discord of the implementation

structures, unclear and confusing mandates and the general lack of a coordinated regulatory system. Although several governments continue to express a need to provide increased assistance to resident small-scale miners, the fact remains that few de facto commitments have been made to deliver badly needed support (Hilson, 2002)

There is limited research undertaken in the sector of artisanal mining in Kenya, particularly sand harvesting, thus the rationalization of this study. This study therefore came up with a policy and regulatory framework for sustainable sand harvesting, considered appropriate for the study area, and the process is expected to be replicated in other areas that practice artisanal mining. The policy and regulatory framework, proposed in this study should guide in sustainable exploitation of sand; which will hopefully increase employment opportunities for the locals, reduce crime rates, increase revenue collections for the local county councils, increase funding for community-based projects and reduce conflicts within the various actors in this industry. It would also form a good basis for future research in this field.

Briefly, the society and the academia world is bound to gain in the following ways:-

Knowledge gap - There is limited research undertaken in the sector of artisanal mining in Kenya, particularly sand harvesting, thus rationalization of this study.

Policy makers - Provides a guidelines on mainstreaming sustainable artisanal mining in rural development

Students of natural resources - It broadens their knowledge in artisanal mining and forms a baseline for further research

University Lecturers - Provides University Lecturers with information

Society - it provides information on how to sustainably harness resources within their locality

Sociologists - It points out the social challenges that would be witnessed with discovery of resources in the rural areas

Environmentalists - it Provides knowledge in management of environmental challenges posed by artisanal mining in the rural areas

1.6 Scope and Limitations of Study

The study area is Kangonde Location, located in south eastern part of Masinga District in Machakos County, about 15Km from Matuu town, and along the Nairobi–Embu road, 3Km off the Thika-Garissa highway. Kangonde location occupies approximately 120 ha of land.

The project was undertaken for a period of six months (6) and proposed a sustainable governance structure, for artisanal sand mining in the study area. Among other issues that were studied, include the governance structure of artisanal sand mining, socio-economic profiles of the people in the study area, physical and environmental structures.

A few problems were experienced during the process of data collection, where non responses formed a relatively large portion of the responses, definitely affecting data accuracy. Secondly, some of the respondents were a bit cautious of the intentions study, and based on their position and interests on the sand harvesting industry, some of them were not truthful with their responses. Thirdly, although most of the data collected was justified as a trend that has been occurring in the study area, it's also true that data is a snapshot in time and is only correct for the time it was taken. Fourth, the study was made difficult by the geographical hardships of the area of study area and the scattered settlements/research units and this had impact on the sampling design; nevertheless, the research was successful and very reliable despite the prevailing conditions.

1.7 Definition of Terms

The following are some key operational definitions employed in this study:

Artisanal mining refers to the extraction of minerals by individuals, groups, families or cooperatives with minimal or no mechanization often in the informal sector; it is practiced all over the world more often and undertaken through rudimentary processes (Lei Shen and Aaron, 2004).

Governance can be defined as the body of rules, enforcement mechanisms and corresponding interactive processes that coordinate the activities of the involved persons with regard to a concerted outcome (Huppert et al., 2001).

Natural resource management refers to the management of natural resources such as land, water, soil, plants and animals, with a particular focus on how management affects the quality of life for both present and future generations, (Kellert et al., 2000). Natural resources are not just valuable economic resources; they are also political and social resources. At all levels, local, national and international, actors compete to gain access, control and benefit from natural resources.

Sand is defined as a naturally occurring granular material composed of finely divided rock and mineral particles.

Sustainability refers to simultaneous pursuit of sustained or enhanced environmental quality, economic growth, and social justice (Eggert, 2006).

Sand harvesting is a practice that is used to extract sand mainly through open pits. Sand is also obtained from beaches, inland dunes, ocean beads and river beds. Muhammad et al. (2011), define the practice of sand mining as the removal of sand from their natural configuration. The Kenya National Sand Harvesting Guidelines, (2007) define the practice as the removal, extraction, harvesting or scooping of sand from designated sites.

1.8 Organization of the Project

The study was organized into the following chapters:

Chapter one: Introduction- This is the introductory chapter, which grounds the project. The chapter describes project background, discusses problem statement, and highlights project goals and objectives, justification of the project, scope of the project, and conceptual framework of the project.

Chapter Two: Literature Review- This chapter reviews literature on sustainable governance, artisanal mining and sand as a resource. It also discusses institutional and policy guidelines on resource governance and sand harvesting, their mandates, capacities, and their weaknesses. The chapter also contains discussions on artisanal mining in Kenya, and case study on success stories of artisanal mining.

Chapter Three: Background and location Context-This chapter discusses background and location issues of the project including location context of the study area, physical and climatic conditions, population and demographic characteristics among other issues that contextualizes the project area

Chapter Four: Research Methodology- this chapter highlights the methodology that was used to achieve the objectives of this study and discusses the results of the study

Chapter Five: Results and Discussion- This chapter discusses the findings of the study in relation to the study objectives, to ascertain whether the study had achieved the objectives

Chapter Six: Summary of Findings, Conclusions and Recommendations- This chapter discusses the project proposals and recommendations on sustainable governance for artisanal sand mining in the study area, with considerations given to the study and references from the literature reviewed.

Appendices and References include appendices and a list of reference materials used in the project.

Chapter Two: Literature Review

2.1 Introduction

This chapter contains discussions on artisanal mining in Kenya, studies done on artisanal mining, and case studies on success stories of artisanal mining. It also discusses institutional and policy guidelines on resource governance and sand harvesting, their mandates, capacities, and their weaknesses in Kenyan context. The chapter also reviews and discusses literature on artisanal mining, governance and sustainability, and concludes by highlighting theoretical background and the conceptual framework of the research, discussing concepts on governance and sustainability in artisanal mining.

2.2 Global Artisanal Mining

Artisanal and small-scale mining (ASM) has continued to increase international attention over the years; even though, this important subsistence subsector has largely been dismissed by regulators, who for the most part permitted operations to flourish alongside state-owned mining projects (Hilson, 2005). A number of attempts have been made to define ‘small-scale mining’ in an international context, according to criteria such as mine output, labour productivity, organization of the enterprise, and levels of technology (Hilson, 2002). Over the past decades though, many African, Asian and Latin American governments have continued to implement an array of projects aimed at both improving the organization of indigenous mining activities and raising the living standards of its participants (Hilson, 2005). This has been largely influenced by the realization that Artisanal and small-scale mining has continued to contribute significantly to national economies and especially so in the rural areas; according to Hilson (2009), artisanal mining has rapidly become a permanent segment of Africa’s rural economy. Although it is difficult to ascertain very recent figures on employment in this sector, according to the International Institute for Environment and Development (2001), about 13 million people were working directly in small mines throughout the world, mainly in developing countries and with about 80 to 100 million people depending on such mining for their livelihoods. Hilson (2009), estimated about 2 million people were directly involved in artisanal mining in sub-Saharan Africa.

The sector of Artisanal and small-scale mining, has acquired some significant strides over the years. In the 1970s, for instance, the policy or research focus in this sector was anchored on

definitional issues/compartmentalizing ASM; the sector further improved to technical issues in the 1980s and Integration of environmental, technical, legal and socio-economic issues in early 1990s. Between mid to late 1990s, the sector of Artisanal and small-scale mining developed further to include Legalization and formalization of ASM; and from 2000s, the focus of various authors continues to incorporate community issues and sustainability principles (Jennings, 2003).

Despite the immeasurable socio-economic benefits brought about by artisanal and small scale mining, the sector continues to experience numerous similar challenges across the globe. According to (Hilson, 2005, 2009), this subsector continues to be an activity beset with problems of sustainability, stemming from an overall inadequate legal and regulatory framework (*design of ineffective, inappropriate and/or incompatible regulatory approaches and policies and the prescription to different approaches to formalization and support of the sector*), and low productivity, exacerbated by the application of rudimentary and inappropriate technology, inappropriate processing and environmental technologies, and implementation of bureaucratic licensing schemes; all these in turn impact on capacities to generate income this sector. Hilson (2009), further stipulates that the failure to take into account the dynamics of ASM communities almost always leads to the implementation of inappropriate legislation and industry support schemes, and this has largely been evident in sub-Saharan Africa. Therefore it is important that governments, NGOs and donor institutions adopt a more pragmatic approach to ASM policy-making and research by carrying out complementary work to collect baseline demographic information on target populations (Hilson, 2002).

2.3 Studies on Small Scale Artisanal Mining

Global Artisanal and Small-scale Mining Artisanal or small-scale mining is a poverty-driven activity, typically practised in the poorest and most remote rural areas of a country by a largely itinerant, poorly educated populace with few employment alternatives (International Institute for Environment and Development, 2001). Such mining activities have substantially increased over the years, and according to International Institute for Environment and Development (2001), following the financial crisis in many countries many poor people, in particular women and children, were driven to artisanal mining. In many countries though, much of the actual economic potential is lost due to the absence of a legal or fiscal framework for small-scale mining and due to rudimentary production, processing and marketing

techniques (International Institute for Environment and Development, 2001). Whereas, acknowledging the fact that small-scale mining can lead to a wastage of non-renewable resources and be hazardous to human and environmental health, it can also enrich nations and economically empower disadvantaged groups by virtue of its low investment costs (International Institute for Environment and Development, 2001).

There is very limited literature available on artisanal sand mining and especially in Kenya, however, several authors have authored on sustainable governance on artisanal small scale mining in various parts of the world. International Institute for Environment and Development (2001), discuss small scale mining and sustainable development within the SADC Region which included Malawi, Mozambique, Tanzania, South Africa, Zambia and Zimbabwe, where according to the authors, 1.5 million people are directly employed in this sector. Many issues surrounding artisanal small scale mining and sustainable development are discussed and among them are the legal and regulatory frameworks. According to the authors, the widely semi-legal or informal character of the sector, operating outside any regulation framework often leads to the adoption of casual business approaches in the sector. They also argue that much of the actual economic potential of small scale artisanal mining is lost due to the absence of a legal or fiscal framework for small-scale mining and due to rudimentary production, processing and marketing techniques. As such, the authors strongly recommend that interventions in the sector must therefore consider regulations and formal recognition of the sector as priorities. Gunson and Veiga (2004), in their research on mercury and artisanal mining in china, a sector that employed over 6 million people recommended that emphasis should be placed on supporting sustainable, integrated approaches for artisanal mining communities. According to the authors, a legal framework that would specifically address the problems of artisanal miners would also be important especially in reducing the distrust between miners and government officials. In a study undertaken in Sierra Leone by Maconachie (2009), to examine some of the main challenges associated with facilitating good governance in artisanal small-scale diamond-mining communities, (Maconachie, 2009; Ocheje, 2006) argue that the panacea of resource curse is good governance and that governments and extractive industry companies operating in developing countries must commit to higher standards of transparency and accountability. Maconachie (2009), further argues that in managing natural resources and their revenues, better attention to governance can reduce poverty, facilitate economic growth and promote more meaningful development.

2.4 Artisanal Mining in Kenya

Artisanal mining, is a sub-sector of mining that is labour intensive and therefore has great potential to generate employment at local levels (K'Akumu, 2009). The Ministry of Environment and Mineral Resources (2010), through National Minerals and Mining policy, stipulates that artisanal and small-scale miners (ASM) contribute significantly to the creation of mineral wealth, but there is however, need to mainstream the operations of ASM in order to address the challenges they face. As authored by Masibo (2010), Michuki underscores the fact that a significant percentage of mineral production comes from the artisanal mining operations in Kenya. Davies and Osano (2005), further underscore the importance of artisanal and small scale mining in Kenya, and they indicate that the activity is very significant, in job creation and poverty reduction. The authors enlist them to include the gold mining in riverbeds and along riverbanks, small scale mining of gemstones and marble as well as industrial and construction materials, but even though according to these authors, the activities come with a number of social and environmental consequences.

According to PEN, 2009, approximately 175,484 tonnes of sand are harvested yearly in the greater Machakos district with very little income earned being ploughed back to the local area for development. Further, they insinuate that the practice of irresponsible and unsustainable sand harvesting has caused environmental destruction and devastated scenery.

NEMA, 2013, advocates for sustainable sand harvesting. Unsustainable scooping of sand causes soil erosion, negatively impacts biodiversity, changes river courses making the flow of rivers a problem. Sand harvesting also leads to loss of water for livestock and domestic use.

Challenges facing artisanal mining in Kenya, just like all the other mining activities are environmental degradation, inadequate research and development, lack of mineral processing for value addition, cases of insecurity, inadequate Institutional and human capacity, lack of up-to-date baseline geological information and data, mainstreaming the artisanal mining, inadequate mineral promotion and marketing, inequitable sharing of benefits among national Government, Counties, Investors and the Local communities, intergenerational inequity, lack of transparency and accountability, mainstreaming of gender issues (Ministry of Environment and Mineral Resources, 2010).

Some of the suggestion of the National Minerals and Mining policy, 2010, on Artisanal mining include developing appropriate training programs for ASM, access to appropriate technology, funds and partnerships for ASM, encouragement and facilitation of orderly ASM by putting in place appropriate guidelines, Setting aside mining reserves for ASM activities; and encouraging and facilitation of the formation of cooperatives and ASM associations.

2.4.1 Sand Harvesting in Kenya

Kariuki (2002), articulates that in order to achieve national and industrial development, any country including Kenya, there is a huge requirement of large supplies of raw materials such as aggregates for the construction industry.

Evidently, as human population increases, the demand for concrete also increases substantially. In their River Sand Mining Management Guideline, the Ministry of Natural Resources and Environment Department of Irrigation and Drainage (2009), in Malaysia acknowledges that in recent years, rapid development has led to an increased demand for river sand as a source of construction material. This according to him has resulted in a mushrooming of river sand mining activities, which have given rise to various problems. Kariuki (2002), articulates that sand mining has direct impact on the physical environment and to the biodiversity.

A baseline study carried out by PEN in 2009, showed that sand harvesting is a major concern in the greater Machakos district and the larger lower eastern region of eastern province. Most of the sand used for construction, especially in Nairobi and the surrounding satellite towns is harvested from Ukambani, mainly in the Districts of Makueni, Makindu, Kilome, Machakos, Mwala, Yatta, Kangundo and Masinga. The sand harvesting business is booming due to the growing demand in the construction industry. As a result, streams around Machakos, Kangundo, Kathiani, and Mwala are badly affected. Even though, the demand for this raw material in the building and construction industries is bound to increase with the proposal to upgrade Nairobi into a metropolis.

2.5 Resource Mining

Mining is at the economic core of today's world. The practice is very significant, as it supports industrial development, offers employment opportunities and opens up rural areas

through infrastructural developments. Naturally, the process of resource mining or acquisition is a process to satisfy this demand. The manufacturing sector, the high technology industries and even the resource industries are all dependent, in one way or the other on the mining industry, (Kariuki, 2002).

Mining of aggregates, according to other researched sources, frequently generates land use conflicts in populated areas from its negative externalities including noise, dust, truck traffic, pollution and visually unpleasant landscapes, (Garrod & Willis, 1999). Surface mining destroys soil and vegetation, and disturbs areas where deposits are situated. According to Makweba and Ndonde (1996), operations of mining, whether small- or large-scale, are inherently disruptive to the environment. Marta et al. (2005), asserts that mining effects environmental and social change no matter where it occurs. Sand is one such mined resource that is pretty vital in industrial development and construction works, and according to Pettijohn et al. (1987), it is a very important economic resource.

The Intergovernmental Forum on Mining (2010), organizes the mining activities as follows:

Large scale mining: This is characterized by high capital investment, high investment per employee, dominance of multinational firms, high degree of public ownership, and high operating and managerial competence. They are the actors best placed to make investments that change the developmental dynamics: they have the capacity. Very significantly, they are required to operate to high standards, and their choices are the most likely way that best practices will be introduced into a national mining economy. They also, in the event of an error, have the resources and the incentive to put things right. Those operators are generally public entities. They are therefore held to greater standards of disclosure on their operations, not only on their financial but also on their social and environmental performance.

Small scale industrial mining: Some of these are substantial operations in their own right and are “small” only in comparison to the operations of the senior mining corporations. The mines can have long operating lives and are operated for profit, not subsistence. Ownership varies greatly from national ownership to family to cooperatives. There are also small scale mines operated by large entities. Small scale industrial mines can operate profitably on deposits that are not of interest to the big players. Also there are vast numbers of small scale miners that

deal with commonplace but essential building blocks of society: sand, gravel, aggregates, clays, etc.

Artisanal and small scale mining (ASM): This informal mining activity comprises individuals, families or small cooperatives that often operate in an unregulated manner. Targets of their interest are high-value materials such as gold, sand and gemstones although not confined to that. In different country contexts, ASM and the informal mining sector can assume a very high political and environmental importance; it often creates a large number of jobs for the poorest people.

2.6 Sand as a Resource

2.6.1 Overview

Different scholars and sources have attempted to define sand from different dimensions including the size (diameter), composition, and some defining it from the aspect of its genesis. The international sand collectors society define sand as a naturally occurring granular material composed of finely divided rock and mineral particles. Other sources define sand as sedimentary material finer than gravel and coarser than silt with grains between 0.06mm and 2mm in diameter and include stones, coral, earth and turf, (Kenya National Sand Harvesting Guidelines, 2007). The composition of sand is highly variable, depending on the local rock sources and conditions, but the most common constituent of sand in inland continental settings and non-tropical coastal settings is silica (silicon dioxide, or SiO₂), usually in the form of quartz. A sand sample can be described in terms of grain size, color, composition, morphology (angularity and shape) and surface texture. In terms of particle size as used by geologists, sand particles range in diameter from 0.0625 mm (or 1/16 mm) to 2 mm.

2.6.2 Process of Sand Formation

Sand is a naturally occurring fragmented material comprised of tiny particles of decomposed rocks, shells, or corals. The most common natural process of sand formation is weathering. Majority of sand comes from chemical and mechanical breakdown (weathering) of bedrocks; such process can take hundreds or even millions of years depending on other mechanical processes such as temperature changes, wedging by plant roots or salt crystals, and ice gouging underneath glaciers.

Formation and composition of sand is largely dependent on the source material. Beach sand is composed of quartz which is the most common material found in sand, or possibly some amounts of feldspar which is more prone to chemical breakdown, and other commonly occurring materials in the general beach vicinity coming from igneous rocks nearby. On the other hand, sand around volcanic islands is commonly composed of volcanic rock decomposed fragments and other minerals coming from volcanic rocks such as volcanic glass. In areas where there isn't much of sedimentary material from mountains or volcanoes, sand is commonly composed of organic material that have decayed and fragmented such as corals, shells, and skeletons of little planktonic organisms.

Quartz has a high resistance to chemical and mechanical weathering and it is also one of the most common and naturally occurring mineral on Earth. Plenty of types of sand consist largely of quartz. Other types of sand consist of feldspar, fragments of igneous, and fragments of metamorphic rocks. Hydrodynamic or chemical precipitation processes can produce sand that consists mostly of glauconite, calcite, or dense and dark-colored minerals like magnetite and ilmenite.

At a certain size, the rock particles are easily transported and tossed about by wind and water. The abrasion of particle against particle further reduces their size. Eventually in the erosion process, the particles are carried by wind and can form dunes, or are carried by water to river banks, lakes, or seas where they can form beaches.

Sand as a resource is of great economic value. It has several varied uses, among them, used as a concrete constituent in the building and construction industry, as an abrasive (sand paper, sand blast), as a source of silica for making sodium silicate, used in foundries for molding and parting. Thus, the importance of the resource cannot be over emphasized, and its uses are inevitable. This brings in the question of the sources of this important resource.

2.7 Institutional and Legal Framework Governing Sand Harvesting In Kenya

2.7.1 Introduction

Kenya has diverse legal and institutional underpinnings geared towards protection and sustainable protection of natural resources. The statutes are most times duplicative, disintegrated and uncoordinated making their implementation intricate. Their interactions are

more complex, sometimes overlapping, other times competing amongst the various stakeholders. Deficiency of a reliable and conclusive policy and institutional framework for sand harvesting industry in Kenya has resulted to multifaceted conditions, which directly or indirectly affect the overall operations. Either there is a number of Kenyan and international statutes that affect the artisanal sand industry, directly or indirectly, which among others, include:

- i.) EMCA, 1999
- ii.) National Sand Harvesting Guidelines, 2007
- iii.) The Mining Act Cap 306
- iv.) County Government Act, 2012
- v.) The Constitution of Kenya, 2010
- vi.) Kenya Vision 2030
- vii.) The National Minerals and Mining Policy, 2012
- viii.) Environmental Impact Assessment and Audit Regulations, 2003
- ix.) The Cooperatives Societies Act, 2004

The institutions that guard and protect natural resources in Kenya include:

- i.) NEMA
- ii.) WARMA
- iii.) Riparian Resource Management Authority
- iv.) Ministry of Environment and Mineral Resources
- v.) National Environment Commission
- vi.) Provincial and district committees
- vii.) Community Based Organizations
- viii.) NGOs
- ix.) Cooperatives
- x.) International Bodies Guidelines, such as the UN, ILO

Alongside the Kenyan legislative framework, other international legislative frameworks on sand harvesting were reviewed and incorporated in suggesting the best way forward for sustainable sand harvesting.

2.7.2 Laws, Policies and Regulations on Sand Harvesting

National Sand Harvesting Guidelines, 2007

In Kenya, national sand harvesting guidelines stand out as the most spelt out regulations towards sand harvesting. There are touches by other legislations, some in contradiction. The sand harvesting guidelines have covered multifaceted directives on sand harvesting in Kenya; which include environmental and social considerations. The accomplishment of these guidelines is still very weak, considering the prevailing indicators. Wrecked sceneries, land degradation and environmental degradation are widespread conditions in sand mining areas, suggesting failures to protection of resources.

According to the environmental considerations of the sand harvesting policy guidelines, a technical sand harvesting committee should be in place in sand mining areas, which will ensure that the following stipulations are adhered to:

- Construction of sand dams/gabions in designated sand harvesting sites, which if implemented would go a long way in land conservation and prevention of soil erosion
- 200m apart for where more than one gabion is constructed
- Use of designate access roads by lorries transporting sand
- Rehabilitation of sand harvesting sites by the Riparian Resource Management Association, County Council and approved dealers
- Restriction of sand harvesting from the river banks, to curb loss of river courses, widening of rivers, increased evaporation,
- Carrying out of an EIA prior to sand harvesting

There remains a big gap in actualization of these environmental considerations; sadly, in most sand harvesting areas, these stipulations remain just that, stipulations. There no stipulations on the punitive measures that should be undertaken if these provisions are not adhered to, for example. Thus, they are as good as non-existent. The results have been piteously disastrous. Are these guidelines satisfactory? How do sand harvesters, ensure the environment is safeguarded, and enhanced? How should they rehabilitate the deteriorated sand harvesting environments?

The social guidelines of the same Policy principally consider the social welfare of the people working in the sand industry. They however remain blanket policies, with weak implementation consideration. The policy is silent on implementation procedures. The social considerations of the policy guidelines include:

- Sand loaders to be above 18 years of age
- Approved sand dealers to pay a negotiated and agreed wage to sand loaders
- Loaders to organize themselves into recognized groups with clearly operational structures for their self-regulation.
- Approved sand dealers encouraged to support local community projects in consultation with the Riparian Resource Management Association.

The National Minerals and Mining policy, 2010

Through the National Minerals and Mining Policy, 2010, the Ministry of Environment and Mineral Resources proposes the following for consideration for all mining activities in Kenya;

- Optimal utilization of mineral resources and sound environmental management in order to ensure sustainable development of the sector.
- Since investment in the minerals and mining sector is relatively risky and capital intensive, the policy advocates for the provision of a variety of fiscal incentives.
- The policy also recommends the creation of mitigation mechanisms such as stabilization funds to cushion investments from negative effects of cyclic mineral prices and other externalities.
- The policy advocates for equitable benefit sharing and addresses the issue of intergenerational equity by prescribing various measures aimed at bequeathing future generations with direct and indirect benefits from mineral wealth, and;
- In order to effectively regulate activities in the minerals and mining sector, the policy proposes the enactment of a simple, clear and transparent legislative framework.

County Governments Act, 2012

Subject to the County Government Act, 2012, county governments are encouraged to invest proceeds of sand cess in environmental conservation activities and local community projects in the County.

The Constitution of Kenya, 2010

The Constitution of Kenya advocates for sustainable and productive management of land resources, as well as sound conservation and protection of ecologically sensitive areas. The public is encouraged to participate in the management, protection and conservation of the environment, genetic resources and biological diversity. The state is expected to establish systems of environmental impact assessment, environmental audit and monitoring of the environment; and eliminate processes and activities that are likely to endanger the environment. Thus, it is in the public interest for the government of Kenya to ensure that there is policy framework in place to guide in natural resources utilization, and protection of the environment.

Environmental Management and Co-ordination Act (EMCA)

Among other priorities of natural resources by EMCA, the following provisions are of interest to this study:

1. Have an analytical profile of the various uses and value of the natural resources incorporating considerations of intergenerational equity;
2. Recommend appropriate legal and fiscal incentives that may be used to encourage the business community to incorporate environmental requirements into their planning and operational processes;
3. Recommend methods for building national awareness through environmental education on the importance of sustainable use of the environment and natural resources for national development;
4. set out operational guidelines for the planning and management of the environment and natural resources;
5. identify actual or likely problems as may affect the natural resources and the broader environment context in which they exist;
6. Identify and appraise trends in the development of urban and rural settlements, their impacts on the environment, and strategies for the amelioration of their negative impacts;

7. Propose guidelines for the integration of standards of environmental protection into development planning and management;
8. Identify and recommend policy and legislative approaches for preventing, controlling or mitigating specific as well as general adverse impacts on the environment

Environmental Impact Assessment (EIA) and Environmental Auditing (EA) for commercial sand harvesting

For any person(s) to be granted an approval to harvest sand an EIA for the river or part of the river must be done and an EIA License issued in accordance with EMCA and the Environmental Impact Assessment and Audit Regulations 2003.

Consequent initial and annual Environmental Audits (EAs) must be undertaken for such approvals granted after the EIA to be renewed every subsequent year.

The Land Act, 2012

The Land Act 2012 also has provisions for protection of land based resources. The act mandates the commission to make rules and regulations for the sustainable conservation of land based natural resources. The commission also is expected to have measures to protect critical ecosystems and habitats; provide incentives for communities and individuals to invest in income generating natural resource conservation programmes; deduce measures to facilitate the access, use and co-management of forests, water and other resources by communities who have customary rights to these resources; prepare procedures for the registration of natural resources in an appropriate register; procedures on the involvement of stakeholders in the management and utilization of land based natural resources; and measures to ensure benefit sharing to the affected communities.

The Cooperatives Societies Act, 2004

The Cooperatives Societies Act is mandated with promotion of the welfare and economic interests of its members; and as incorporated in its by-laws adhere to the following co-operative principles -

- i.) Voluntary and open membership;
- ii.) Democratic member control;
- iii.) Economic participation by members;
- iv.) Autonomy and independence;

- v.) Education, training and information;
- vi.) Co-operation among co-operatives, and
- vii.) Concern for community in general;

Vision 2030

Kenya's Vision 2030 aims at achieving an economic growth rate of 10% by the year 2030. Under the social pillar, one of the flagship strategies advocated for by Vision 2030 is efficient use of natural resources.

2.7.3 Institutions Governing Sand Harvesting

Riparian Resource Management Association (RRMA)

The sand harvesting guidelines direct for formation of District Environmental Committee, which should further establish local Riparian Resource Management Associations (RRMA) mandated with sustainable management of sand harvesting activities. However, this has remained a delusion in most of these areas, with barely having any institutional representation.

The Riparian Resource Management Association is expected to direct for Environmental Impact assessment before sand extractions, as well carry out annual environmental audits in sand harvesting areas, but again, none of this ever happens.

Ensuring rehabilitation of the sand harvested sites and other environmental damage associated with harvesting and transportation of sand is a mandate expected to be undertaken by the riparian resource management associations. Preparation of an environmental management plan for sand harvesting areas is a requirement of the association, of which the sand harvesters should adhere to, but that largely remains unaccomplished. The composition of the association has no regard for environmental experts, and suggests for inclusion of community representatives including landowners, 2 women representatives, 2 youth representatives, 2 elders and 2 religious representatives. Thus, questions the possibility of formation of an environmental management plan.

Some of the guidelines the association is expected to accomplish are:

- Sand scooping not to exceed six (6) feet in depth.
- Designated sand collection sites should to be at least 50 meters from the riverbanks or dykes for on-farm sand harvesting.
- Scooping /harvesting to be done concurrently with restoration of areas previously harvested.
- The scooping/harvesting should be strictly open-cast harvesting.
- Appropriate extraction technology should be applied for underground tunneling to safeguard human safety.
- Sand harvesting from any riverbed to be undertaken in a way that ensures adequate reserve of the sand is retained to ensure water retention.
- Sand harvesting I not to be allowed on any riverbanks.
- Loading of sand to be done in the designated harvesting sites through controlled access points.
- No sand harvesting to take place within 100 meters of either side of any physical infrastructure including bridges, roads, railway lines, dykes, among others.

National Environmental Management Authority (NEMA)

Under EMCA, the key roles of NEMA include:

- (i) Environmental impact assessment (EIA) in sand harvesting areas as required under section 58 and the second schedule of EMCA and granting of such approvals as may be necessary or appropriate EIAs have been conducted as required under section 42(1) of EMCA
- (ii) Issuing guidelines in consultation with relevant Lead Agencies for the management of the environment in lakes and rivers as required under section 42(4) of EMCA. To this effect, the National Sand Harvesting Guidelines have been issued and rolled out to guide environmental management in sand harvesting sites through public/social effective social organization and environmentally sound sand harvesting practices. However, the guidelines are not enforceable.

District Environment Committees

The mandate of the District Environment Committees, being the legal instrument established by EMCA at the district level, includes:

- Enforcement for compliance to EMCA, EIA/EA, Regulations and the National Sand Harvesting guidelines. Indeed the DEC is responsible for the implementation of the national Sand Harvesting Guidelines.
- Providing the necessary advice and directions in sand harvesting
- Monitoring and Restoration of Designated Sand harvesting sites
- Arbitration of any disagreement regarding access, ownership, benefit sharing, management approaches in sand harvesting

Community Based Organizations

Community Based Organizations with the help of NGOs have been in the forefront in awareness, prevention and alleviation campaign of environmental degradation due to adverse effects of human activities including, mining, and quarrying.

2.8 Success Story-Sustainable Artisanal Mining

2.8.1 Case of India: - Contribution of small-scale mining to employment, development and sustainability

By Ghose, M. K., & Roy, S. (2007).

Overview

The article analyses the challenges in fostering a sustainable governance of resources by local governments, within the context of their functional responsibilities, and suggests some policy solutions. The article concentrates on the Indian context, while suggesting features of inter-governmental design that comprise the right mix of checks and balances that is essential for the good governance of natural resources.

The trend globally and in India paints scenarios in resource governance that are rapidly changing in terms of pattern, design and operation of local government. It is clear to note on one hand that how local governments run is influenced by globalization. Secondly, there is need for concerted and coordinated global action in the light of the energy crisis and climate change, and this also exerts pressure on inter-governmental systems to move towards centralization and regulatory controls. The article analyses, the local structures in India, elements of good design for real devolution, role clarity through activity mapping, and design precautions of natural resource conservation by local governments.

Lessons and Suggestions from the case study important to this study

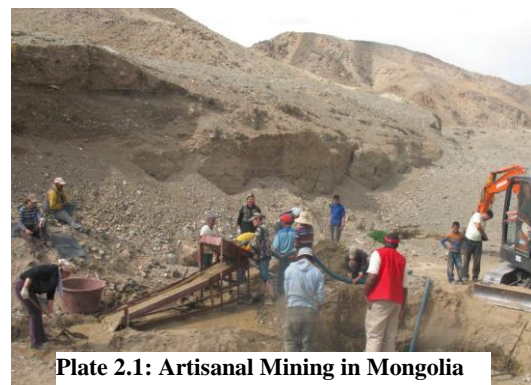
As the study reveals, Local governments should be encouraged to enter into partnerships with each other, form clusters and collaborate with private entities due to externalities that are associated with natural resource management and governance. The article further suggests that possibilities that are more flexible and which can go beyond the tiered system of local governments for the management of natural resources should be explored and further, local authorities should not be allowed to substitute their tax bases with revenues earned from indiscriminate exploitation of finite natural resources. The author also suggests that devolution of powers of licensing natural resource use to local bodies without adequate safeguards can result in unsustainable exploitation of these resources. He is also of the opinion that institution frameworks that govern the District and Metropolitan Planning Committees should be used to develop solutions for governance matters of natural resources that cut across rural and urban jurisdictions. He also suggests that it would be necessary to create a set of new fiscal instruments and arrangements for resource sharing and benefit sharing from the exploitation of natural resources.

2.8.2 Case of Mongolia - ‘Sustainable Artisanal Mining Project.’

By SDC (Swiss Agency for Development Cooperation), 2009.

Introduction

This is a case study of a success story of sustainable artisanal mining in Mongolia, with sustainable governance being one of the pillars of the achieved success. For this case, artisanal miners in Mongolia faced a host of challenges, which included lack of legal recognition and government registration. This meant that many were unable to access basic social services. On mine sites, occupational health and safety standards were not observed, and outbreaks of disease were a common occurrence as a result of poor health standards. There was also widespread and uncontrolled use of mercury during processing of gold as evidenced by mercury and cyanide contamination found in nine provinces of the Central and the Gobi regions. The study also found out that if these issues were to be addressed through the enactment of legislation and appropriate government policy and through the introduction of environmentally sound



technologies, then artisanal mining could develop into a sustainable small-scale mining sector.

To achieve this, Swiss Development Cooperation in conjunction with the Government of Mongolia launched an eight-year project entitled the Sustainable Artisanal Mining Project (SAM) to contribute to poverty alleviation in the rural area, while at the same time taking into consideration the implications for the environment. The first phase of this project sought to develop an Artisanal Small-Scale Mining Law and develop an appropriate organizational structures for miners to enable them use natural resources more efficiently and in a more environmentally friendly manner. The key players included The Ministry of Mineral Resources and Energy, Ministry of Social Welfare, and Labour, Ministry of Nature, Environment, and Tourism Mining Rescue Services, Local governments, national, NGOs, research institutions, other donors

In Mongolia, Artisanal and Small-Scale Mining (ASM) is considered as a poverty driven activity that engages more than 100,000 artisanal miners who were former herders, but have turned to exploiting gold and, to a lesser extent, coal and fluorspar in Mongolia as a source of alternative livelihood. Due to insufficient institutional arrangement, their activities were illegal except in a few places where pilot temporary regulations were being implemented. Lack of awareness and knowledge about the sector's peculiarities hindered a straightforward legal solution to the problem.

There was increasing tensions between the formal mining industry and the artisanal miners, as well as between local communities and artisanal miners. Besides, the existing artisanal mining practices caused severe environmental damage, social problems and unacceptable livelihood conditions for the artisanal miners and their families. The activities were also characterized by a lack of knowledge, skills, and inappropriate organizational structures to ensure an efficient sector management. Public opinion on artisanal mining did not recognize the development opportunities for this industry. For these reasons, artisanal miners were marginalized and lived at the edge of the society, which demanded an immediate intervention.

SAD in conjunction with the Mongolian government set out goals and objectives to try align this industry into the mainstream economic environment of Mongolia in order to spur growth and alleviate poverty in the rural area. Their main goal was to contribute to the development of responsible mining in Mongolia by working with all stakeholders to ensure that artisanal

miners are recognized as responsible members of a key economic sub-sector contributing to sustainable rural development.

Objectives set were as follows:-

1. Improve the development and implementation of a transparent and straight-forward policy and regulatory framework for artisanal mining
2. Improve the formation and functioning of institutional structures and organizations within artisanal mining at all levels
3. Strengthen the capacity of artisanal mining communities to engage in profitable and responsible mining and extended business
4. Activities aimed to reduce poverty
5. Empower artisanal miners and other resource users to address and solve ecological as well as existing social and potential conflicts responsibly (Component 4)

The objectives set out realized the need to create a legal framework, propose organizational structure of the various groups in this industry and engraved the environmental protection policies to ensure sustainability of the sector as follows :-

1. Creation of favourable legislation

Under the Minister's auspices, a Task Force was set up to develop ASM policy and regulatory framework. The Task Force developed drafts of amendments to some laws such as the Laws on Minerals, on Land, and on Taxation of Personal Incomes derived from private businesses and services. These policies and regulations created a legal framework within which Artisanal activities could be carried out.

2. Artisanal miner's self-organization

With empowering and support from the project, artisanal miners' started to be organized among themselves in forms of partnerships and cooperatives which could be recognized as legal entities. As at the time this document was being published, there were four NGOs and 300 unregistered partnerships with more than 2000 members on the project sites. The Artisanal and Small scale Mining NGOs were structured into the sub-groups as follows:-

- Executive Committee that speaks for artisanal miners' voices and rights for better recognition at local and national levels

- Social initiative group/team deals with social issues including social/health insurance, gender, savings among partnerships members, and environmental issues
- Technical and rescue group/team to address the ASM occupational and health safety issues during mining and procession operations
- Vulnerable group to reach the most excluded ones among artisanal miners.

3. Environmental Rehabilitation

Rehabilitation of ravaged sites by Artisanal miners from Jargalant and Bumbugursoums had begun by filling in extraction holes on areas of mined land. In total, 2.9 ha (1.4 ha in Jargalant and 1.5 ha in Bumbugur) was rehabilitated. In addition, partnership members in Jargalant soum undertook their own initiative to erect a fence around the natural springs they use for drinking water in order to protect the water source from pollution. The Project has been supporting such responsible initiatives and provided tractors to assist in their land-rehabilitation efforts.

Conclusion

These case studies have shown that industries requires proper governance structure in order to sustainably carry out their activities. This is more so where open access resources are concerned. Governments must be able to provide leadership in natural resource management through their own initiatives or by partnering with other research based organization. The Indian case provides lesson on cross county resource managements by encouraging partnerships with each other, form clusters and collaborate with private entities, local authorities should not be allowed to substitute their tax bases with revenues earned from indiscriminate exploitation of finite natural resources, it has also been noted that devolution of powers of licensing natural resource use to local bodies without adequate safeguards usually result in unsustainable exploitation of natural resources and also it is important create fiscal instruments and arrangements for resource sharing and benefit.

The Mongolian case provides lessons in that encouraging partnership with the local community in artisanal mining instead of admonishing the activity, and providing a localized solution to governance structures encourages sustainable exploitation of natural resources. Benefits are realized faster and in a structured way. This encourages locals to be more engaged in environmental protection for their continued benefit in socio economic gains.

2.9 Theoretical Framework

2.9.1 Sustainability in Artisanal Small Scale Mining

The exact application of sustainability principles in the mining and minerals industry has precipitated considerable debate in recent years (Hilson & Basu, 2003). There is no one definition of sustainability that has been universally adopted by the mining industry. According to Hilson and Basu (2003), the burgeoning literature combined with innumerable frameworks and indicator sets have made it extremely difficult to define sustainability in the mining context. It is even more difficult to define sustainability when addressing an industry defined by extraction of limited resources; the fact is by extraction, there is definite depletion of a resource Bredenberg (2012). Numerous interpretations and principles have been put forth by various authors, concerning sustainable mining activities. Even though, James (1999) argues that miners can achieve sustainable development by embracing the social, economic and environment pillars. Eggert (2006), further asserts that sustainable mining entails the simultaneous pursuit of sustained or enhanced environmental quality, economic growth, and social justice, and according to Labonne (1999), sustainable mining activities occasion offsetting or reinventing the benefits from the mineral asset. Laurence (2011), acknowledges that there is limited guidance for mine operators to put sustainability frameworks and theory into action on the ground. Despite that many researchers dismiss the possibility of compatibility between mining operations and sustainability goals, Laurence (2011) argues that sustainable mining activities would be feasible “if the rate of use of minerals does not exceed the capacity to find new sources, acceptable substitutes or recycle,” and as such, he suggests five key areas which should be implemented to achieve sustainable mining activities. These include the three conventional triple bottom line (economic performance, environmental performance and community benefit) as well as safety of the miners and extraction practices of the minerals as shown in figure 2.1 below.

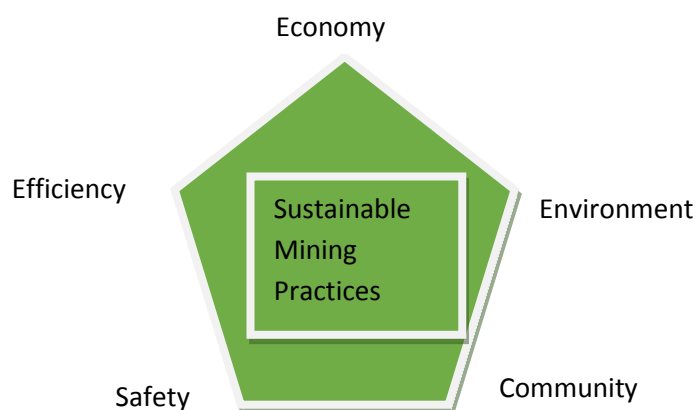


Figure 2.1: Sustainable Mining Practices

Adopted from Establishing a Sustainable Mining Operation: An Overview (Laurence, 2011)

As shown in figure 2.1 above, Laurence (2011), suggests that sustainable mining practices should be safe, demonstrate leading practice in environmental management and community engagement, should be economically robust and efficiently uses the mineral resource. If this is achieved lifespan of the mines will be optimised, the benefit to the community maximised, and the mining industry will have wider community acceptance. In this research, only three principles of sustainability were explored in artisanal sand mining in Kangonde, including economic performance, environmental performance and social/community justice.

2.9.2 Governance

Governance is constituted and legitimized by institutions (Paavola & Adger, 2005). According to Patti et al. (2011), governance is the keystone of sound natural resource management and its core principles –accountability, transparency, participation, and the rule of law – are at the heart of the efforts being made at local, national, bilateral and multilateral levels to ensure that decisions that affect natural resources and resource users are well informed and implemented equitably. Further, they advocate for transparent, sustainable, fair, and just governance of natural resources as a key for peace and sustainable development worldwide. Where actors want to increase sustainability of resource management or improve upon one of its dimensions, active governance of resource use should go hand in hand with demands for institutional change (Hirshman, 1967/1995; Robin & Stephen, 2004). In situations of weak governance, people have limited incentives to manage their resources for the long term and face significant barriers to building a sustainable livelihood for themselves. Ineffective management of common property resources can often lead to competition, over-exploitation and eventually the degradation of the resource itself. Elite capture of resource revenues can prevent the benefits generated by natural resource wealth from reaching poor

people. Insecure and biased property rights regimes can foster social and economic exclusion and generate conflict. All of these processes undermine poor people's livelihoods and increase their poverty and marginality.

Matioli (2011), says the importance of natural resources to the economy of Kenya and for combating poverty cannot be overstated. Thus, natural resources management including water, land and agriculture, forestry, sound environmental management and wildlife conservation are the key to sustainably preserving and improving the livelihoods of millions of Kenyans.

2.9.3 Sustainable Governance in Artisanal Mining

Like many authors of sustainable governance in artisanal mining, Kalindekafe (2013) emphasizes that mining has led to creation of the economic activity, financial and social infrastructure, and has as well created skilled work forces and contributed to sustainable wealth creation over time and space. Thus, the importance of organizational tools and institutional capacities needed to achieve this and to avoid lesser negative outcomes are extremely important.

According to Raghunandan (2010) the management of increasingly scarce natural resources is perhaps the most important governance challenge facing humanity today. Rather than some end point to be reached, Kalindekafe (2013) views sustainability as a path that is to be tirelessly and continuously negotiated and adjustments made accordingly, as people learn and understand the consequences and symptoms of non-sustainability.

Cordoba (2013), discusses artisanal mining as a complex reality in key ecosystems, because shaping human behavior, enhancing human development and understanding the resilience of particular ecosystems need to be at the heart of any conservation effort. Further, as she explains, standards are important tools that shape behaviors, and as well have the potential to enhance human development when linked to market access and socio-economic benefits, and would support particular criteria that serve different ecosystems and realities. Accordingly, standards initiatives such as Fair-trade & Fair-minded have demonstrated that artisanal and small scale miners are willing to adopt better practices. The success of this engagement with ASM communities partly rests on seeing miners as legitimate actors with rights and obligations and as change agents rather than as a social or an environmental menace.

The International Institute for Environment and Development (2000) ascertains that there is need to look at sustainability in mineral resource development from a multidimensional, multi angle and holistic perspective, and goes further to enlist the main themes that would define sustainability in artisanal mining to include social, environmental and economic concerns. Social concerns consider issues such as human rights of the indigenous people and ethnic minorities and community empowerment, with regards to artisanal mining. Economically, of great importance would be issues of wealth generation and distribution, financial drivers, and artisanal mining market cycles. While environmental concerns would be defined by the nature and processes of the material flows and effects to the physical and natural environments, the end uses and waste disposals. Other themes that would be of important consideration include information and transparency with regard to artisanal mining.

Artisanal and small scale mining (ASM) is a complex and diversified sector that includes poor informal individual miners seeking to eke out or supplement a subsistence livelihood, to small-scale formal commercial mining entities that can produce minerals in a responsible way respecting local laws. To enhance the quality of life of those miners working outside the legal framework and to enhance their contribution to sustainable development, the relevant institutions should consider at least consider ways of integrating informal ASM activities into the legal system.

2.10 Conceptual Framework

The conceptual framework anchors on the theoretical framework; developed based on the integration of governance structures and pillars of sustainability, limited to economic performance, environmental performance and community benefit, informed by the theoretical background, earlier discussed in this chapter.

The conceptual framework (figure 2.2 below) constitutes three major concept elements, which ground this research. They include artisanal sand mining, governance and sustainability. Artisanal sand mining is the core of the study, and as shown by the conceptual framework, the sources and processes of artisanal mining occur in open pits, river beds, ocean beads, beaches and inland dunes. Artisanal sand mining is a very important source of livelihood especially to the rural economies. Some of other benefits of artisanal mining, include development of rural areas, source of income, and poverty alleviation among others. The negative impacts of artisanal sand mining could be enlisted as depletion of the non-renewable resource,

environmental degradation, soil erosion, destruction of rivers, land degradation-abandoned open pits, change of river courses, among others.

Artisanal sand mining, and for the purposes of this study, is evaluated through the lenses of governance structures and sustainability. The governance aspect evaluates existing policy, institutional and regulatory frameworks governing artisanal mining, and their impact. The indicators measuring the performance levels of the existing governance structures are defined by the selected principles of sustainability, which include physical and environmental profiles, social and economic profiles of the community.

Sustainability is another concept important for this study, as highlighted in the conceptual framework. Although organizational tools and institutional capacities are vital for this study, the need to lessen negative outcomes associated with artisanal sand mining is extremely important for the main purpose of sustaining the present and future generations. Sustainability for this study is looked at from the standpoint of the impact of exploitation of the sand resource to the physical and environmental profiles, social and economic profiles in the study area. As it is the case from literature review, most sand miners (and other artisanal miners) are apathetic about the physical, environmental and social disorders associated with the activity, and for the few who are otherwise sensitive, the policy and regulatory frameworks if any, do little to support them. The benefits of sustainable exploitation of sand, management and conservation of the physical and natural environments, cannot be overstated, listing a few, it ensures equitable sharing of the accruing benefits, sustainable incomes and employment opportunities, safeguarded and enhanced environments, protected biodiversities, enhanced sceneries, managed land degradation, improved welfares and preservation of water sources.

Thus this study identifies a pressing need for harmonized and coordinated sand harvesting governance system geared towards sustainable sand harvesting. Sustainable governance would not only ensure the demands of the current generation are met but also those of the future generation, with regards to the mining of this depletable resource.

Conceptual Framework

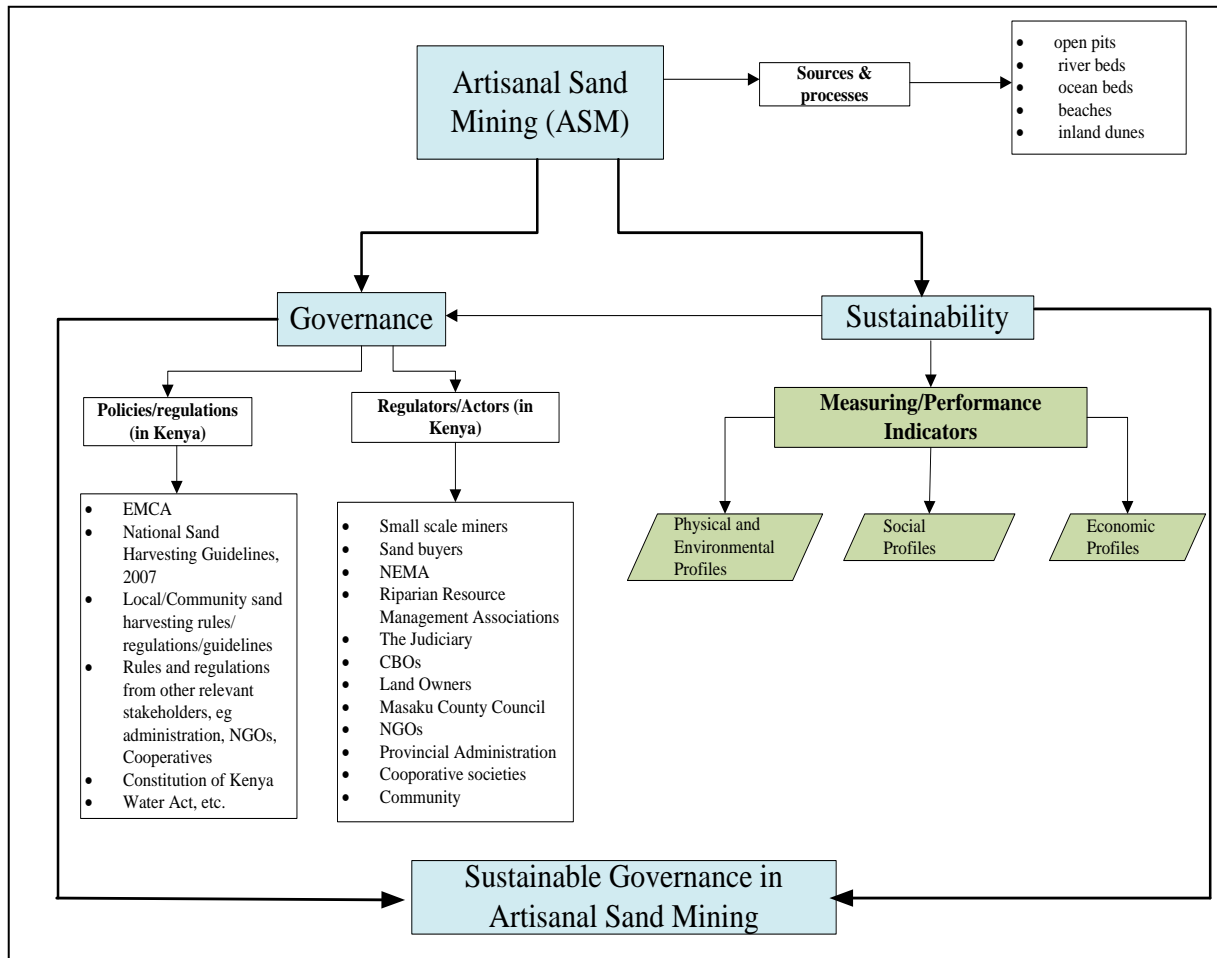


Figure 2.2: Conceptual Framework

Source: Author 2012 (modified from literature several reviewed)

2.11 Summary of Literature Review

This chapter highlighted the concepts, policies and regulations that informed this study, and especially in formulating the recommendations. The case studies (India and Mongolia) were particularly important in formulation of the sand harvesting framework for the study area. Sand harvesting guidelines 2007, are the closest that the regulatory and legislation system in Kenya comes to direct governance to sand mining. However, the sand harvesting and regulatory framework, stipulates blanket legislations that should apply to all sand miners in Kenya regardless of the prevailing differences in local contexts, and from literature reviewed, implementation of these guidelines has been quite intricate. This study suggested a governance structure that is specific to the study area; borrowing from the broad policy guidelines and legislations discussed in this chapter and the prevailing local conditions

Chapter Three: Background to the Study Area

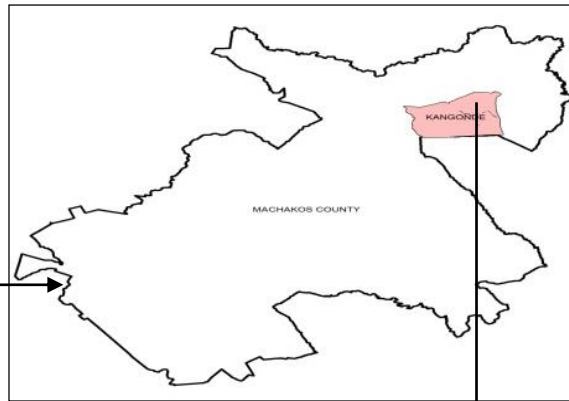
3.1 Location of the Study area

The study, Kangonde is located in Masinga District in Machakos County. In the Regional Context, Masinga District borders Kitui, Mwingi, Mbeere, Maragua, Thika and Yatta Districts. Kangonde Location is located on the south - Eastern Part of Masinga District, about 15Km from Matuu town, along the Nairobi–Embu road, 3Km off the Thika-Garissa highway. Kivaa Location borders it on the Northern part, on the western part Masinga/Ikaatini location, on the Southern by Kitui West District and on the Eastern Part by Kithyoko Location. Kangonde location occupies approximately 120 ha of land.

National Context: Kenya



Regional Context: Machakos County



Local Context: Kangonde

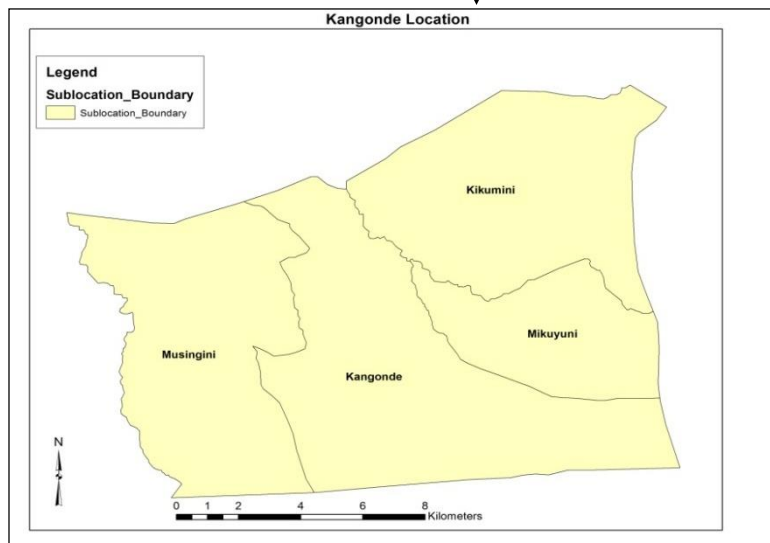


Figure 3.1: Location of the Study Area
Source: IEBC, 2012

3.2 Climate

Masinga District, in which the study area is located is part of the larger Machakos County, and is characterized by semi-arid climate, which is characterized by changes in climate that usually results in a deficiency in available moisture below levels that are normally expected. Consequently, one of the important features of the semi-arid Masinga is vulnerability to drought events. The resultant effect of this is recurrent droughts that vary in their duration, severity and spatial extent. The landscape is hilly, rising from an altitude of 1,000 to 1,600 meters above sea level.

The rainfall pattern is erratic and unpredictable with rains of less than 500mm annually. It has a bimodal rainfall pattern; with short rains occurring between November to December and the long rains in late March to May. Temperatures are relatively high, ranging between 27⁰c and 30⁰c. The coldest months are June to July, while the hottest months are august and September. Drought in Masinga Division is not a new phenomenon. The division is located in the semi-arid environment, ASAL area represent 84% of the land, thus most of the land remains largely underutilized.

3.3 Topography and Geology

The study area Kangonde is situated in Machakos County, it has varied topography ranging from undulating to flat, with a number of small hills, rising from heights of 4,700ft to a low of 3800ft above the sea level. The underlying rocks are volcanic lavas, tuffs and basement complex. The underlying rocks and the undulating hills provide ideal physical environment for the formation of sand particles. Figure 3.2 below is a digital elevation model of the study area generated from top sheets of the study area using surfer 8 software.

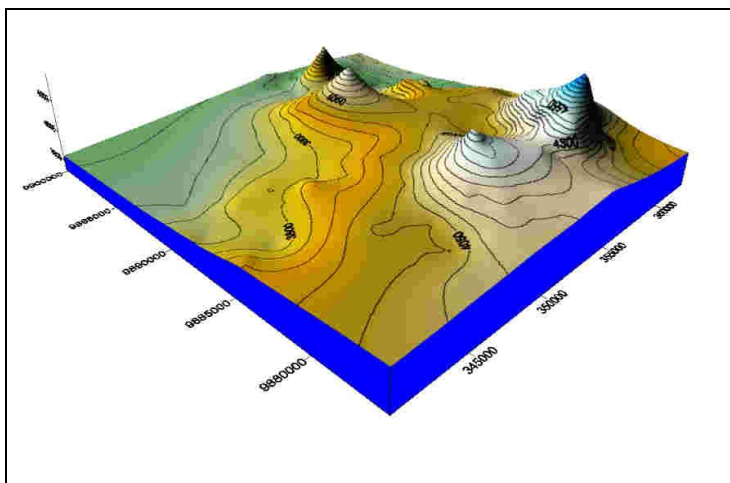


Figure 3.2: Digital Elevation Model of the Study Area
Source: Modified from top sheet 136_4 - Survey of Kenya



Plate 3.3: Dry River Beds In the Study Area
Source: Field Survey, 2012



Plate 3.4: Gabions built for trapping sand
Source: Field Survey, 2012

3.6 Population of the Study Area

The total population of Kangonde location, according to 2009 Kenya population census is 15,458, with 8,025 females and 7,533 males. At a population growth rate of 1.7% per annum against the country's population growth rate of 3%, the study area's current population is projected at 16536 persons. The most populated sub location according to 2009 population census is Kikumini with 4514 persons, followed by Kangonde with a population of 3,965. Musingini comes third with a population of 3965 and lastly is Mikuyuni sublocation with a population of 2,846. Amongst the four sub locations, Mikuyuni has the highest population density of 112 persons per square km, followed by kikumini at 87 persons per square kilometer, then Musingini at 74 persons per square km, and lastly Kangonde at 61 persons per square km, according to 2009 household and population census data, as shown in table 3.1 below.

Table 3.1: Population of Kangonde Location

Sublocation	Population 2009	Projected Population 2013	Area Coverage (km ²)
Mikuyuni	2846	3045	25,4
Kangonde	4133	4421	67,8
Musingini	3965	4242	53,6
Kikumini	4514	4829	51,9
Total (kangonde Location)	15458	16536	199

Source: Modified from Kenya Population Census, 2009

Population Distribution per Sub Location

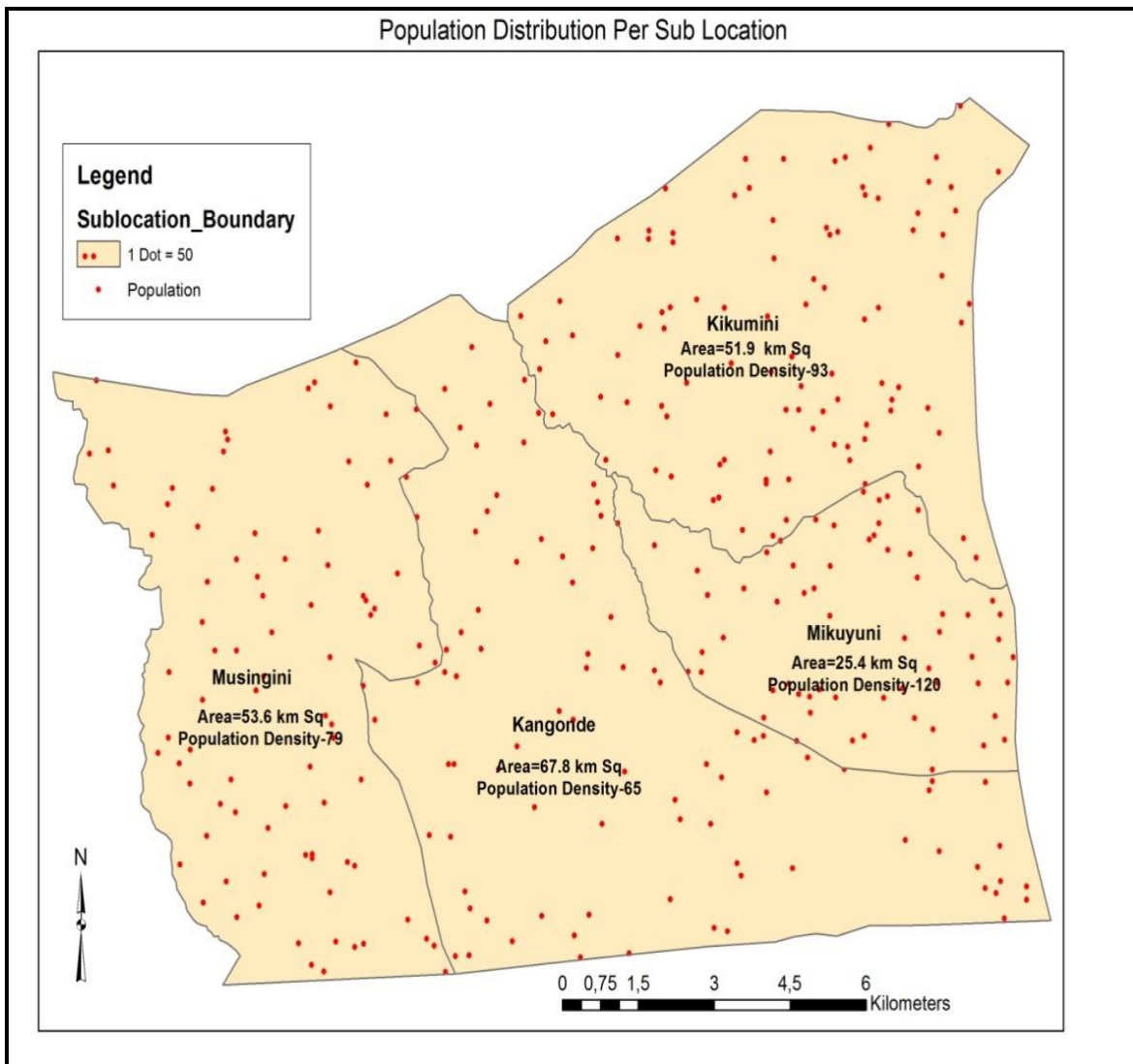


Figure 3.4: Sub location Boundaries and Population Distribution in the Study Area

Source: Modified from KNBS Data, 2009

Chapter Four: Research Methodology

4.1 Introduction

To achieve the study objectives, the research methods on artisanal sand mining involved two major aspects, namely governance and sustainability. The governance aspect was measured through the lenses of sand harvesting regulators/and actors in the study area, while sustainability was measured through sand harvesting ‘performance’ indicators (including socio-demographic profiles, economic profiles, physical and environmental profiles). These aspects were correlated to the sand harvesting activity and used to analyze the benefits/non benefits of sand harvesting, hence the weaknesses/strengths of governance structures, understand and analyze the governance structures, establish the level of sustainability of the resource and inform recommendations for the study.

Research methodology for this study was largely informed by case study approach. With the broader view of artisanal mining largely informed by secondary data sources, it was also important to have a test of the empirical reality of artisanal sand mining, therefore necessitating a real time investigation.

4.2 Reconnaissance Survey

A two days detailed reconnaissance of the project area was undertaken which facilitated familiarization of the study area, delineation and fine tuning of the project scope, and appreciation of its challenges and opportunities.

Initial meetings with key stakeholders including area chiefs (Kangonde and Mikuyuni) and sub chief (Kikumini) and Masinga sand harvesting cooperative society representatives were conducted.

4.3 Pilot survey

A one day pilot survey was conducted with twenty questionnaires. This process was considered vital for the study, as it involved testing the actual practicability of survey instruments, in facilitating collection of the expected data, test the capability of the research

assistants, familiarization with the study area and testing the reliability of the sampling frame. A few adjustments were done to the survey instruments, on completion of the pilot survey.

4.4 Data Requirements

Data that was required for this study included:

Table 4.1: Data Requirements

Data Requirements	Objective Covered
Socio-demographic profile of the study area	Objectives 2,3 and 4
Base maps showing the study area, and sand harvesting areas	Objectives 1,2,3 and 4
Economic Profile	Objective 3 and 4
Environmental Profile	Objective 3 and 4
Physical profile	Objective 3 and 4
Existing sand harvesting governance structures	Objective 1, 2 and 4

4.5 Data Collection

4.5.1 Introduction

Data collection was an important component of research methodology, for three main purposes, namely description of the present situation in the study area, as input for formulation of project proposals/recommendations and as a base to implementation. The study aim and objectives formed the basis for data collection and analysis.

The procedure undertaken for data collection was as follows. First, an inventory of existing data (from secondary sources) was undertaken to establish the gaps or data that would be required from the primary sources. Available data resources were established and analyzed, survey instruments selected, sampling designed and field survey plan thereby instituted. A pilot survey was conducted for one day, with twenty questionnaires, to test the survey instruments which led to a few adjustments of some of the instruments. Fine tuning of the sample was also informed by the pilot study.

Data collection was done at two levels, from secondary sources and primary sources.

4.5.2 Secondary Data Collection

Data was collected from various sources, including District Environment Office, District Commissioner’s Office, County Council of Masaku, District Development Officer’s Office, and Internet sources (Kenya law reports). The secondary data sources were primarily reviewed through desk reviews, after which contextual analysis and synthesis of findings was done particularly to furnish study objectives 1 and 4.

A key interest for contextual analysis for this study was National Sand Harvesting Guidelines which spells out comprehensive considerations with regards to sand harvesting, expected to be applicable in any part of the country. Extensive literature authored on artisanal mining and sand harvesting was from the above mentioned sources were considered. Other important legislations that were reviewed included Environmental Management and Coordination Act; The Constitution of Kenya, 2010; Kenya’s Vision 2030; The Mining Act 2030; by laws on sand harvesting; brochures and journals on sand mining/harvesting; as contextualized in table 5.1.

4.5.2 Primary Data Collection

Primary data collection was generally achieved through the following key data sources, and data collection methods;

Table 4. 2: Data Collection Units

Data collection sources/units	Households, institutions, individuals
Data collection methods	direct interviews, discussions, recording, structured questionnaires, mapping, photography, field observations and checklists
Respondents	Household representative (above 18 years of age) and key informants

4.6 Data collection Sources

4.6.1 Key Informants

Key informants formed another critical component of primary data source for this study. They were interviewed using interview schedules, recording, discussions and photography to inform the study on critical matters on the subject of current conditions of sand mining, and

the initiatives being undertaken by the public, private and other interest groups on sand mining.

The key informants interviewed included: District Officer (1) for Masinga, District Environmental Officer-NEMA, District Cooperative Officer (Masinga), Chief of Kangonde Location, four (4) sand loaders, two (2) representatives from Masinga and Kandamasi Cooperative Societies, eight (8) land owners, three (3) sand transporters/buyers, two (2) section leaders, two (2) sub chiefs (the sub chief of Kangonde and sub chief of Musingini), and Two community elders, from Kaseve and Mukunga villages.

Data collected from the key informants was mostly related to the sand harvesting institutional structures and capacities, rules and regulations governing sand harvesting, sand harvesting sites/locations, socio-economic impacts of sand harvesting and the challenges of sand mining in the area. Principally, the key informants addressed all the study objectives, and their responses to sand harvesting issues in the region were rather uniform.

4.6.2 Household based Survey

Household based survey was conducted for 104 households, in accordance to the sampling design, detailed out under section 4.8.1 below. This was predominantly to get insight on people's opinions on the sand mining activity in the study area (on policy and regulatory frameworks, accrued benefits) and to seek their opinions on addressing the study objectives.

The household surveys were conducted using structured questionnaires (which involved direct interaction between the researcher and the respondent), and largely constituted closed ended questions. A few open ended questions generally sought data on respondents' opinions and recommendations on specific questions. The close ended questions however, were guided and precise. Both types, allowed for multi-responses for some questions to a maximum of three answers per multi response question. Other methods used to collect household based data included field observations, photography, and face to face discussions.

4.7 Data Analysis Methods

Data analysis method was determined by the type/nature of data collected and the expected outputs from the data, informed by the study objectives. Contextual analysis was undertaken

for data collected from secondary sources. Data collected from household surveys was analyzed using SPSS (Statistical Package for Social Scientist), an application which was deemed adequate for undertaking statistical analysis. The process of data analysis of household based data was preceded by data coding and data entry, after which data corrections were performed, especially to cover for non-responses. Various statistical analyses were thereafter performed. Descriptive statistics were performed on all the sectors covered in the household questionnaires, which were also correlated as deemed appropriate to achieve the expected outputs, as detailed out in the next section-results.

Multiple response analysis was performed for questions with more than one answer, especially on questions that touched on the social, economic and environmental indicators. Cross tabulations, were performed for some variables that could be related as deemed appropriate for this study. As well, correlations and regressions analysis were performed to establish the level of relationship between indicators, deemed appropriate for this study.

4.8 Sampling Design

4.8.1 Sampling Method

For household surveys, cluster sampling was considered where the target population was divided into four clusters based on the sub locational administrative boundaries, as informed by Lohr (2010), thereby forming four clusters (Kangonde, Musingini, Kikumini and Mikuyuni)-figure 3.4. Thereafter, convenience sampling was used for selecting households that participated in the survey. Convenience sampling was considered because of the geographical nature of the settlements/households, which were so sparsely located and also due limitation of financial resources. Purposive non random sampling method was used for key informants.

4.8.2 Sample size

In selecting the sample size, various factors were considered including available time and financial resources, variability of the population (which was considered relatively homogeneous based on the study topic), confidence level, precision level and the population size. At precision levels (sampling error) of + or -5 %, (based on balancing of expected accuracy level and available time and financial resources), confidence level of 95% and at 20% degree of variability- level of 2. Adopted from Watson (2001), (Watson's table on how

to determine a sample size) as shown in appendix 1, suggests a sample size of 101 units for a population of 15,000 elements. Thus, a sample size of 104 units (for household surveys) and twenty seven (27) key informants was considered optimal and reliable based on the expected data requirements (and the identified data gaps) for this study, with 10% of the sample units expected to cover for non-responses.

The 104 units were shared proportionally amongst the four clusters, based on the based on the ratio of total number of households in the location vis a vis the number of households per sub location per cluster and level of variability as follows:

Table 4.3: Sample Size Distribution for Household Based Survey

Sub-Location Name	Population size	Area(km2)	No. of households	Actual Percentage Sample Size	Sample Size
Kangonde	4514	67.3	826	26%	29
Musingini	3965	53.3	795	25%	23
Kikumini	4133	51.7	947	30%	37
Mikuyuni	2846	25.4	569	19%	15
Total	15458	197.7	3137	100%	104

Source: IEBC, 2009

Chapter Five: Results and Discussion

5.1 Regulatory, institutional and policy frameworks governing sand harvesting in Kenya

This section addresses the first objective of this study as stated above. Table 5.1 below represents a contextual analysis of the existing governance structures of sand harvesting in Kenya, outlining the data reviewed and the objectives addressed

Table 5.1: Contextual Analysis of Secondary Data Sources

National Sand Harvesting Guidelines	Provided data on the existing sand harvesting policies and guidelines Addressed Objectives: 1 and 4
Constitution of Kenya	<p>The constitution of Kenya advocates for sustainable and productive management of land resources; sound conservation and protection of ecologically sensitive areas; ensuring sustainable exploitation, utilization, management and conservation of the environment and natural resources, and ensure the equitable sharing of the accruing benefits; protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities; encourage public participation in the management, protection and conservation of the environment; establish systems of environmental impact assessment, environmental audit and monitoring of the environment; eliminate processes and activities that are likely to endanger the environment; and utilize the environment and natural resources for the benefit of the people of Kenya.</p> <p>All these measures directly relate to sand mining, as an environmental and land based natural resource</p> <p>Addressed Objectives: 1 and 4</p>
EMCA, 1999	Provisions on protection of the environment were reviewed from this Act through the planning and operational guidelines advocated for, value(s) of natural resources, legal and fiscal incentives towards protection of the natural environment, in which sand mining sites fall

Addressed Objectives: 1 and 4

The Mining Act The Mining Act exempts sand as a mineral, thus does not govern its exploitation. However, it is considered a mineral by the ministry of Environment and Natural Resources

Addressed Objectives: 1 and 4

Vision 2030 Under the social pillar, one of the flagship strategies advocated for by Vision 2030 is efficient use of natural resources.

Addressed Objectives: 1 and 4

Land Act Stresses on protection measures of land based resources and land ownership

Addressed Objectives: 1 and 4

County Government Act Of interest from this Act, relevant to the study is the fact that county governments are encouraged to invest proceeds of sand cess in environmental conservation activities and local community projects in the district. **Addressed Objectives: 1 and 4**

From the literature reviewed, existing regulatory, institutional and policy framework relevant to sand harvesting activities in Kenya shows that there are provisions through policies and regulations on environmental protection in a broad-spectrum, that cover all the natural resources, of which the actors are expected to adhere to. There however exists gaps and overlaps in the implementation procedures of these provisions, which although are meant to protect the environment, are inadequate in specificity. The guidelines and provisions also do not harness the multisectoral and intricate existence of the natural resources, of interest, are issues of socio-economic benefits accrued from exploitation of these resources, thus issues pertaining their governance.

Analyzing the activities of sand harvesting in the study area, including perceived benefits and challenges necessitated acquisition of first-hand information from the actors, as well as gathering vital information of performance of other livelihood indicators in the area. Where

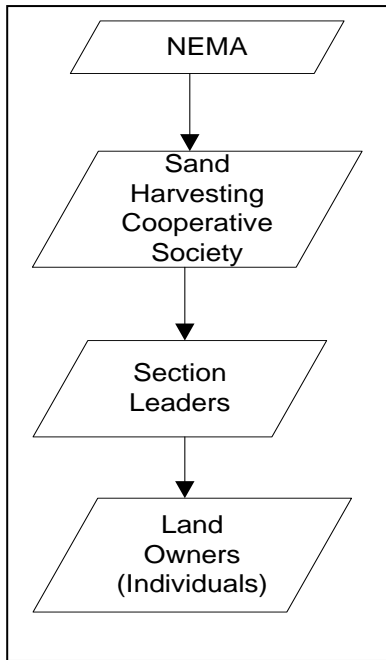
then, would this study place sand harvesting as a livelihood activity, and what would be the recommendations towards its sustainability?

5.2 Existing Governance Structures in the Study Area and their Impact

This section covers results that relate to the second objective as stated above. In order to investigate the existing governance structures of artisanal mining in the study area and their impact, interviews were conducted with key informants and household representatives. One of the most important issue that repeatedly came out in the interviews and discussion with the provincial administrators is that sand harvesting management should be done at the local level since they believe that the communities know their problems best, and should be involved at all levels of formulating rules and regulations on sand harvesting. They proposed that coordination amongst the various interest groups would go a long way towards sustainable harvesting. Some group leaders however, form groups for their own benefits; “they eat money and go” according to the chief.

The administrators were also of the opinion that all the stakeholders involved should come up with practical guidelines that would help the community. They noted that NEMA has good policies and regulations that are not implementable, since they are not area specific, and the institution lacks human capacity to oversee the localization, implementation and monitoring of NEMA policies. According to the respondents, the community apparently understand their area best, and can therefore assist in coming up with practical guidelines. Community sensitization of the good and ills of sand mining was also proposed by the respondents.

As part of the Provincial Administration structure, two sub chiefs were interviewed, the sub chief of Kangonde and sub chief of Musingini. They had administrated the area for 10 years and 5 years respectively. Both sub chiefs acknowledged that there exists two sand harvesting cooperative societies namely Masinga and Kandamasi. According to the sub chiefs, the functions of the cooperative societies included levying sand transporters, conflict resolution amongst land owners, maintaining law and order and ensuring security for sand transporters. The role of the provincial administration outlined by the sub chiefs as far as sand harvesting was concerned, is to maintain peace and order and guarantee security for residents. The sub chiefs proposed that NEMA should also ensure that sand is not harvested at night, as well as address the environmental concerns.



Sand harvesting regulatory structure in the study area as given by the sub chief of Kangonde sub location

Figure 5.1: Existing Sand Harvesting Regulatory Structure according to the Sub Chiefs

Source: Field Survey, 2012



Plate 5.1: Sand Loaders
Source: Field Survey, 2012

Sand loaders formed another important group interviewed for this study. Four sand loaders were interviewed, two of them belonged to a registered cooperative society - Kandamasi (in which they paid membership fees of ksh. 200), and two of them were independent loaders. The loaders confirmed that the

group is registered, has officials and is made up of approximately 300 members. The loaders who worked under cooperative societies admitted that they get dividends, and this makes their work easier as opposed to working as individuals. They mentioned the roles of the cooperative society as that of harvesting sand, selling sand and collecting revenue from sand harvesting, dividing responsibilities amongst the members, distributing dividends to members and collecting levies from the Lorries passing through barrier within their area of operation. According to the loaders, the members of kandamasi cooperative society harvested sand from Makila River, Iluuma River, Tulyumumbu and Inyaanza River, within the extent of the administrative boundary of Kangonde Location.

Loaders from kandamasi cooperative society mentioned NEMA as the authority issuing licenses for sand harvesting to cooperative societies and land owners adjacent to the rivers, contradicting opinion by the individual loaders who said that there are no permits/licenses issued for sand harvesting. Being a member of a cooperative societies attracted some benefits which were listed as being paid dividends, being offered job opportunities, and diversification of investments by acquiring properties for members, as for the case of Masinga Cooperative Society. The loaders suggested that the government should be directly involved in streamlining sand harvesting activities, and open a direct link between sand harvesters and the final sand users (markets). The existing governance structure according to them is disjointed and therefore denies them the opportunities to derive more benefit from this resource.

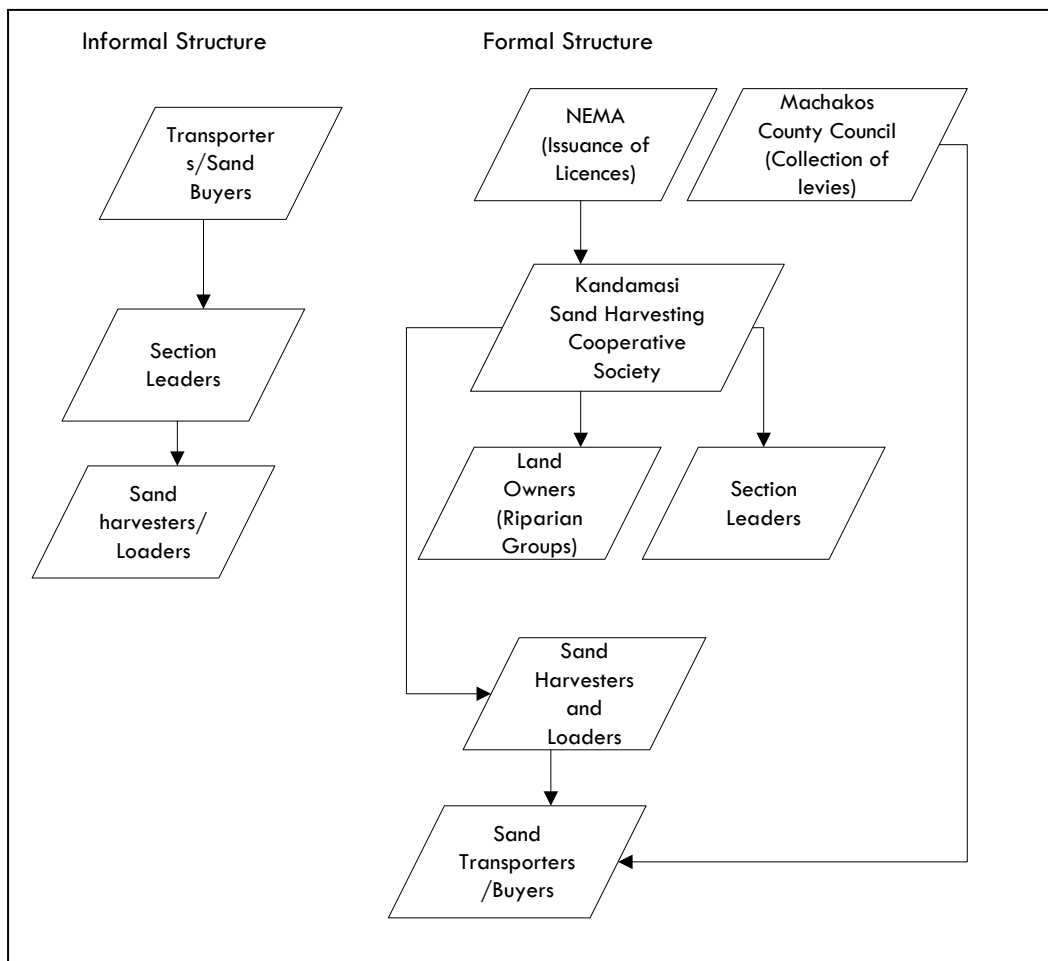


Figure 5.2: Existing Sand Harvesting Regulatory Structure-According to the Sand Loaders
 Source: Field Survey, 2012

Two representatives from Masinga and Kandamasi cooperative societies were interviewed for this study. The two had lived in the settlement for 48 and 46 years respectively. Masinga cooperative society had existed since 1995, while kandamasi cooperative society had existed

since 2006 according to the respondents. Both cooperatives had been registered by commissioner of cooperatives according to the respondents, and licensed by NEMA upon carrying out an Environmental Impact Assessment report on sand harvesting. Both cooperative societies are purportedly answerable to the district cooperative officer. The cooperative societies had visions of improving the lives of their members; through developing strong asset base and diversified investments. According representatives of the two cooperative Societies, the societies offered employment opportunities and engaged in the construction of dams for drinking water, an opinion which was shared by the loaders who had been previously interviewed.

Both representatives said their cooperatives represented land owners and loaders in the sand harvesting industry. Other functions included sand harvesting and selling, levying cess on vehicles transporting sand, repairing of access roads to the sand mines. The officials from both cooperatives societies were charged with management and running operations of the organization, recruitment of members in sand harvesting activities and selling of sand, distributing duties amongst their members, collecting and banking proceeds from sand and paying dividends to the members.

Masinga Cooperative Society had 1300 members, while Kandamasi cooperative had 290 members. Some of the conditions for being a member of Masinga cooperative society included;

- One must be a resident of Masinga Division
- One must pledge his/her support to the activities of the society
- One is required to purchase shares each costing 100/=; all members must have equal the number of shares.

For Kandamasi cooperative society, some of mentioned conditions for membership were as follows:

- One must be either a resident of Kaseve, Kwandei or Uvaani villages
- One must pay subscription fee of 200/=

Masinga cooperative society controlled sand harvesting at Tulimiyumbu, Iuuma, Karwea, Tulimikuyu (Ikalakala), Itooma, Masaku, Inyaanza for the entire Masinga division according to the respondent. Kandamasi cooperative society controlled sand harvesting in Iuuma River,

only within kangonde Location, according to the respondent. Sand was harvested throughout the year but in varying quantities. Loaders for both cooperative societies were locals who are members of the societies. The respondents also mentioned that it was the responsibility of the management to establish links with customers from different areas while at the same time, it emerged that some customers just came by on learning/hearing about the quality of sand in this area.

The land owners form riparian groups for sand harvesting. According to the representative of Masinga society the riparian groups report to the cooperative society. The representative of kandamasi society indicated that the cooperative pays the land owners for damages caused to their land during sand harvesting. It was however not clear how this payment was quantified. The representative of Masinga Society indicated that they associate with NEMA who issue temporary bans on sand harvesting during dry seasons and with the county council, who issue licenses.

Eight land owners who had lived in the settlement for between 28 and 57 years were interviewed. They were from kaseve, Mukunga, Inyaanza, Makila, Tulimiumbu, and Iuuma, Their parcel of land ranged between 0.25 acres and 2 acres. Only two of them belonged to any sand harvesting cooperative society. Some of the benefits the two listed for belonging to the cooperative societies was that they get collective bargaining power for sand, protects their rights as land owners, they receive dividends, benefit from projects undertaken by the societies and enjoy controlled pricing which protects them from exploitation by buyers. They also mentioned the groups faced challenges in controlling sand harvesting, selling sand, paying dividends to members and they faced resistance from land owners who are non-members. Transporters also at times refused to pay levies.

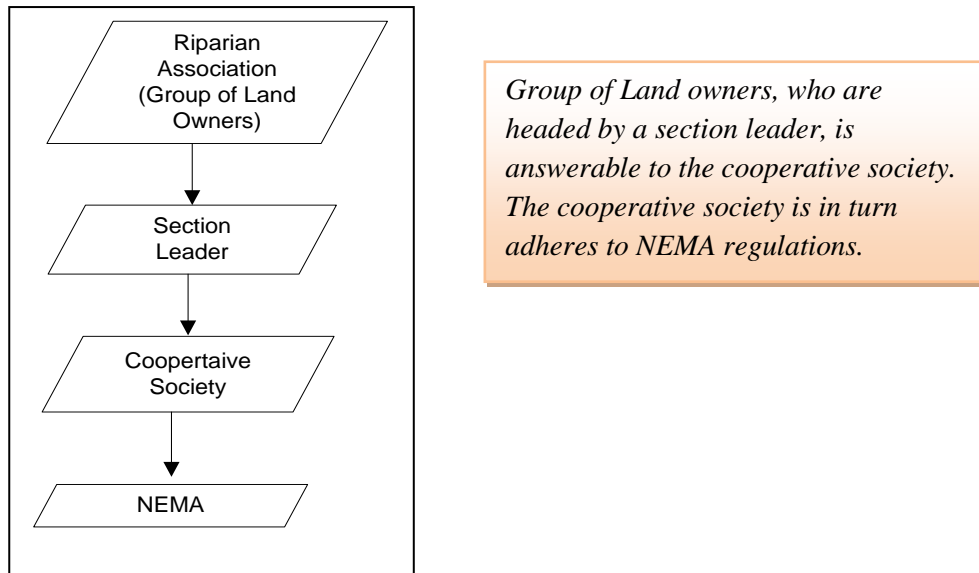


Figure 5.3: Existing Sand Harvesting Regulatory Structure according to the Land Owners

Source: Field Survey, 2012

Land owners reportedly have explicit rights to sand harvesting. According to the respondents, among other roles and responsibilities the land owners are expected to adhere to include surrendering part of their land as access roads, assisting in sand harvesting, giving guidance/directing sand harvesters to areas with has potential for sand harvesting and allowing sand harvesting on their lands. The land owners have good relations, and among other activities that they undertake jointly are finding ways in which sand mining can be undertaken without compromising farming activities. They also find ways of optimizing sand harvesting without compromising each other's rights. However, some respondents said that there are conflicts between those who are for and those against sand harvesting. For others though, they negotiate, and resolve conflicts amongst the land owners through riparian groups.

Three sand transporters were interviewed for this study, they ranged between 30 to 35 years old. The transporters listed only two rules they were aware of; that sand should not be harvested at night and sand harvesting bans by NEMA should always be respected. They recommended that the local authorities liaise with sand harvesting groups in maintaining the access roads.

Two section leaders who had had lived in the settlement for 33 years and 39 years respectively were also interviewed. Both of them did not belong to any sand harvesting group; neither did they have any links or associations with any sand harvesting regulators. They listed their roles in sand harvesting industry as loading and receiving loading fees from

transporters/buyers on behalf of the loaders, and sharing the money amongst them. These are informal groups, which are run by cartels

The two said there was no chain of command between them and any organization, and as such everybody was equal, and they did not report to anyone. They didn't therefore require asking for permission from anyone to harvest sand; they also lacked sand harvesting permits.

According to the section leaders, most land owners complained about sand harvesting, but they were okay with proceeds from the sand. The section leaders indicated that gabion construction is a very expensive undertaking and that the government should get involved. They said that gabion construction along rivers prevent encroachment into people's lands.

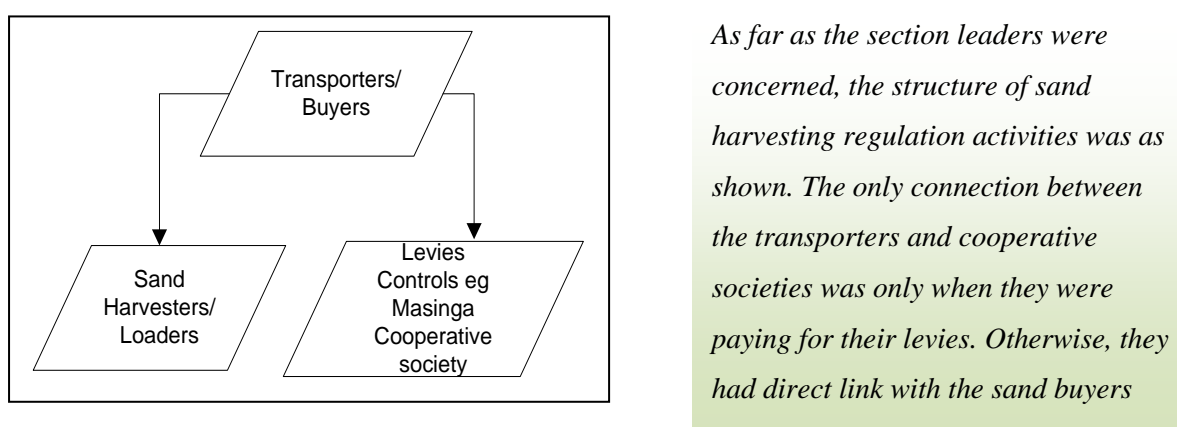


Figure 5.4: Existing Sand Harvesting Regulatory Structure according to the Sand Transporters

Source: Field Survey, 2012

Two community elders, from Kaseve and Mukunga villages who had lived in the study area for 8 and 17 years respectively were also interviewed. According to them, they were not linked to the management of sand harvesting in any way. They however acknowledged Masinga cooperative Society and Kandamasi Cooperative society as the existing sand harvesting groups, listing their functions as those of harvesting and selling sand and resolving conflicts amongst the land owners within the community. They suggested that the central government should take over sand mining activities to ensure everyone benefits as well as standardize sand buying prices. NEMA should also take up its responsibility of ensuring that sand is only harvested during the day. The community elder of kaseve outlined the existing sand harvesting governance structure as follows:

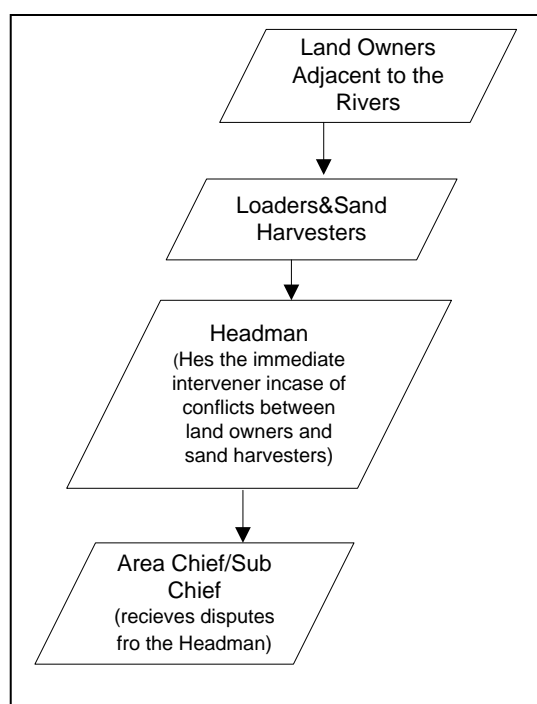


Figure 5.5: Existing Sand Harvesting Regulatory Structure according to the Section Leaders

Source: Field Survey, 2012

5.2.1. Summary of Results

The following is a summary of the main issues from the key informants on governance structures and their impact in the study area.

Table 5.2: Summary of Emerging Issues from Key Informants on Governance Structures

Section	Emerging issues
Existing Cooperative Societies	<ul style="list-style-type: none"> - Masinga cooperative society - Kandamasi cooperative society
Membership	<ul style="list-style-type: none"> - Kandamasi 290-300 members - Masinga 1300 members
Benefits of being a member of a cooperative societies	<ul style="list-style-type: none"> - Dividends - Eases work (sand harvesting) - Acquisition of assets and properties - collective bargaining power for sand - protects their rights as land owners - controlled sand pricing
Roles/responsibilities of Cooperative Societies	<ul style="list-style-type: none"> - sand harvesting - selling sand, collecting and banking proceeds from sand - issuing dividends to members - dividing responsibilities amongst members - collecting levies from sand transporters - Representing land owners and loaders

	<ul style="list-style-type: none"> - Repairing of access roads to the sand mines
Challenges of cooperative societies	<ul style="list-style-type: none"> - controlling sand harvesting - selling the sand - paying dividends to members - resistance from land owners who are non-members - Resistance by transporters in paying levies
Permits issued by	<ul style="list-style-type: none"> - NEMA - Local Authority - for others, no permits issued
Payments	<ul style="list-style-type: none"> - To land owners to compensate for damages on their land, for scooping sand from their land and for surrendering part of their land for access roads
Rivers where sand mining is undertaken	<ul style="list-style-type: none"> - liuuma River, Makila River, Tulimikuyu River, Karwea River, Itoma River, Tulyumumbu and Inyaanza River
Customers/Clients for Sand	<ul style="list-style-type: none"> - clients came by themselves - waiting for clients by the road side or at the shopping centers
Customers came from	<ul style="list-style-type: none"> - Nairobi City, Mlolongo town , Ruiru town, Thika town, Kitui town, Embu town Makutano town , and Matuu town
Proposed recommendations to the challenges	<ul style="list-style-type: none"> - sand harvesters and loaders to unite, and set better prices for sand - direct involvement of central government in streamlining sand prices, creating a direct link to the final consumers and generally ensuring the entire community benefits - Do away with periodic sand bans - NEMA should also take up responsibility in ensuring sand is only harvested during the day.
Existing Sand Harvesting Governance Structure	<ul style="list-style-type: none"> - Varied; as presented by sand loaders, section leaders, sub chiefs and sand transporters.

Source: Author, from field Survey 2012

This study also sought to establish existing policy and regulatory frameworks from household



Plate 5.2: Masinga Cooperative Society
Source: Field Survey, 2012

survey. The study established several sand harvesting actors, which can be grouped into two broad groups, community based structures and government based structures (figure 5.6 below). Community based actors comprised sand harvesting cooperative societies (Masinga, Musingini and Karwea) , Kandamasi water project society, village elders, land owners adjacent to the sand harvesting

sites, self-help groups (Ngumo, Mukondo, Kikwasa,) and the community at large. According to the respondents, the government arm was represented by the DC, Chiefs, sub chiefs and NEMA.

Cooperative societies, as a formal structure formed the largest part of community representation, with Kandamasi Water Project Society getting the biggest share of responsibility at (25%), and others like Karwea Sand Harvesting group (7.7%) and Masinga Sand Harvesting group (5.8%) (Figure 5.6 below). It is however interesting to note that Kandamasi Water Project Society, having the highest percentage, is more proactive in protecting the water resources and not as direct sand harvesting governor, but its role in the community is much felt, than the direct sand harvesting governors (societies). Area chiefs also were listed as significant sand harvesting regulators. A majority of (10%) simply didn't know the regulators in the sand harvesting industry, and this prompts the questioning of how they undertake the activity without any governing structure, or would it be that they are non-existent as suggested by 4% of the respondents, or they are irrelevant?

Multiplicity of regulators was a definite outcome of the study, without any definitive structural organization. Duplication of roles and responsibilities was one of the consequences of the existing 'structure', with other important roles and responsibilities completely evaded by all the actors. As shown by Table 5.3 below, these actors undertake several roles including regulation of sand harvesting activities, (21%), implying it is a role undertaken by quite a number of the actors, to the least popular roles of environmental management (1%), maintenance of riparian reserves (1%) and provision of security, also at 1%. Effectiveness of regulators in executing their perceived duties was rated at 56%, by the respondents.

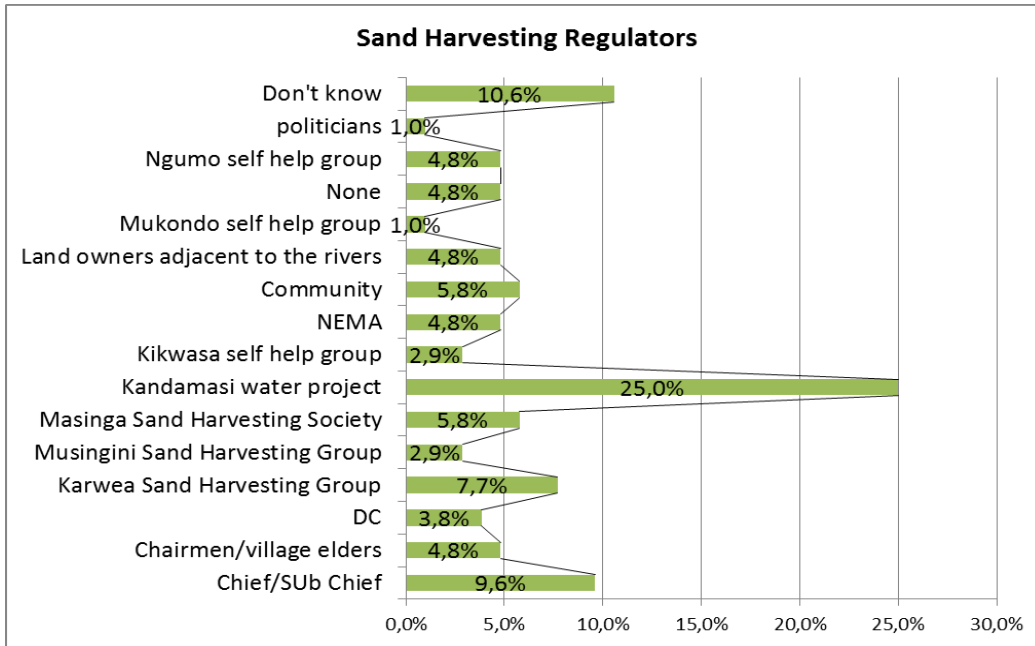


Figure 5.6: Sand Harvesting Regulators

Source: Field Survey, 2012

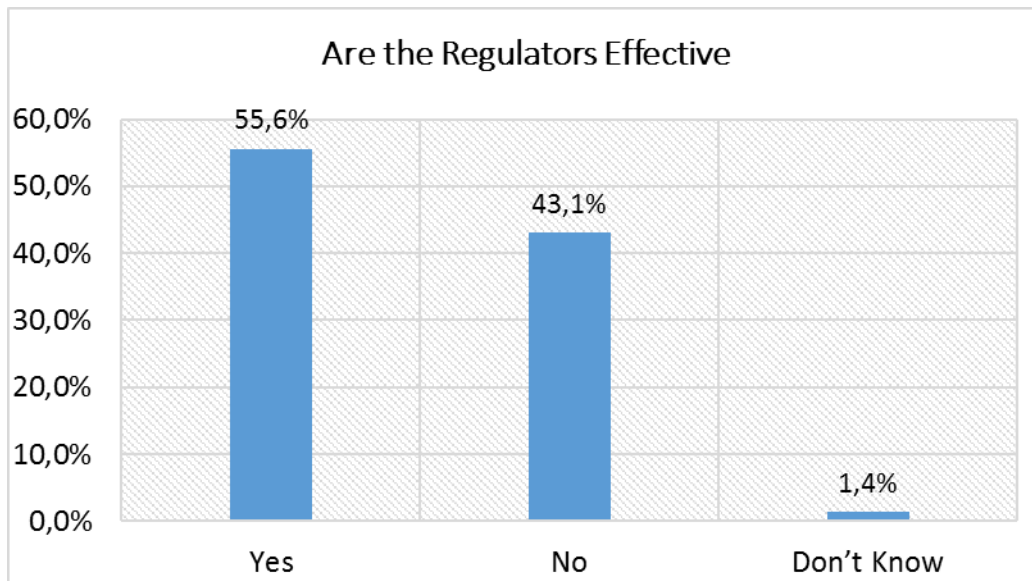


Figure 5.7: Effectiveness of Regulators

Source: Field Survey, 2012

Table 5.3: Roles and Responsibilities of Sand Harvesting Regulators

Roles and Responsibilities of Sand Harvesting Regulators				
		Responses		Percent of Cases
		N	Percent	
Roles and Responsibilities of sand Harvesting Regulators	Management of trade to reduce corruption	4	4,4%	5,7%
	Sell sand	6	6,7%	8,6%
	Maintain Peace	3	3,3%	4,3%
	Ensure sand sellers are paid	2	2,2%	2,9%
	Savings for the community	3	3,3%	4,3%
	building gabions	12	13,3%	17,1%
	Collect revenue from sand trucks	8	8,9%	11,4%
	Offer Casual employment	3	3,3%	4,3%
	Construct Bridges	2	2,2%	2,9%
	road repairs and maintenance	6	6,7%	8,6%
	Provision of security	1	1,1%	1,4%
	regulate sand harvesting activities	19	21,1%	27,1%
	Plant trees	4	4,4%	5,7%
	maintenance of the riparian reserves	1	1,1%	1,4%
	Sink boreholes	1	1,1%	1,4%
	stop sand harvesting	8	8,9%	11,4%
	Environmental management	1	1,1%	1,4%
	sand harvesting	2	2,2%	2,9%
Don't know	4	4,4%	5,7%	
Total		90	100,0%	128,6%

Source: Field Survey, 2012

Table 5.4: Proposed Improvements Policy and Regulatory Framework for Sand Harvesting

Proposed Changes/Improvements				
		Responses		Percent of Cases
		N	Percent	
Changes/ Improvements in policy and regulatory framework for Sand Harvesting	NONE	6	5,6%	7,1%
	Good payments for sand loaders	1	0,9%	1,2%
	Good prices for sand	10	9,3%	11,8%
	set up an organization to control sand harvesting and marketing	9	8,4%	10,6%
	Formal registration of the sand harvesting group	2	1,9%	2,4%
	Lorry for the group	1	0,9%	1,2%
	Stern action against sand stealing	1	0,9%	1,2%
	Strict enforcement of rules and regulations on sand harvesting	9	8,4%	10,6%
	stop sand harvesting	25	23,4%	29,4%
	Construction of gabions	9	8,4%	10,6%
	control the amounts of sand harvested	1	0,9%	1,2%
	Marketing policies for sand	3	2,8%	3,5%
	Construction/roads improvement	1	0,9%	1,2%
	Transparency in use and sharing of revenue from sand	2	1,9%	2,4%
	Commitment of some of the proceeds from sand harvesting to community development	2	1,9%	2,4%
	Sand Harvesting activities to be conducted by the youths	2	1,9%	2,4%
	Regulation of sand harvesting activities by the government	12	11,2%	14,1%
	sand harvesting to be undertaken during rainy seasons	2	1,9%	2,4%
	No harm to people during sand harvesting	1	0,9%	1,2%
	community sensitization	2	1,9%	2,4%
DON'T KNOW	6	5,6%	7,1%	
Total		107	100,0%	125,9%

Source: Field Survey, 2012

Execution of their roles seemed unsatisfactory to the residents, with quite a number of proposed suggestions to improve execution of their mandates. Stopping sand harvesting was one of the measures largely suggested by stakeholders, and from key informants, the study established that residents opted for this radical measure because governance of sand

harvesting was deficient, and instead caused more harm to the general physical and natural environment (Table 5.4 above). Ensuring that the people had sufficient water was the strongest reason given for the proposed changes to sand harvesting, followed by the fact that there were a lot of complains from the sand loaders and destroyed environments. This is despite the fact that 48% (figure 5.8 below) of them had a general perception that sand harvesting was beneficial to the community as it offered employment (source of livelihood), equally quite significant percentage (43%), are of contradicting opinion, purporting that the activity has significantly no benefit to them but again, the study established that not everyone is getting a direct benefit from sand harvesting. Thus, these divergent views have to be balanced by this study for the ultimate good of the community.

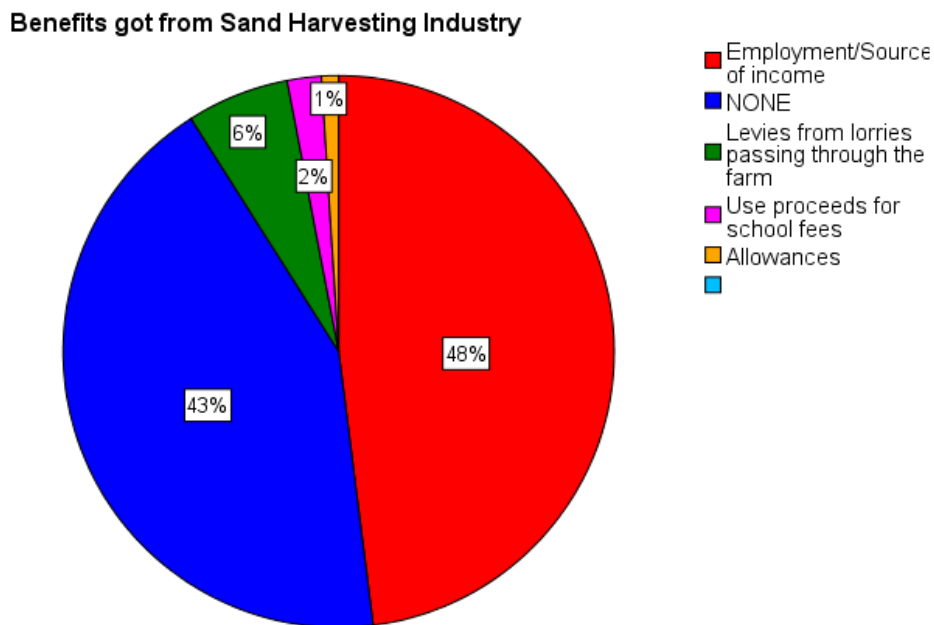


Figure 5.8: Benefits of Sand Harvesting

Source: Field Survey, 2012

Table 5.5: Reasons for suggestions in the sand harvesting policy/regulatory framework

Reasons for suggestions in the sand harvesting policy/regulatory framework					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NONE	5	4,8	6,2	6,2
	Increase employment opportunities	1	1,0	1,2	7,4
	Government is the only body that can regulate sand harvesting	4	3,8	4,9	12,3
	Soil erosion	1	1,0	1,2	13,6
	Prevent manipulation by middlemen	2	1,9	2,5	16,0
	To ensure the rivers don't dry up	1	1,0	1,2	17,3
	Children drop out of school	1	1,0	1,2	18,5
	Ensure the process of sand harvesting is conducted peacefully	1	1,0	1,2	19,8
	Ensure sand harvesters adhere to the rules and regulations	3	2,9	3,7	23,5
	A lot of complains from loaders	1	1,0	1,2	24,7
	Benefit of the whole society	13	12,5	16,0	40,7
	Accountability	3	2,9	3,7	44,4
	Caused environmental destruction	11	10,6	13,6	58,0
	To reduce on sand losses	3	2,9	3,7	61,7
	Ensure there is water supply/restore rivers volumes	20	19,2	24,7	86,4
	Increase income obtained from sand	9	8,7	11,1	97,5
	Improve accessibility	1	1,0	1,2	98,8
	DON'T KNOW	1	1,0	1,2	100,0
Total	81	77,9	100,0		
Missing	NO ANSWER	22	21,2		
	N/A	1	1,0		
Total		104	100,0		

Source: Field Survey, 2012

5.3 Sustainability and the performance of the existing sand harvesting governance structures

This section addresses the third objective of the study, as stated above and elaborates on the measures and indicators of sustainability in relation to the governance structure of artisanal sand mining in the study area.

5.3.1 Socio-Demographic Characteristics

This section informed the study on the general social-demographic profile of the respondents, to understand the population under study and to give a foundation for examining the indicators of sand mining in the study area, and inform recommendations of the study.

i.) Gender and Age of Respondents

A sample population of one hundred and four (104) respondents was considered to achieve these results, where 57% were males and 43% females. Mikuyuni sub location which had the largest population density of one hundred and twelve persons (112) per square kilometre, Mikuyuni took the largest share of respondents, 35.58%, followed by Kikumini 27.88%, Mikuyuni 22.12% and 14.42% for Musingini sub location. Majority of respondents (40.4%) were between the ages 25-35 years old, basically representing the youthful age, 35-55 years (2 subgroups combined) also had a relatively big representation of 40.4% (Table 5.6 below).

Table 5 6: Age of Respondents

Age Group		Frequency	Percent	Valid Percent
	18-25	11	10,6	10,6
	26-35	31	29,8	29,8
	36-45	21	20,2	20,2
	46-55	21	20,2	20,2
	56-65	11	10,6	10,6
	Above 65 years	7	6,7	6,7
	Dont Know	2	1,9	1,9
	Total	104	100,0	100,0

Source: Field Survey, 2012

ii.) Literacy Levels

Literacy levels would generally be considered low, with the highest percentage of 33.01% having only primary education, and a relatively small percentage of 9.71% having attained higher education at college level. None of respondents had attained university education.

iii.) Marital Status

84.6% of the respondents were married implying high value attached to family structures (Table 5.7), with highest percentage of married people represented by the youths at 93.5%, and ages 36-45 at 90.5%, 46-55 years at 81%. Generally, respondents above 65% had a low representation of marriage within the age group, at 57.1%.

Table 5.7: Marital Status and Age of Respondents Cross Tabulation

Marital status * Age of Respondent Cross tabulation									
% within Age of Respondent									
		Age of Respondent							Total
		18-25	26-35	36-45	46-55	56-65	Above 65 years	Dont Know	
Marital status	Married	81,8%	93,5%	90,5%	81,0%	72,7%	57,1%	100,0%	84,6%
	Widow/Widower			9,5%	19,0%	27,3%	42,9%		11,5%
	Single	18,2%	6,5%						3,8%
Total		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Source: Field Survey, 2012

iv.) Number of Children

This question was important to understand a little more on the background of the respondents, based on the number of direct dependants the respondents had. 92.3% of the respondents had a male child while 88.5 % of the respondents had a female child. Most respondents had between 1-5 children, as shown in figure 5.9 graph below.

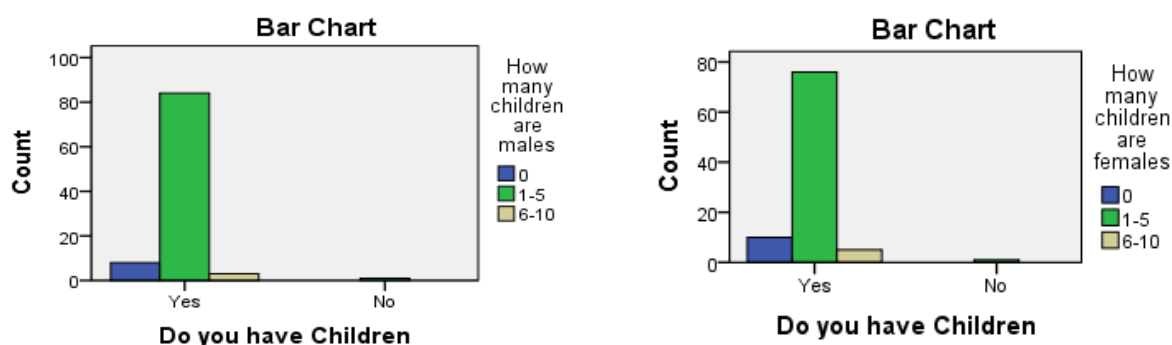


Figure 5.9: Number of Children
Source: Field Survey, 2012

Table 5.8: No of males and female Children Cross Tabulations

Do you have Children * How many children are males Cross tabulation					
		How many children are males			Total
		0	1-5	6-10	
Do you have Children	Yes	8	84	3	95
	No	0	1	0	1
Total		8	85	3	96

Do you have Children * How many children are females Cross tabulation					
		How many children are females			Total
		0	1-5	6-10	
Do you have Children	Yes	10	76	5	91
	No	0	1	0	1
Total		10	77	5	92

Source: Field Survey, 2012

v.) Number of Years Lived in the Settlement

Most of the respondents (71.1%) had lived in the study area above twenty years, and were therefore very conversant with the area, and better placed as respondents of the study

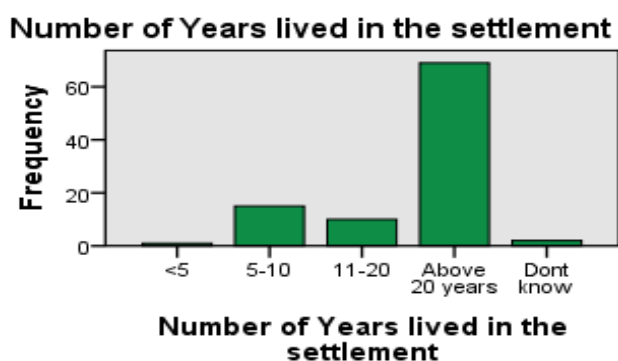


Figure 5.10: Number of years in the settlement
Source: Field Survey, 2012

vi.) Migration trends

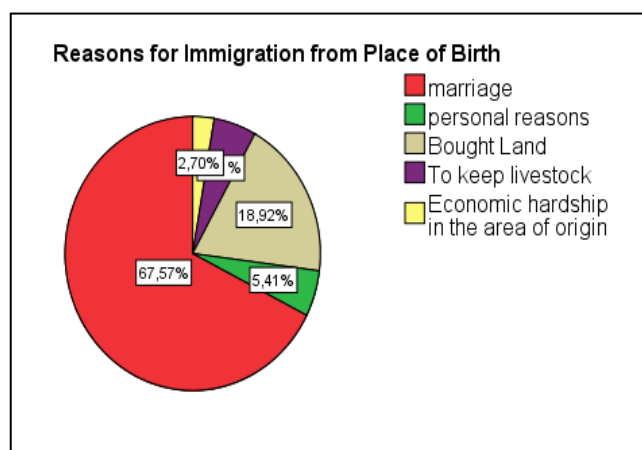


Figure 5.11: Reasons for immigration
Source: Field Survey, 2012

Data on migration trends was sought to understand the movement patterns in and out of the study area, and therefore inform the study of the pull and push factors, where sand mining could be a strong factor as well as enlighten on recommendations for this study. 59% of the respondents interviewed were born within the study area. Immigration was most reported between the year 1951 and 2000. Out of the 41% of the respondents born outside the study area, 68% migrated to the area for marriage reasons, and were largely women (96%). 18.92% bought land, while a small percentage (2.70%) experienced hardships at areas of origin. 5.41% could not disclose their personal reasons that made them move to the area. Thus, according to the Migration trends, the results do not display sand harvesting as a pull factor for the immigrants, and probably not considered a strong economical factor. Emigration was also reported, with 12% of the respondents quoting employment as being the reason.

5.3.2 Social Impacts of Sand Harvesting

Social concerns of sand harvesting in the study area were especially brought out by the key informants. District Officer 1 and Chief of Kangonde highlighted poverty and hunger as some main motivations towards sand harvesting in the study area by the. An important issue that came out from these key respondents was that sand harvesting was affecting the social life of the community; school dropouts were of chief concern and especially on the boy child, who reportedly left school to engage in sand harvesting activities. Even though, the money acquired from sand harvesting by the young boys did not help them much, as they ended up in alcoholism and prostitution. The girl child however, didn't seem to suffer from the plight of sand harvesting, according to the key informants.

Women and Children Involvement in sand harvesting

Reportedly, women did not participate in sand harvesting for the following reasons; lack of interest, barred by their husbands and apparently, sand harvesting was a heavy task for them; instead they engaged in related activities such as selling food to the sand harvesters. Although children under the age of 18 years were not allowed to participate in sand harvesting, school going boys still find their way to the mines, especially at night.

Challenges of Sand Harvesting from the Social Perspective

Some of the social challenges experienced by the community were:

- Participation by underage school going children and especially at night
- Frequent conflicts between land owners, sand harvesters and truck drivers. This was reportedly caused by using their land as access roads to the sand mines and forcefully wanting to harvest sand from their lands adjacent to the rivers. Reduction of the amounts of sand during dry seasons was one of reasons mentioned for encroaching people's farms.
- Noise from the hooting lorries especially at night
- Social ills such as drug abuse by the young loaders
- Insecurity due to the irregular sand harvesting pattern

Suggestions

Suggestions given by the key informants for curbing the social ills include collective responsibility by the community to the social ills and especially to dealing with participation of school going children in sand harvesting, and finding other job opportunities for the youths.

5.3.3 Economic Costs and Benefits of Sand Harvesting

Apart from understanding the poverty levels of the study area, this section also sought to understand the value of sand mining as an economic activity for this community and its impacts in people's lives, and inform the study on the perceptions of the people towards the performance of sand harvesting regulatory mechanisms, as far as the economic returns from sand mining is concerned.

The following are results from household based survey on economic measures and indicators on governance and sustainability of sand harvesting in the study area.

Main Economic activity/Main Source of Income in the study area

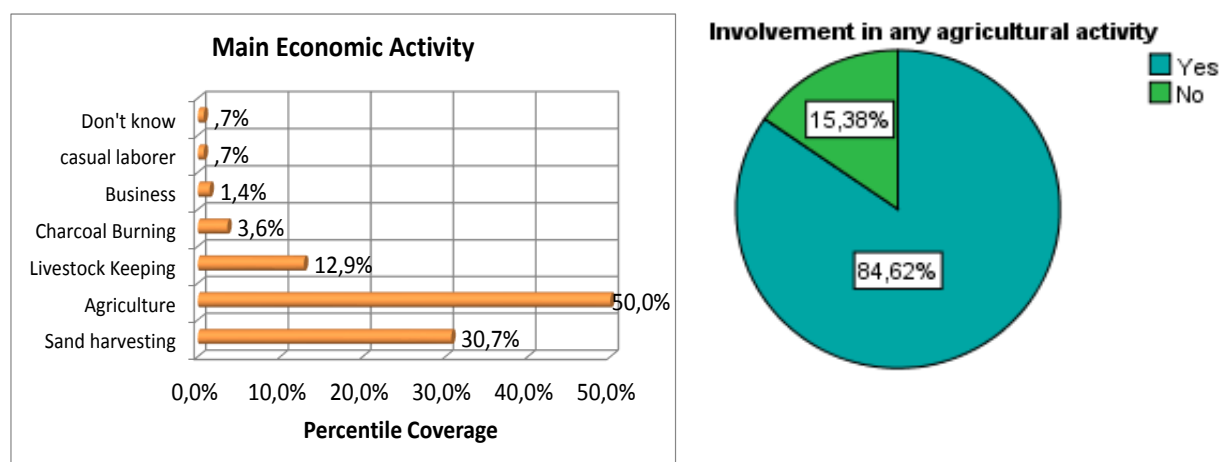


Figure 5.12: Main Economic activity/Involvement in any Agricultural Activity

Source: Field Survey, 2012

At 30.7% as a main source of income and at 13.5% as a main economic activity in the study area, significance of sand harvesting for livelihood provision was ascertained explicitly. A considerable number of families depend on the activity for their sustenance; thus lives would definitely be affected in case the activity is terminated. Being a depletable resource, governance measures therefore, have to be put in place for its exploitation to ensure sustainability. Although agriculture was established as the main economic activity (and as many as 84.62% of respondents were involved in some form of agricultural activity), it had its share of challenges that would limit its maximum exploitation among them being insufficient rainfall, erratic weather conditions and poor returns. From table 5.9 below, the main agricultural activity established was food crops growing (75.4%), implying that the residents barely make any income from agriculture. Thus, sand harvesting can be enhanced as an alternative economic activity to agriculture, and this would necessitate proper governance structures for its sustainability.

Challenges facing the main economic activity were sought with an aim of establishing policy related issues to the success of the main economic activity. Agriculture, sand harvesting and trading, being the main economic activities across the population, experienced the biggest challenge of insufficient rainfall (33%), and poor returns (12.5%). This would definitely call for the community to venture into and enhance alternative livelihood activities that limit their dependency on rainfall.

Table 5.9: Challenges of the Main Economic Activity

Challenges of the main Economic Activity				
		Responses		Percent of Cases
		N	Percent	
Challenges of the main Economic Activity	Shortage of seeds	6	3,9%	5,9%
	Insufficient Rainfall	50	32,9%	49,0%
	Inadequate Water supply	9	5,9%	8,8%
	Inadequate Pasture	5	3,3%	4,9%
	livestock diseases	6	3,9%	5,9%
	None	3	2,0%	2,9%
	Pests and crop diseases	10	6,6%	9,8%
	Poor Agricultural methods	5	3,3%	4,9%
	Lack of cooperation by sand harvesters	1	0,7%	1,0%
	Lack of proper sand harvesting guidelines	1	0,7%	1,0%
	No economic benefits accrued	1	0,7%	1,0%
	shortage of trees/destroyed forests	2	1,3%	2,0%
	poor roads	6	3,9%	5,9%
	sand shortage	1	0,7%	1,0%
	Lack of market to sell produce	5	3,3%	4,9%
	Poor returns	19	12,5%	18,6%
	erratic weather conditions	8	5,3%	7,8%
	Not wholly embraced by the community	1	0,7%	1,0%
	Has been stopped by the community due to destruction to the environment	1	0,7%	1,0%
High cost of farm inputs	2	1,3%	2,0%	
It is seasonal	2	1,3%	2,0%	
Elusive sand buyers(don't pay up)	1	0,7%	1,0%	
Dont Know	7	4,6%	6,9%	
Total	152	100,0%	149,0%	

Source: Field Survey, 2012

Table 5.10: Involvement in Agricultural Activity

Involvement in Agricultural Activity				
		Responses		Percent of Cases
		N	Percent	
Agricultural Activity Involved In ^a	Horticulture	4	3,4%	4,2%
	Food Crops	89	75,4%	93,7%
	Livestock Keeping	25	21,2%	26,3%
Total		118	100,0%	124,2%

Source: Field Survey, 2012

Presence of a number of (micro)-financial institutions, including KWFT supported by 41%, Faulu Kenya (32%) and Equity Bank (11.5%), suggest a growing economy in the study area, thus necessitating support to the income sources.

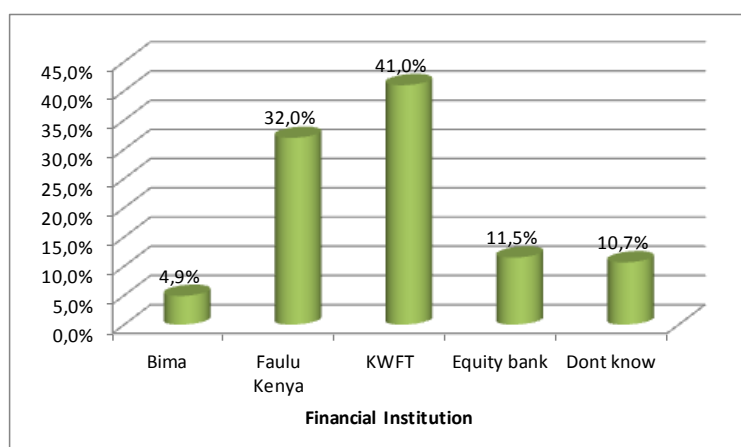


Figure 5.13: Financial Institutions in the study Area

Source: Field Survey, 2012

Income and Expenditure

Daily income and expenditure patterns depicted a relatively deprived community; with highest percentage of respondents (47%) earning between kshs. 100-200, and again, the highest percentage of the respondents (48%) (Figure 5.14 above) spending between kshs.100-200 per day. This trend implies that most of the respondents are low income earners, who spend all the income they earn per day and therefore suggesting that they have no savings. At a positive correlation of 0.621, the results suggest a relatively strong linear correlation between average daily income, and average daily expenditure, as shown in figure 5.14 below. The main expense in a household, at 98% is food.

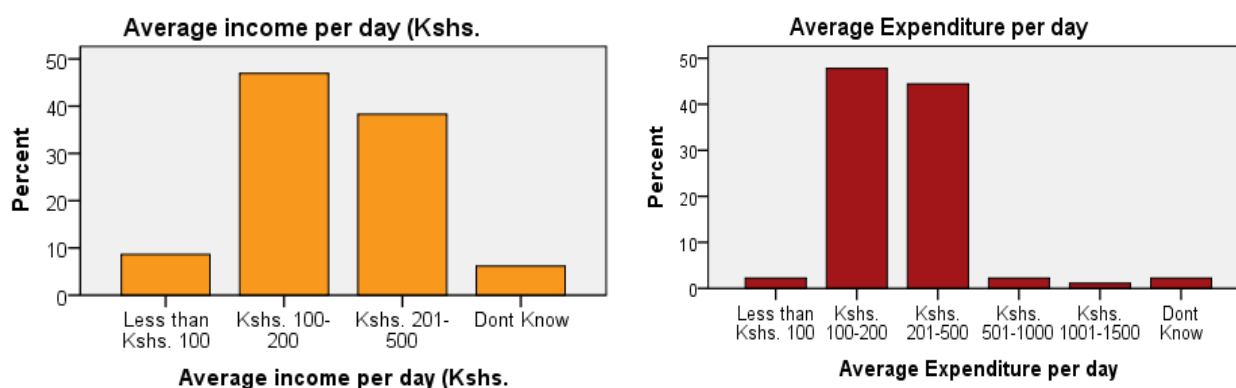


Figure 5.14: Income and Expenditure patterns

Source: Field Survey, 2012

Table 5.11: Average Income and Expenditure Correlations

Correlations			
		Average income per day (Kshs.)	Average Expenditure per day
Average income per day (Kshs.)	Pearson Correlation	1	,621**
	Sig. (2-tailed)		,000
	N	81	79
Average Expenditure per day	Pearson Correlation	,621**	1
	Sig. (2-tailed)	,000	
	N	79	90

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

Source: Field Survey, 2012

The economic profile of the study area is basically supported by agriculture, sand harvesting and trading. Sand harvesting stands out as an equally important livelihood supporter; with the acquaintance that the area is in ASAL area, agriculture is bound to underperform, and that's largely the reason why the inhabitants engage in food crop agriculture. Income and expenditure levels depict a relatively deprived community, with respondents merely working for food, and with no savings. Economic profile of the study area informs the study that sand harvesting stand its prominence in livelihood provision, and it also gives information in formulation of area based policies for the study area.

5.3.3.1 Transactions in Sand Trade

Apart from household based survey, key informants also elaborated further on economic measures and indicators on governance and sustainability of sand harvesting in the study area. The critical issues addressed by key informants included benefits of sand harvesting, sand pricing, sand harvesting seasons, reasons for buying sand in the study area, challenges limiting maximum exploitation of the resource, among other issues.

The District Officer 1 and Chief of Kangonde acknowledged that there are some regions that sand harvesting has indeed been of help, but according to them, Kangonde was not one of them. This was largely because the community did not benefit from sand mining as an entity but instead, just a few people benefited.

i.) Sand Harvesting Seasons

This information was sought from key informants and they all admitted that sand was harvested throughout the year, but the quantities varied.

ii.) Sand Price

According to the sand loaders and transporters, sand costed 3000/= for a 7-10 tonne lorry while for a 30 tonne lorry ranged between kshs. 5000 to kshs. 10000, depending on the season and the availability of sand. An additional kshs.1500 was charged for loading, with each loader getting between kshs.200 to kshs.300 per lorry.

Two of the three transporters found the price of sand fair with reasons such as sand is a natural resource, with very few costs incurred for harvesting and should therefore not be expensive. The other transporter was of the idea that the price of sand should be reduced because they incur a lot of costs in transportation. They all however, appreciate the good quality of sand from this study area.

The transporters undertook between 2-3 trips per day, making a net profit of approximately kshs. 10,000 per trip.

iii.) Reasons for buying sand in the study area

The reasons given by the transporters for buying sand in the study area include the fact that sand quality is good and that sand was always available at a cheap price.

iv.) Customers for Sand

This information was sought from transporters, sand loaders, cooperative societies and section leaders. Sand loaders who belonged to a cooperative society said the customers came by themselves since they knew the place; apparently they hardly got new customers. As for the independent loaders, they said they waited for the buyers at the shopping centers, and then directed them to the sand mining pits. Customers came from Nairobi and other major neighboring towns like Mulolongu, Ruiru, Githurai, Makutano Thika, Kitui, Makutano, and Matuu.

v.) How did section leaders get loaders?

The section leaders indicated that they had no problem getting people to load sand, as there are many people hanging along roads and rivers waiting for Lorries.

vi.) Costs incurred-transporters

The transporters reported that they paid about kshs. 500 for every police road block which reduced as they approach Thika town up to around kshs. 200. They also paid kshs. 300 for council receipts and kshs. 1000 to the cooperative society per trip. Generally the transporters said they parted with around kshs. 5000 before reaching their destinations. This is split across the police, the council, several sand harvesting groups and land owners adjacent to the access roads.

All the transporters interviewed agreed that sand harvesting was a sustainable source of income for them.

vii.) Sand harvesting benefits

All the respondents agreed to a certain degree that sand harvesting was beneficial to the community, largely citing source of employment and income, as the main benefits of the activity. According to the sand loaders, sand harvesting was the only source of employment since the area is very dry, and most people depend on it for their daily sustenance. The land owners said they benefited more from sand harvesting through compensation of sand harvested from directly from their parcels and from surrendering part of their land for access roads.

viii.) Land owners

Most of the landowners said they benefited for bordering the river, through payments for damage caused on their land. According to the sand loaders, each lorry paid 1000/= to the land owner to compensate for damages, and for scooping sand from their land.

ix.) Challenges encountered

Respondents acknowledged that there have been massive challenges associated with sand harvesting in the study area. One big challenge for instance, is that there are major individual beneficiaries in sand harvesting industries, and the community doesn't benefit as a whole. According to the informants, it would be beneficial to the community if they harvested sand sustainably. Other challenges that were highlighted as limitations to obtaining maximum benefits from sand mining include:

- Increase in the number of middle men
- Poor access roads to the mines
- Prolonged droughts and low rainfalls
- Lack of finances to construct gabions
- Underpayment to loaders
- Low sand prices and exploitation by the transporters
- Interference by the various authorities
- Council Levies
- High costs of maintenance for the lorries especially due to bad roads
- Temporary bans by NEMA , provincial administration, politicians and councils
- Payments to access the sand mines
- Reduction of sand quantity during dry seasons

The Land owners experienced unique challenges. One of the main challenges was the fact that many access roads had to pass through their lands thereby destroying their crops and degrading their land. Soil erosion along the river as a result of scooping sand from the walls of the river banks, increase in the rate of river flow and danger of flooding, deep valleys left by sand harvesting and overexploitation of sand at the expense of crop farming were also enlisted as challenges specific to land owners.

x.) Recommendations

The sand loaders suggested that they should unite, and set better prices for sand, for they are currently very vulnerable to poor pricing; better pricing for sand was a proposal reverberated by all the key informants. Secondly, periodic sand bans should be done away with, because people still harvest sand even with the bans. And thirdly, alternative employment opportunities for the residents should be sought, so that the community does not entirely depend on sand harvesting.

5.3.4 Land Issues

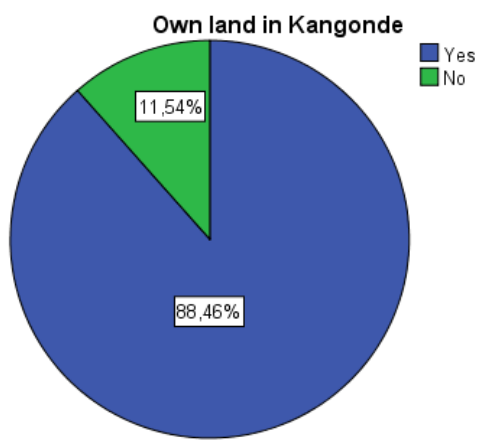


Figure 5.15: Land Issues

Source: Field Survey, 2012

Land issues were brought through household based survey. Apart from establishing poverty levels, which would inform the patterns of sand mining, this sector also sought answers on land ownership of respondents in relation to sand harvesting mines.

88.5% of the respondents owned land in the study area, with the largest percentage of them

(41.6%) owning between 1 to 3 acres, and 34.6% owning between 3.1 to 6 acres. All the respondents interviewed had their land under freehold ownership, with only about 8% of them possessing title deeds; 7% of the respondents with title deeds knew of their land parcel number, while the rest didn't know. The value of land per acre varied between kshs. 10,000 and 250, 000, with the largest percentage being between 35000 to 50, 000, occupying a cumulative percentage of 37% (table 5.12 below).

Table 5.12: Size of Land Owned

Size of land Owned			
		Frequency	Valid Percent
Valid	< 1 acre	1	1,0
	1-3 acres	42	41,6
	3.1-6 acres	36	35,6
	6.1-10 acra	7	6,9
	10.1-15 acres	3	3,0
	Above 20 acres	1	1,0
	99,00	1	1,0
	N/A	10	9,9
	Total	101	100,0
Missing	No answer	3	
Total		104	

Source: Field Survey, 2012

Table 5.13: Value of Land per Acre

Value of Land per Acre				
		Frequency	Percent	Valid Percent
Valid	Don't Know	15	14,4	15,8
	N/A	6	5,8	6,3
	10000	1	1,0	1,1
	15000	1	1,0	1,1
	20000	3	2,9	3,2
	30000	5	4,8	5,3
	35000	11	10,6	11,6
	40000	17	16,3	17,9
	45000	7	6,7	7,4
	50000	22	21,2	23,2
	52000	1	1,0	1,1
	60000	2	1,9	2,1
	100000	1	1,0	1,1
	150000	1	1,0	1,1
	200000	1	1,0	1,1
	250000	1	1,0	1,1
Total	95	91,3	100,0	
Missing	No answer	9	8,7	
Total		104	100,0	

Source: Field Survey, 2012

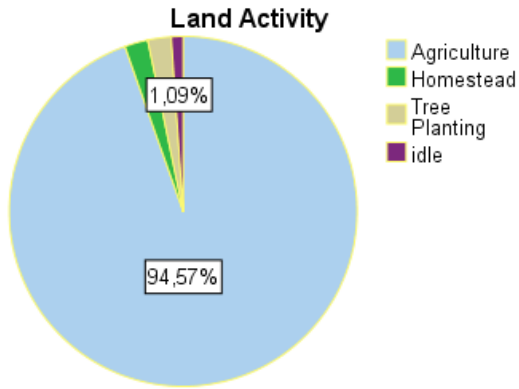


Figure 5.16: Land Activity
Source: Field Survey, 2012

from land ownership were not established, and on inquiry on the type of activity undertaken in their lands, 95% reported that they used their land for agricultural purposes (figure 5.16). A further probing informed the study that the respondents majored in subsistence farming, largely because of erratic and unreliable weather pattern.

Land is generally considered a big factor of production, and its ownership often associated with adequacy. If land was the only consideration, or an indicator of poverty or economic performance then the respondents would not be regarded as poor. However productivity levels or economic benefits accruing

As an indicator of economic performance, land ownership was not satisfactory, because much as a big percentage of the respondents own land, the respondents were substantially deprived, according to the income and consumption levels. The relatively low land prices, low level of production from their lands and the fact that most of them did not have title deeds, suggests that they barely use land as a major factor of production. Consequently, sand harvesting would find a better place as an alternative economic opportunity to agriculture.

5.3.5 Housing Conditions

This section sought to establish the nature of housing for the respondents with an aim of establishing the relationship with none/benefits accrued from sand harvesting. 47% of respondent's occupied permanent dwellings, made of iron sheets, brick walls and concrete floors (Table 5.14). Sand as a construction constituent and locally available is believed to contribute to the high percentage of permanent and semi-permanent housing (38.5%).

100% reported that they owned the houses, and 99% of them had constructed their own houses. Only 1% had bought their house.

Table 5.14: Housing Typologies

Housing typology		Frequency	Percent	Valid Percent
Valid	Permanent	49	47,1	47,1
	Semi-Permanent	40	38,5	38,5
	Temporary	15	14,4	14,4
	Total	104	100,0	100,0

Source: Field Survey, 2012

The high level of ownership of permanent and semi-permanent houses, places sand as an important raw material for construction for the residents, implying that they have ease of access to sand.

5.3.6 Road Conditions

This section looked into the road types and road conditions to the sand mining sites, to establish whether sand mining activity ploughs back into the community's wellbeing. 57% of the respondents (and with confirmation with physical measurement) reported that the roads measured between 4-6 meters while 36% reported that the roads widths were below meters. 71% of the roads were reported to be murramed while 29% were murram all weather.

Table 5.15: Size of the road to the sand mines in meters

Size of the Road to the sand mines in Meters		Frequency	Valid Percent
Valid	<4 metres	26	36,1
	4-6 metres	41	56,9
	6.1-10 metres	5	6,9
	Total	72	100,0
Missing	No Answer	32	
Total		104	

Source: Field Survey, 2012

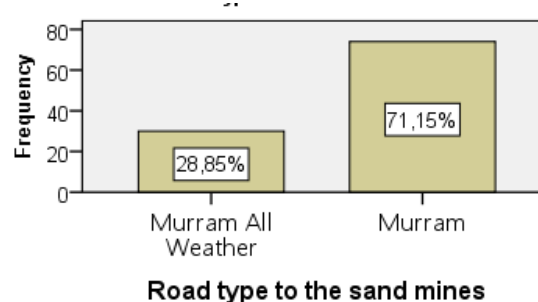


Figure 5.17: Road Type to the Sand Mines
Source: Field Survey, 2012

10.3% of the respondents thought that the road conditions to the sand mines were satisfactory, while 19.4% said the roads were in poor condition, 34.2% thought the roads were full of dust deposits, and 21% said the roads were narrow.

Table 5.16: Road Conditions

Road condition Frequencies				
		Responses		Percent of Cases
		N	Percent	
Road Condition	Poor	30	19,4%	29,4%
	Dusty	11	7,1%	10,8%
	Rugged	17	11,0%	16,7%
	Narrow	33	21,3%	32,4%
	None	16	10,3%	15,7%
	Full of Sand deposits	42	27,1%	41,2%
	No drainage facilities	6	3,9%	5,9%
Total		155	100,0%	152,0%

Source: Field Survey, 2012

It is clear from the responses that sand harvesting activity does relatively very little plough back (if any) to maintain the road in the study area. Most of the respondents described the road conditions as poor, dusty, rugged, narrow, and full of drainage deposits. Only 10% of the respondents were satisfied with the roads in their current state. From interviews with key informants, there were some efforts from the sand loaders, youths and land owners adjacent to the roads, in maintenance of the roads, but not at all, a community's imitative. The photo plates below, further explain the state of the roads to the mines.



Condition of Access Roads to the Sand Mines

Plate 5.3: Road conditions to the mines

Source: Field Survey, 2012

5.3.7 Environmental Issues

This sector therefore sought to understand a critical component of the study-the environment, which has been authored in negativity, with concerns to destruction of the physical and natural environments. Environmental sector sought to understand the exact sites where sand mining is undertaken, the associated environmental impacts, as far as the residents were concerned, their rate of satisfaction with the general environment, and the residents participatory views on the improvement of the environment. Impacts of the regulatory frameworks were also be assessed from these questions, as well as suggestions for improvement.

From house based survey, a general perception of the environment was inquired where 73.5% of the respondents expressed dissatisfaction with the environment, because of reasons such as reduction in river water volumes (48%), soil erosion (25%), reduced vegetation at (9%)-table 5.17 below. For environmental improvement, respondents mentioned building of gabions as the strongest solution (39.7%) followed by creation of alternative water sources (35.9%).

From key informants, one of the reasons why sand harvesting is banned from time to time is because of massive destruction of the roads-the Lorries are overloaded. Even though, the bans cannot be fully implemented because of insufficient resources and lack of enforcement capacity.

Table 5.17: Environmental Impacts of Sand Harvesting

Environmental Impacts of Sand Harvesting (Multi Response Frequencies)				
		Responses		Percent of Cases
		N	Percent	
Environmental Impacts of Sand Harvesting	Flood Plains	2	1,4%	2,1%
	Soil Erosion	35	25,0%	36,5%
	Widening of Rivers	8	5,7%	8,3%
	Reduced Vegetation	11	7,9%	11,5%
	Change of River Courses	1	0,7%	1,0%
	Reduction of water volumes in the rivers	67	47,9%	69,8%
	None	8	5,7%	8,3%
	Water Pollution	1	0,7%	1,0%
	Dust	1	0,7%	1,0%
	valleys cause accidents to children	2	1,4%	2,1%
	Drought	1	0,7%	1,0%
	destruction of roads since some people scoop sand from the roads	2	1,4%	2,1%
	Don't know	1	0,7%	1,0%
Total	140	100,0%	145,8%	

Source: Field Survey, 2012

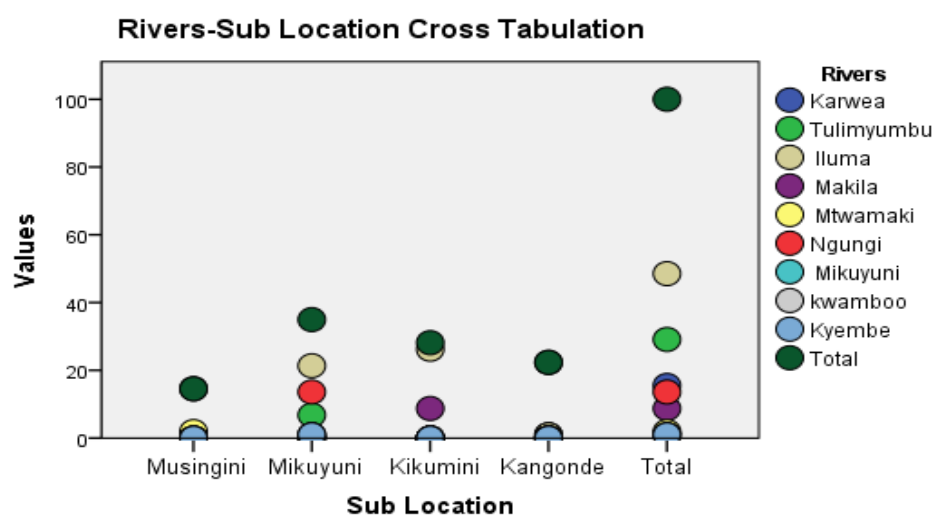


Figure 5.18: Cross tabulation Between Rivers and Sub Locations

Source: Field Survey, 2012

Table 5.18: Recommendations on Environmental Improvements

Environmental Improvements	Count	Percentage %	Percent of cases
Building Gabions	31	39,7%	29,0%
Other Job opportunities for the community	3	3,8%	2,8%
Stop sand harvesting	18	23,1%	16,8%
Plant trees/Afforestation	10	12,8%	9,3%
Alternative water sources	28	35,9%	26,2%
Construction of roads	10	12,8%	9,3%
Build more sand dams	1	1,3%	0,9%
Regulation of sand harvesting activities	5	6,4%	4,7%
Protect some rivers/river sections from sand harvesting	1	1,3%	0,9%
Don't know	0	0,0%	0,0%

Source: Field Survey, 2012

All respondents (100%) alleged that they harvested sand from rivers. Some of respondents mentioned that mining was undertaken from more than one river, and this necessitated a multiple response analysis. A cross tabulation between rivers and sub locations revealed that most rivers from where sand was mined are in Mikuyuni sub location (35%), followed by Kikumini sub location (28.2%). Sand was largely harvested from Iuuma river (48%) followed by Tulimyumbu (29.1%)-Figure 5.18.



Dry river beds and destroyed river bank vegetation



Deformed landscapes

Plate 5.4: Conditions of the Physical and natural environments
Source: Field Survey, 2012

Destruction of the physical and natural environments was evident in the study area, implying that the miners give no attention to environmental sustainability.

Type and Sources of Pollution

Air pollution was established as the leading type of pollution at 80%, of all the cases and dust was the main pollutant for this type, at 57.1%.

Table 5.19: Type of Pollution and Source of Pollution Cross tabulation

Type of Pollution and Source of Pollution Cross tabulation										
			Source of Pollution							Total
			Sand Lorries	Animals Droppings	Dust	surface runoff	human activity	soil erosion	oil spillage from trucks	
Type of Pollution	Noise	Count	10	1	6	0	0	0	0	10
		% of Total	14,3%	1,4%	8,6%	0,0%	0,0%	0,0%	0,0%	14,3%
	Air	Count	25	3	40	7	0	9	0	56
		% of Total	35,7%	4,3%	57,1%	10,0%	0,0%	12,9%	0,0%	80,0%
	Ground/Sand	Count	2	4	19	8	1	11	0	25
		% of Total	2,9%	5,7%	27,1%	11,4%	1,4%	15,7%	0,0%	35,7%
	Water	Count	4	3	1	0	0	1	1	8
		% of Total	5,7%	4,3%	1,4%	0,0%	0,0%	1,4%	1,4%	11,4%
	Total	Count	29	7	41	8	1	12	1	70
		% of Total	41,4%	10,0%	58,6%	11,4%	1,4%	17,1%	1,4%	100,0%

Percentages and totals are based on respondents.

Source: Field Survey, 2012

Air pollution is detrimental to the health of human beings; with the largest sources being sand transporting lorries and dust at the mining sites, this shows that there no regard to health and safety standard for those involved in sand mining, or to the residents of the study area.

Type of Energy and Source of Energy

Wood energy formed the biggest type of domestic energy use, which was largely locally available, followed by charcoal and kerosene respectively as shown in table 5.21.

Table 5.20: Type of Energy and Source of Energy Cross tabulation

Type of Energy and Source of Energy Cross tabulation						
			Source of Energy			Total
			Farms/Locally available	Buying	Forests	
Type of Energy	Kerosene	Count	15	16	1	17
		% of Total	14,6%	15,5%	1,0%	16,5%
	Charcoal	Count	32	7	0	22
		% of Total	31,1%	6,8%	0,0%	21,4%
	wood	Count	105	16	1	94
		% of Total	101,9%	15,5%	1,0%	91,3%
Total		Count	111	21	1	103
		% of Total	107,8%	20,4%	1,0%	100,0%
Percentages and totals are based on respondents.						

Source: Field Survey, 2012

Most respondents, who used wood energy, obtained it from their farms and from forests. Efforts of environmental conservation are therefore threatened if this trend continues, in an area perceived as semi-arid.

Environmental Concerns

One loader, one transporter and one section leader were of the opinion that sand harvesting does not affect the physical environment, at least not negatively, and as far as they were concerned, the associated economic benefits override the supposed negative impacts on the environment. However, other key informants were of a strong opinion that sand harvesting is destructive to the environment; quoting reasons such as destruction to crops and vegetation, deformation of landscapes prone to landslides, massive soil erosion, overexploitation of the resource, flooding of farms adjacent to rivers during heavy rains and impingement on the retention capacity of rivers, drying up the rivers. They therefore gave the following suggestions for environmental protection and conservation:

- Construction of roads to the mines so that Lorries don't access the mines through people's farms.
- Construction of gabions
- stopping sand harvesting

- strict measures for controlling the rate of sand harvesting especially to protect the rivers
- planting more trees
- sustainable sand harvesting
- use of dams as alternative sources of water

The issue on whether sand harvesting was sustainable to the community and the environments was posed to the key informants.

One of the strongest reasons given by some of the respondents in support of economic sustainability is the fact that sand mining had continued to offer employment to people for a long time; however, to some respondents, the activity benefited only a few people economically and therefore ruling out economic sustainability. Environmentally, most of the respondents refuted claims that sand was being mined sustainably, grounding their reasons to the fact that the activity has continued raise environmental concerns and especially destruction of rivers and roads, overexploitation of the resource and reduction of water levels. There were strong indications that social sustainability has not been achieved from the existing governance structure. Some negative social indicators were identified, these included, participation in sand harvesting by underage school going children and especially at night, frequent conflicts between land owners, sand harvesters and truck drivers and this was reportedly caused by using private land as access roads to the sand mines and forcefully wanting to harvest sand from private land adjacent to the rivers, emergence of cartels who control sand mining industry, reduction of the amounts of sand during dry seasons was one of the reasons mentioned for encroaching private farms, noise from the hooting lorries especially at night, social ills such as drug abuse by the young loaders, insecurity due to the irregular sand harvesting pattern. Emerging issues further confirmed the need to review the existing governance structures with an aim of proposing a sustainable one.

5.4 Sustainable governance that improves sand harvesting activities in the study area

This study inquired from the respondents' point of view, what they would consider as a sustainable institutional and policy framework that would improve sand harvesting activities in the study area. The next chapter further elaborates on this objective.

5.5 Conclusion

The study has revealed a disjointed governance structure in artisanal sand mining at Kangonde, with a dissatisfied community calling for a total ban of the activity. Proceeds from sand harvesting seem to have benefited only a small segment of the population with majority of them living in poverty. Due to weak Institutional, Legislative and Policy framework, the activity seems to be unsustainable in all its forms. From the study social, economic and environmental indicators has painted a gloomy picture of breakdown in these three pillars of sustainability.

To redeem the confidence of the community that sand harvesting can benefit them, the research has proposed a governance structure that takes into consideration the opinion of all stakeholders, proposes a collaborative working relation between the statutory institution and the community to ensure that they achieve economic gain, eliminate the social ills brought about by this activity while at the same time ensuring the negative environmental and physical characteristics of the Kangonde is reversed. The proposed governance structure is explained in details as recommendation in chapter six.

Chapter Six: Summary of Findings, Conclusions and Recommendations

6.1 Introduction

This chapter starts with a summary of the research findings based on the research objectives, followed by conclusions and finally recommendations to both policy makers and scholars for future research.

6.2 Summary of Findings

6.2.1 Examining the existing governance systems that governs sand harvesting in Kenya

Under this objective, the study sought to examine the existing governance structure of sand mining in the country both from secondary and primary sources and their relevance to the study area.

It was established that several fragmented legislations and policies that should contribute towards governance and direct exploitation of sand as a resource exist, this includes:-

- a) The Constitution of Kenya, 2010,
- b) EMCA, 1999,
- c) National Sand Harvesting Guidelines, 2007,
- d) The Mining Act,
- e) Local Government Act,
- f) Kenya Vision 2030,
- g) Water Act, and
- h) Environmental Impact Assessment and Audit Regulations, 2003.

On analysis of these legislations from secondary data and confirming operating structures through primary data collection, the following was found out:-

That none of these legislations and policy directives undertakes the mandate of governing sand harvesting in totality and more so in relation to the study area - Kangode. Each of these legislations general touches on sand management as a resource, rather than the process of sand harvesting, hence leaving gaps and overlaps in their implementation.

The National Environmental Management Authority (NEMA) formulated the National Sand Harvesting Guidelines, 2007, to provide broad based guidelines on governance of sand harvesting. From the study conducted, the 2007 guidelines have not done much in the study

area due to its broad base approach and lack of specific approach to sand harvesting. The study identified that there are many stakeholders in the sand mining industry that the governance structure needs to approach the situation from a point of comprehension, rather than from a management perspective. NEMA was mentioned by the respondents, especially in areas of issuing harvesting license and enforcing bans on sand harvesting, as a control measure to the activity. There are several fragmented forms of governance structures in the study area; these structure actually depended on the user according to the key informants. The study depicted a rather disjointed governance structures, but a key recognition was the existence of several sand harvesting groups and cooperative societies that had different mandates, mostly overlapping roles. There was no clear authority on sand harvesting governance. Worth noting, was the existence of ghost groups, whose leaders often disappear with the members' money. Others still, were not aware of existence of any governance structure, and according to them, the resource was free for exploitation.

This begged the question of whether the existing tools of governance had any impact on managing the industry. Considering that sand is a depletable resource, sustainability was a key concern for this study.

6.2.2 Establishing the impact of the existing governance structures in the study area

The study area has multiple sand regulators whom the community admits have fallen short of their perceived mandates. The study area has the government arm represented by NEMA, while the community structures are represented by the sand harvesting groups and cooperative societies. Generally, 56% of the household based respondents acknowledged the effectiveness of these institutions through the roles they undertook in the community, which included management of sand harvesting, selling of sand, ensuring sellers are paid, savings for the community, roads repair and maintenance, among others. Whereas some of the respondents preferred working under some governance structures like NEMA, or cooperative societies, some were completely comfortable working independently, oblivious of existence of these structures, or how possibly they could impact on their earnings. Key informants, and some household based respondents felt that NEMA played a crucial role in licensing sand miners, but even with that, some people still carried out the activities without licenses. There was no mention by the respondents of how the existing structures ensure that all sand miners have licenses for sand mining. Out of desperation, a large number of respondents interviewed opted

for abolishment of the sand mining activity due to negative impact like social ills, environmental degradation and lack of a guaranteed economic gain.

6.2.3 Determining the indicators that define the performance levels of the existing regulatory, institutional and policy frameworks governing sand harvesting in Kangonde

The indicators that were used to measure the level of sustainability of the sand mining activity in the study area were economic indicators, environmental indicators and the social indicators.

Social indicators were assessed from two perspectives. First, was a general perspective to have a background overview of the community under study by inquiring about their marital status, gender and age, number of dependent children and the number of children in school, health status, and the literacy levels of the respondents, Secondly the migration trends, women and children involvement in sand mining, social ills associated with sand harvesting and number of years the respondent had lived in the study area.

From the study, migration trends were ruled out as a pull factor to the study area, however, it was found out that the social ills associated with sand harvesting including, insecurity, contributing to school dropout rate of the boy child, alcoholism and drug abuse were a worrying trend. There was no direct involvement of the women in the sand mining activity but indirectly, women sold food to the sand miners, according to some of the key informants.

Economic Indicators included establishing whether sand mining was considered an important economic activity by the respondents, these included presence of financial institutions, expenditure and consumption levels of the respondents, the conditions of the physical infrastructure and the challenges that faced the main economic activity of the respondents.

It was found out that 88% of the respondents owned land but the value of land is relatively low. Land productivity was generally low owing to ASAL conditions of the study area. Most of the respondents confessed that agriculture was the main economic activity, though they hardly got any meaningful returns. Sand harvesting was considered the second best economic activity in the study area, and was ranked the second most important income for most households. Daily income and expenditure patterns depicted a relatively deprived community; with highest percentage of respondents earning between kshs.100-200, which they admitted was equivalent to their daily expenditure.

The interviewed buyers confessed of making a profit which was higher than the money paid to the sand harvesters. Women are reportedly not involved in sand mining, and therefore have no direct benefits from the sand harvesting industry. Sand harvesters have no direct link to the market, hence they are being exploited by middlemen operating in this industry.

Most respondents had permanent and semi-permanent housing structures, as opposed to the expected temporary structures, based on their income and expenditure levels and their pessimistic responses towards monetary gains from sand harvesting. Housing typology was associated to the ease of accessibility to sand as raw material for building. Access roads to the sand pits are narrow, dusty, rugged and full of sand deposits meaning that there is little plough back of income from sand harvesting in road maintenance.

Environmental indicators assessed showed that a big percentage of respondents expressed dissatisfaction with the state of the environment, citing reasons such as reduction of river water volumes and retention capacities, soil erosion, reduced vegetation at the river banks, destroyed landscapes, long droughts, flooding of farms during rainy seasons and the general overexploitation of the resource, among others. Some respondents opted for complete abolishment of sand mining activity, due to these factors, citing that the activity was not being undertaken with cautiousness of environmental sustainability.

6.2.4 Suggesting a sustainable governance structure that improves sand harvesting activities in the study area

This objective forms the backbone of this study. Respondents suggested that all stakeholders must be involved in decisions affecting sand harvesting and elect officials of various groups who must be transparent and accountable in the manner in which they carry out their delegated mandates. The government should be given bigger roles in the governance of sand as a resource, more so in enforcement of policies. It was also felt that NEMA should take a lead role in educating the community on the benefits of sustainable sand harvesting. In order to encourage environmental sustainability, the research found out that benefits of sand harvesting must be felt by the community. The governance structure should ensure direct markets for the resource in order to eliminate the many middlemen who exploit sand harvesters. This study intends to recommend a sustainable governance structure that will bring all these interests together, to ensure the community benefits from this resource while at the same time ensuring environmental, economic and social sustainability.

6.3 Recommendations

The study undertaken was comprehensive and brought out many socio-economic, physical and environmental issues associated with governance of artisanal sand harvesting. Striking a balance between the good and the bad side of sand harvesting; between the economic gains on one side and the social ills, physical and environmental concerns on the other hand, including sustainable engagement in the activity has been proved to be a big challenge in this study. On one hand, sand harvesting is considered a very big source of income and offers employment opportunities for the community so much that most households would not survive without it. Even with these obvious advantages, others still advocate for complete abolishment of the activity to save the deteriorating environment and curb the associated social ills; with benefits being termed as superficial.

In an effort to come up with a sustainable governance structure for artisanal mining, all the issues discussed above play pivotal role while placing the community in question playing at the central point. Policies and regulations governing artisanal mining in Kenya, and best practices from national and international bodies and institutions as earlier discussed, form a very important base for formulating and implementing community based governance structures; they define broad guidelines and regulations which need to be interpreted in the local context. The successes witnessed in other countries on artisanal mining in the reviewed literature provided sound guidelines on which our recommendations are grounded and put in the local context.

It is worth noting that no one stakeholder can handle sustainable management of artisanal sand harvesting alone, and therefore all the stakeholders should have their responsibilities cut out and well known to the entire community. The case of Mongolia for instance, which was earlier discussed as a success story in artisanal mining, tagged its success to the commitment, collaboration and coordination of all the stakeholders involved in the sector. The willingness of the community to participate fully would be a considerable a boost for the success of sustainable sand harvesting in the study area.

In proposing a sustainable governance structure for artisanal sand mining, a multi-sectoral approach was considered that brings all the pillars of sustainable governance together including environmental consideration, economic issues, and social concerns, as brought out by the study. Involvement of both the government arm and the community were considered

fundamental in the recommendations of this study, especially in the formulation of rules and regulations to govern the activity. Involvement of the community in governance formulation was deemed to encourage the community to easily accept and adhere to set rules and regulations. Of importance to acknowledgement is the new county government structure that would be considered a much closer government representation to the community as opposed to the central government.

Sand mining is a uni-sectoral, rather than a multi-sectoral activity cutting across several sectors, including environmental, social and economic sectors among others. Therefore the recommended governance structure considered a multi-sectoral approach, and as earlier mentioned, informed by a number of references. In this regard, this study proposes a central body of governance for artisanal sand mining against the existing disjointed regulatory structures. This structure is envisaged to constitute four tiers each with different mandates. The social arm of governance shall deal with issues of social sustainability, the economic arm will deal with issues of economic sustainability, and so will be the environmental arm. There will be a special arm that will oversee the activities of the three arms and deal with the overall formulation of rules and regulations governing sand mining in the study areas as well as other stipulated rules. This body shall be referred to as Kangonde Sand Harvesting Association, which shall be answerable to the community and to the Proposed Machakos County Sand Harvesting Committee.

It is important that the community is fully sensitized and made aware of the pros and cons of artisanal mining activity, and the fact that resources accrued is for the entire community not for a few individuals in this way, they will make decisions from an informed point of view. A synergy ought to be created between the technical committees (governance structures) and the community, and for this reason, the study finds it appropriate that community representatives should be part of every committee, and the election/nomination process should be conducted by the community in a clear and transparent way.

The county government plays a critical role in this study. Unlike in the past where decisions were undertaken by the central government, it is appreciative that the county government, which is considerably closer to the people should be fully involved, especially in governance. For this reason, this study proposes that a County Sand Harvesting Committee should be put in place to oversee the activities of sand mining in the county. To achieve these objectives,

financial commitments will be required at the initial stage, and it is therefore very important that the County government be involved. Based on the study conducted, it is envisaged that the committees will ultimately be able to run themselves with proceeds obtained from sand mining, if the proposed governance structure is implemented. With this, sustainability in all sectors will not only be achieved, but the livelihoods of the community will be uplifted.

Although the proposed governance structure for artisanal mining is expected to be implemented at the local community level, the role of the various institutions and legislations in Kenya informing this sector, as earlier discussed cannot be overstated. It is important that the various committees be informed within the context of the various Acts of parliament within which they operate, so that in execution of their mandates, they are fully aware of their operational limits and obligations within the law.

In conclusion, it is important to know that although the study identifies the actors to the several proposed committees, their roles are basically to champion the needs and demands of the community, and otherwise the whole community should be involved in the process of sustainable governance. Coordination and commitment amongst the technical committees with the community will be key to success.

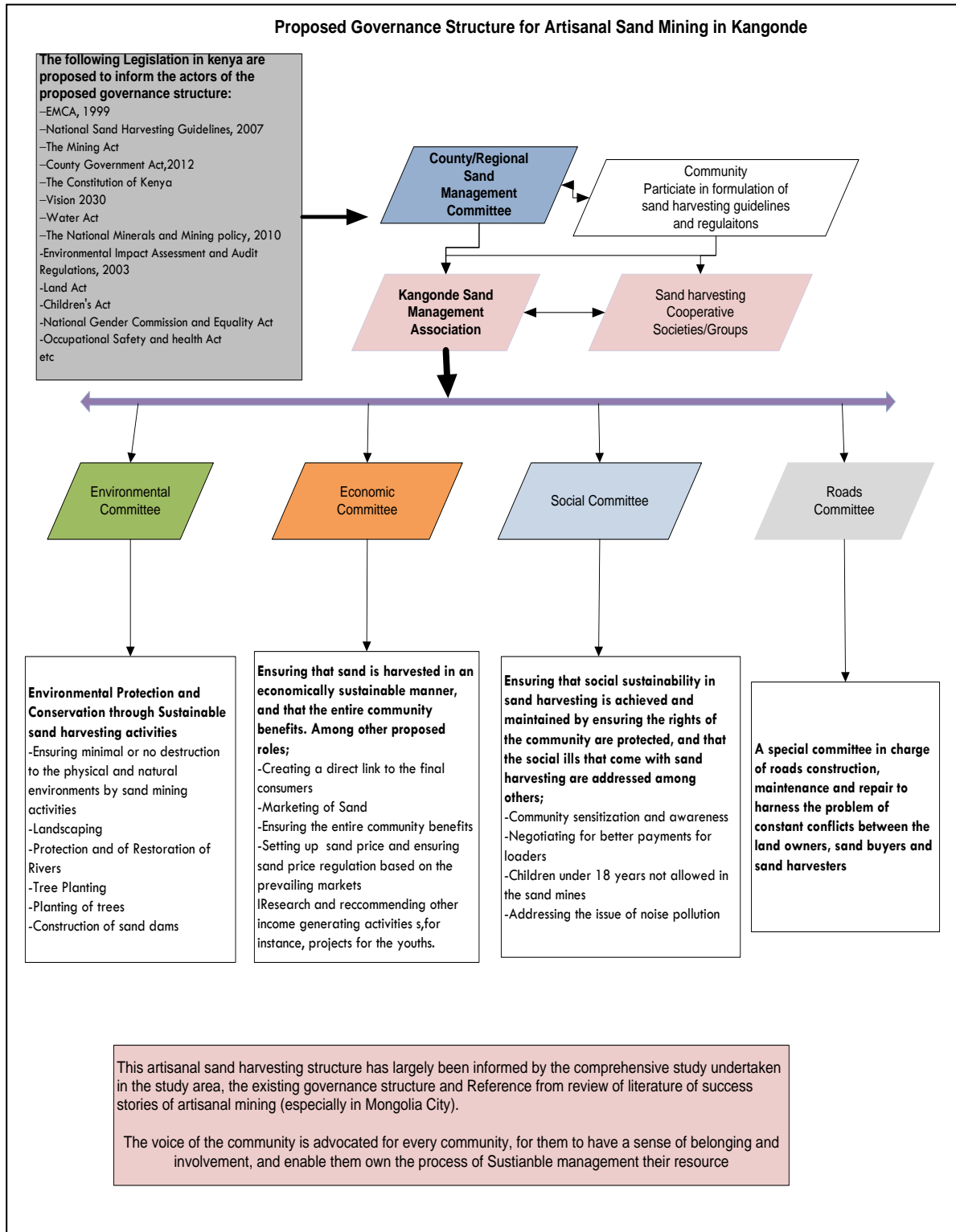


Figure 6.1: Proposed Governance Structure for Artisanal Sand Mining in Kangonde

Source: Author, 2013

Table 6.1: Implementation Matrix for Proposed Governance Structure for Sustainable Artisanal Sand Mining

Objective	Sector/Area of Address	Emerging Issues from the Study	Recommendations	Recommended Actors	Remarks
Suggesting a sustainable governance structure that improves sand harvesting activities in the study area	Existing Sand Harvesting Governance Structure	<ul style="list-style-type: none"> – Several disjointed sand harvesting groups and cooperative societies governing sand harvesting – Some are operational, while some have collapsed, although some people are still holding onto them – NEMA and County Council involved with licensing-some groups are not licensed though – some of the groups are registered with central govt while some are not – Inadequacy of the existing sand harvesting guidelines; Rules are there, but there is a big problem with enforcement, – Lack of transparency in use and sharing of revenue from sand 	<p>Formulation of an independent sand management Association at the County/Regional Level that will discharge the following duties;</p> <ul style="list-style-type: none"> • An overall overseer role to the other proposed committees/sectoral arms of administration • Formal Registration of all sand harvesting groups and cooperatives • Retaining a manageable and known number of sand harvesting groups • Ensuring that all sand miners belong to a group/cooperative society • Strict enforcement of rules and regulations on sand harvesting • Harvesting and selling sand • Commitment of some of the proceeds from sand harvesting to community development • Community to be fully involved in formulation of rules and regulations governing sand mining • Community sensitization and awareness 	<ul style="list-style-type: none"> - NEMA(representing Central Government) -County Governor -County Senator -Sand Management Association -The Community representation constituting (land owners, women reps, youth reps, religious leaders, section leaders, loaders, community elders, 	<p>The existing sand harvesting governance structure is unstructured and uncoordinated</p> <p>This study proposes that the governance structure be improved by implementing the suggested recommendations. Of key importance is constitution of an independent sand management association that will execute the given roles</p> <p>The community should be at the core of these improvements and therefore community awareness and sensitization should be fully undertaken in the study area. Apart from the actors suggested by this study and by the sand harvesting guidelines (2007) any other important representation deemed necessary by the community should be considered.</p>
	Social Sector	<ul style="list-style-type: none"> – Women are not involved in the sand mining industry – Persistent conflicts between sand harvesters and land owners – Reduction of the amounts of sand during dry seasons makes sand harvesters encroach onto people’s farms, and this causes conflicts – Alcoholism and drugs abuse among the youths – Noise from hooting lorries 	<ul style="list-style-type: none"> • Children under 18 years not allowed in the sand mines • Addressing the issue of noise pollution • Sensitization for inclusiveness of women in the industry • Sensitization to the youths • Projects for the youths to ensure continuance of income when sand harvesting season is low. This will also ensure cases of insecurity are minimized. • Formulation of guidelines, and strict 	<ul style="list-style-type: none"> -County Governor/Senator -Women Representatives -Youths representatives -the administration -Land Owners -Sand miners -sand management 	<p>The main aim of this arm of administration is to ensure that the social ills are addressed and that sand is harvested in a socially sustainable manner.</p> <p>The Committee representing the social sector should undertake their full mandate solely for this sector, to be able to fully solve the issues ailing this sector. They should however hold regular meetings with the other arms of administration /tiers governing sand harvesting in other sectors to harmonize and coordinate all</p>

	<ul style="list-style-type: none"> - Frequent conflicts between sand harvesters and truck drivers - Insecurity due to the irregular sand harvesting pattern - Participation by underage school going boys 	<p>enforcement of the same for sand harvesting from land parcels</p> <ul style="list-style-type: none"> • Patrols to be undertaken to beef up security and to ensure no sand mining is undertaken at night • Community sensitization and awareness • Negotiating for better payments for loaders 	<p>Association</p> <ul style="list-style-type: none"> -community elders -Sociologists -Religious Leaders 	<p>the activities.</p> <ul style="list-style-type: none"> -the community should be at the core of this activity and should be given the opportunity to select their representatives.
Economic sector	<ul style="list-style-type: none"> - Increasing number of middle men - Underpayment to loaders - Levies and other charges (transporters) - Cheap and unsustainable sand prices - Demeaning incomes and expenditure patterns - High level of land ownership 	<ul style="list-style-type: none"> • Sand to be sold only through registered groups and cooperatives. No individuals should sell sand • Harvesting and selling sand • Creating a direct link to the final consumers • Marketing of Sand • Ensuring the entire community benefits • Do away with periodic sand bans • Setting up sand price and ensuring sand price regulation based on the prevailing markets • Sand to be harvested during the day only • Investing in other income generating activities, for instance, projects for the youths. • Community sensitization and awareness 	<ul style="list-style-type: none"> -County Governor/Senator - County/Community Development Officer -Women Representatives -Youths representatives -Economic experts -Land Owners -Sand miners -sand management Association -community elders 	<p>The main aim of this committee is to ensure that the community gets the economic gains they rightfully deserve from sand harvesting and that the incomes are sustainable. One way of ensuring this is connecting the community direct to the consumer, or negotiating with the buyers.</p> <ul style="list-style-type: none"> -This committee should also ensure that there is fair compensation to the community, through formulation of guidelines of giving back to community projects for instance through construction of roads, gabions, schools, boreholes, etc. This should however be discussed and agreed upon by the entire community. This committee should ensure that the prices of sand are regulated and sustainable to the entire community. the issue of middlemen should be addressed by this committee once and for all, before the sand prices drop to extremely unsustainable levels -If well managed, this arm of governance should be able to create funding avenues and especially for sustaining the committees
Roads	<ul style="list-style-type: none"> - No designate land for roads, thus pass by people's farms - Existing roads are poor roads (Dusty, rugged, narrow, full of sand deposits) 	<ul style="list-style-type: none"> • come up with a development plan demarcating land for roads • compensation plan for land owners where the roads to the mines shall cross • construction and repair of roads to the mines 	<ul style="list-style-type: none"> -County Governor -Surveyor - County/Community Engineer -The administration 	<p>To harness the problem of constant conflicts between the land owners, sand buyers and sand harvesters, clearly demarcated roads should be created, and policies for their construction and regular maintenance formulated.</p>

			<ul style="list-style-type: none"> • Community sensitization and awareness 	<ul style="list-style-type: none"> -land owners -Sand Management Association -Community Elders 	
	Environmental Sector	<ul style="list-style-type: none"> - Destruction of crops and vegetation - Drying up of rivers and reduced water levels - Long droughts - Overexploitation of the sand resource - Soil erosion - Deformed landscapes prone to landslides and erosion - Flooding of farms during rainy seasons - Unreliable rainfall - Lack of finances to construct gabions - Impingement on the retention capacity of rivers - ASAL conditions in the study area - Noise , water and air pollution - Widening of river banks - Wood energy widely used by community 	<ul style="list-style-type: none"> • Construction of gabions, • Controlling the rate of sand harvesting • Planting more trees • Building of more sand dams • Alternative water sources • Considering seasonal Sand harvesting for instance, sand harvesting to be undertaken during rainy seasons • Avoiding sand harvesting at river banks • Landscaping • Protection of crops and vegetation • Community sensitization and awareness 	<ul style="list-style-type: none"> -NEMA -District Environment Officer -County Environment Officer -Environmental Experts -Sand Miners -Sand Management Association 	<p>The chief role of this governance arm will be to ensure environmental sustainability in sand harvesting, through promoting protection and conservation measures of the physical and natural environments. Together with the entire community and the other administration tiers, this arm of governance shall not work solely, but rather in regular consultations.</p> <p>-The study area is already an ASAL area, and any efforts of worsening this situation should be strongly discouraged. Although sand mining is supporting a number of livelihoods, it should be done sustainability, with regards to the physical and natural environments as well. It's a fact that sand mining activity has continued to cause water shortages, destroyed rives and vegetation, and all measures of reclaiming and protecting the natural environment should be undertaken by this committee.</p> <p>-Like all the other committees/tiers, this should be a daily undertaking and should be considered as an income earning job for the committee members.</p> <p>-the community should be sensitized about the dangers of overexploitation of sand against considerably bad climate</p>

6.4 Areas for further Research

This study proposes areas for further research. These include:-

Artisanal mining and health of miners: There is need to carry out research to determine the impact of artisanal mining on the health of the miners. Since artisanal miners use basic tools for their activities, work in dusty environments and do not adhere to health and safety standards, it is important to determine the health hazards that this activity exposes them to.

Economic value of sand deposit per season: Artisanal sand mining contributes significantly to development and poverty alleviation in the rural areas. Determining the quantity of sand per season and deriving its value will enable counties that have this resource to align the value of this resource with their development agenda. This will enable the sector to attract funding from the county government and other institutions to streamline it.

Riverine vegetation and soil erosion: There is need to research on the impacts of Artisanal sand mining on the vegetation cover along rivers and the impact of this loss of vegetation in soil erosion and the resultant flood plains within the study area.

Boy child and Artisanal mining: Further research needs to be carried out on matters pertaining to boy child. Sand harvesting is predominantly carried out by men with women providing very peripheral services like selling food to the miners. There is need to research on the school completion rate between boys and girls, with an aim of addressing this imbalance. Promise of quick money is attracting boys to the sand pits more than girls.

Sand harvesting and Water Resource: Research should be carried out to determine the impact of Artisanal sand harvesting on water resource, both on the river and ground water sources, since this is an ASAL area, and bearing in mind the responses obtained from the study which indicated that water was the most critical resource needed by the community.

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Appendix 1: Tables for Finding a Base Sample Size

Appendix 1: Tables^a for Finding a Base Sample Size^b
 +/- 5% Margin of Error^c

Population	Sample Size				
	50%	40%	30%	20%	10% ^d
100*	81	79	63	50	37
125	96	93	72	56	40
150	110	107	80	60	42
175	122	119	87	64	44
200	134	130	93	67	45
225	144	140	98	70	46
250	154	149	102	72	47
275	163	158	106	74	48
300	172	165	109	76	49
325	180	173	113	77	50
350	187	180	115	79	50
375	194	188	118	80	51
400	201	192	120	81	51
425	207	197	122	82	51
450	212	203	124	83	52
500	222	212	128	84	52
600	240	228	134	87	53
700	255	242	138	88	54
800	267	252	142	90	54
900	277	262	144	91	55
1,000	286	269	147	92	55
2,000	333	311	158	96	57
3,000	353	328	163	98	57
4,000	364	338	165	99	58
5,000	370	343	166	99	58
6,000	375	347	167	100	58
7,000	378	350	168	100	58
8,000	381	353	168	100	58
9,000	383	354	169	100	58
10,000	385	356	169	100	58
15,000	390	360	170	101	58
20,000	392	362	171	101	58
25,000	394	363	171	101	58
50,000	397	366	172	101	58
100,000	398	367	172	101	58

Qualifications

- This table assumes a 95% confidence level, identifying a risk of 1 in 20 that actual error is larger than the margin of error (greater than 5%).
- Base sample size should be increased to take into consideration potential non-response.
- A five percent margin of error indicates willingness to accept an estimate within +/- 5 of the given value.
- When the estimated population with the smaller attribute or concept is less than 10 percent, the sample may need to be increased.
- The assumption of normal population is poor for 5% precision levels when the population is 100 or less. The entire population should be sampled, or a lesser precision accepted.

Source: Watson, 2001.

Appendix 2: Key Informant Questionnaire for Cooperative Societies

**SUSTAINABLE GOVERNANCE FOR ARTISANAL MINING -
CASE OF SAND HARVESTING INDUSTRY IN KANGONDE
LOCATION, MASINGA DISTRICT**

KEY INFORMANTS (SURVEY FOR RESEARCH PROJECT IN PARTIAL

IDENTIFICATION
Institution/Cooperative society/Association Name
Position of the Key Informant

PHONE NO OF INTERVIEWEE-----

Signature of the interviewer that a verbal consent was obtained:

(Note to interviewer: 98 =No answer provided, 99 = Don't know)

COOPERATIVE SOCIETY/ASSOCIATION		
N°	QUESTIONS	ANSWERS
101.	Record sex of the respondent	01 = Male 02 = Female |_|_|_|
102.	For how long have you lived in this settlement/Area? (Years)	|_|_|_|
103.	Name of Cooperative Society (If Any)	01= Masinga Cooperative Society 02 = kandamasi Cooperative Society 03 = Musingini Sand Harvesting Group |_|_|_| 04 = Kikwasa Self Help Group 05 = Mukondo Water Project Group 06=Karwea Sand Harvesting Group 06=Other(specify)----- 98 = No answer
104.	How long has this association/organization been in existence?-years	|_|_|_|
105.	Is the (Cooperative) Society registered?	01 = yes 02 = NO 98=No Answer 99 = Don't know
106.	What is the vision/target for the cooperative/association?	..... ..... .....
107.	If yes, who registered the society/association?	..... ..... .....
108.	Who is the association/organization answerable to?	..... ..... .....
109.	How is this organization/society linked to sand harvesting?	..... ..... .....
110.	What are the roles/functions of the society/association?	..... ..... .....
111.	Do you have officials?	01 = yes 02 = NO 98=No Answer 99 = Don't know
112.	What are their responsibilities?	..... ..... .....
113.	How many members are you?	..... ..... .....
114.	How does one become a member? Any subscriptions?	..... ..... .....

COOPERATIVE SOCIETY/ASSOCIATION		
N°	QUESTIONS	ANSWERS
115.	Which rivers/areas do you control sand mining activities?	..... ..... .....
116.	How wide is the area in qsn 113 above?	..... .....
117.	How is your relation with land owners who are along the river banks, do you pay them?	..... .....
118.	How many times do you mine in a year? (sand harvesting calendar)	..... .....
119.	Who gives authority for the society/association to undertake sand mining?	..... .....
120.	How do you get loaders?	..... .....
121.	Are they also Members of this association?	01 = yes 02=No 98=No Answer
122.	How do you get clients (customers)?	..... .....
123.	How much do you charge your customers per lorry of sand? Size of lorry?	..... .....
124.	Where do your customers come from?	..... .....
125.	Why do you think transporters (customers) come all the way to buy you sand here?	..... .....
126.	How much do you pay the loaders?	..... .....
127.	Apart from the loaders, which other people do you pay?	..... .....
128.	What is your association with other sand mining regulators? (eg other cooperative society, chiefs, DC, NEMA, County Council)	..... ..... ..... .....
129.	In your opinion, is sand harvesting destructive to the environment? And to the river?	01 = yes 02=No 98=No Answer
130.	If yes in qsn 127 above, How?	..... ..... .....

COOPERATIVE SOCIETY/ASSOCIATION		
N°	QUESTIONS	ANSWERS
131.	What suggestions do you have for your answer in qsn 128 above?	..... ..... .....
132.	Any benefits accrued from sand harvesting?	..... ..... .....
133.	What challenges does your organization/association encounter?	..... ..... .....
134.	How do you deal with underage/school going loaders?	..... .....
135.	Are women involved in sand loading?	01 = yes 02=No 98=No Answer
136.	If no in qsn 133, why?	..... ..... .....
137.	Do you have any permits for sand harvesting?	01 = yes 02=No 98=No Answer
138.	Who issues you with permits, if any?	..... .....
139.	Who maintains the roads of access of this association?	..... ..... .....
140.	Final suggestion/recommendations for sand harvesting mining in this area?	..... ..... .....
141.	Structure of sand harvesting in Kangonde location How/what is the regulatory structure of sand harvesting in Kangonde?	

END...THANK YOU FOR YOUR COOPERATION

Appendix 3: Household Based Questionnaire

**SUSTAINABLE GOVERNANCE FOR ARTISANAL MINING -
CASE OF SAND HARVESTING INDUSTRY IN KANGONDE
LOCATION, MASINGA DISTRICT**

**HOUSEHOLD SURVEY FOR RESEARCH PROJECT IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR MASTERS OF ARTS**

IDENTIFICATION

AREA|_|_|

HOUSEHOLD NUMBER|_|_|_|

PHONE NO OF INTERVIEWEE-----

Signature of the interviewer that a verbal consent was obtained:

(Note to interviewer: 98 =No answer provided, 99 = Don't know)

N°	QUESTIONS	ANSWERS	SKIP
A. SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS			
101.	Record sex of the respondent	01 = Male 02 = Female	
102.	How old are you? Record age in years	Record number of years 99 = Don't Know	
103.	For how long have you lived in this settlement/Area? (Years)		
104.	What is the highest level of schooling you have attained?	00 = None 01= Some primary education 02 = Completed Primary 03 = Secondary 04 = College 05 = University 06=Other(specify)----- 98 = No answer 99 = Don't know	
105.	What is your main source of income? <i>(Only one answer is possible. Record the principal income sector.)</i>	01 = None 02= Agriculture 03 = Trading 04 = Sand harvesting 05 = Transport 06 = Crafts 07 = Public service.....specify..... 08 = Humanitarian or development group 09 = Remittance 10 = Other (Specify) _____ 98 = No answer 99 = Don't know	
106.	Is there anyone in family in formal employment?	01 = yes 02 = NO	
107.	If yes in Qsn 106, where are they employed?	01=Within kangonde 02=Outside Kangonde	
108.	What is the main source of food for the household?	01=Subsistence Farming 02=Buying 03=Other, Specify.....	
109.	What is your marital status?	01 = Married 02 = Divorced/Separated 03 = Widow/ Widower 04=Single 98 = No answer 99 = Don't know	
110.	Do you have any child/children?	01 = yes 02 = NO 98 = No answer 99 = Don't know	
111.	If YES above, how many children do you have and what is the gender split?	RECORD EXACT NUMBER _____ Male.....Female.....	
112.	How many of the above children are in school?	RECORD ACTUAL NUMBER _____	
113.	Are there any of your children who are of school going age and are currently not attending school?	01 = yes 02 = NO 98 = No answer 99 = Don't know	
114.	If YES above, what are the reasons that they are not attending school?	01=Lack of fees 02=Lack of/Inadequate schools 03=Refused to go to school 04=Married 05=working-----Specify..... 06=Other (specify)----- 98=No answer 99=Don't Know	
115.	Where do you seek medical services?		
116.	What is the most common ailment in this area?		

N°	QUESTIONS	ANSWERS	SKIP
117.	What challenges do you face in seeking medical services?		
118.	Do you use herbal medicine? (Miiti shamba)	01 = yes 02=No	
119.	What is the source of the herbal medicine?		
120.	Where do you get water?	01=Tap 02=River.....mention river..... 03=Other, Specify-----	
B. MIGRATION TRENDS (For respondents born elsewhere)			
121.	Place of Birth of the Respondent	01=Within the study Area 02=Outside the study area	IF BORN within THE STUDY Area, continue
122.	When did you migrate to this Area?	----- -----	
123.	Reasons for migration from place of birth to this settlement	----- ----- -----	
124.	Have you at any time moved out of this settlement?	01 = yes 02 = NO 98 = No answer 99 = Don't know	
125.	What were your reasons for emigration?	----- -----	
C. LAND ISSUES			
126.	Do you own Land in the area?	01 = yes 02 = NO 98 = No answer 99 = Don't know	If no, skip to next section
127.	If yes, which part of the Kangonde? Mention names, location, for instance, next to the river...	----- -----	
128.	What is the size of your land? (acres/hectares)	RECORD EXACT SIZE |_|_|_|	
129.	What is the nature of ownership?	01 Trust/Community Land 02 Freehold/Private Land 03 Leasehold 04 Others (Specify).....	
130.	If under private Ownership, do you have a title deed?	01 = yes 02 = NO 98 = No answer 99 = Don't know	
131.	If yes, what is the parcel number?	-----	
132.	What do you do with your land?	01= Agriculture 02=Homestead 03=Sand Harvesting 04=Other, Specify-----	
133.	What is the value of your land? (Per acre)	-----	
D. Housing			
134.	Type of house occupied by the respondent (<i>Observation</i>)	01= Bungalows 02 =Flats 03 =Single rooms 04 =Maisonettes 05 =Others (specify).....	

N°	QUESTIONS	ANSWERS	SKIP														
151	Types of pollution within the study area	<table border="1"> <thead> <tr> <th>Pollution Type</th> <th>Source</th> </tr> </thead> <tbody> <tr><td>Noise</td><td></td></tr> <tr><td>Air</td><td></td></tr> <tr><td>Ground</td><td></td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> </tbody> </table>	Pollution Type	Source	Noise		Air		Ground								
Pollution Type	Source																
Noise																	
Air																	
Ground																	
152	What type of energy do you use and what is the source?	<table border="1"> <thead> <tr> <th>Type</th> <th>Source</th> </tr> </thead> <tbody> <tr><td>Electricity</td><td></td></tr> <tr><td>Kerosene</td><td></td></tr> <tr><td>Charcoal</td><td></td></tr> <tr><td>Wood</td><td></td></tr> <tr><td>Others, Specify ----- ----- -----</td><td></td></tr> </tbody> </table>	Type	Source	Electricity		Kerosene		Charcoal		Wood		Others, Specify ----- ----- -----				
Type	Source																
Electricity																	
Kerosene																	
Charcoal																	
Wood																	
Others, Specify ----- ----- -----																	
<i>G. Economic Investment</i>																	
153	What is the main economic activity in this area? Mention two at most	01=Sand Harvesting 02=Agriculture 03=Livestock Keeping 04=Other, specify----- ----- -----															
154	What are the challenges facing the main economic activity mentioned in 153 above?	----- ----- -----															
155	Which other investment opportunities are available in the area, apart from the main economic activity?	----- ----- -----															
156	Are you involved in any agricultural activity?	01 = Yes 02 = No 98 = No answer															
157	What type of agricultural activity are you involved in?	02 =Horticulture 03 =Food crops 04 =Livestock 05 =Fish farming															
158	Which financial institutions are available within the area of study?	----- ----- -----															
159	What are the main employment opportunities in this area?	----- ----- -----															
160	What are your income sources? Mention at most three in order of priority 1=Most preferred 3= Least preferred																
161	What is your average income per day?																
162	What is your average expenditure per day/per month?																
162	What is the main expense in this house	01=house 02=food 03= medical 04=clothes 05=other, mention															

