ANALYSING THE IMPACT OF SOCIAL TENURE DOMAIN MODEL (STDM) ON TENURE SECURITY IN AN INFORMAL SETTLEMENT

CASE STUDY OF MASHIMONI VILLAGE – NAIROBI, KENYA

ELIZABETH ODOL OTIENO

Enschede, The Netherlands, MARCH 2017

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Thesis submitted to the faculty of Geo-Information Science and Earth Observation of the University of Twente in partial fulfilment of the requirements for the degree of Master of Science in Geo-information Science and Earth Observation.

Specialization: Land Administration

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ABSTRACT

Tenure security for informal settlers remains a challenge in developing countries. In Kenya, the Kenya National Land Policy (2009) makes provision for the government to facilitate the registration of informal settlements found on public and community land. This is expressly for the purposes of upgrading and development. In practise this registration is yet to be achieved, the populations living in the slums and squalid places continues to increase and there is little motivation and appropriate resources available to complete the task.

The main objective in this study was to analyse the impact of STDM in tenure security, a case study of Mashimoni village, Nairobi. In this regard, pro-poor land tools offer alternatives that seek to support faster, cheaper, and more flexible methods of registration.

However, little is known on whether the use of pro-poor tools in land registration actually improves the lives of those for whom the tools are aimed at, for example, informal settlers. In response, this research seeks to find out if the use of the Global Land Tool Network's Social Tenure Domain Model (STDM) software reduces the threats of eviction for settlers; enhances their ability to leave, rent, and invest in land; and improves the housing stock and surrounding infrastructure.

The methods used in the data capture are both quantitative and qualitative analysis done by use of frequency distribution and spatial analysis. The findings in this research show varied impacts in the man-land activities after the STDM implementation. Looking at the variables used in measuring the indicators for the sub-objectives, four out of nine imply a positive impact of STDM in Mashimoni, which is a commendable gain considering that it is three years since it's implementation.

The limitations were due to the source data used and the spatial analysis techniques, while it is also recommended that further work can be done in analysing vertical expansion using 3D analysis.

Keywords: *Tenure Security, Pro-poor tools, Informal settlements, Mashimoni Village*

ACKNOWLEDGEMENT

I most sincerely acknowledge the Almighty God, without whom I would have deferred this course along the way. I say He is Jehovah Ebenezer!

I acknowledge the assistance and guidance I got from my supervisors Dr. Monica Lengoiboni and Dr. Rohan M. Bennett with honour and gratitude. Their constructive critique, encouragement and willingness to give important advice were consistent. I also thank the entire staff of Land Administration domain whose lectures were of a great contribution towards the writing of this thesis. To the Student's Affairs office (Marie-Chantal and Thereza) I salute you. I also appreciate both the University of Twente and TUK for granting me the scholarship.

Special thanks go to the Settlement Executive Committee-Mashimoni; GLTN staff; TUK staff; Pamoja Trust and the Nairobi Water & Sewer Company. They were quite resourceful in provision of data and information.

Am truly indebted to my fellow students who were quite handy throughout this studies. To my classmates – LA; we were the fantastic four – Karma, Freeman and Nattapon. To the Kenyan students, we had great discussions during the core modules; to the international students, it was great working with you; to John and Msafiri, you were really generous with knowledge; to Jacob, you are daring and would seek justice for all; to my friends Steve and Anne you are the kind that swing in action in the nick of time. I also appreciate Wayumba, Ayugi, Jack, Malaki and other TUK staff for their support. Am also grateful to my extended family, the larger Okore's and Okelo's.

I am greatly indebted to the various authors whose publications I have used and also cited. I commend them for their superb works, which have enabled me to conceptualize the methodology of this thesis.

And to the ICF-Church, thank you for nourishing my soul spiritually in my low and high moments.

DEDICATION

I dedicate this thesis to Yolaine-my special girl, you are my inspiration. To her sister Crystal, thank you for nursing her with love; to her cousins Christine and Annett, you were angels to her; to Naomi Tangai you have become my sister – I say thank you!

To my sons Daniel and Joel, you kept wishing that you would wake up and find yourself in March 2017; indeed it has come, and I will be home physically

To the love of life Zaddy, your unequalled encouragement during my study abroad is immeasurable.

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ACRONYM

STDM	Social Tenure Domain Model
TUK	Technical University of Kenya
SEC	Settlement Executive Committee
GLTN	Global Land Tool Network
GIS	Geographical Information System
GPS	Global Positioning System
RMSE	Root Mean Square Error
KISIP	Kenya Informal Settlement Improvement Programme
SPSS	Statistical Package for the Social Sciences
DFID – UK	Department for International Development – United Kingdom

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1.0. INTRODUCTION

1.1. Background and Justification

The informal settlement population as at 2001 had risen to 924 million in the world as reported by UN-HABITAT, (2003) which is about 15 percent of the world's total population. "In 2005 the number of people living in insecurity of tenure reached one billion. These people experience poverty, social exclusion and inadequate housing, water and sanitation on a daily basis and hence, unless urgent action is taken, the number is likely to rise to more than two billion by 2030" (UN-HABITAT, 2010, p.3). According to Cohen, (2006) this increase can be attributed to the rural-urban migration due to the technological and political change, with cities being the focal points for economic growth, innovation and employment. In her book Huchzermeyer, Marie Karam, (2006 p.2) defines informal settlement as "neglected parts of cities where housing and living conditions are appallingly poor, ranging from high density, squalid central-city tenements to spontaneous squatter settlements without legal recognition or rights, sprawling at the edge of cities". Informal settlers are a part of the majority who can't afford the formal property system while a tiny minority have their properties legally documented as observed by De Soto, (2000) and as a result, they cannot access credit facilities. De Soto, (2000) further says that recognition of their rights makes the people more accountable because their names and identity are documented and linked to their property hence, increasing their business network. So it becomes easier for the government to collect taxes while on the other hand, the people can use their property as collateral and it becomes easier to access credit. People who are not secure in their property rights will not be motivated to have any serious investments. They will not have the enthusiasm to improve their houses neither will they be concerned with the improvement of their neighbouring infrastructure (Ubink, Hoekema, & Assies, 2009). Another main issue with tenure insecurity is the high likelihood of being evicted which causes a lot of fear and anxiety (Weinstein, 2014; Huchzermeyer, 2007).

In most of the developed countries e.g. Netherlands, Australia, formal rights are given precedence in the conventional land administration and have their lands documented. Conventional land administration refers to the formal registration accompanied by issue of titles and official registry. In the developing countries like Kenya and Ethiopia registration

has been slow and are yet to be completed. Unconventional land administration is more common since most of their land is communal typical with customary agreements on land ownership. Atwood, (1990) acknowledges the need for land registration in Africa to increase agricultural production, creation of incentives for investment and increase in Land markets. However, most countries in the sub-Saharan Africa are yet to complete their land recordation which have been slowed down with the high costs in land transactions and the complicated administrative procedures. In Kenya, like many other developing countries, the demand for land recordation is high as observed by (Miceli, Sirmans, & Kieyah, 2001). However this has been equally slow. This can be attributed to the conventional approach used in land administration which has costly land transactions and focusses on individual freehold. Augustinus, (2010) suggests that tenure security of the slums and rural land should be based on social tenures and not individual freehold. In the Kenyan National Land Policy (Lands, 2009), it is observed that many people live as squatters in slums and other squalid places. Hence it is documented that it will " facilitate the registration of squatter settlements found on public and community land for purposes of upgrading or development" (Lands, 2009 p.48). Nevertheless, Kenya is yet to achieve this policy by bridging this technical gap between the registered and non-registered land.

Several studies have been done in an effort to bridge the land registration gap (Augustinus, 2010; Augustinus, Lemmen, & Oosterom, 2006), with Lemmen beginning to develop the Social Tenure Domain Model (STDM) from 2002, under ITC being financed by Global land Tool Network (GLTN). Also, in view of this need, Zevenbergen, Augustinus, Antonio and Bennett (2013) emphasize on the need to speed up land registration using the cheap pro-poor land tools. In line with this, various stakeholders like the World Bank, (GLTN) and others are supporting the development of pro-poor land management tools. GLTN partners support a continuum of land rights, which includes all rights documented and undocumented. However, these range of rights cannot be described relative to a parcel and so new forms of spatial units and a domain model was developed to accommodate these social tenures, termed Social Tenure Domain Model (STDM) (Augustinus et al., 2006). This is a pro-poor tool for land information management system suitable to cater for the land systems of the poor in urban and rural areas, but can also be connected to the cadastral system where by all the information is held on one system. STDM is a tool based on PostgreSQL and a plugin on QGIS (open source software). Other examples of pro-poor tools are the Open Title, SOLA (Solutions for Open Land Administration) and Land Mapp products and services amongst

others. Several countries have used the various pro-poor tools. Uganda had it's first STDM pilot project done in Mbale 2011. Mashimoni (Nairobi), Kwa Bulo (Mombasa), Kisumu and Nakuru in Kenya were beneficiaries too. Other contexts where the tools has been trialled are the Caribbean, Zambia and Colombia among others.

There is an urgent need to bridge the technical gap in land registration services. More specifically, there is a need to better understand whether alternative pro-poor land administration tools actually improve land tenure security outcomes. To this end, this research aims to contribute to this need by evaluating the impact of using STDM on tenure security. This study will focus on Mashimoni informal settlement in Nairobi, Kenya. The results of this research will shed light on the correlations of documenting rights using STDM and lessons learnt will be of interest to relevant authorities and policy makers.

1.2. Research Problem

With the documentation of people-land relationships sometimes people are given certificates of occupancy which further quicken the recognition of tenures. This recordation has an influence on people's perception of land and investments. According to Veldkamp, (2009) every aspect of man-land relationship should be studied, this enables the understanding of how humans react when in possession of land certificate which enhances tenure security. Several studies have been done to find out if there are any investments; reduction of threat evictions; changes in the infrastructure and social amenities (Batson, 2011;Shrestha, 2013;van Gelder, 2010; Marie Christine D Simbizi, Zevenbergen, & Bennett, 2014; Fosudo, 2014; Archer, 2016; Zevenbergen, De Vries, & Bennett, (2015, p.251) after registration using pro-poor tools. It is upon this security of tenure and perceived changes on human behaviour that this research is based. The changes here refer to liberty to rent their property; existence and non-existence of eviction threats; investments in terms of improving of their house structures and expansion; improvement of roads and service utilities.

1.3. Problem Statement

Tenure security for the informal settlers remains a challenge in developing countries. Little is known if the use of pro-poor tools in land registration impact or improve the lives of informal settlers. More specifically, it is not clear whether the use of STDM in land registration leads to a reduction in the threats of eviction; improves the ability to leave, lease and rent their

property to their beneficiary of choice; leads to improved house structures; and whether expansion and improvement of roads and service utilities occurs.

1.4. Research Objective

1.4.1. Main Objective

The main objective of this research is to evaluate the impact of STDM on tenure security in Mashimoni, Nairobi County, Kenya.

1.4.2. Sub objectives

1. To assess how the land interest holders perceive their tenure security and the drive to improve their property following an STDM intervention
2. To ascertain the perceived level of threat of eviction by land - subsequent to the STDM implementation from land interest holders.
3. To evaluate if the introduction of STDM has attracted government and private sector stakeholders to invest in the infrastructure.

1.5. Research questions

Questions for sub objective 1 - *To assess how the land interest holders perceive their tenure security and the drive to improve their property following an STDM intervention*

a) What is the confidence of land interest holders on tenure security after the STDM enumeration?
b) What are the changes in their house/business structures?
c) What is their view of the role of STDM in protecting their rights against freedom to lease, leave and rent their property

Questions for sub objective 2 - *To ascertain the perceived level of threat of eviction by land – subsequent to the STDM implementation from land interest holders.*

a) What are the types and characteristics of internal threats experienced within the community after STDM?

b) What are the types and characteristics of external threats experienced from outside the community after STDM?

c) What is the role of STDM in minimizing/eliminating forced evictions?

Questions for sub objective 3 - *To evaluate if the introduction of STDM has attracted government and private sector stakeholders to invest in the infrastructure.*

a) What was the change in the road coverage in the period 2013-2016
b) What is the change in the fresh water and electricity supply in the period 2013-2016
c) What is the change in the sewerage system in the period 2013-2016

1.6. Operationalization of Variables

This matrix aims at breaking down the main objective into concepts, indicators and measurable variables. To find out if there are any threat evictions after the STDM implementation, the specific objective of eviction threats was broken into three indicators e.g. internal evictions resulting within the community will be measured under the category of family, neighbours and the landlord.

Table 1:1: Operationalization of Variables

Sub objective	**Concepts**	**Indicators**	**Research Questions**	**Variables**
1.To assess how the land interest holders perceive their tenure security and the drive to improve their property following an STDM intervention	Tenure security	1.Perception of tenure security	What is the confidence of land interest holders on tenure security after the STDM enumeration?	-confidence will not be taken away in the next 5 years (short term) -confidence will not be taken away in the next 15 years (long term)
		2.Buildings	What is the change of the house structures	1.% of house area change 2.Type of building materials used
		3. View on the role of STDM in property transactions	What is their perception of the use of the STDM in protecting their rights and their mode of	-protection of rights -mode of acquisition

			acquisition	
2. To ascertain the perceived level of threat of eviction by land -subsequent to the STDM implementation from land interest holders.	Eviction threats	Types of internal threats of eviction	What are the characteristics of internal threats within the community	-Pressure from the family, neighbours or landlord
		Types of external threats of eviction	What are the characteristics of external threats from outside the community	-Pressure from the government, private developers
		View on the role of STDM in minimizing forced evictions	What is their opinion of the government use of the STDM in protecting them against forced evictions	-% of confidence in the government using STDM to protect them from forced evictions
3. To evaluate if the introduction of STDM has attracted government and private sector stakeholders to invest in the infrastructure.	Infrastructural changes in the period 2013-2016	1.Road status	What is the change of the road network in the period 2013-2016	-No. of major and feeder roads increased -No. of roads expanded
		2.water services and electricity supply	What is the change of water services in the period 2013-2016	% of increase of fresh water and electricity supply
		3.sewerage system	What is the change of sewerage system in the period 2013-2016	% Increase in sewer line

1.7. Flow chart of the thesis

Figure 1.1 gives an overview of the entire thesis from the pre-field work consisting of literature review leading to problem identification and definition of objectives and research

questions. The fieldwork stage comprises collection of all the data required while the post fieldwork stage focussed on the data analysis, results and discussions.

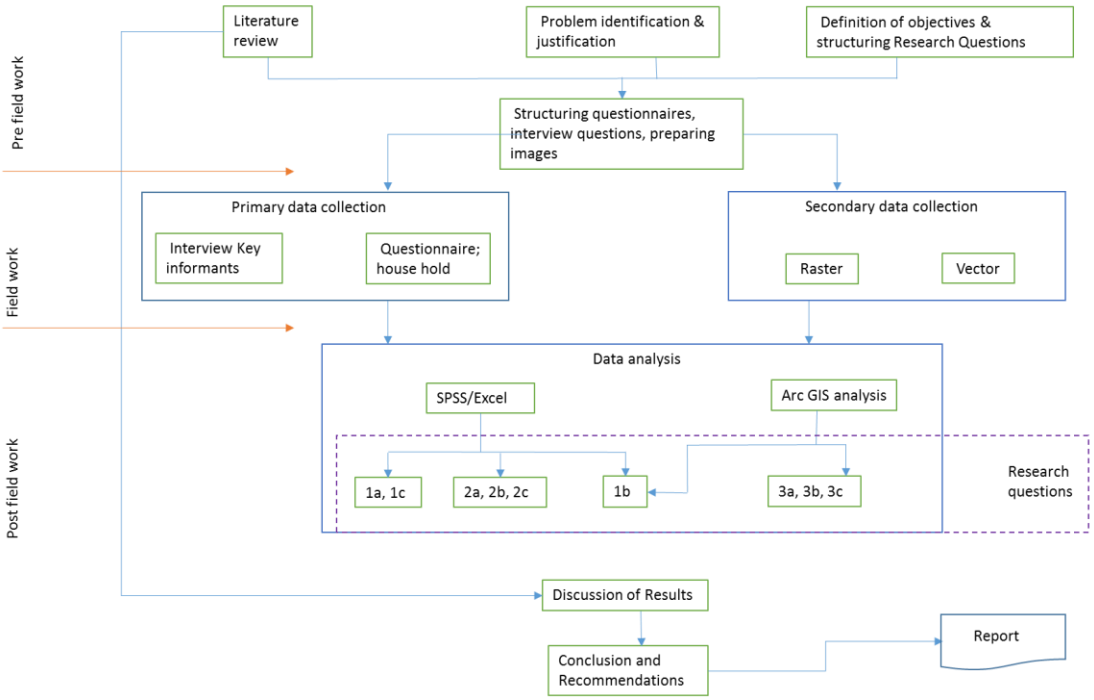


Figure 1:1 Flow chart of the thesis

1.8. Conclusion

This chapter gave an overview of the research with the background and justification of the study giving a broad illustration of the tenure situation in the developed and developing countries. It further introduces the need to use pro-poor tools in land registration, zeroing in on its application in one case study, with the operationalization matrix defining the research questions to achieve the sub objectives stated. Finally it gives a flow of steps taken to achieve the objective of the study in the flowchart – Figure 1.1

2.0. LITERATURE REVIEW

2.1. Literature review

This literature is guided by the concepts introduced in chapter one. More information is expounded on tenure security, informal settlement and pro-poor tools. The ultimate goal is exploring the possibility of achieving a fast land recordation of the informal settlement and understanding the state-of-play as to whether alternative forms of land registration are actually improving land tenure security outcomes within a community.

2.2. Informal Settlement

Informal settlements have been studied extensively in various contexts and are found to be complex and highly dynamic hence their recordation to enhance tenure security has been difficult. The term is broad and can be defined by several characteristics. Their features, explanation and names vary in definition by various authors. Hence, UN-HABITAT, (2003), for the purpose of global application e.g. Sustainable Development Goals considered and interpreted the various definitions. Accordingly, it defined informal settlement as inclusive of poor housing and infrastructure; inadequate access to water and sanitation; overcrowding and insecurity of land tenure.

The birth of informal settlements in Nairobi is approximated to be before the 1960s and it's tremendous growth and multiplication occurred after the 1960s when the colonial government left (Amnesty International, 2009; Pamoja Trust, 2009). The population of Nairobi is approximated at 3.36 million (United Nations Development programme, 2011) with about 134 informal settlements (UNEP, 2006), housing almost 60% of it's population (UN-HABITAT, 2006). "Proliferation of the informal settlement is as a result of market and public policy failure for a significant segment of the urban poor population and also it impacts negatively on the quality of life" (Wekesa, Steyn, & Otieno, 2011).

As shown in Figure 2-1, informal settlements lie towards the informal land rights typical of the customary, occupancy and group tenures where land registration is yet to be achieved. The leases and freehold lie on the formal land rights where registration is vibrant under the conventional land administration. However, all these property rights may change status at some point because even the individuals with freehold on the formal rights can subdivide their land and fail to update the changes in the registry. Nevertheless, the gap continues to widen unless a solution is sought. Under the formal land rights, common tenure security

indicators are possession of title, the duration, the transferability and the exclusivity of land rights (Marie Christine D Simbizi et al., 2014). These authors Simbizi et al., (2014) further acknowledge that these indicators cannot suit the informal land rights and so they designed a more holistic conceptual model that captures all forms of tenure. Durand-Lasserve & Selod, (2009) also agree that tenure security, can be enhanced by land recordation and length of occupation of the inhabitants. This recordation can be quickened in land administration by use of the pro-poor tools.

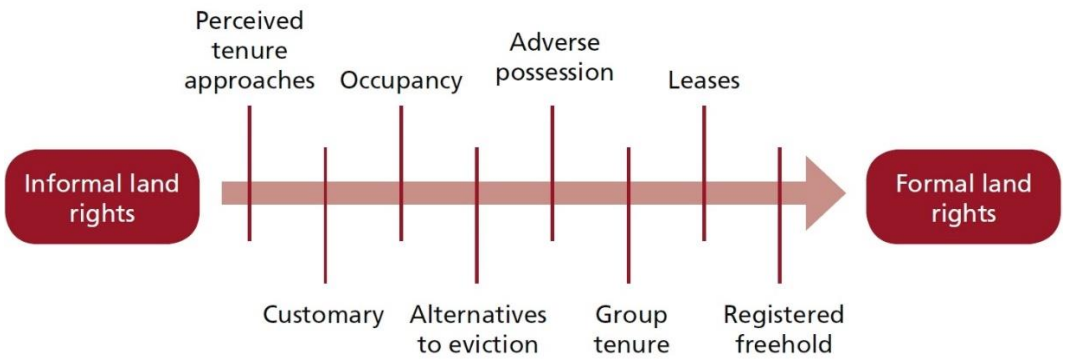


Figure 2:1: Continuum of Land rights (UN-HABITAT: 2008)

Showing the variety of property rights - ranging from the informal on one end to formal on the other. In between are the customary, occupancy and leases among others.

2.3. Pro-poor tools

Pro-poor tools have been developed intentionally to speed up land registration in the sub-Saharan countries. In the developing countries about seventy percent of the land is not registered (Augustinus, 2010). As a result they are not beneficiaries of the land administration system in terms of security of tenure, service delivery and land management approaches. The 30% under the cadastral coverage have unique parcel based polygons that are mapped and also accompanied with legal evidence and land rights. On the other hand, the 70% have a variety of social tenures typical of the pastoralists, slum dwellers and the vulnerable whose land rights have not been documented. This technical gap was identified as early as 1980s by policy specialists who realised that the social tenures could not fit in the conventional land administration systems in terms of rights held, customary areas, spatial description of the rights and land title conditions (Dorner: 1992; Bruce & Migot-Adholla, 1994; Migot-Adholla, Hazell, Blarel, & Place, 1991). These findings gained popularity towards the end of the 1990s and early 2000 when many professionals in the land administration became convinced of this social tenure misfit.

This concern led to the development of pro-poor tools for land administration. These are affordable and efficient tools suitable for bridging the gap of recorded and unrecorded land by providing a standard for representing the relationship of people to their land (Augustinus, 2010).

The Global land Tool Network (GLTN) in partnership with UN-HABITAT and funded by the Sweden, Norway, and the Netherlands (amongst others) have focussed on the development of eighteen pro-poor management land tools suitable for both rural and urban areas (www.gltn.net). "A land tool is a practical way of solving a problem in land administration putting principles, policies and legislation into effect. It covers a range of methods: from simple checklist to use when conducting a survey, a set of software and accompanying protocols, or a broad set of guidelines and approaches". The suitability of a land tool for the poor and disadvantaged are: affordability; equitable and gender-responsive; governance; subsidiarity; sustainable; systematic, large-scale and pro-poor. (www.gltn.net). The eighteen land tools are addressed differently from country to country depending on their availability and is the chief reason for failed implementation of land policies worldwide. These tools are embedded in 5 themes, namely land management and planning; land administration and information; land policy and legislation; land based financing and Access to land & tenure security. An example of the GLTN tool is STDM. Other tools that fit in the five themes are Open data Kit, GeoODK, Kobo Toolbox and MapMyRights.

From the features on the land tools, it's flexibility allows for participatory approach where by the community is involved and as a result there are almost no land disputes since transparency and trust is built, UN-HABITAT, (2010). Also the incremental acquisition of rights over time is viable. This makes the tools suitable for Fit for Purpose approach where general boundaries are sufficient for most land administration purposes. However, some scholars are of the opinion of focussing on the precision and so would not go for the incremental approach. Whereas in reality, most of the accuracy, if required will be based on the purpose and so the beneficiary should pay for it. Also, from experience, the precision approach typical in the conventional land administration has been slow in the developing countries and as a result, the pro-poor tools are the better alternative in bridging the technical gap in land documentation. .

To achieve the tenure security project in the informal settlement, the use of pro-poor tools was found to be viable, and the implementation done.

Pamoja Trust were the main implementers assisted by the TUK charged with the responsibility of mapping, integrating the spatial and attribute data. The implementation was conducted as follows, as explained by Makokha (personal communication, September 28, 2016).

Planning and Consultation

- Visit of the field was done to understand the settlement layout with the aid of community leaders. Focus group discussions were held with the stakeholders mainly to enlighten them on the importance of enumeration that further enhances data capture in the STDM environment. A suitable team to carry out the enumeration were identified and their roles defined.
- Awareness of the project was done by use of posters and hand bills before the launch of the enumeration.
- A community resource centre was set up and installed with the required stationery for the purpose of training the enumerators and also for data management.

Enumeration Process

- Numbering of the structures was done on the ground and the corresponding structure indicated on the map as well
- Questionnaires were administered to the households
- Photographs of the household owners/tenants with the house numbers in the picture were taken
- Recording of all disputes and issues requiring clarification was done

Mapping process

- Reconnaissance walk to identify the boundary extent of the settlement with the aid of aerial image and hand held GPS
- The aerial image and the GPS data was uploaded into the QGIS software and digitization of the structures done
- The digital map of the structures was produced and used for the verification of the exercise.
- Labelling of the digitised plots was then done using the enumeration numbers

Data capture, analysis and output

- Socio-economic and spatial data was entered into the STDM database.
- Pictures of the parcel user/owner were entered into the image data base
- The parcel data, spatial data and photos were consolidated into an STDM database.

- Individual parcel verification forms; community display registers and certificates of occupancy were generated.

Data maintenance and updating

- Community Resource Centre has been established equipped with powerful computers for data management.
- A team has been trained on STDM data management, under the leadership of Settlement Executive Committee (SEC).
- Participatory approach is used to enhance data verification.
- Updating is done quarterly since the team is not on full time employment.

2.4. Tenure Security

Tenure security of the informal settlers in the developing countries is still wanting and needs to be completed. Tenure security has been defined differently by different authors through the years. According to van Gelder, (2010) tenure security can be based on one's perception; allocation of property rights (de jure) and/or the (f)actual circumstances of a tenure situation (de facto). In the de jure approach the property rights of the owner are in a title and in case of any breach, the government can step in to solve. De facto is defined by the intrinsic characteristics based on the length of time in a settlement, the size of the settlement and the community solidarity. On the other hand, the extrinsic characteristics would be the support by the media, political acceptance or organisational practises that eventually lead to it's recognition although without provision of rights. Perceived tenure insecurity is when an individual lives with the riskiness of probable eviction by state, land owner or conflicts with family, neighbours or gangs.

Simbizi et al., (2014) further builds on van Gelder's definition of tenure security by looking at it in totality/holism since it's a complex dynamism. These authors Marie Christine Dushimyimana Simbizi, Bennett, & Zevenbergen, (2014) referred to many other literatures on tenure security and concluded their definition under a) economic oriented school; b) legal based school and c) adaptation paradigm oriented school. The economic oriented is based on an individual being in possession of a title; the legal based school focuses on protection of one's rights in accordance to the legal system. The adaptation paradigm has two facets namely; the individual and communal land rights which are secure since it can be passed on to the next of kin and also investments are vibrant; and tenure security is based on community's norms and value of recognising land rights.

From these literatures, the western concept of tenure security under the economic and legal based schools dominates the definition and even influence the land policy formulation in developing countries. The holistic approach of the adaptation paradigm, suitable for the Sub-Saharan, needs more weight in order to improve the balance of recorded and non-recorded lands.

The United Nations (UN-HABITAT, 2008) adapted tenure security definition from FAO, 2003 and UN-HABITAT, 2003. It narrows it to "a) the degree of confidence that land users will not be arbitrarily deprived of the rights they enjoy over land and the economic benefits that flow from it; b) the certainty that an individual's rights to land will be recognised by others and protected in cases of specific challenges; and c) the right of all individuals and groups to effective government protection against forced evictions". So tenure security should be embedded on the length/duration of rights for the individual/group use and protection from any arbitrary curtailment of land rights. The government should guarantee legal protection. Also of importance to these inhabitants is the freedom to leave, lease, and rent property to their beneficiary of choice. For the purposes of this research, the United Nations (2008) definition of tenure security will be adopted.

From the definitions above, it is worth noting that the tenure security of the informal settlement is bleak with constant threats of eviction (Du Plessis, 2007). The evictions can either be from inside community (family, clan or neighbour) and outside community (government and private developers). In Kenya people have encroached government land and are under constant threats of eviction since they have no tenure security. As a result, some of these inhabitants in these informal settlements resort to "pay fees to the local authorities, village elders, politicians, the police, private land owners or gangs for official permission" to live in that area (UN-HABITAT 2010, p.44). For people who have occupied private land for 12 straight years can claim possession legally. However the high costs of court processes makes the poor shy away from this remedy. In 2006 the Ministry of Lands (Kenya) commissioned a group to draft eviction guidelines, however, they have not yet born fruit (COHRE, 2006; www.hakijamii.net).

With threats at hand, regardless of internationally agreed procedures, the inhabitants of informal settlements minds are not at peace to enable them think of investments in their land in terms of crops, improve their houses, expand their business/shops and rent their land/property (UN-HABITAT, 2010). People with secure tenures are keen to preserve their land/property knowing that their heirs or future generations will benefit from it. It is therefore paramount to speed up land recordation which is only possible if the gap between the

registered and non-registered lands is closed using the unconventional method to ensure tenure security of the informal settlers. So when this gap is bridged, the definition adopted for this research of ensuring the certainty of the individual's right to land are recognised and protected as defined by UN-HABITAT, (2008) will be valid.

3.0. STUDY AREA AND METHODS

This chapter aims to describe the case study area, methods of data collection and the processing of the data to achieve answers for the research questions formulated. The research design matrix gives an overview of the objective questions and the anticipated results.

3.1. Area of study

Mashimoni is one of the 13 villages forming the entire Mathare valley informal settlement in Nairobi, the capital city of Kenya (Muungano Support Trust, Slum Dwellers International, University of Nairobi, & University of California, 2012). It is approximately 6km from Nairobi's central business district on the North-Eastern side bordered by Juja Road in Kasarani division on one side and Mathare River on the other side see Figure 3.1

The settlement area is about 0.0526 Sq. Km with a population that has grown to 4478 in about 1692 households (Muungano Support Trust et al., 2012)

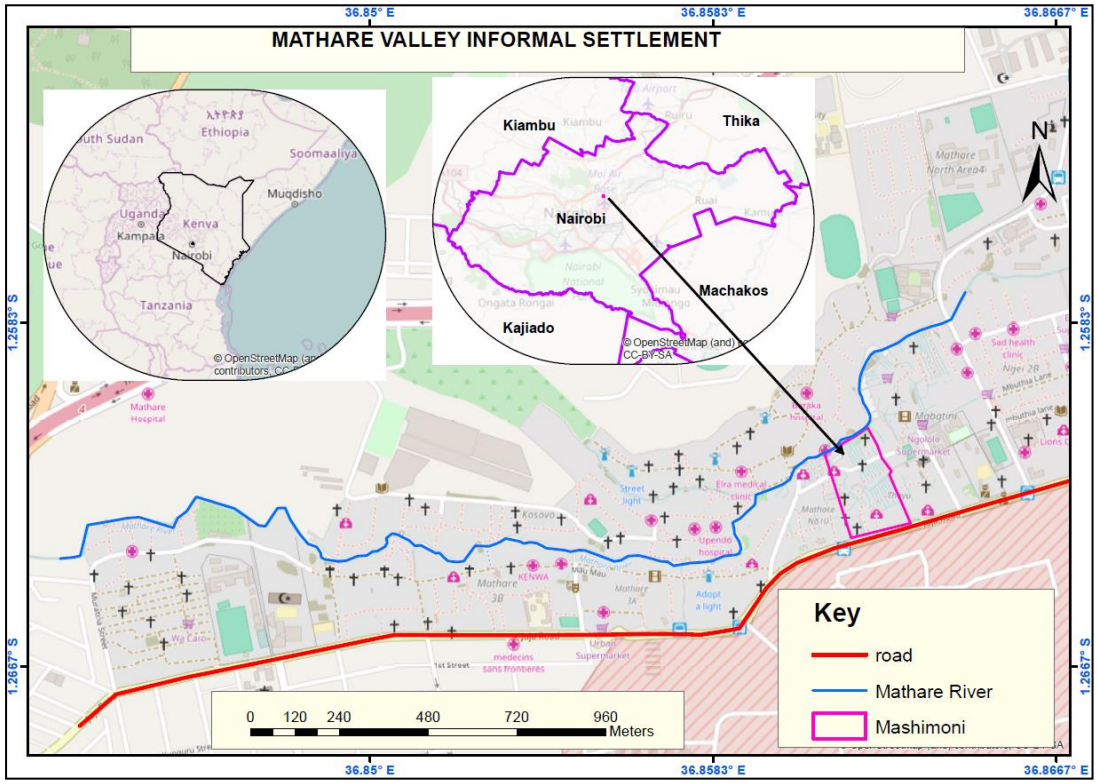


Figure 3:1: Location map of Mashimoni, Mathare valley, Nairobi Kenya:

Mashimoni informal settlement was originally owned by an Asian. The settlement of Asians in Kenya dates back to the 14th century during the Indian Ocean trade and was further catalysed by the construction of the Uganda railway (Okoth-Ogendo, 1991). According to Wayumba, (2015) the Kenya Air Force took possession of this land from the Asian and used

it for their shooting practice sessions. When the practice sessions stopped, people started inhabiting the land. Like many other informal settlements, they did not have any permission from the government or the air force to settle on the land, hence being squatters, they have no tenure security.

However, in the recent years the government of Kenya in it's quest for improving the livelihood of these inhabitants to ensure tenure security, has introduced the Kenya Slum Upgrading Program (2004) and Kenya Informal Settlement Improvement Programme (KISIP) (Anderson, Mark Mwelu, 2004). To ensure success of this project, Kenya government sought funding from World Bank, Swedish International Development Cooperation agency (SIDA), and the French Development Agency. KISIP was tasked with four projects namely a) Infrastructure strengthening of tenure security b) Participatory urban planning c) strengthening key institutions of urban management and d) five year project from 2011-2016

3.2. Type of tenures in the study area

Kenya has various types of tenures systems namely; public tenures, private tenures, customary and informal tenures, as recognised in the Kenyan constitution (National Council For Law Reporting, (2011). Figure 3-2 shows the types of rights found in informal settlements in a quadrant grouping. Legal/legitimate quadrant refers to rights conforming to the laws with titles; legal/non-legitimate quadrant has laws observed, not in spirit and questionable titles; extra-legal/non-legitimate quadrant is typical with criminals; and the extra-legal/legitimate refers to rights conforming to social acceptance and some level of statutory law.

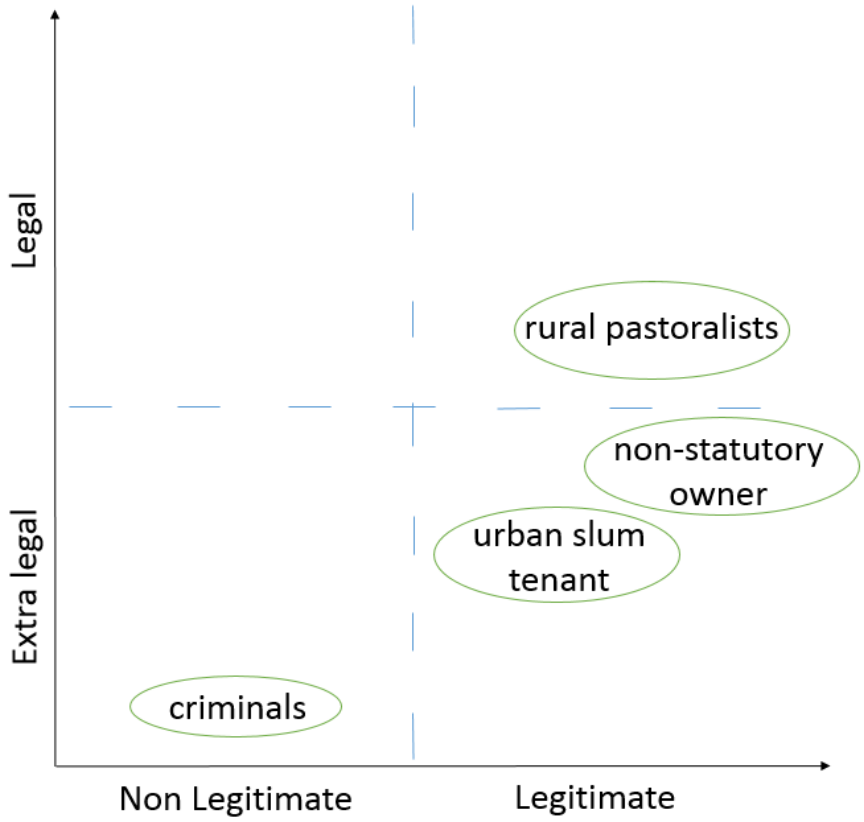


Figure 3:2: Types of Informal tenures systems (adopted from J.A. Zevenbergen [1])

Mashimoni falls under the extra-legal/legitimate rights where land policies support them and the community spirit of unity is valued as van Gelder, (2010) explains. These residents are grouped as land interest holders. Land interest holders in this study refer to non-statutory owner who is actually the property/structure owner and the tenants. These residents enjoy limited rights (Law, Briefing, Doshi, & Kamunde-aquino, 2014) as illustrated in Table 3-1 where;

- Access rights allow one to use the road and other paths.
- Transfer rights allows one to sell, inherit, and reallocate property rights.
- Usufruct rights allow use of water and sanitation.
- Use rights allow one to stay for a limited period

[1] *A quadrant approach to land tenure rights (2016)*

Table 3:1: Rights in the informal tenure system

BUNDLE OF RIGHTS	
NON-STATUTORY OWNER	**TENANT**
Use	Access
Access	Usufruct
Transfer	Use
Usufruct	

3.3. Research Design

The study design adopted for this theses is twofold; a case study design and after-only design (Kumar, 2011 p.103-123). Case study here refers to the fact that this particular population have one thing in common. The people in Mashimoni had the STDM implementation in the year 2014, making the population suitable for case study. This case study is important in understanding the impact of STDM on this particular group. Analysing the impact in 2016 after the implementation qualifies the research to be studied under the after-only design since before the STDM no research was done.

A mixed study design of both qualitative and quantitative was used. Qualitative research in this context focuses on understanding the population's perception and experiences. A sample of the population is selected and information obtained from them is analysed logically in a deductive manner. This is done using excel and SPSS software. On the other hand, quantitative research focuses on accuracy in measurement and classification of the information collected from the group. Information about perception obtained in a qualitative design can be measured by varying the number of respondents with the same belief in a quantitative design.

3.4. Methods

Methods of data collection are categorised into primary and secondary sources.

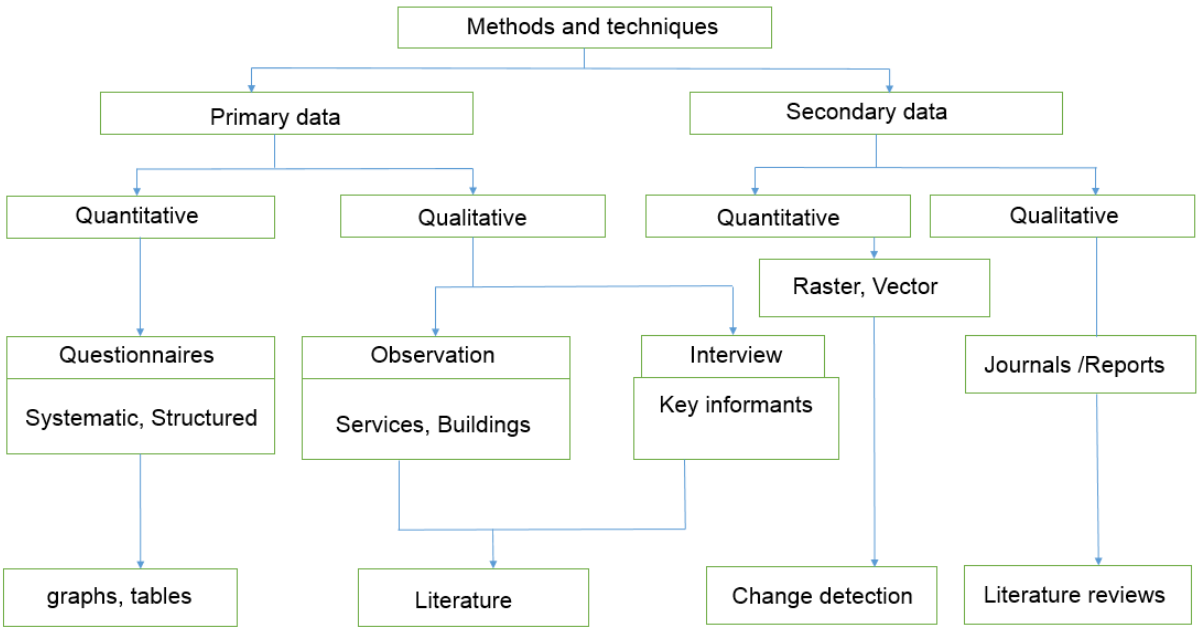


Figure 3:3: Research Methods and techniques

From figure 3-3 above, it is evident that a mixed methodology approach was used in data collection. The primary and secondary methods of data collection are used independently for all the sub objectives. However for the first sub objective, research question 2, both the primary and secondary are used with equal weighting with a little bias in favour to the primary because some of the secondary data was not available in the format needed and it's validity and reliability in analysis was not guaranteed (Kumar, 2011).

3.4.1. Primary data collection

The main primary sources of data are Observation, Interview and Questionnaire

Observation: The non-participant observation was adopted where the researcher was a passive observer, drawing conclusions from watching and listening as the interviews go on (Kumar, 2011). This was relevant in confirming some information given e.g. most of the materials used for building are mainly iron sheets and mud. Also, observed were utilities like power lines, water points and sanitation facilities among others. To increase validity of this information, photographs were taken.

Interview: A set of questions were designed to guide the questions to be asked making it a structured interview. The interview questions were open ended. This was necessary to allow the respondent freedom of expressing him/herself freely without the bias of the interviewer

(Kumar 2011, p. 143). The respondents were leaders from the community, the area chief and TUK staff. Recording of the interviews was not done but short notes were taken with an assistant in the field.

There was an in-depth interview with some of the Settlement Executive Committee (SEC) leaders of community comprising namely the chairman, secretary and a member. This was held at Huruma-Nairobi, on 4/10/16.

The chief was interviewed in his office in Huruma –Nairobi on 11/10/2016. While the director of survey school and a staff of TUK were interviewed on the 13/10/16 in the University.

Focus Group Discussion: This was carried out to explore the opinions of some of the stakeholders in the STDM programme. It was done at the UN Habitat boardroom on 28/09/2016 with participants from UN Habitat, Pamoja Trust and Resource Contact Institute and Reconcile. In total there were 9 participants.

3.4.2. Sampling size and sampling technique

There are many sampling designs and simple random sampling was used to select a probability sample where by each element in the population had an equal and independent chance of selection (Kumar, 2011). The sampling frame is based on the total population of land interest holders obtained from the community leader. To determine the sample size, Alain Bouchard sampling formula was used as shown in equation (1) below

$$\text{Sample size (n)} = \frac{(Z\propto/2)^2 \times P(1-P) \times N}{[(E^2) \times N] + [(Z\propto/2)^2 \times P(1-P)]} \qquad \text{equation (1)}$$

Where;

N = Total population size is 1754

P = the estimated frequency for the sample size n; that is proportion of success (50% for this study)

E = Tolerable error (15%); the amount of error acceptable in the calculation

$Z\alpha/2$ = value given to the confidence interval according to precision desired (1.96 for this study)

$$\text{Sample size} = \frac{1.96^2 \times 0.5^2 \times 1754}{[0.15^2 \times 1754] + [1.96^2 \times 0.5^2]} = 41.67 \approx 42$$

Forty five respondents filled the questionnaires which is slightly above the determined sample size, since the greater the sample size, the higher the accuracy.

Questionnaires: A list of questions were drafted (appendix 8) and given to the respondents to answer. The respondents here were the property right holders and the tenants. Since most of them are out hustling for income during the day, it was viable to engage them in the evening when they come back. To identify the structure owners and the tenants, the snowball method was used (Kumar, 2011,p. 190). Two of the residents of Mashimoni who are familiar with the area first filled the questionnaires, then through their networks, they were able to identify the specific respondents to fill the rest of the questionnaires. This was a preferred method since they knew where the owners and tenants lived.

Unlike the interview where the researcher reads the questions, here the respondent reads and answers the questions, which are clear and easy to understand. The questionnaire were designed with open-ended questions where the respondent answers in his own words; and closed questions with possible answers e.g. Likert scale, so that the respondent only ticks the appropriate answer that suits him/her. The questionnaires were answered by non-statutory owners and the tenants. The questionnaires helped in deriving both quantitative and qualitative data concerning the population's perception on tenure security. Questionnaires are suitable because they are cheap, and save on time and offers greater anonymity and as a result, the respondent can answer sensitive questions with ease since his/her name will not be written (Kumar 2011, p.140).

3.4.3. Secondary data collection

Secondary data was sourced from journals, report documents and satellite images. Proposed road plan was obtained from the SEC. Data containing the water points, their pipeline layout and sewer line was obtained from the Nairobi Water and Sewer Company. Both the water and sewer data were in the shapefile format. The vector data for the house structures were provided by TUK. These helped in enhancing information required for this research. Some of it formed the basis for validating information obtained from the primary data sources.

3.4.4. Satellite images

The spatial data required for the analysis of spatial changes since the introduction of STDM required fine resolution satellite imagery less 0.5m. Fine resolution imagery was preferred

since the study area is an informal settlement area with high population density characterized by close house structures with fuzzy boundaries. Although orthorectified aerial imagery data of 0.1m (Wayumba, 2015) was used in the same study area, there has not been a recent survey that can allow comparing of spatial changes that has occurred within two periods. Furthermore, acquiring these data through such requires complex planning, time and expertise which makes its implementation expensive. Therefore the use of available free resolution imagery by Digital Globe in Google pro of different temporal periods (2013 and 2016), with a resolution of 0.7m provided a cost effective and easy process of acquiring fine resolution imagery based on the zoom level.

3.4.5. Processing of primary and secondary data

Data collected from the interviews, questionnaires and observation were processed by use of excel and Statistical Package for the Social sciences SPSS.

Google Earth satellite imagery download

The first step in extracting these images was to determine approximate tile size that gave a resolution of less than 0.05 meter. This was determined by testing different zoom level in which the scale 1:10 was found to be optimal. At this scale, a fishnet mask covering the study area of 4 columns and 6 rows gave the desired resolution, and this was found after comparing varying number of columns and rows with the output image resolution. The process of generating fishnet gave an output of both polygon and its corresponding centroids. The polygon was used as a guide in ensuring there was overlap between one tile and the subsequent tile, however, these were hidden when downloading the image as it would create unnecessary lines in the output image which would affect delineation of features. The centroids were overlaid with the image and used as georeferencing control points. Other control points used in georeferencing were road intersections and edges of buildings.

Georeferencing accuracies Root Mean Square Error (RMSE)

A minimum of 10 control points were maintained in georeferencing the tiles and the resulting average RMSE for the 2013 image was 0.00235 pixel and 0.00126 pixel for the 2016 image. The resulting image resolution was 0.066 m for the 2013 image and 0.056 m for the 2016, and to harmonize the resolution, the images were both resampled to 0.07m to cater for geometric shifts during georeferencing and generating pixels of same size. The final step in carrying out geometric adjustment was to mosaic the tiles of each year and align the mosaicked images with 2016 being the master image since it had better georeferencing

RMSE and clear control points such as road intersections and permanent building; which existed both in 2013 and 2016. The overall RMSE of georeferencing the two images was 0.00823 pixels with a resampled pixel size of 0.07 meters. The table 3-2 provides a summary of the image download and processing.

Table 3:2: Google earth image properties

Image	Pixel size	Resampled Pixel size	Google earth scale	Number of tiles	Tiles georeferencing RMSE	2013 and 2016 georeferencing RMSE
30 Sep2013	0.066	0.07	1:10	18	0.00235	0.00823
16 Oct 2016	0.056	0.07	1:10	18	0.00126	

The following figure 3-4 is a flow chat of image data download and geometric correction.

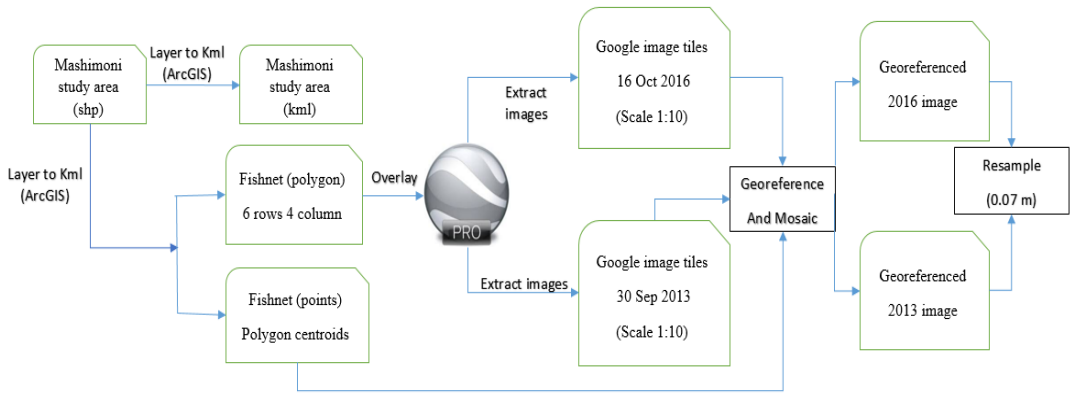


Figure 3:4: Processing of the satellite image

The resulting images for the two years are as shown in Figure 3-5 below

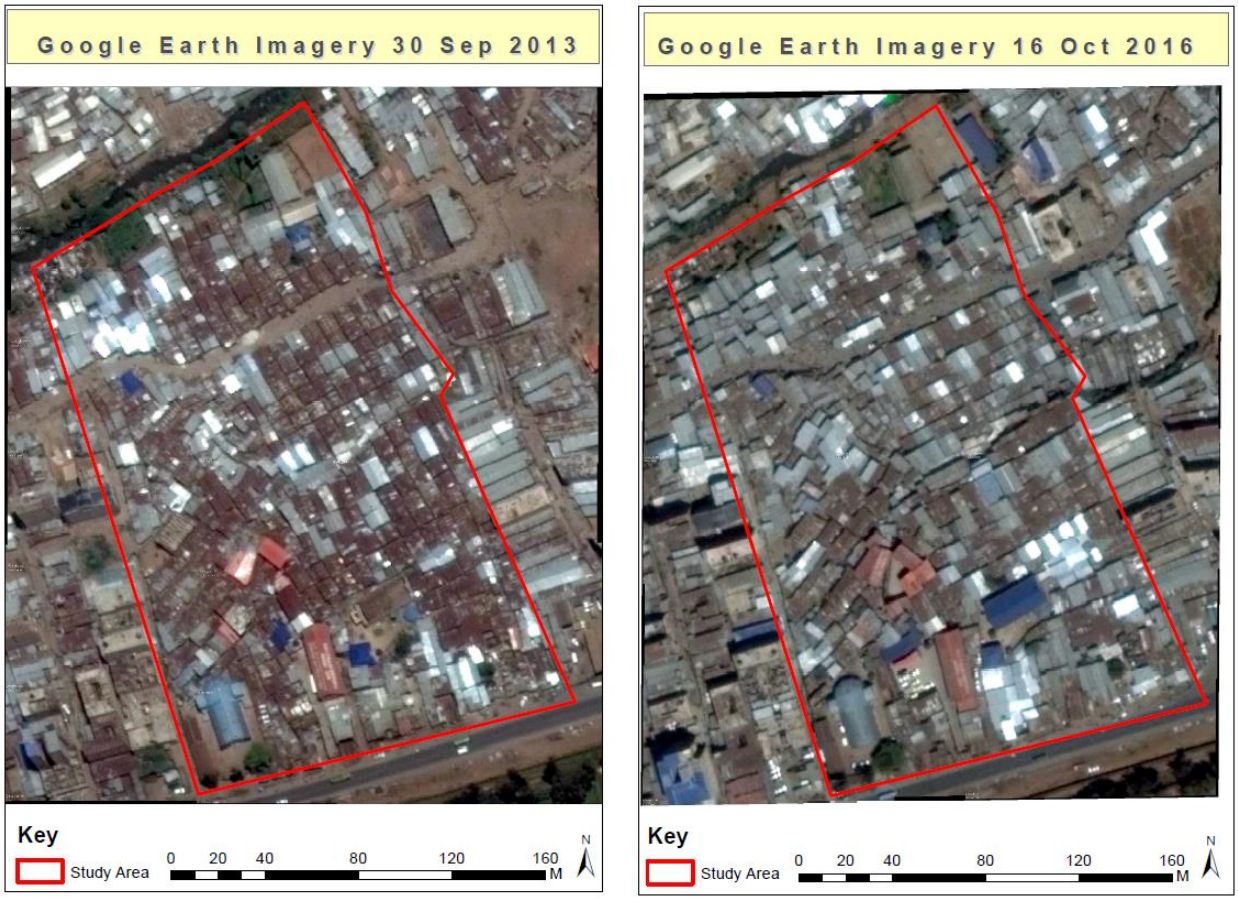


Figure 3:5: Mosaicked images of the two years

Processing Images for Classification

Both the images were imported into the Ecognition software and similar parameters used to process each separately. To improve visualization, layer mixing was maintained at the three layer mix of RGB and equalization done by use of histogram. The algorithm was based on the multiresolution segmentation (Flanders, Hall-Beyer, & Pereverzoff, 2003) with scale at 40, shape and compactness at 0.5 each. The object information was based on the layer values; geometry extent showing area of pixels and number of pixels; and class name composing 8 classes as shown in Figure 3-6 below.

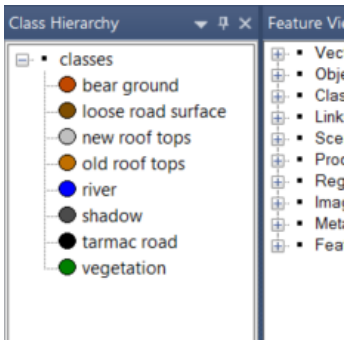


Figure 3:6: Classes for training samples for classification

The white/gray, blue and red coloured roofs were classified as new roofs while the brown were classified as old roofs. Several training samples were selected for eight classes in order to do a supervised classification. Classification was run by use of nearest neighbor (Im, Jensen, & Tullis, 2008). Accuracy assessment was done by use of Error matrix based on Samples and 100% results achieved as shown in (appendices 3). However, this does not give the level of accuracy, which is a limitation of the data. The results were then exported to Arc GIS for further analysis where change in area was determined (El-Hattab, 2016).

The flowchart in figure 3-7 shows the process of classifying the two images of 2013 and 2016

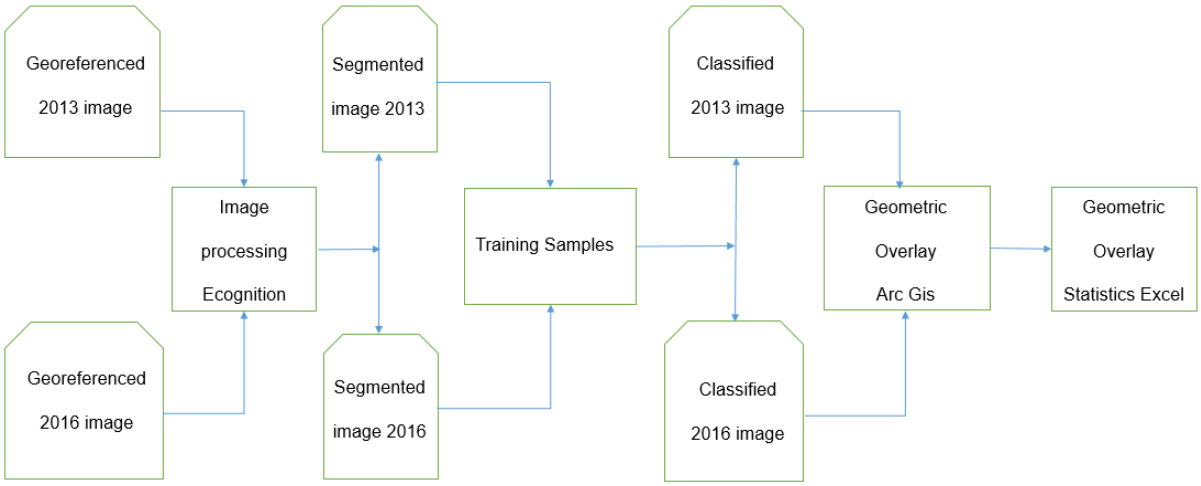


Figure 3-7: Classification of the two images

3.4.6. Research Design matrix

This matrix gives a summary of the objectives, questions, analysis, and anticipated results for the research.

Table 3:3: Research Design matrix

Research sub objective	**Research questions**	**Techniques of data collection**	**Indicators**	**Required source of data**	**Techniques of data analysis**	**Anticipated Result**
1.To assess how the land interest holders perceive their tenure	What is the confidence of land interest holders on tenure	Interviews, Questionnaires, Obser	1.Perception of tenure security	Original property right holders; tenants; bought (new owners)	Frequency distribution; graphs	- variations in perception of tenure

security and the drive to improve their property following an STDM intervention	security after the STDM enumeration ?	vations				security,
	What is the change of the house structures		2.Buildings	Digital Globe images	Change detection using ArcGIS	-% of changes in house coverage area
		Observations Questionnaires		Questionnaire Respondents	Graphs, tables	variation in building materials
	What is their perception of the use of the STDM in protecting their rights and their mode of acquisition	Interviews, Questionnaires	3. View on the role of STDM in property transactions	Questionnaire Respondents	Frequency distribution analysis, Graphs, tables	- variations in opinion of the role of STDM in transactions
2.To ascertain the perceived level of threat of eviction by land - subsequent to the STDM implementation from land interest holders.	What are the characteristics of internal threats within the community	Interviews Questionnaires	Types of evictions from within the community	Property right holders, tenants, Community leaders	Frequency distribution analysis graphs, tables	- Variations in threats from within the community
	What are the characteristics of		Types of evictions from			- Variations in

	external threats from outside community		outside the community			threats from without the community
	What is their opinion of the government use of the STDM in protecting them against forced evictions		Certainty in the government use of STDM			- variations in opinion of the use of STDM data
3. To evaluate if the introduction of STDM has attracted the government and private sector stakeholders to invest in the infrastructure.	What is the changes of the road network		Road changes	Digital Globe images	Change detection over time	-% of changes in road network
	What is the changes of water services & electricity supply	Interviews	Water services & electricity supply	Nairobi Water Company; Hand held GPS	change detection over period	Increase in water services and electricity supply
	What is the changes of sewerage system	Interviews	Sewerage system	Nairobi Water & Sewer Company	change detection over period	Increase in sewerage system

3.5. Concluding remark

This chapter focussed on defining the study area and the methods to be used in answering the research questions. The data sources for both the qualitative and quantitative methods are summarized in the research matrix, with the techniques of data capture and analysis defined as well. The in-depth analysis is elaborated in the following chapter with the corresponding results shown

4.0. RESULTS

This chapter aims at presenting results from analysis of data collected from questionnaires, interviews with various actors, observation and satellite images. The findings are shown in the following subheadings based on the research questions.

Socio economics

These results were obtained from the analysis of answers given in response to question A1 on the questionnaire

Figure 4-1 depicts the monthly income of the residents in Mashimoni which characterises the wages of the majority in the informal settlements. Majority of the residents, 48.8% fall within the wage bracket of (Kshs 5001-15000, about 50 – 150 euros), 24.4% (Kshs 0-5000, equivalent to 0 – 50 euros), 22.2% (Kshs 15001-25000 approx. 150-250 euros) while the minority 4.44% earned a wage of between (ksh 25001-35000, 250-350 euros) and (35001-45000, 350-450 euros). 73.3% of the respondents earn low wages below the reference figure quoted in the wage indicator while 26.7% earn high wages above the reference figure (Africapay.org/Kenya, 2015). In accordance with the Africapay.org/Kenya, (2015), the minimum wage per month for the general workers, cleaners, day watchmen, messengers, children's ayah and gardeners should be approximately (Ksh 11000, about 110 euros) per month for those in Nairobi, Mombasa and Kisumu.

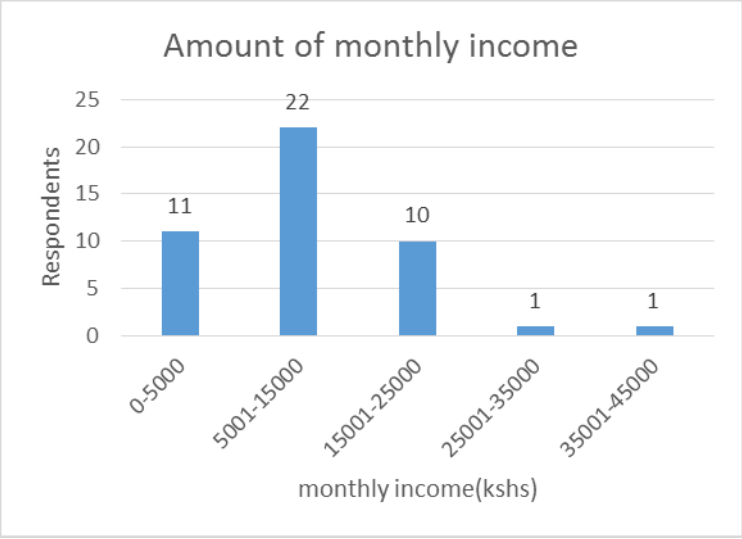


Figure 4:1: Monthly wage distribution amongst Mashimoni residents

Figure 4-2 depicts the family size categories within communities at Mashimoni. Majority of the residents (53.3%) consisted of a household with 1-3 persons; 33.3% (4-6) while 13.3%

families of between 7-9 persons. This shows that the income has to cater for more than one dependant which increases the poverty level of the people, thus verifying their status of informal settlement.

Also notable is the congestion depicted by the closeness of the structures inhibiting accessibility in case of emergencies, e.g. the frequent fires experienced in the village. A case in point is Photo 1a and 1b (appendices) taken at different locations of the study area and both show high congestion of the area.

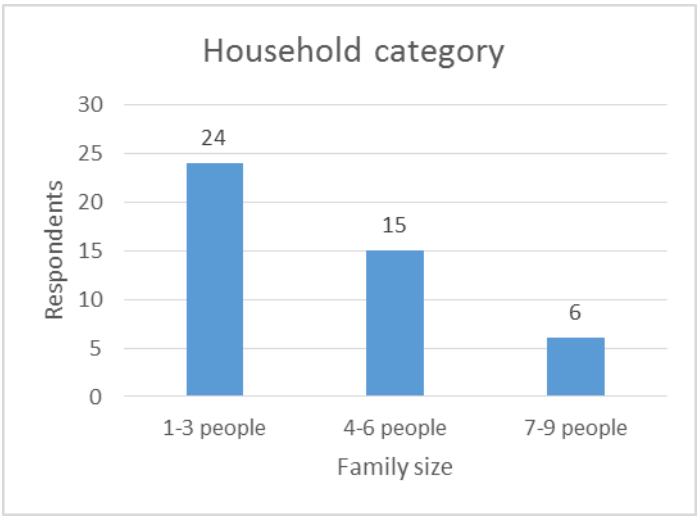


Figure 4:2: Count of household category

About 60% of the respondents in Mashimoni are both unschooled and have up to the primary level of education. This is indicated in figure 4-3. Those with the secondary and tertiary education make up the remaining 40%

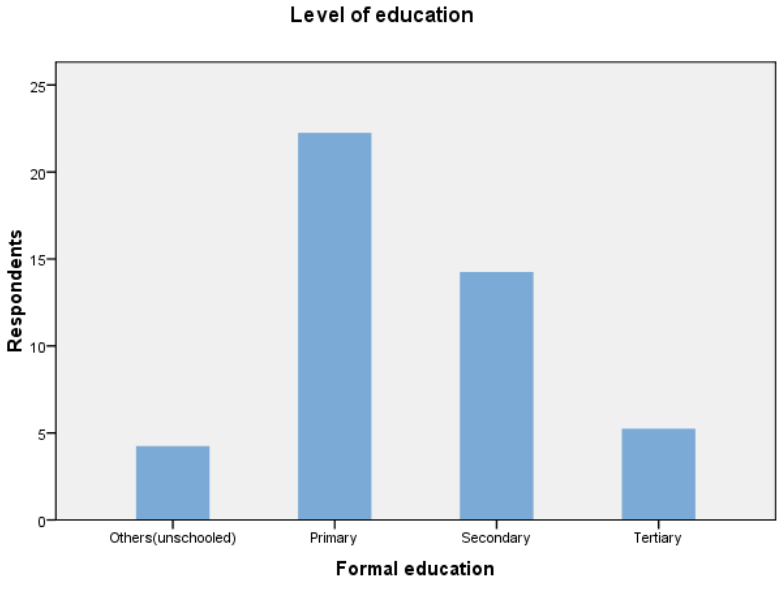


Figure 4:3: Level of education

4.1. To assess the property owners perception towards tenure security and motivation to invest in their structures

4.1.1. What is the perception of land interest holders on tenure security after STDM

Figure 4-4 indicates how the land interest holders have different perceptions of tenure security as obtained from the Likert scale under B1 in the questionnaire. 86% of the non-statutory owners exhibit levels of confidence with only 14% showing no confidence. The high confidence perhaps can be attributed to the fact that their names are in the database making them have some sense of tenure security. This is an achievement courtesy of the GLTN scaling up the land tool and providing a team of STDM developers that trained the users. Others are confident because of the solidarity and unity in the large number that have registered in the STDM, as is explained in their answer to Q2 under B1. The non-statutory owners showing some level of No confidence reason on the fact that they are not in possession of certificates. The tenants don't show any confidence simply because they have no property of their own and are only registered as tenants, saying they can be evicted by the landlords any time, hence they are not tenure secure. 71% of the tenants indicated they are not confident at all, as shown in Figure 4-4. From the interview with GLTN, it is the government's responsibility to ensure tenure security while they support data management.

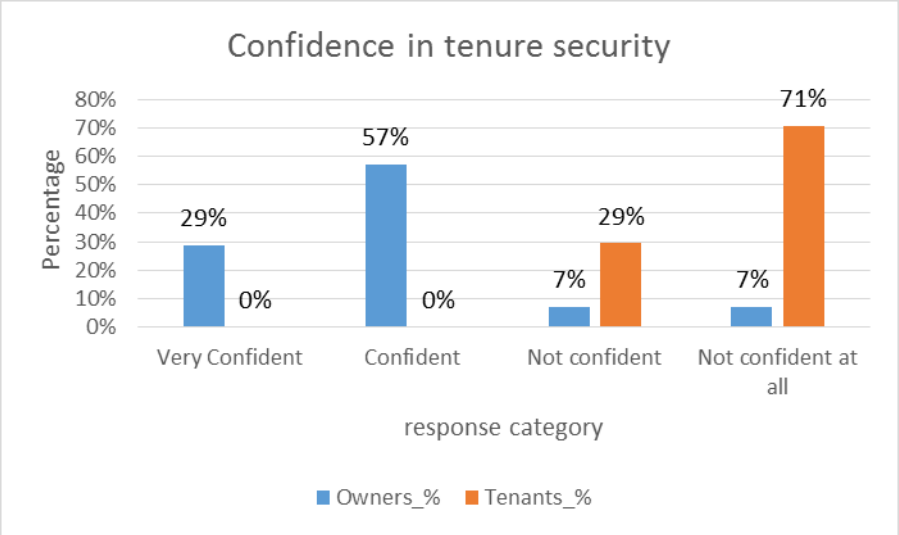


Figure 4:4: The perception of Mashimoni Residents on Tenure Security

Out of the total respondents of the non-statutory owners in figure 4-5, 64% are confident of staying for 5 years (short term), 36% say for 10 and 15 years (long term). Some of those with the long term have properties for social purposes like school and churches, while those in the

short term period (5 years) attribute their confidence in their long stay in Mashimoni, as derived from their explanation in the questionnaire.

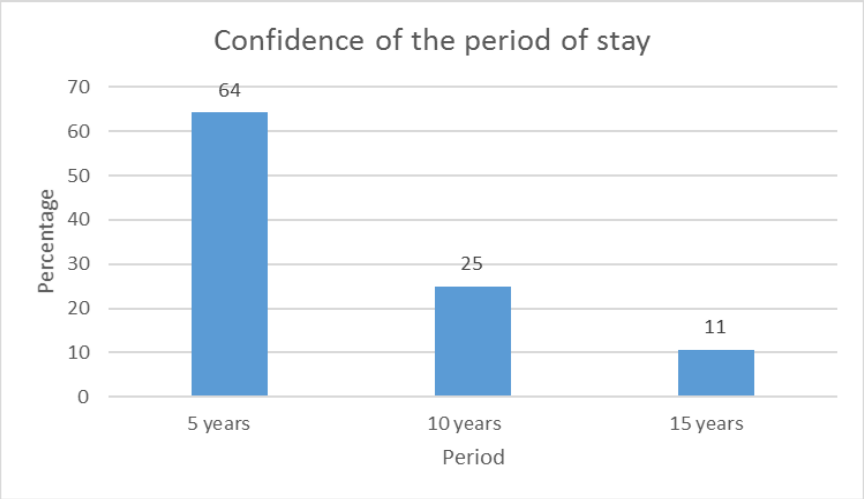


Figure 4:5: Years of confidence

Figure 4-6, derived from a cross-tabulation of confidence level and education level from questionnaire, sheds light on the response of the various persons based on their education level. Those with the primary level education and others (unschooled) exhibit great confidence whereas those in the secondary level education have a lower confidence level while the tertiary (college) show the least confidence. This perhaps may be attributed to their varied levels of understanding because those in the primary level understand tenure security in terms of their photographs captured while the learned attach tenure security to title possession.

4.1.2. What is the state of the house structures?

Another indicator of perceiving security of tenure was the observation of the materials of the house structures in the field area and if there were any changes since the introduction of STDM. According to the results in Figure 4-7 below obtained from B2 in the questionnaire, the number of house structures made with iron sheets increased from 33% (n=15) to 53.3% (n=24). On the other hand mud walled houses reduced from 51.1% (n=23) to 33.3 % (n=15). This means that some of the mud walled houses were upgraded to iron sheets, and probably iron sheets to brick houses (6.7%) or possibly additional brick houses were built during the period under review. There was no change in the number of Iron & Carton (2.2%), mud wall & Iron sheets (2.2%) and Mud wall and Carton (2.2%). The upgrading follows the order mud wall → iron sheets → brick walls.

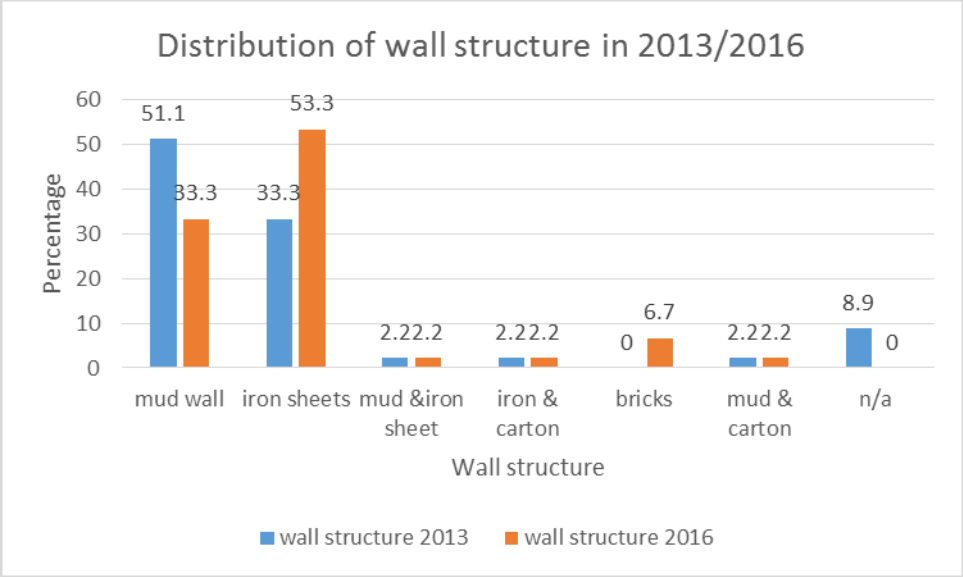


Figure 4:6: Distribution of houses made of various wall structure in 2013/16

Another notable change is that structures are extending upwards as depicted in photos 3a and 3b (appendices). Most of the non-statutory owners agree that since there is no space to expand sideways, they opt to go upwards, as they explain in the questionnaire and also from the interview with the community leaders.

House coverage change analysis between 2013 and 2016

In order to determine changes in the size of the house coverage, the classified images (2013 and 2016) are imported into the ArcGIS shown in figure 4-8. The 8 classes are reduced to four in order to focus in the change in house area. The image is clipped to the area of study and the areas of the old and new roofs within the study area are sampled and analyzed in excel.

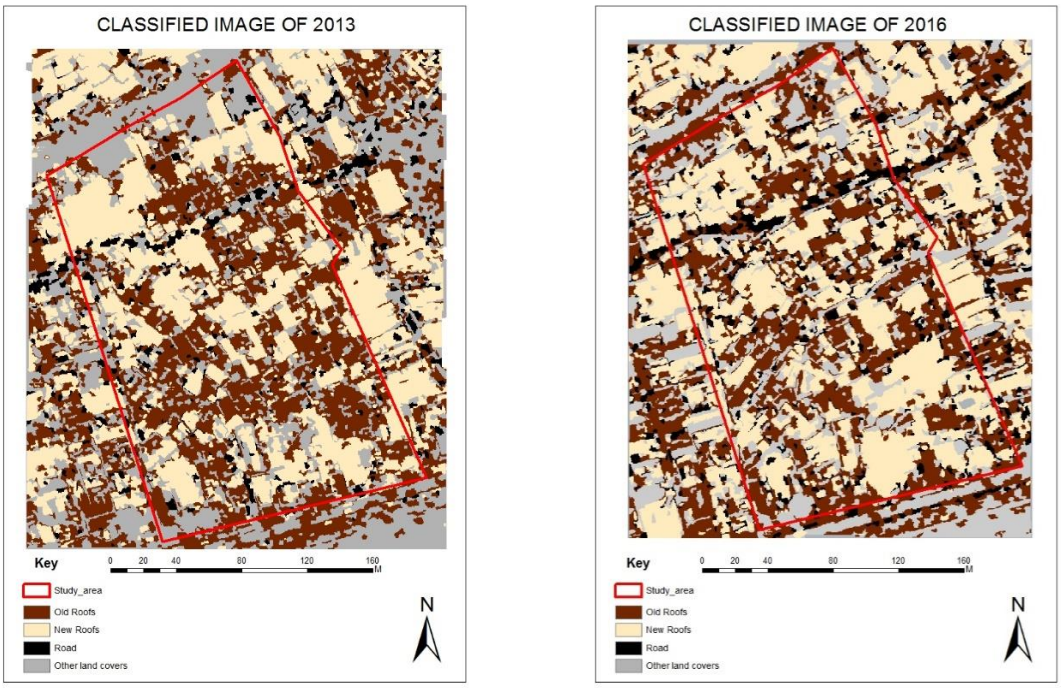


Figure 4:7: Classification of the two images

Analysing the area covered by the house roof tops in both the years using Excel, revealed that there was very little decrease of the area in 2016 as compared to 2013, howbeit it's certainty is questionable due to the spatial data source. This change is visible in the sum of areas of the roof tops shown in Figure 4-9

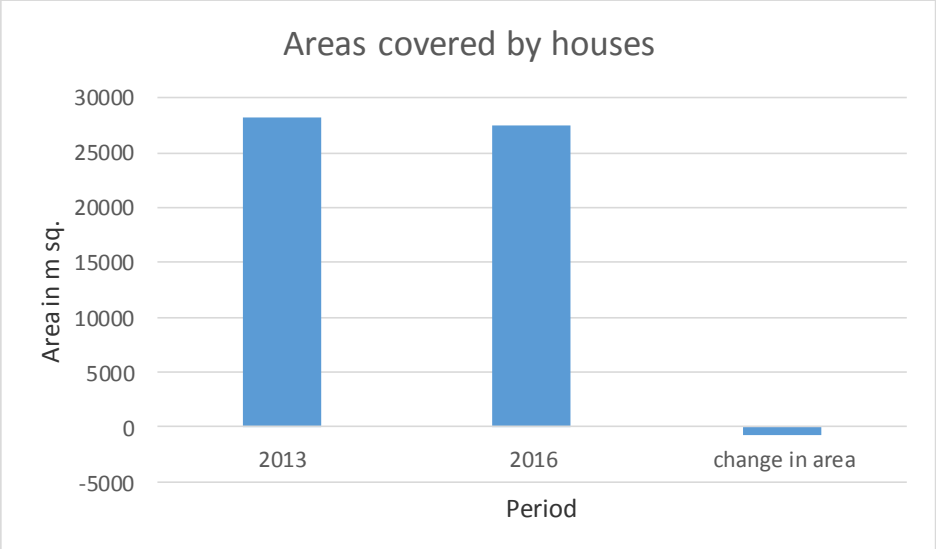


Figure 4:8: Summation of areas covered by houses

The percentage change of the area covered by the roof tops has a decrease of -2 % which is a small change considering that the residents reasoned that there was no space for sideway

expansion but are expanding vertically. Probably some of the houses were demolished to pave way for churches and schools as derived from interview of the leaders.

4.1.3. What is their perception of the use of the STDM in property transactions?

Land issues are known to be dynamic with a lot of transactions taking place. Figure 4-10 derived from response to A2 in the questionnaire depicts the changes in non-statutory owners from 1984 to 2016. The number of non-statutory owners between 1984 and 2013 was 17, approx. 62%. Between 2000 and 2013 property buying had declined. This outcome of the data reflects an up-down trend in property buying through the years with a little increase in 2015 which could be as a result of the introduction of STDM in 2014.

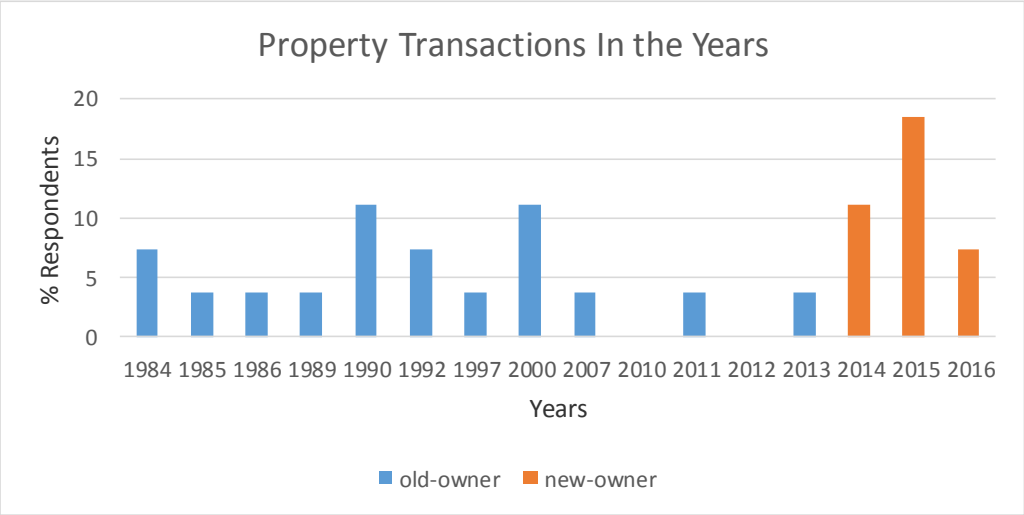


Figure 4:9: Distribution of when people bought property in the various years

Figure 4-11 analysed from A3 in questionnaire, depicts the distribution of tenants in Mashimoni. The number of tenants from 1984 to 2007 were approx. 12%. This is far below the number of non-statutory owners, meaning that during that period there was a possibility of non-statutory owners occupying their own housing units. From 2010 onwards, the number of tenants increased which is typical of the influx of people into the informal settlements where monthly rent is affordable for the majority of people with low income.

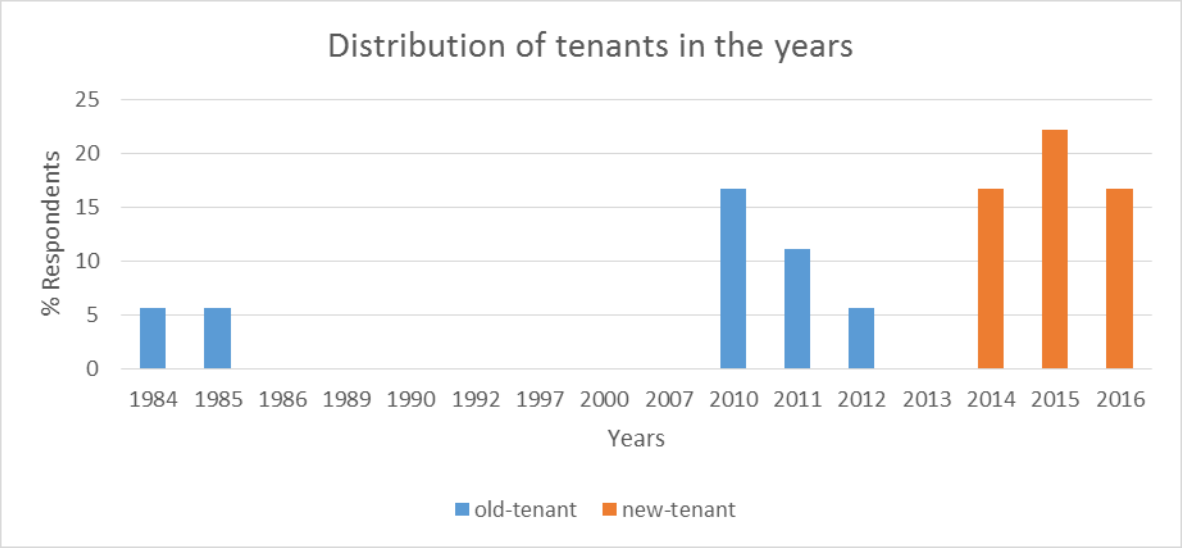


Figure 4:10: Distribution of tenants in the years

Figure 4-12 derived from Q3 under B1 in questionnaire shows that the majority of land interest holders in Mashimoni acquired their property through buying; receiving as a gift and inheriting; as squatters and tenants. This documentation shows that the residents are assured of protection of their structures, hence a recognised data for the residents to refer to in case of buying, selling and leasing their property. The main settlers are the non-statutory structure owners at 37.8% (n=17); followed by 35.6% (n=16) who are tenants. Other non-statutory owners are 13.3% (n=6) who inherited the structures while those who moved in as squatters and received as gifts were 6.7% (n=3) each. In general all the non-statutory owners are 64.4% while the tenants are at 35.6% in reference to the Figure 4-12 below

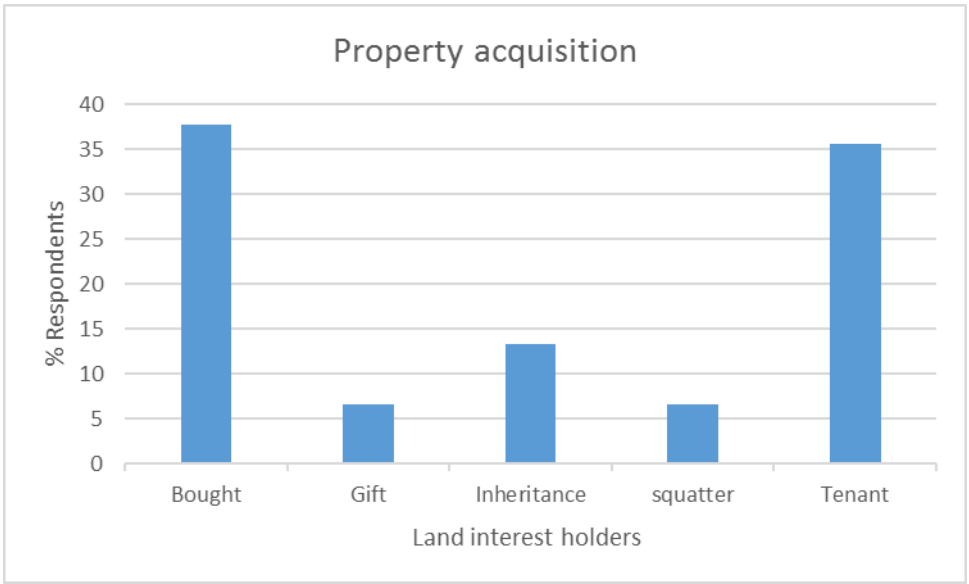


Figure 4:11: Variation in property acquisition

Out of the 28 non-statutory owners, Figure 4-13 (analysed from Q2 under B3 and A2 in questionnaire) shows that 39% feel that their rights are fully protected, while the majority 57% feel that it partially protects. The minority 4% feel that it does not protect at all. This implies that 96% are assured that their rights of use, sell and disposal of their property is protected in the STDM. This can be attributed to the awareness that has been going on through meetings with the residents' representatives forming the SEC. Since the STDM data was originally generated by the land interest holders and is also managed by the very non-statutory owners with periodic updating, then they are no longer under threat. The 4% are those who are not keen in embracing the STDM. An example is cited during interview with the chief, who narrates a case reported to him where the non-statutory owner sold one of his houses and failed to update in their data. So when he died, the new non-statutory owner and the children of the deceased both claimed ownership. If this change had been updated in the STDM data base, then it would have been resolved, however at the time of this research, the matter was still at the chief's desk awaiting his decree.

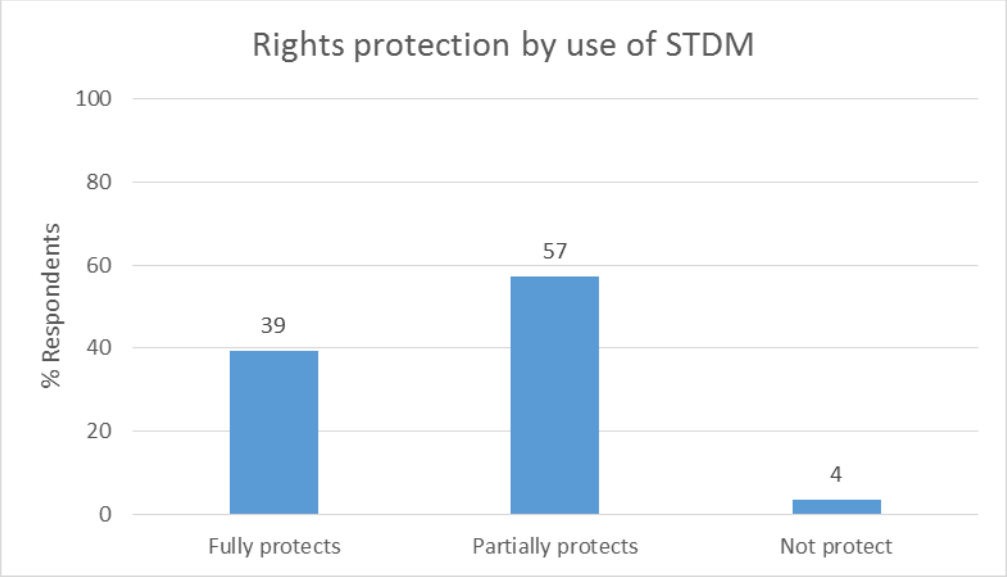


Figure 4:12: Respondents perception of the STDM in protecting their rights

4.1.4. Conclusion: Sub-objective 1

From the results above majority of the land interest holders exhibit a high level of confidence in tenure security perhaps because their names are in the database and in the solidarity and unity in the great number that have registered in the STDM. This was enabled by GLTN financing the implementer's and supporting data management by training users. The minority of the land interest holders are not confident because there are no certificates issued to show

their ownership. According to the GLTN it is the government's responsibility to ensure tenure security. The tenants don't show any confidence since they don't own any property and can be evicted any time by their landlords.

The change of the wall materials from the temporary mud and iron sheets to bricks wall was very minimal. The change of the roof tops from old to new was also small. This implies that much as they embraced STDM, it had not influenced them to invest in their properties. From the spatial analysis on the change in size of the structures, the change is small, (-2%) indicating that STDM has not influenced them to expand their houses although a few have expanded vertically.

The property transactions have generally increased with new tenants moving in, others buying the properties as sold by the non-statutory owners while others inheriting. This implies that the respondents perceive the STDM as reliable in protecting their rights of use, lease and selling their properties.

4.2. To find out if there are any threats of evictions after the STDM implementation.

From Figure 4-14 (derived from C1 in questionnaire and coded in SPSS), 47% of the threats were from external forces from outside the community; 31% from internally within the community and 22% felt there were no threats at all as observed by all the respondents. This indicates that even after the STDM, there were still eviction threats.

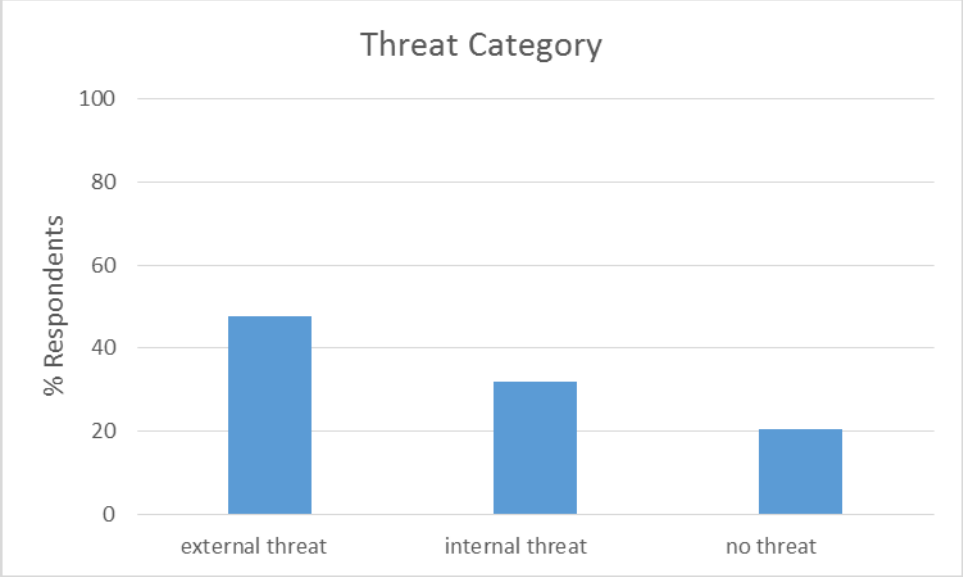


Figure 4:13: Threat categories after the STDM

From the observation in figure 4-15 (analysed from Q1 under C2 and A2 in questionnaire), the 40% (11+18+7+4) of the non-statutory owners have varied degrees of existence of threats mainly from government and private organisation while about 60% think that there are no eviction threats after STDM. On the other hand about 60% (53+6) of the tenants show high eviction threats which mostly emanate from within while about 40% show no eviction threats. So the land interest holders view the STDM as a model that may be used to minimize forced evictions while the 59% of tenants are under threat of eviction and so view it differently.

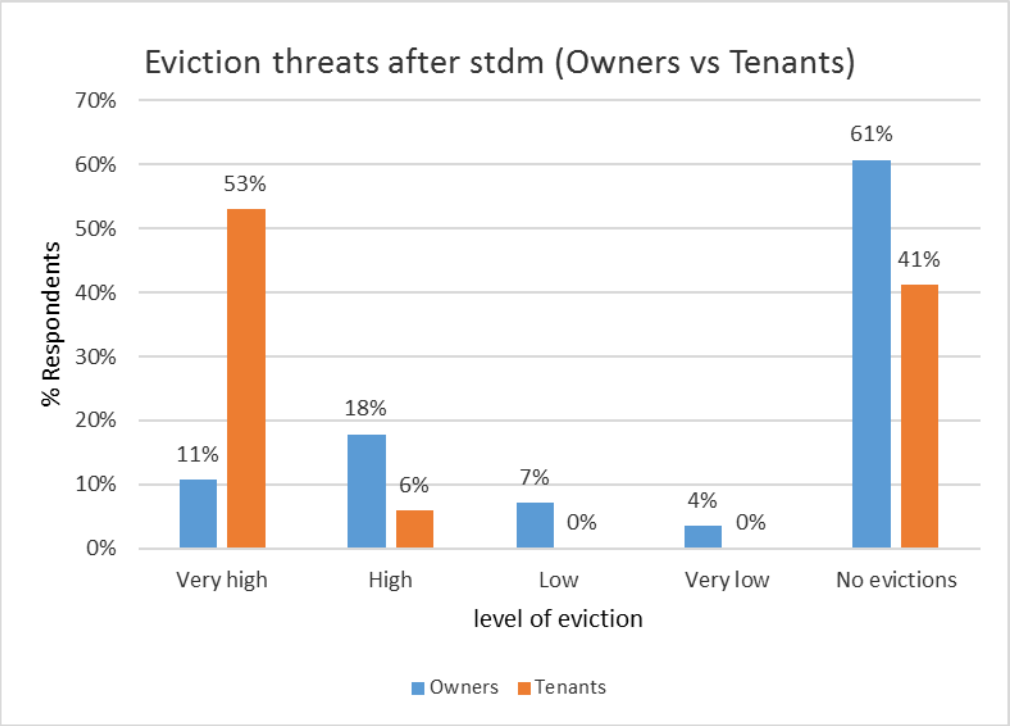


Figure 4:14: Perceived eviction threats after introduction of STDM

From Figure 4-16 (derived from Q1 under C2, A2, A3) shows the various trends of evictions before and after STDM from the land interest holders who stayed in the village before STDM intervention to date. Before STDM 66% of them said there were low eviction threats while 34% said there were high and very high. On the other hand, 50% said there were no evictions after STDM intervention while the remainder had varied levels of threat evictions. So this implies that the STDM intervention could have led to the reduction of eviction threats.

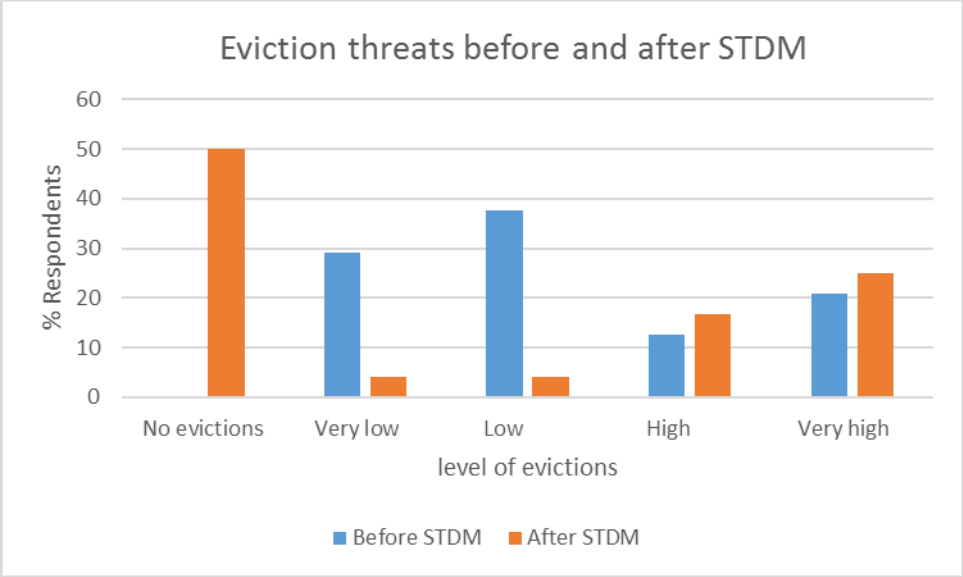


Figure 4:15: various levels of threat evictions in the entire period

4.2.1. Characteristics of internal threats within the community

Notable threats as observed from Figure 4-17 (derived from C1 in Questionnaire) from within the community arise from family, state of the house condition, landlord, fires and SEC. Some of the family threats arose when a non-statutory owner dies and the children start fighting on ownership of the house; the building materials are temporary and vulnerable to the quick spread of the frequent fires (as observed in the field); the landlords can also increase the rent at will (the varied house rents derived from A3 in Questionnaire); and the SEC receiving resistance from those who are anti-development. A total of 14 out of the 45 respondents experienced threats within the community.

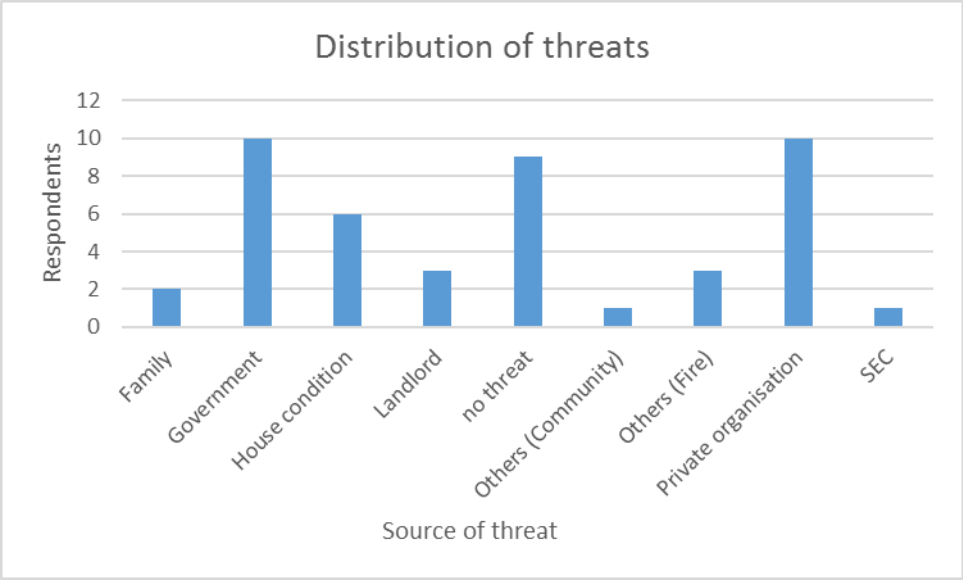


Figure 4:16: Distribution of threats

4.2.2. Characteristics of external threats from outside the community

From Figure 4-17 above, 10 of the respondents felt threatened by the government and private organisations; 1 from other communities which adds to 21 out of the 45 respondents; equivalent to 47%. With the ongoing dialogue on road expansion by the government, some residents feel threatened with evictions due to the road expansion plan and the churches are also expanding their property, making them also threatened.

4.2.3. What is their opinion on the role of STDM in minimizing/eliminating forced evictions?

Out of the 25 respondents that faced eviction threats after the implementation of STDM, 56% did not report the threats, 24% reported and nothing was done while 20% reported and got a positive response as seen in figure 4-18 (derived from C2 in Questionnaire). This could mean that they are not confident in the government use of the data in eliminating/minimizing forced evictions. However, out of the 44% that reported, 20% (more than half) received a positive response.

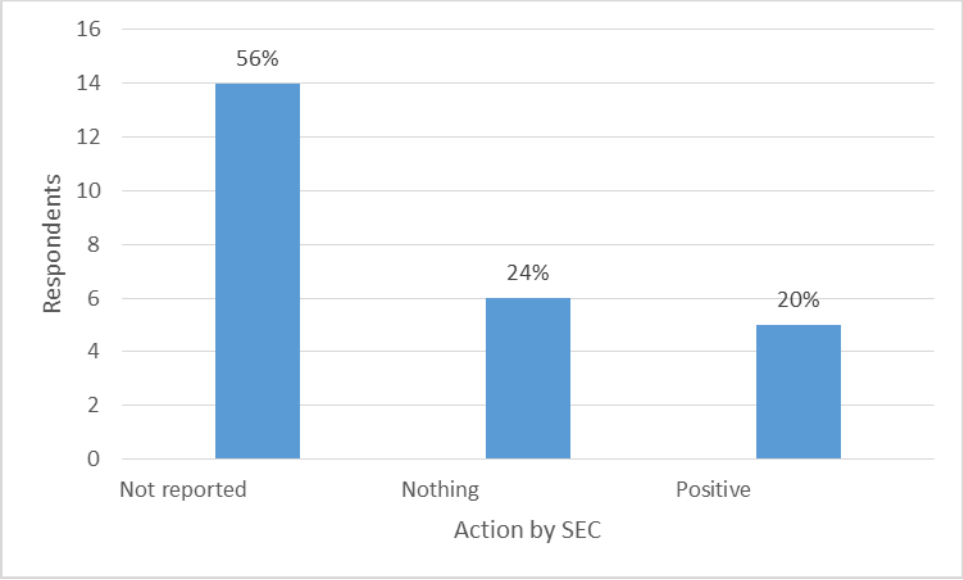


Figure 4:17: Action taken by SEC on eviction threats

4.2.4. Conclusion: Sub-objective 2

From the results above, although there is a general increase in the threats from both within and without the community, 50% of the total respondents agree that there are no threats any more Figure 4-16. The non-statutory owners are more positive with 61% indicating there are no eviction threats as compared to the tenants 53% who are under eviction threats (Figure 4-

15). Also if the non-statutory owners would have built permanent houses, then the spread of fires would reduce and those threatened by the house condition would be free from the house condition threat.

For those threatened with the government are mainly due to the road expansion, but if they would embrace the bigger picture of group titles in future, they would not be threatened. So this means that the SEC still have to preach the benefits of STDM at large.

On the government's role in using the data, the residents are not confident since most of them have not reported to the immediate authorities, while those who have reported have not found positive help.

In conclusion, based on Figure 4-16 above, eviction threats still exist since the introduction of STDM.

4.3. To evaluate if the introduction of STDM has attracted the government and private organisations to improve the infrastructure.

4.2.5. What was the change in the road coverage in the period 2013-2016

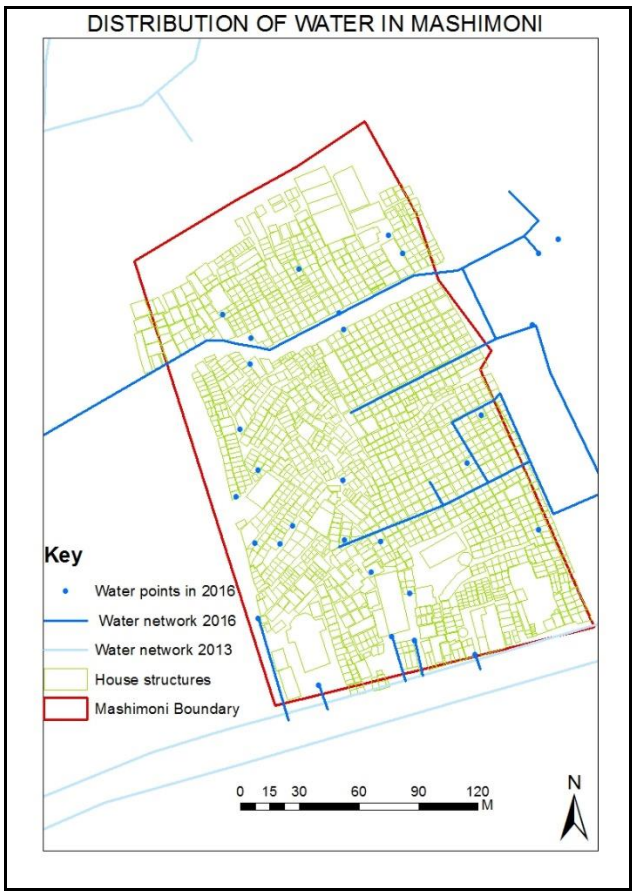
From Figure 3-5 Mosaicked images of the two years, it is clear that there has not been an improvement in the road coverage of both the main and feeder roads. However, from the interview with the SEC, they have been engaging the government through Kenya Informal Settlement Improvement Project (KISIP) to build the roads using the proposed plan shown in appendices 4.

4.2.6. What is the change in the fresh water and electricity supply?

a) Change in fresh water supply

Fresh water has been provided by the Nairobi City Water & Sewerage Company Ltd (see photo 4 Appendices). There has been quite a remarkable improvement in the water points as shown in Figure 4-19 (derived from the shapefiles from the water company). As at 2013, they would fetch water in the neighbouring villages. The Nairobi City Water & Sewerage are planning to increase even more water points as is explained by a key informant in the

interview. These water points are in the form of water kiosks where the residents buy it (derived from A1 in Questionnaire).



Source Nairobi Water & Sewerage Company

Figure 4:18: Distribution of water points

b) Change in electricity supply

Electricity is still illegally connected and there are no plans yet to improve it. However, the World Bank through KISIP has put flood lights throughout the village (interview with the SEC). Some of the flood lights that were captured in the field using hand held GPS are as shown in Figure 4-20 below. There were big and small ones, as shown in photo 5a and b (Appendices 2).

Source: Google Earth

Figure 4:19: Distribution of floodlights

4.2.7. What is the change in the sewerage system

One very notable change as depicted in Figure 4-21 (derived from Q1 under B2 in Questionnaire) is in the sanitation, followed by change in both house walls and toilet and finally the change in the walls. About 36% of some of the structures have also not changed.

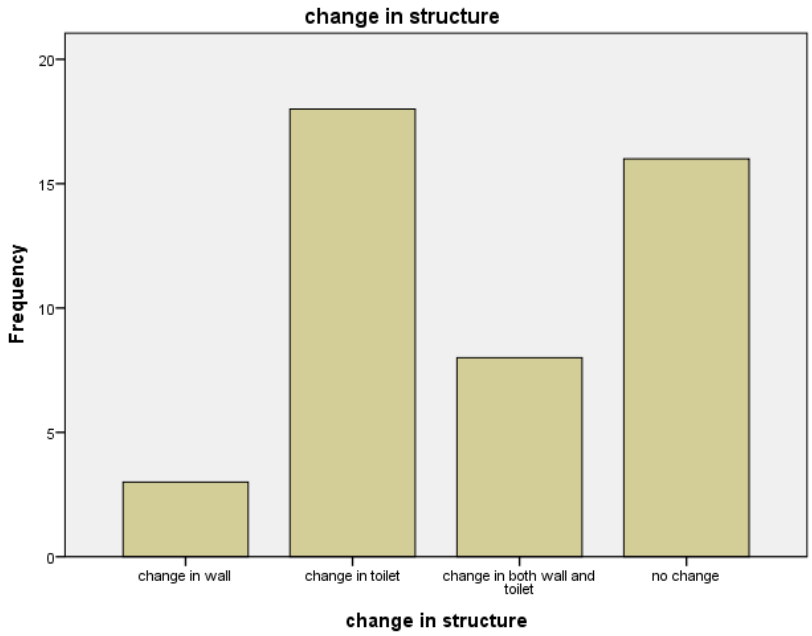


Figure 4:20: Structural changes in the buildings

Photo 2a shows the status of the toilets being phased out with the better ones depicted in photo 2b (appendices). The high percentage in the sanitation change is because loans were offered free of interest that motivated the owners to invest in the sanitation as explained by the SEC and Pamoja Trust during interview

Figure 4-22 (derived from Q1 under B2 with codes for sanitation) depicts the distribution of sanitation in Mashimoni. 51% of the respondents used flash toilets as provided by the Landlord; 9% used flush toilets at a fee of kshs 5 per every visit while 13% prefered using pit latrine at kshs 3 per visit. 22% of respondents had no independent toilet to attend to in times of nature's call. Others (5%) had no specific preference.

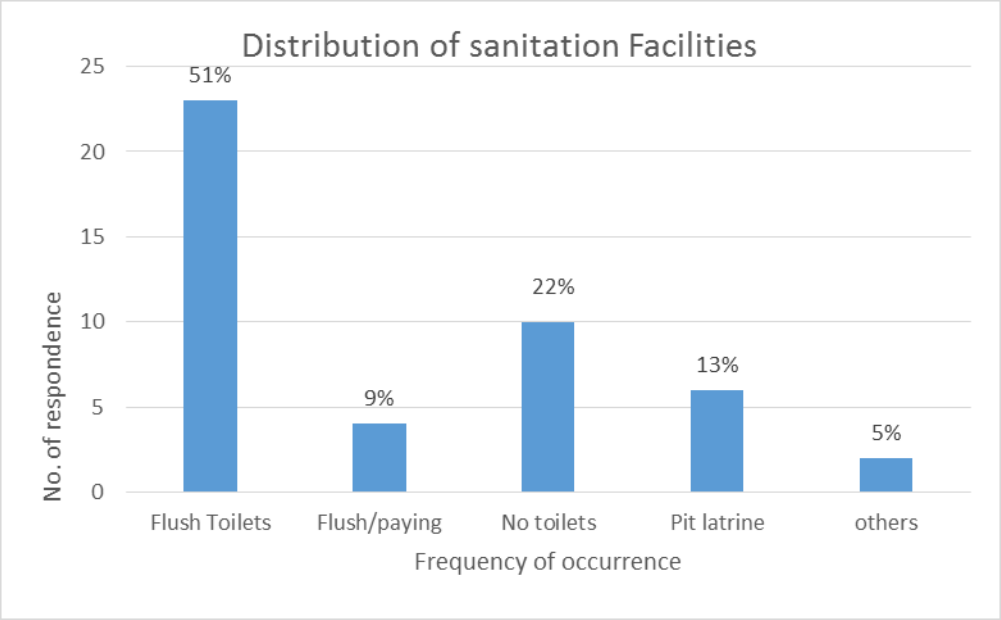


Figure 4:21: Frequency of the sanitation facilities

Before 2014, there was only one sewer line and as at 2016, there was an addition of another two as shown in Figure 4-23 (derived from shapefiles from Nairobi water and Pamoja trust). These were put by the government through the city council and county governments respectively in the two years, the latter funded by DFID – UK in partnership with Pamoja, as explained in the interview by SEC.

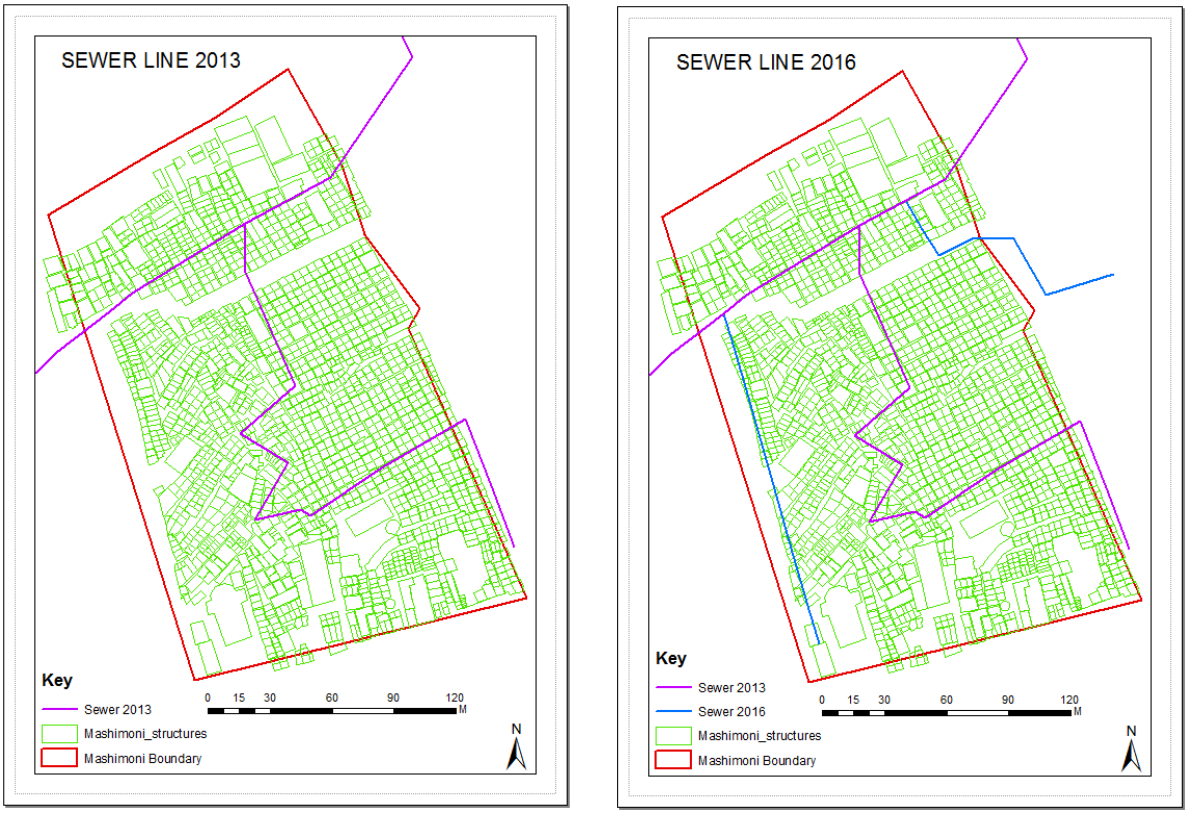


Figure 4:22: Distribution of the sewer lines between 2013 and 2016

There was a 50% increase in the sewer line as seen in Figure 4-24 below

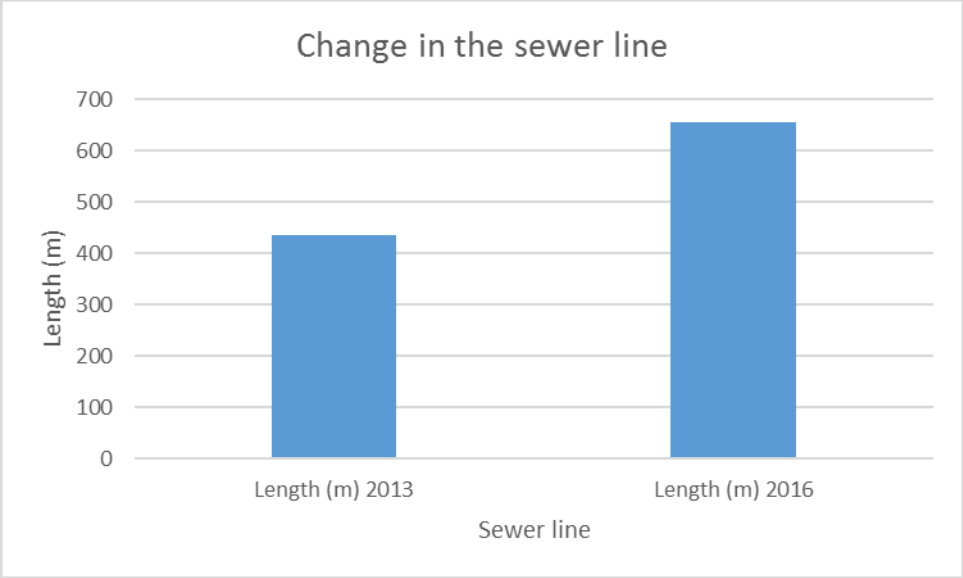


Figure 4:23: change in the sewer line

4.2.8. Conclusion: Sub-objective 3

Since the SEC has been engaging the government through KISIP, there is a likelihood that the proposed road plan will bear fruit, but as for now, there are no changes in the road network.

The water services have also improved courtesy of the Nairobi water services. The electricity supply has not improved except for the floodlights put by the private organisation, while the illegal connections remain.

The sewerage was earlier put by the government and later own, after STDM, a new sewer line was added courtesy of the county government. Although there is improvement in sanitation, it is not attributed to STDM but to the interest free loans offered to them, hence not a personal initiative.

In conclusion, the implementation of the STDM may not be directly linked to the infrastructural developments but can be seen being used in engaging the various bodies for further developments like the road plan.

4.2.9. Concluding Remark

This chapter dwelt on presenting results obtained through the methods specified for each sub objective. On tenure security, there is a high level of confidence perhaps due to the STDM

with very little investment and some level of trust in the data as seen in the vibrant transactions. With regard to threats of evictions, there is a general increase both internally and externally. Concerning the infrastructural developments, the electricity, water and sewer may not be directly linked to the STDM but it is being used to plan for the road expansion as visible from the plan.

5.0. DISCUSSION

5.1. Introduction

The aim of this study was to analyse the impact of STDM. A case study method was used to address the three sub-objectives namely; how property right holders perceived their tenure security and motivation to invest in their property, if there are any threats of evictions after the STDM implementation, and to evaluate if the introduction of STDM has attracted the government and private organisations to invest in the infrastructure. This section discusses the findings in the context of literature.

5.2. How the property right holders perceive their tenure security and motivation to improve their property

Results show that majority of the property owners are confident of tenure security in the short and long term stay because of the solidarity and unity in the great number of people registered (defacto) as explained by van Gelder, (2010). This was enabled by the GLTN financing the implementer's and supporting data management by training users. This confidence augurs well with the observation by Deininger & Feder,(2009) who agree that tenure security increases with the registration although not uniformly. Although they do not have certificates yet, it has not deterred their trust in the STDM and remain hopeful that in the long run, they will eventually possess titles. In reference to Kanji, Cotula, Hilhorst, Toulmin, & Witten, (2005) tenure security increases with certification for areas prone to conflicts or land values are rising rapidly; or without certificates for areas of low conflicts where simple agreements witnessed at local level are acceptable. Augustinus, (2010) and Zevenbergen et al., (2013) also advocate for collective land rights in attaining tenure security that is affordable for the millions living in shantytowns in the sub-Saharan African.

The actors' in this study observe that tenure security will be fully realised when titles are issued. The area chief adds that the property owners are waiting to have full ownership of the land culminating in the issuance of titles. The Pamoja trust view the entire project as a process that leads to the title issuance and according to the GLTN, it supports the continuum of land rights while it is the responsibility of the government to ensure tenure security. The TUK perception of tenure security is based on proper survey with placement of beacons, aiming at having group titles and finally individual titles. This is possible through slum

upgrading program, which can be enabled when extra funding is sought to put up high rise buildings, eventually replacing the slums.

Although the property owners in Mashimoni have embraced STDM, it has not influenced them to invest in their buildings (Ubink et al., 2009). There is little investment in the roofs and upgrading of the walls from mud to iron sheets and bricks. This could be attributed to the low income of the majority of the residents. However, according to the community leaders some of the property owners are eager to put up permanent buildings after they receive the land titles. This means that they perceive limited rights in the STDM as clarified by Ali, Dercon, & Gautam, (2011) who observed that the Ethiopians increased their investments with the increase in transfer rights, and Deininger et al., (2007) further adds that with certification, investments tend to increase. Also notable spatially as illustrated by Mas, (2010) and El-Hattab, (2016) in change detection, they have not expanded their houses horizontally but a few have expanded vertically as seen in Table 4-8.

The property transactions have generally increased with new tenants moving in and others buying. Others also inherited property with very few women being beneficiaries as explained by Lastarria-Cornhiel, (1997). Similarly, in Zambia, notable is the inclusion of polygamous relations which were previously excluded as possible inheritors of property (GLTN, 2015c). Deininger & Feder, (2009) explains that when property is documented, it becomes easier for the owner to rent out knowing that at the end of the contract, one can easily get it back. So for those moving in, the STDM was reliable in protecting their rights of use, lease and selling their properties. In Colombia (GLTN, 2015d) the documentation of property rights has influenced their choice of neighbourhood upgrading programs.

5.3. Threat evictions after the STDM implementation

History records that most of the informal settlements have been subjected to evictions as highlighted by various authors (Weinstein, 2014; Huchzermeyer, 2007; Berner, 2000; Weru, 2004). Mashimoni was not an exception in this because before the piloting of the STDM, evictions were the order of the day as explained by the community leaders. The actors reveal that with the participatory enumeration approach (Karanja, 2010) of mobilization and sensitization of the leaders, village elders and the wider community during the implementation phase, it became harder for outsiders to penetrate the area. Also the fact that they were trained on how to install and use the software, made them own the STDM and update it periodically. According to Patel, Baptist, & D'Cruz, (2012), enumerations provide a

long term solution to evictions by using this data to engage at local level, government and global platforms. This is a true reflection of Mashimoni where there is a remarkable reduction of evictions since the piloting of STDM which was founded on participatory enumeration. However, eviction threats still exist.

Looking at results in section 4.2 indicate that threats of evictions have reduced since the introduction of STDM, as indicated by 61% of the non-statutory owners while the opposite is the case for tenants (Figure 4-15). Augustinus, (2010) observes that forced evictions get limited with the use of this tenure model. Similar sentiments are observed by Wayumba (personal communication, October 13 2016) who adds that evictions tend to reduce with the use of STDM. Entebbe airport expansion would have caused eviction of Kigungu residents but the use of STDM helped in evading eviction plans (GLTN, 2015a). Findings by Pamoja Trust, (2014), Griffith-Charles, (2011) and GLTN, (2015b) on Mombasa, Caribbean and DRC, respectively all point to the reality of reduction of evictions with the use of this social model.

On the government's role in using the data, the residents are probably not confident since most of them have not reported to the immediate authorities, while half of those who have reported have not found positive help.

5.4. Government and private organisations investments in the infrastructure.

The Kenyan government (Policy, 2007) is putting effort in honouring it's commitment to upgrading the lives of those in the informal settlement. The results in section 4.3.2 show the improvement of water services and sewerage system, courtesy of the Nairobi water and Sewerage Company partly funded by the World Bank as explained by the actors. Flood lights observed above were put courtesy of the World Bank through KISIP.

The STDM data has also been used in the designing of the proposed road layout as seen in appendix 4, which the SEC is using to engage the government through KISIP requesting for it's construction. Just like GIS overlays and cadastral data have previously been used as input in the designing of road networks (Waddell, 2007) STDM has an equal potential to be used as a planning tool because it incorporates both the cadastre and the socio-economic data (Enemark, Bell, Christiaan, & Robin, 2014) which is suitable for the informal settlement development.

5.5. Limitations of the study

While this study addressed the objective on impact of STDM in Mashimoni, limitations were visible when;

Getting appointment with some of the stakeholders never materialised.

The spatial data used was not of very high resolution. Also standard correlation methods were not used to check if there really are relationships between STDM and changes to the slum area.

Some of the respondents were not keen in answering the questionnaires because they had answered several before and were rather tired of them, while others were unschooled and of low level education, hence, they probably did not understand some of the questions.

6.0. CONCLUSION

This chapter aims at giving a summary of the findings gathered from this research based on the objectives that were defined for the study.

6.1. To assess how the property right holders perceived their tenure security and motivation to invest in their property

In assessing the people's perception on tenure security, majority (86%) of the property owners exhibit a high level of confidence in tenure security perhaps because their names are in the database and in the solidarity and unity in the great number that have registered in the STDM. The minority are not confident because there are no certificates issued to show their ownership.

Concerning the state of the house structures, the change of the wall materials from the temporary mud and iron sheets to brick wall was very minimal. From the spatial analysis on the change in size of the structures, the change is small, (2%), although a few have expanded vertically. This implies that much as they embraced STDM, it has not influenced them to invest in their properties, however this could also be ascribed to lack of space and capacity.

The property transactions have generally increased with new tenants moving in, others buying the properties as sold by the structure owners while others inheriting. This indicates that the respondents perceive the STDM as reliable in protecting their rights of use, lease and selling their properties.

6.2. To find out if there are any threat evictions after the STDM implementation

Although there is a general reduction in the threats from both within and without the community, 50% of the total respondents agree that there are still threats. Albeit if the non-statutory owners would have built permanent houses, then the spread of fires would reduce and those threatened by the house condition would be free from the house condition threat. Those threatened with the government are mainly due to the road expansion, but if they would embrace the bigger picture of group titles in future, they would not be threatened. So this means that the SEC still have to preach the benefits of STDM at large.

In totality the non-statutory owners are more positive with 61% indicating there are no eviction threats as compared to the tenants 53% who are under eviction threats. A great

percentage of the residents also view the government's role in using the STDM data in reducing forced evictions to be very low.

6.3. **To evaluate if the introduction of STDM has attracted the government and private organisations to invest in the infrastructure**.

There has not been any change in the road status, however, the SEC is engaging the government through KISIP and there is a likelihood that the proposed road plan will be constructed.

The water services have improved courtesy of the World Bank financing the Nairobi Water and Sewerage Company. Electricity is still connected illegally except for the flood lights put due to the rural electrification project but financed by the World Bank.

The sewerage was earlier put by the government and later own, after STDM, a new sewer line was added courtesy of the county government with financial aid from DFID. Although there is improvement in sanitation, it is not attributed to STDM but to the interest free loans offered to them.

6.4. General Conclusion

Looking at the variables used in measuring the indicators for the sub-objectives, only four out of nine imply a positive impact of STDM in Mashimoni. However, if the owners invest in their buildings, then the threats within will be dealt away with. Also if the SEC continue to enlighten those threatened with road expansion to see the bigger picture, then the threat will reduce tremendously. Both the road construction and building investment require a lot of money which is not affordable to the majority poor in this settlement and hence, may require external funding. Although the impacts seen in the confidence in tenure security, transactions, water & sewer, and electricity do not stand out as much, there could be a link to the STDM implementation. Credit is also given to other organisations that have contributed to the infrastructural development although not directly linked to STDM. Considering that it is only 3 years since the piloting of the STDM in this village, the gains are commendable.

6.5. Recommendations

This study analysed the impact of STDM on tenure security in Mashimoni village and highlighted the applicability of this tenure model in the informal settlement. From this study,

the reality on the ground is revealed that could influence the relevant authorities and policy makers. Hence, the following is hereby suggested;

- Further research should be done by use of 3D analysis to capture the expansion of houses that has reached saturation point horizontally and is now making use of the vertical space upwards.
- Other factors that could influence investments for these residents in terms of their capacity and cost of building materials would be valuable if researched. For example, if they eventually get certificates, can they be used to access credit.
- Although the GLTN have improved the STDM software to be able to produce certificates of occupancy, it has not been felt on the ground by the residents and so there is a need for them to train the local data managers on the same.
- The government's input through the Ministry of Lands and Housing as a major stake holder is necessary. This is because the residents are still not confident in the government's protection. They are also not sure how legal the certificate will be, no wonder they still hope to get titles as their ultimate goal.

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APPENDICES

Annex 1: Provisional work plan for the proposed research

	Week 1 September							Week 2 October							Week 3 October						
Activity	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Visit community leaders/Stakeholders																					
Refining the questionnnaire																					
Interview community leaders																					
Collection of service points																					
Administer questionnaire																					
Data cleaning																					
Additional data collection (if required)																					
Data processing																					
Evaluation of collected data																					
Follow up with community leaders																					
Community leaders + stakeholders and appreciation																					

Month	September				October				November				December				January				February			
Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Pre-fieldwork																								
Fieldwork																								
Data processing																								
Data analysis																								
Mid presentation																								
Report writing																								

Annex 2: Field photographs

Photo 1a

Photo 1b

Congested house structures (Source: Author 2016

Photo 2a : old toilets being phased out

Photo 2b : new toilets being constructed

Photo 3a: upward extension to one level

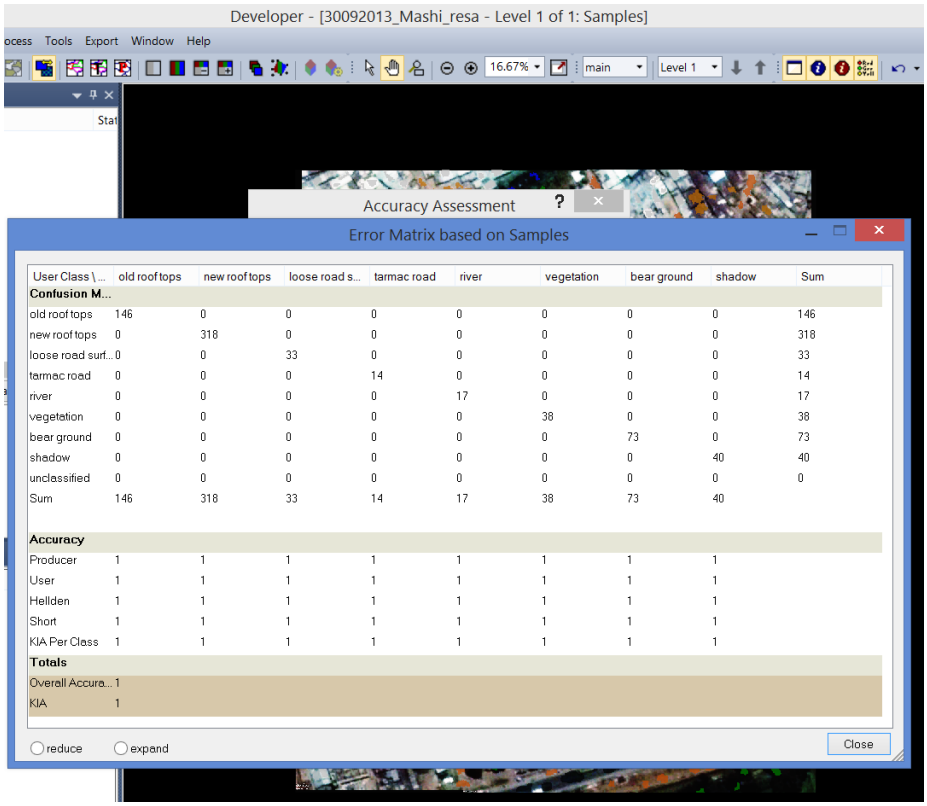
Photo 3b: upward extension to two levels

Photo 4: Water point by Nairobi City Water

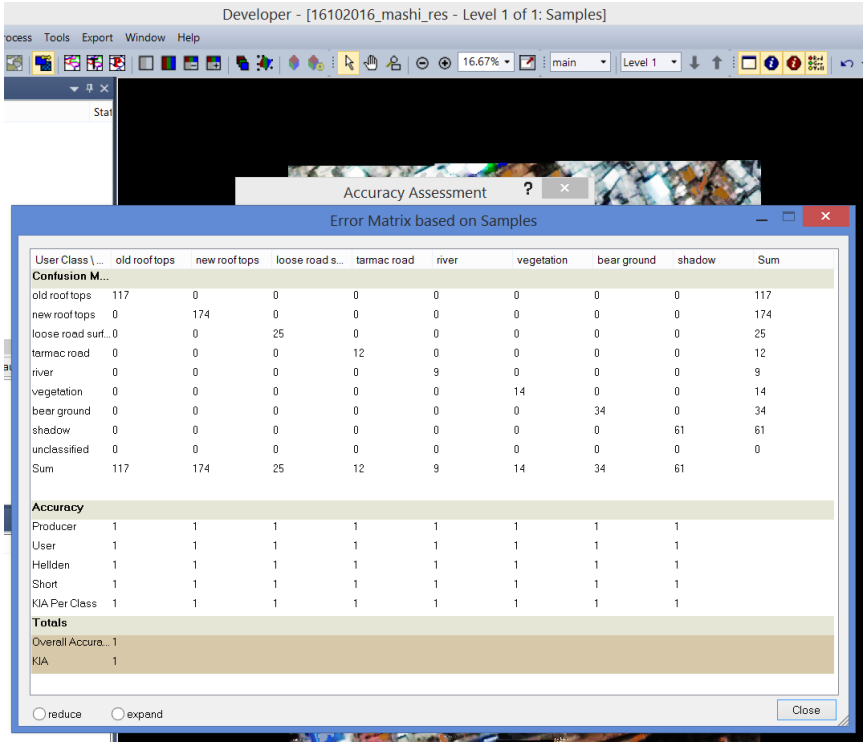
Photo 5a Big floodlight

Photo 5b Small floodlight

Annex 3: Accuracy assesement



User Class \ ...	old roof tops	new roof tops	loose road s...	tarmac road	river	vegetation	bear ground	shadow	Sum
Confusion M...									
old roof tops	146	0	0	0	0	0	0	0	146
new roof tops	0	318	0	0	0	0	0	0	318
loose road surf...	0	0	33	0	0	0	0	0	33
tarmac road	0	0	0	14	0	0	0	0	14
river	0	0	0	0	17	0	0	0	17
vegetation	0	0	0	0	0	38	0	0	38
bear ground	0	0	0	0	0	0	73	0	73
shadow	0	0	0	0	0	0	0	40	40
unclassified	0	0	0	0	0	0	0	0	0
Sum	146	318	33	14	17	38	73	40	
Accuracy									
Producer	1	1	1	1	1	1	1	1	
User	1	1	1	1	1	1	1	1	
Hellden	1	1	1	1	1	1	1	1	
Short	1	1	1	1	1	1	1	1	
KIA Per Class	1	1	1	1	1	1	1	1	
Totals									
Overall Accura...	1								
KIA	1								



User Class \ ...	old roof tops	new roof tops	loose road s...	tarmac road	river	vegetation	bear ground	shadow	Sum
Confusion M...									
old roof tops	117	0	0	0	0	0	0	0	117
new roof tops	0	174	0	0	0	0	0	0	174
loose road surf...	0	0	25	0	0	0	0	0	25
tarmac road	0	0	0	12	0	0	0	0	12
river	0	0	0	0	9	0	0	0	9
vegetation	0	0	0	0	0	14	0	0	14
bear ground	0	0	0	0	0	0	34	0	34
shadow	0	0	0	0	0	0	0	61	61
unclassified	0	0	0	0	0	0	0	0	0
Sum	117	174	25	12	9	14	34	61	
Accuracy									
Producer	1	1	1	1	1	1	1	1	
User	1	1	1	1	1	1	1	1	
Hellden	1	1	1	1	1	1	1	1	
Short	1	1	1	1	1	1	1	1	
KIA Per Class	1	1	1	1	1	1	1	1	
Totals									
Overall Accura...	1								
KIA	1								

Annex 4: Proposed Road Plan

Source: Chairman of SEC

Annex 5: Questionnaire for Mashimoni residents

I, Ms. Elizabeth Otieno from The University of Twente is carrying out a study on **Analyzing the Impact of social tenure domain model (STDM) on tenure security in the informal settlement, a case study of Mashimoni village in Nairobi, Kenya.** You are one among several settlers in this area who have been selected for this study. The information you deliver will be kept strictly confidential and used for Academic purpose only.

(QN) Questionnaire No…… Date……

(EN) Enumerator' name…….....

A. SOCIO-ECONOMIC DATA

A.1 Information of the household head

sex	Age in Yrs.	Formal education	House hold size	Source of energy most frequently used	Source of water	Average monthly Income	Structure number

1=Male 2=Female	1=Below 18 2=19-29 3=30-39 4=40-49 5=50-59 6=Above 60	1=Primary 2=Secondary 3=Tertiary 4=others (specify) _____	People living in the homestead	1=Charcoal 2=Fuel 3=Wood 4=Electricity 5=Solar 6=Petroleum products 7=Other (specify) _____	1=River 2=Bore–hole 3=Tap water 4=Rain water 5=Roof catchment 6=Other (Specify) _____	1=Below 5000 2=5001-15000 3=15001-25000 4=25001-35000 5=35001-45000 6=Above 45001	
[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	

A.2 Status of ownership

	When did you move into Mashimoni	Reasons for moving	Have you expanded house	When did you expand	Reason for expanding	Reason for planning to expand in future
Original owner during STDM						
New owner after STDM						

A.3 Status of tenants

	When did you mo Mashimoni	Where were you in 2013	Reasons for movi	Previous rent pai 2013	Current rent pai
Tenant during S					
Tenant after STI					

B1 PERCEPTION OF TENURE SECURITY

Q1. How confident are you that this property/house will be yours in …years?

Confidence level	After 5 years	After 10 years	After 15 Years
Not confident at a			
Not confident			
Confident			

Very confident			

Q2. Explain the reason for your choice above

……
……

Q3. How did you acquire this property? (Tick where appropriate)

Squater	
Bought from previous owner(s)	
Inheritance	
Gift	
Others (specify) …….	

Q4. Did you enroll for STDM enumeration?

Yes ☐ No ☐

Q5. If Yes, Why did you choose to be included in STDM project?

……
……

B2 BUILDING STRUCTURE

Q1. What is the condition of your building structure? (Use the codes below to answer)

BEFORE STDM/2014			**AFTER STDM/2014**		
Roof material	**Wall material**	**Sanitation**	**Roof material**	**Wall material**	**Sanitation**

Codes for roofing material

1=corrugated iron 2=grass thatched 3=Roofing tiles 4=carton 5=wooden 6 others (specify)
……

Codes for wall material

1=Brick wall 2=mud wall 3=iron sheets 4=wooden wall 5= Carton 6 others (specify) …….

Codes for sanitation

1=Flush toilets **2=** Pit Latrine 3= others (Specify) …….

Q2. Who funded the improvement of your structure?

Roof material	**Wall material**	**Sanitation**

Codes for funding

1=Self 2=Loan 3=Others (Specify) …….

B3 PERCEPTION OF THE SETTLERS ON STDM

Q1. What is your perception on the strength of STDM in protecting your rights, in terms of leasing (kukodesha), buying, selling and inheriting property? (Tick where applicable).

High	1	
Middle	2	
Low	3	

Q2. To what extent do you feel STDM protects you from others encroaching on your property (Tick where appropriate)

1	Fully protects	
2	Partially protects	
3	Does not protect at all	

Q3. Do you have any concerns related to tenure security that are not addressed by the STDM?

Yes ☐ No ☐

If Yes (Specify)

……
……

C EVICTION THREATS

C1: Information on threats from various sources

Source of threats	How often did it occur	When did it happen	Explain what happened	How did you protect yourself
Family				
Landlord				
House condition				
Private organization				
Government				
Others. (Specify)				

C2: Information on the role of STDM in protection against evictions

Did you discuss the threats with STDM team	
What was done about the threat	
What were the results of the action	

Q1. What is your perception of the eviction threats? (Tick where appropriate)

	Before STDM	After STDM
Very high		
High		
Low		
Very low		
No evictions		

THANK YOU FOR YOUR TIME AND COOPERATION

Interview questions for stake holders

A. GLTN/PAMOJA TRUST

Background of STDM

- Description of Social Tenure Domain Model (STDM) within the GLTN project framework
- What's the local term for STDM in the community
- What was the objective of the STDM
- When was it implemented?
- How was it implemented?
- Apart from Mashimoni, was this model applied in other informal settlements in the country
- What informed the choice of Mashimoni as a preferred study site?
- Who were the key partners involved
- As an organization, did you meet the targeted objectives?
- What challenges/limitations did you face during the implementation of this project?
- How did you resolve/overcome these challenges

Status

- How are the community in Mashimoni benefiting from the project
- How did they embrace the project?
- How has been the stakeholders support (household, government, human right groups, CBO's, NGO's)
- How has this initiative impacted on the livelihoods of the community
- Have you observed any direct impact of this initiative?
- What plans were put in place to make the STDM sustainable (updating data, data quality control check)

Future prospects

- Follow up activities
- Knowledge repository from the STDM project, (publications, media articles, conference papers)
- Applicability of the model in other informal settlement in the country

Data

- Need of spatial data of the house structures (shapefile)

Interview with TUK

1. What was the objective of STDM in Mashimoni
2. Was the objective achieved
3. What was the role of TUK in STDM implementation
4. What challenges did you face
5. How did you overcome/resolve the challenges
6. What's the plan to make it sustainable (updating the data, quality control checks)

7. What are the future prospects – any follow up activities

8. As a professional surveyor, how do you view STDMs objective

Interview with Community Leaders

Q1. Current Status

a) What's the local term for STDM
b) What was the objective of STDM
c) How did the residents embrace the project?
d) How has been the stakeholders support (owners, government, human right groups, CBO's, NGO's)
e) How has this initiative impacted on the livelihoods of the community?
e) How are the community in Mashimoni benefiting from the project
f) Have you observed any direct impact of this initiative?
g) What plans were put in place to make the STDM sustainable (updating data, data quality control check)

Q2. What's the residents confidence in the STDM in terms of

a) Staying for 5 years and above
b) Updating changes in the data for the new owners

Q3. What were the eviction threats experienced in the community before STDM

Q4. What are the eviction threats experienced in the community after STDM

Q5. How has the STDM been used to engage with

a) Water service providers?
b) Sewer service providers?
c) Electricity providers?
d) Road constructors?

Interview with the area chief

a) What is the status of the village with the STDM implementation

b) What is the response to the STDM

c) What are the threats of evictions experienced

d) Which are the investments taking place