Households Strategies in Mitigating Environmental Risks in Informal Settlements: the Case of Lacey Road, Sydenham in Durban

University of KwaZulu Natal-Howard College

Households Strategies in Mitigating Environmental Risks in Informal settlements: the case of Lacey Road, Sydenham in Durban

by

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I declare that this dissertation is my own unaided work. All citations, references and borrowed ideas have been duly acknowledged. I confirm that an external editor was / was not used (delete whichever is applicable) and that my Supervisor was informed of the identity and details of my editor. It is being submitted for the degree of *Masters of Science Urban and Regional Planning (Environment and Planning)* in the Faculty of Humanities, Development and Social Science, University of KwaZulu-Natal, South Africa. None of the present work has been submitted previously for any degree or examination in any other University.

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ABSTRACT

This study is concerned with the manner in which households create strategies to mitigate environmental risks in informal settlements for example Lacey Road which is located in Sydenham in the eThekwini metropolitan area of KwaZulu-Natal. Informal settlements result from migration and urbanisation trends whereby people from rural areas migrate to the city in search of job opportunities and a better life. Many fail to find the formal employment opportunities they seek and find themselves having to provide their own shelter. These circumstances culminate in the construction of informal settlements in and near the city. People settle on land that is often undesirable for development because of geological or environmental pressures e.g. it has unstable soils, the land is located within flood plains or on very steep slopes.

The vulnerability approach and political ecology framework underpin this study. These two approaches have been used in order to understand the capabilities of informal settlers to cope with risks they are faced with. They have been also used to understand how human activities and political systems may be linked to the spread of environmental degradation and risks. Household survey and key informants interviews were used to conduct this study.

The findings of the research show that Lacey Road informal settlement is exposed to various risks such as floods, fire, waste disposal, and indoor air pollution and other health risks. It is clear that residents from Lacey Road are regularly exposed to the harsh realities of spatial and environmental marginalisation. The main reason for their vulnerability is the lack of service delivery by the municipality. This is due to a unique set of power relations where the community does not have profile to force the municipality to provide access to basic services.

It is within this context that the researcher sought to analyse and explore the interface between environmental risk management and coping strategies of residents within informal settlements. Whilst there are general risks that face all residents of informal settlements, the researcher also considered what is specific to the Lacey Road settlement in Sydenham. The intention of this research is to identify environmental risks being experienced in Lacey Road informal settlements. Furthermore, to understand household strategies employed to mitigate those environmental risks at Lacey Road.

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ACRONYMS

ABM	Abahlali baseMjondolo
BNG	Breaking New Ground
DEAT	Department of Environmental Affairs
DMSLP	Disaster Mitigation for Sustainable Livelihoods Programme
DoH	Department of Housing
DWAF	Department of Water Affairs and Forestry
GIS	Geographic Information Systems
HER	Environmental Health Risks
IDP	Integrated Development Plan
MSA	Municipal Systems Act
NEMA	National Environmental Management Act
NWMS	National Waste Management Strategy
RDP	Reconstruction and Development Plan
SA	South Africa
UN	United Nations
UN-HABITAT	UN Human Settlements Programme
VA	Vulnerability Approach
WCED	World Commission on Environment and Development

CHAPTER 1:   INTRODUCTION AND OVERVIEW

1.1   INTRODUCTION

Informal dwellers are usually exposed to harsh living conditions such as environmental hazards due to their geographical locations. There is growing awareness amongst planning practitioners regarding the issues related to the environment and its impact in the upgrading of informal settlements. This chapter introduces the research project and presents the background as well as the main arguments of the project. The same chapter discusses the aim, objectives, research questions and methodological approach of the study.

1.2   BACKGROUND AND OUTLINE OF THE RESEARCH PROBLEM

The development of informal settlements results from migration and urbanization, where people from rural areas migrate to the city in search of job opportunities and a better life. These people fail to find employment and this culminates in the construction of informal settlements in and near the city. Many people tend to settle on land that is often undesirable for development; has unstable geology, in flood plains or on very steep slopes.   Here, environmental risks like floods, and far more significantly, fires take place. Poor service delivery in these communities has also led to poor sanitation, lack of water and refuse disposal, all of which put the environment and community health under threat. It is clear that residents are regularly exposed to the harsh realities of spatial and environmental marginalization that accompany living in informal settlements (Napier, 2002). Demand often outstrips supply in this regard as delivery systems do not keep up with demand for housing.

Lacey Road, which is situated in Sydenham, is one of the informal settlements in Durban which suffers from environmental risks. A lack of environmental education within this community also has an impact on the natural and built surroundings. The conditions that people are living in and the demands for daily survival, place environmental issues in second place to survival

strategies. The long term impacts are not understood. This becomes a threat to the environment and to the communities like that located in Lacey Road.

Despite government efforts to redress past imbalances and access to housing through national policies, for example, the Redistribution Development Programme (RDP), informal settlements continue to grow and little has been delivered in this particular area. Due to limits of government intervention, people rely on marginal livelihood strategies to access resources and manage the environment.

In response to the above mentioned problems, the researcher aims to assess the exposure to the environmental risks found in informal settlements, in order to better understand how communities perceive their urban environment and to draw upon information found during the research process. The intention is to understand household strategies used to mitigate environmental risks in Lacey Road in Sydenham and thereby be able to make recommendations about other interventions to support these strategies. Examples from good practices will be used to enrich and to suggest strategies to be utilized in order to reduce risks in informal settlements.

1.3   AIM AND OBJECTIVES

The aim of the study is to understand the interface between environmental risk management as well as coping strategies of residents within informal settlements in Lacey Road, Sydenham. Based on the purpose of the study, the objectives are:

- To identify the environmental risks in Lacey Road informal settlement;

- To examine the living conditions of people in the Lacey Road informal settlement; and,

- To understand household strategies used to mitigate environmental risks.

1.4   RESEARCH QUESTION

How do households and the community at large in Lacey Road, informal settlement respond to environmental risks?

1.4.1   Sub Questions

The sub question can be summarised as follows:

- What are the environmental risks that people experience by living in Lacey Road informal settlement?
- What are causes of these environmental problems?
- What are the impacts of these risks at a household level?
- What are the implications for the upgrading of the informal settlement?
- How can planning interventions reduce environmental risks in this informal settlement?

1.5   RESEARCH METHODOLOGY

This section outlines the methods used in the collection, processing and the presentation of data including the limitations of the study. The choice of research methodology is a vitally important aspect of any academic study as it shapes the overall approach and specific procedures adopted in the collection and analysis of evidence. Use was made of secondary sources as well as the collection of primary data in Lacey Road informal settlement.

1.5.1   Research Design

The research used both qualitative and quantitative data, which was collected from the field through semi-structured questions in interviews and observations. The interview questions

were written in English and were translated into IsiZulu when interviewing the households because the interviewees were mostly Zulu speakers and most of them were not much educated. Some interviews were conducted with the Municipal officials with the aim of getting their views with regards to living conditions and service delivery in informal settlement.

1.5.1.1 Primary Sources

The primary sources used in the study included questionnaire survey of household heads, semi-structured interviews and observational studies. The researcher gathered the information from the household heads. As they were expected to know the area better and the environmental risks that they are experiencing and those that they had experienced in the past. This was done using a semi-structured questionnaire in interviews. It was the major source of oral primary data. Some data were gathered by direct observation of living conditions and factors that contribute to environmental risks within the area. Semi formal interviews were conducted with the Municipal Officials in order to understand their role in assisting people living in informal settlement (Lacey Road).

1.5.1.2 Secondary Sources

Secondary data provides the basis for conceptualizing the research problem and formulating the conceptual framework. The secondary sources of data about environmental risks in informal settlements in general and in Lacey Road, Sydenham in particular were journals, books, theses, internet sites and other articles. The secondary data collection served to inform as well as to conceptualize the present study.

1.5.1.3 Questionnaire

The questions that were asked were guided by the objectives of this study. The survey in this study included closed-ended questions and open-ended questions. The closed-ended questions were related to environmental risks in informal settlements which could be quantified.

Open ended types of questions are appropriate in a sense that they introduce the subject and elicit general reactions. The researcher used more open ended questions to find out the living conditions of informal settlements and the mitigation strategies which households employ to reduce or cope with environmental risks. This type of question was also used to encourage communication and to provide information about the respondents' feelings, attitudes and their past experience. The problem with the open ended questionnaires is that they were time consuming.

The researcher conducted household survey through face to face interviews using the questionnaires. The use of this method is because it has highest response rate (Maree, 2007). Furthermore, the interviewer can assist with issues that are not clear to the respondent. The disadvantage of this method as outlined by Maree (2007:158) is that "the cost is very high and the interviewer bias is a great risk".

1.5.1.4 Key Informants Interviews

The researcher conducted some interviews with some key respondents. Purposive sampling was used in selecting the key respondents from the Municipality. The researcher decided to use purposive sampling because the researcher judges who can provide the best information to achieve the objectives of the study. Purposive sampling is different from other sampling in that the researcher does not simply study whoever is available, but uses his or her judgment to select the sample for a specific purpose (Jack, 2001). The researcher visited the different Departments at eThekwini Municipality to conduct some interviews. Department of Environmental Affairs was visited and two key respondents were interviewed. Department of Housing was also approached and the Manager for Human Settlements was interviewed. Lastly, the Department of Disaster Management and Water Affairs (water and sanitation) was interviewed. These are the departments that work closely with informal settlements particularly Lacey Road. These departments were part of the study in order for the researcher to find out the role they play in informal areas. The aim was to compare the findings from the

households and from the Municipality. The researcher was always available in order to clarify the questions during the interviews thereby helping the respondents give relevant responses.

1.5.1.5 Observations

"Observation is the systematic process of recording the behavioural patterns of participants, objects and occurrences without necessarily questioning or communicating with them" (Marree, 2007:83). Observation is an open research design which increases the possibility of the researcher being able to identify unexpected issues. Non-participant observation was used whereby the researcher observed the environmental risks and the way people responded to them. The researcher used this method in order to gain a deeper insight and understanding of living conditions of the informal settlement and environmental risks being experienced in Lacey Road. Observation allowed the researcher to see and begin to experience reality as a participant (Marree, 2007). Visual data was captured through the use of a digital camera.

1.6   SAMPLING METHOD

The community of Lacey Road was surveyed using a systematic sampling method. The researcher interviewed every 5th households. In the case where the fifth household was not available the researcher selected the sixth household until forty household heads were interviewed. The researcher selected this sampling method to ensure that the data was valid and reliable.

1.7   DATA ANALYSIS

The quantitative data was analyzed using SPSS (Statistical Package for Social Sciences). SPSS is an "enormously powerful data analysis package that can handle very complex statistical procedures" (Pallant, 2007: xiii). SPSS text analysis for surveys enables the researcher to quickly and reliably categorise or code responses to open ended questions in survey or questionnaires. The data was described and summarized through the use of descriptive statistics, frequency

tables and graphic presentation. Graphs were generated using the EXCEL system. MAPS were gathered through the use of Geographic Information System (GIS).

Qualitative methods of data analysis were employed to analyse the data collected from all the different sources. Descriptive analysis was done to make interpretation of data easy. Interpretive analysis was done also to make data meaningful to people. This was done by comparing different cases and findings of other researchers or writers. Data analysis was thematic qualitative analysis. The information that was gathered during data collection was categorized and scrutinized to depict the situation. This involved looking at the categories applicable to all tools and identifying the similarities and differences of people's perceptions that helped to reach the conclusions.

1.8   LIMITATIONS OF THE STUDY

One of the constraints of this study is that the researcher had limited time and resources and therefore most of the data collection was undertaken during weekends. In as much as this time limitation may be a constraint, it could be argued that it presented a chance to interview a more representative sample since it included people who would have been at work. The Lacey Road settlement is wracked with political instability and it was not easy to collect data. After the political conflict amongst some residents and the 'Abahlali BaseMjondolo Movement' which is the organisation for informal residents in the adjoining Kennedy Road informal settlement, it was difficult to approach and visit the study area because community members thought that the researcher may have an affiliation to one side of conflict. Political tension made it even difficult for the researcher to get hold of the Councillor of the area. The researcher had to be strategic in terms of collecting the data which made the researcher wonder sometimes if the responses that were given were of best quality and true. Fortunately, it was towards the end of researchers' survey. The researcher was limited in terms of taking the photos because most of the interviewees did not want their pictures to be taken especially of their houses.

1.9 ETHICAL CONSIDERATIONS

Schwartz (1991) in Struwig and Stead (2001:66) refers to ethics as "a system of morals, rules of behaviour which provide researchers with a code of moral guidelines on how to conduct research in a morally acceptable way". The researcher adherence to this approach by ensuring that before starting the interview process, the participants were given the opportunity to voluntarily take part in the research. All respondents were given the consent form to sign which stated clearly that participation was voluntary and they are free to withdraw from participating should it be necessary and it also stated clearly the nature of the study. In this manner, permission from the head of households was gained which gave the research credibility.

The respondents were assured that the information gathered will be kept confidential, and would only be used for the purpose of the research. This implies that confidentiality was maintained by explaining that precise quotations might be used, but anonymity will be guaranteed and maintained. Confidentiality was maintained by not writing the names of the respondents as a way of protecting the participants' identity.

1.10 DISSERTATION STRUCTURE

1.10.1 Chapter 1: Introduction and Overview
This study has been organised into six chapters. The first chapter introduces the study and presents the aim and objectives. It is within this chapter where the research methodology and limitations of the study are outlined.

1.10.2 Chapter 2: Literature Review
This chapter discusses concepts such as environmental risks and vulnerability and looks at the possible measures to be taken in order to reduce environmental risks in informal settlements. It

is within this chapter that the main arguments of this study are discussed in depth using different literature. Policy implications in terms of environment and informal settlements are also discussed in this chapter.

1.10.3   Chapter 3: Political Ecology and Vulnerability Approach

This chapter established a theoretical framework for the study. It draws from the political ecology and vulnerability approach perspectives.

1.10.4   Chapter 4: Case Study of Lacey Road

This chapter presents the background of the study area in detail.

1.10.5   Chapter 5: Research Field Work and Findings

This is the main chapter of this study, where the findings are presented and analysed and integrated with the theoretical perspectives.

1.10.6   Chapter 6: Conclusions and Recommendations

This chapter provides conclusions and recommendations based on the research. It responds to the research questions and indicates whether the findings validate the initial objectives. In addition, a number of conclusions and recommendations are made.

1.11   CONCLUSION

This chapter introduced and discussed the way the study was conducted and the instruments used to collect data. It includes the sampling methods used, and the population of study and methods used in analyzing the data. The research methodology tools were used with the intention of addressing the objectives of the study as well as trying to address the research questions and objectives. Limitations of the study were also discussed in this chapter. Ethical consideration is discussed as to ensure confidentiality and anonymity of the respondents.

CHAPTER 2: LITERATURE REVIEW: ENVIRONMENTAL RISKS IN INFORMAL SETTLEMENTS

2.1 INTRODUCTION

The fast rate of urbanization in developing countries has continued to put pressure on the lives of informal dwellers. Progress made so far to improve the lives of informal residents does not seem to be able to keep pace with the fast rate of urbanization. Informal dwellers tend to live in especially poor social, housing and environmental conditions. This makes them vulnerable to risks of ill health, crime and violence. This chapter provides a literature review of informal settlements in this study. It discusses concepts such as informal settlements and environmental risks. It will also examine the living conditions in informal settlements. The possible measures that can be taken in order to reduce environmental risks in informal settlements will be discussed. This is done by examining the interface between the natural or spatial environment and sustainable livelihoods and how the interface can be addressed. It is within this chapter that the main argument of this study is discussed in depth using different literatures.

2.2 INFORMAL SETTLEMENTS

2.2.1 A Definition of Informal Settlement

Ackelman and Andersson (2008) have stated that, since the 1960s, the cities of the developing countries have been faced with a high rate of urbanization and increasing poverty. This has resulted in the uncontrolled informal settlements through encroachment and invasion of land and construction of poor housing conditions. Historically, these poor houses have been called by different names such as, shacks, slums, squatter settlements and shantytowns (Ackelman and Andersson, 2008), but the most appropriate is informal settlements which will be used in this

study. Defining the term informal settlement differs according to the field of study. The spatial and environmental context of informal housing also differs from one region to the other. Hunter (2006:156) argues that "the term 'informal settlement', rooted in the language of planners, can serve to homogenize what is a diverse spatial landscape".

Informal settlements are defined as "dense settlements comprising communities housed in self constructed shelters under conditions of informal or traditional land tenure" (Hindson and McCarthy, 1994:1 and Naidoo et al (2008). The Government of the Western Cape defines informal settlement as "Houses and shacks built on undeveloped land. There are no services like electricity, running water and sanitation" (Ackelman and Andersson, 2008:6). UN-HABITAT (2003) Program referred to informal settlements as residential areas where a group of housing units have been constructed on land to which the occupants have no legal claim, or which they occupy illegally. Furthermore, informal settlements are unplanned settlements and areas where housing is not in compliance with current planning and building regulations (Ackelman and Andersson, 2008; Local Government and Housing, 2002). It is clear that there is wide range of meanings for the term informal settlement and the way it is classified in the literature.

Sokhela (2006:22) defines the term informal settlements as "spontaneous settlements without legal recognition or rights, sprawling at the edge of cities, or on pockets of marginal land within city boundaries". According to the Slums Bill (2006) informal settlements are characterized by an area of unplanned and unapproved informal settlement of poor persons with lack or non-existent infrastructure or sanitation.

To summarize the various definitions of informal settlements, they are characterized by inadequate access to safe water, to sanitation and other infrastructure, poor structural quality of housing, overcrowding, poor access to health and education facilities and employment opportunities, lack of effective government and management, and insecure residential status (Local Government and Housing, 2002; UN-HABITAT, 2003; David, 2006; Unger and Riley, 2007; Naidoo et al, 2008). They are consequently areas of increasingly high risk with regard to environment, safety and security (Local Government and Housing, 2002).

From the various definitions discussed, the term informal settlement in this chapter is referred to unplanned and unregulated houses which are subjected to environmental hazards, unhealthy living conditions because of deteriorating environments and due to lack of basic services and infrastructure.

2.2.2   The Nature of Informal Settlements

UN-HABITAT (2003) pointed out that, informal settlements are generally characterized by three major conditions: high population densities, low standards of housing and the experience of filthiness. Furthermore, the quality of dwellings and materials used, and the variety of tenure arrangements practiced, within informal settlements can vary significantly (Naidoo et al, 2008). Informal settlements are usually built with flammable materials, cardboard and zinc sheeting as well as recycled and mixed materials which make the houses very vulnerable (Bustillos et al, 2002). Unger and Rely (2007) declare that houses in informal settlements are densely packed and poorly built with all kinds of materials. Marx and Charlton (2003) assert that informal settlements are characterized by structures that are constructed, to varying degrees of permanence with a variety of materials. Hindson and McCarthy (1994) have argued that there is a common misconception that all informal settlements comprise no more than flimsy, unhealthy dangerous shacks, whereas in fact settlements differ in terms of structures erected, their durability and the internal and external environments they create. As much as informal settlements have some common characteristics, each informal settlement is a unique system of building, internal settlement patterns and forms of tenure.

Informal settlements are complex and diverse with regards to communities. They differ in size, their location, the way they are built and the reason why people settle in them. The physical form of an informal settlement and the design varies and is linked to social networks and livelihood requirements (Smit, 2006). Most dwellings in informal settlements are made up of wood and corrugated iron. People living in informal settlements are exposed to the harsh conditions of spatial and environmental marginalization (Napier, 2002). Informal settlements are primarily in need of basic services such as water, sewerage and electricity (Hindson and McCarthy, 1994; Naidoo, 2008). Most of the freestanding informal houses are located on the far distant peripheries of the cities (Napier and Rubin, 2002). According to Sokhela (2006)

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urbanisation pressures have given rise to the development of informal settlements in a variety of environments, but the greatest spatial concentration of the poor are found in urban centres and on the periphery fringes of cities.

Napier and Rubin (2002) state that these households' experiences added risks due to the lack of service delivery and location which is inappropriate for settlements. These types of informal settlements are vulnerable to disasters because of their location, for example located on steep slopes, next to or on flood plains, on landfill sites and close to heavy industries (Napier and Rubin, 2002). Some settlements are poorly built and some hazards are the results of the condition of the settlement, for example spreading fire, health risks from rising damp and poor indoor air quality.

The key problems of living in informal settlements are inadequate protection against damp, risk of fire and risks of theft (Smit, 2006). Damp housing can be considered to be a contributing factor to rheumatism, arthritis and respiration diseases such as pneumonia, bronchitis and upper respiratory infection (Ranson, 1991; Smit, 2006).   Health problems results from vulnerability for many household, for example in Mocke Road, 29% of households had a severe health risks such as tuberculosis and chronic asthma (DAG, 2001 a; Smit, 2006). Health risks may be the results of lack of access to services. According to Napier and Rubin (2002) about 12% of South Africa's population had no access to clean water in 1999. Other informal settlements depend on pit latrines whilst some have no access to sanitation and the surrounding bush or verge areas are used as toilets. The provision of basic services in informal settlements is low, in most informal settlements there are few communal standpipes and few communal toilets. Unger and Rely (2007) argue that poor quality of water is a leading cause of morbidity and mortality worldwide and defining danger of living in informal settlements. Furthermore, many life threatening infectious diseases are associated with contaminated water in informal settlements. The study that was conducted in Mumbai in India showed that five million informal residents live without toilets (Unger and Rely, 2007).

The lack of access to electricity results to the use of forms of energy that is expensive and detrimental to people's health. Paraffin and candles although easy to acquire and relatively

cheap can result in fire. In recent times there was a shack fire at Kennedy Road in Durban on the 3rd of July 2010 where 3 people including a young child died and more than 800 housing unit burnt down leaving more than 3000 people homeless (www.abahlali.org). This event gives a clear indication that if people are supplied properly with the services that are vitally needed for a healthy and better life for the people there will be no instances of mortality and the loss of people's belongings through shack fire. A backlog of housing and poor service delivery influence many households to live in conditions that affect their health and safety (Thomas, 2006). May et al (1994) argue that where basic needs are not met, the provision of services becomes the central issue for survival of the community? Informal settlements have the highest rate of HIV/Aids infection and impact households and communities which are poorly serviced *(ibid)*. This indicates that residents of informal settlements who have little access to services are particularly exposed to poor environmental health conditions.

Overcrowding seems to be the contributing factor to environmental risks. The health outcomes of those living in overcrowded areas with inadequate access to basic services are more likely to be negatively affected (Thomas, 2006). Overcrowding allows the easy spread of diseases and land pollution (waste). Unger and Rely (2007) assert that crowding is associated with rheumatic heart disease; a chronic and debilitating disease. The study conducted in Manila indicates that in the Philippines, children living in informal settlements are nine times more likely than other children to have tuberculosis *(ibid)*. High density in terms of population also contributes to exposure to risks. The living conditions in informal settlements have direct impact on the health and well being of these communities. Such living conditions limits the informal residents the ability to fight for the rights to safe environments. Napier (2002) point out that addressing the problems of informal settlements requires better understanding of the driving forces contributing to their expansion and growth. Most people move to informal settlements for proximity to jobs, access to transport, cheaper living costs and to be near educational and social facilities for example, schools and clinics. Life in informal settlements has already become the norm of urban human existence (Rely et al, 2007).

2.2.3 The Causes of Informal Settlements

Huchzermeyer (2002) argues that informal settlements are a consequence of past and current policies. In addition, informal settlements situations are being shaped by the broader socio-political processes (*ibid*). The rapid urbanization and the migration of rural people into cities in South Africa resulted in the formation of informal settlements (Unger and Riley, 2007; Naidoo et al, 2008; Tsenkova, 2008). A lack of housing alternatives for poor people has led to household overcrowding in informal settlements, since they can not afford expensive houses and rents.

Lewis and Mioch (2005) and Naidoo et al (2008) argue that poverty cause and are a consequence of informal settlement. Subsequently, poverty remains the major obstacle to accessing adequate housing for the urban poor. In addition, "informal settlements are areas of social exclusion that are often perceived to have high levels of crime and other measures of social dislocation" (Naidoo et al, 2008:17). As informal settlements are a manifestation of urban poverty, there is a need for regularization and upgrading interventions to focus more on the livelihoods of the urban poor and their coping strategies (Lewis and Mioch, 2005). In Cairo, the growth of informal settlements was a cause of a gap in life chances especially between rich and the poor (Davis, 2006). This implies that since poor people cannot afford better life so they end up living in informal settlements.

Ackelman and Andersson (2008) assert that the informal settlements are a breeding ground for political opposition and violence. Economic, social and political forces seem to play an important role in the creation and growth of slums and addressing these forces will take time (Rely et al, 2007). This implies that addressing the issue of informal settlements is not something can happen soon.

2.2.4 International Overview on Informal Settlements

Cities around the world have been characterised by rapid urbanisation which impact on communities, economies and policies. Tsenkova (2008) and Unger and Riley (2007) argue that Informal settlements have become persistent feature of urbanisation and globalisation. It is

projected that by the next fifty (50) years there will be a growing number of people living in towns and cities in a form of informal settlements (Davis, 2006). The United Nations (UN) also projected that the world's urban population will grow by two (2) billion before 2030 and more than 90% of this growth will take place in the developing countries more concentrated informal settlements (Unger and Riley, 2007). This statement shows that the number of informal settlements is still growing and there is no way to eradicate them by 2020 as the Millennium Development Goal aim to improve the lives of at least 100 million slum dwellers by 2020 (World Bank, 2009). Rely et al (2007) argue that in many developing countries, life in informal settlements has already become the norm of urban human existence.

Privatisation of public space and economic problems in many countries has resulted in the dispossession and impoverishment of people and growing socio-economic disproportion (Tsenkova, 2008). Social inequalities have had a negative impact on spatial patterns of our cities including the provision of housing whereby the wealthier people are still being segregated from the poor (*ibid*). The poor lack resources to rent purchase or build their own formal houses. That is when the manifestation of informal settlements arose. Tsenkova (2008:9) argues that "the negative spatial manifestations of informal settlements can be either reinforced by inappropriate policies or successfully mitigated through proactive policies." According to Rely et al (2007) the inability of governments in developing countries to meet people's needs forces them to rely on or create their own informal infrastructure. Furthermore, informal housing, informal employment, and self-employment are some of the survival activities adapted by these urban dwellers that are somewhat within their own power to implement *(ibid).*

As stated by Brown (2009) approximately one (1) billion people worldwide live in informal settlements. It is estimated that informal settlements have the capacity to grow up to 1.5 billion by 2020 (Brown, 2009). United Nations Development Goals (2002) in Sokhela (2006:22) states that "more than 56% of the urban population in Africa lives in informal settlements and the residents of these settlements constitute between 40-60% of the labour force in many countries". According to Brown (2009) between 40% and 70% of the population of African countries reside in informal settlements. The figures presented above indicate high level of informal settlements worldwide especially in developing countries.

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2.2.5 Informal settlements in South Africa

Informal settlements are an integral part of the urban environment in South Africa (Ballantyne and Oelofse, 1999). Past policies during the Apartheid era, has led to the development of vast informal settlements within towns and cities of South Africa. In fact the spatial disparities which the country is currently addressing now are the direct results of Apartheid planning policies which were top-down in nature. At first, it was the Natives Urban Areas Act (Act No. 21 of 1923) which was designed specifically to impose control over African's (Blacks) movement to and within urban areas. It was followed by the Group Areas Act (Act No. 41 of 1950) which was aimed at dividing urban residential land into zones for Whites, Coloureds and Indians. Oelofse and Dodson (1997) argue that the greatest challenge in the construction of society in post-Apartheid South Africa is overcoming the spatial legacy of separate development. Cook (1991) in Ballantyne and Oelofse (1999:204) commented that the "factors underlying the increasingly rapid growth of informal settlements in South Africa are the historic impact of Apartheid ideology, the shortage of formal housing, unavailability of finance to support present structures and the inability of many people to afford formal housing". As a result, informal settlements will remain part of the urban life even in future.

In 1994, it was estimated that out of South Africa's 44 million inhabitants, 7.7 million lived in informal settlements (Ackelman and Andersson, 2008). Van Averbeke (2007) in his article states that poverty in South Africa has been associated with race, gender and rural areas. Approximately 74% of the poor in South Africa lived in rural areas, where the poverty rate was estimated to be 71% (Adelzadeh et al., 2001 in van Averbeke, 2007). Between 1991 and 2001, South Africa has experienced accelerated rural to urban migration of black people who previously had been confined to living in designated rural homelands by legislation that restricted their movements and place of residence (Boraine, 2004; van Averbeke, 2007). Migration was the strategy used by rural poor to improve their livelihood *(ibid).* Due to lack of skills and limited job opportunities, this resulted to the formulation of informal settlements. In the urban areas of South Africa, poverty is particularly concentrated in low-income and informal settlements. Simpson (2001) argues that informal settlements have come into being and continue to expand because of a complex set of inter-related political, economic and social factors. According to the estimates prepared by the UN Human Settlements Programme (UN-

HABITAT), about a third of the world's estimated 3 billion current urban residents dwell in informal settlements (Sclar et al, 2005). This shows a high number of people who lives in informal settlements.

South African cities attract thousands of new residents every year in search of work and a better life. The housing backlog coupled with a shortage of housing subsidies means that for many South Africans there is no alternative than to live in informal housing and shack settlements (Napier, 2002). Statistically, approximately 12% (6 million) in South Africa live in informal settlements (Brown, 2009). The above statistics shows that there is an increasingly number of people in South Africa who lives in informal settlements. Ackelman and Andersson (2008) states that approximately 8,5 million people, out of a population of 43 million that were living in slum conditions in South Africa in 2005, despite the fact that the government has delivered 1,5 million housing subsidy opportunities since 1994.

2.2.6   Durban Case Study

Most of the cities in the developing world face the problem of informal settlements. EThekwini Municipality forms part of these cities. The current patterns of informal settlements in Durban are the results of apartheid factors.   Marx and Charlton (2003:6) state that "Informal settlements historically developed beyond the early City of Durban's boundaries and reflected the lack of adequate formal provision of housing by the Apartheid state, as well as the lack of administrative and legislative control of these areas by the former white administration of the city". UN-HABITAT (2003) and Marx and Charlton (2003) argue that the results of informal settlement in Durban is due to the lack of housing alternatives as well as the devastating drought of the late 1970s and early 1980s which forced people to seek livelihood in urban areas. It is suggested that approximately 35% of informal settlements located within formal settlements, 55 % are located on the periphery of formal houses and 10% are peri urban in location (UN-HABITAT, 2003). During the past there has been extensive harassment of residents and physical destruction of informal dwellings. All informal dwellings that were in existence in Durban in 1996, for example in Cato Manor were granted some status and security from

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arbitrary eviction by the local authority (Marx and Charlton, 2003). The municipality resist the new settlement development by keeping the vacant land free from occupation *(ibid)*.

eThekwini Municipality covers about 2297 km^2 and comprises of urban and rural areas (O'Leary and Ensor, 2005). Approximately five hundred (500) informal settlements were found in Durban in 2005 and it was estimated that at that time approximately 123 000 households lived in informal settlements (*ibid*). By 2009, an estimated 650 000 of a population of 3.5 million (approximately 20%) live at eThekwini Municipality (Brown, 2009). In addition, informal settlements comprise 75% of the housing backlog in eThekwini municipality and over 540 urban settlements (Brown, 2009). The above statistics show that there is a high rate of people living in informal settlements in the eThekwini municipality (figure 1). Over 80% of households earn a monthly income of less than R1600 *(ibid)*. Hindson and McCarthy (1994) addressed this phenomenon six years ago by saying that Informal settlements are here to stay for the next decade and beyond. Hindson and McCarthy's argument stand in stark contrast to the Millennium Development Goals and Durban Housing Strategy to free the city from informal settlements by 2020.
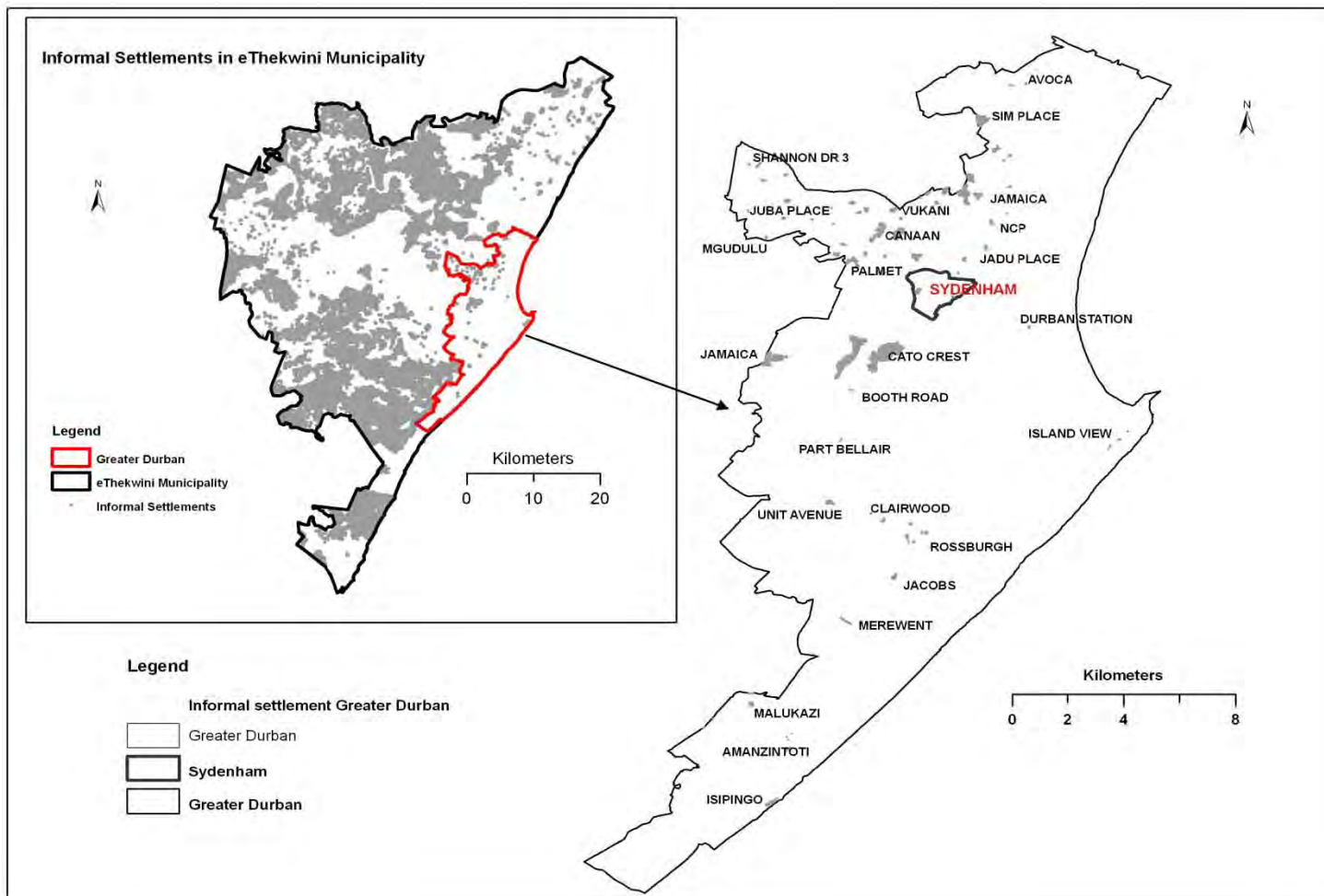
Figure 1: Map of Informal settlements in eThekwini Municipality (School of Environmental Sciences GIS, 2009)

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From the figures above, it shows that proper housing is still an issue or backlog that needs to be addressed in Durban. The map below indicates informal settlements around eThekwini Municipalities. In 2007 there was a march organized by informal dwellers (Abahlali BaseMjondolo) for the failure of eThekwini Council to provide housing to Durban's poor and homeless, (Goldstone, 2007). The 33 % of Durban's population who live in informal areas are overwhelmingly African. 44 % are male, 56% female and 27.9% of the households are female-headed (Marx and Charlton 2003; UN HABITAT, 2003; O'Leary and Ensor, 2005).   These figures represent the legacy of poverty and inequality brought about by Apartheid policies. The UN HABITAT (2003:209) stated that "since 1996, there has been a dramatic transformation of local government focusing on issues of equity, including Integrated Development Planning (IDP) based on local-level community participation to develop a framework for better governance." Community involvement and the establishment of Abahlali baseMjondolo Organisation (ABM) have put the recognition and the importance of improving the lives of people in informal settlements on the housing and poverty agenda.

2.3   ENVIRONMENTAL RISKS IN INFORMAL SETTLEMENTS

2.3.1   A Definition of Environmental Risks

There are many ways of defining environmental risks. Oelofse (2003) defines environment as comprising both natural and social components and risks are described as hazards and vulnerability. From the above definition, environmental risks have been defined as hazards that have negative impacts on the environment and the people. It is the threat of diverse effects on people and the environment by waste, emission and resource depletion resulting from people's activities. Environmental risks are described as the impact the hazards have on social and health being of the residents of a particular settlement and the impacts of such settlements have on the surrounding environment (Napier, 2002). According to Oelofse (2003) environmental risk is the potential of a detrimental outcome which comes from the interaction of the human and natural worlds. Environmental risks derive from human activities and from natural disasters. Unger and Rely (2007:1562) argue that "physical characteristics of informal settlements not only magnify the consequences of natural or manmade disasters, but also hinder rescue efforts". This implies that informal settlements might lack capacity to withstand or cope with the risks.

Hazards can be defined as "the probability that damage could happen in a specific scenario, when that scenario is exposed to a hazard of specific intensity and that scenario has vulnerability as an intrinsic precondition" (Bustillos et al, 2002:13). According to the South African National Environmental Management Act (NEMA) (Act No. 107 of 1998) hazards can mean a source of exposure to danger. A hazard is the threat that has a negative effect on people and the environment. Environmental hazards range from floods and the reduction of biodiversity to issues of poverty, social justice and crime (Oelofse, 2003).

2.3.2   A Broader Understanding of the Environmental Risks in Informal Settlements

Informal settlements are particularly faced with the challenge of environmental risks. In informal settlements people are mainly faced with floods, fires and environmental health risks as chronic risks (DMSLP, 2008). Oelofse (2003) argues that environmental risks in informal areas are usually shaped by biophysical, social, economic and political factors. Napier (2002: 14) states that "the conditions experienced in informal settlements are both external threats from natural and manmade disasters, and the internal threats deriving from the types of temporary housing and lack of services, have their direct impacts on the residents". Informal settlements are more affected by these disasters due to the fact that they are usually located in hazardous areas. According to Santosa (2002: 1), "environmental hazards may occur anywhere in informal settlements, whether in mountainous regions, lowlands, at coastal areas or along river banks. Generally informal settlements are situated at hazardous locations, such as along railroads, on river banks or on the slopes of the hills". Such informal settlements are more vulnerable to risks. These environmental conditions limit resident's ability to fight for the right to safe living conditions. A study conducted in Bam, Iran in 2003, indicates that poor structural quality of housing played a major factor in the earthquake related deaths of 32,000 people (Unger and Rely, 2007) when the natural disaster struck. Houses built against hillsides are similarly subject to landslides during heavy rain.

Environmental management in informal settlements is an issue because of lack of some resources and service delivery. According to Napier and Rubin (2002:1) "Communities living in informal settlements in many parts of the world are particularly vulnerable to environmental hazards, whether these are as a result of the nature and location of the settlement itself, or from external threats which comes from outside of the settlement." Ballantyne and Oelofse support this argument stating that "informal settlements are an integral part of the urban environment in South Africa;

furthermore, people who live in informal settlements exist at a close interface with the environment, constantly having to adjust to environmental changes" (1999:203).

Moreover, people in informal settlements have to improve their quality of life while taking environment into account. The World Commission on Environment and Development (WCED, 1987) in Ballantyne and Oelofse (1999:204) emphasize that "environmental protection must address the needs of people who depend directly on the environment for their livelihood." In this case there is a need for people to maximize environmental opportunities at the cost of minimizing negative impacts on the environment which leads these communities to be more vulnerable to environmental risks. Environmental risks that will be considered in this research are as follows: fire, floods, waste disposal, indoor air pollution, and environmental health risks.

2.3.2.1 Fire

Fire is one of the risks that are likely to affect people living in informal settlements. Energy sources such as, candles, paraffin, gas and fossil fuels are used because they are readily available and perceived as affordable alternatives to electricity but often prove hazardous. Poor people rely on cheap but hazardous sources of energy, which are highly inflammable (DMSLP, 2008). The use of paraffin for lighting and stoves contributes and exacerbates fire risks (Napier and Rubin, 2002). This could be the result of a lack of adequate services like electricity, or simply financial considerations. In more recent times an equally dangerous source of energy is being obtained through illegal electrical connections and in some instances the outcome of this stolen power has been fatal.

The severity of fire is influenced by dwelling density. Overcrowding in settlements increases the easy spread of fire from one dwelling to another and across sections of a settlement. In some instances, where separate settlements are located next to each other, fires can transverse boundaries from one to other. Perceptions of fire risk are also influenced by social and physical factors. Alcohol abuse and domestic violence are the primary cause of fire (MacGregor et al, 2005). The excessive use of alcohol coupled with the irresponsibility of people living in informal settlements contributes to fire occurrence (MacGregor et al, 2005; DMSLP, 2008). Fire severity is sometimes caused by unsupervised candles that fall down onto flammable materials. Similarly, the illegal usage of electricity and overloaded electrical connections can contribute to the outbreak of fires (MacGregor et al, 2005; DMSLP, 2008).

Fire in informal dwellings results from the interaction of environmental and human factors. Climatic conditions can also contribute to the effect of fire. During summer conditions, there is an increase of fire severity due to dry conditions, hot temperatures and high winds which create an environment conducive to the rapid spread of fires (MacGregor et al, 2005). Fire is more likely to occur from November to March in South Africa because of high temperatures. Each time informal dwellers are faced with fire, their ability to recover is severely depleted (Napier and Rubin, 2002). Furthermore, in winter, fire seems to appear less destructive. This may be due to cold temperatures and strong winds accompanied by rain. In these conditions, the ground and housing materials are likely to be damp, thus reducing the ability of fire to spread (MacGregor et al, 2005).

Fire occurrence contributes to the break down of social relations as people are being relocated resulting in some families losing social capital (Napier and Rubin, 2002). Statistically, about 30% of fire incidents in Cape Town's municipal area in 2000 occurred in the Joe Slovo informal settlement which resulted in the 60% destruction of housing within this community (Napier and Rubin, 2002). The study of fire in Duncan Village in East London shows that approximately 80 informal settlements were destroyed by fire in 2001 (*ibid*). In 2008, about 1000 people were displaced in Imizamo Yethu in Hout Bay when 200 shacks went up smoke (www.abahlali.org). Fire accidents at Kennedy Road in Durban have occurred more than three times this year (2010) killing three people. This indicates how severe fire risk is on the lives of people with fire leading to loss of life and possessions, severe injuries and leaving people devastated and hopeless.

2.3.2.2 *Floods*

Floods are natural disasters. They are usually caused by the overflow of rivers produced by rainstorms, prolonged seasonal rainfall, dam-breaks and snowmelt. In addition, floods can be caused by the "accumulation of rainwater in low-lying areas with high water tables or inadequate storm drainage, and intrusion of seawater on to land during cyclonic/tidal surges" (Handmer et al., 1999 in Few, 2003:44) indicating the natural aspects of the phenomenon. However, with regards to informal settlements heavy rainfall and living in flood plains are the most common causes of floods. They affect various populations ranging from urban and rural, formal and informal (Napier and Rubin, 2002). Floods in South Africa arise as a result of "the 50% of the wetland areas being destroyed, grasslands in the upper reaches being overgrazed and subjected to soil erosion process" (Napier and Rubin, 2002: 10). Floods cause devastation to human life which normally results to displacement of the community. There are also health related problems associated with flooding. It

is argued that "the prevalence of infections is greatly worsened by existing environmental health problems such as blockages to drainage channels, poor sanitation systems and dumping of solid waste" (Cairncross and Ouano, 1990 in Few, 2003:46).

DMSLP (2008) documented that flooding in informal settlements caused by the combination of various factors. For example, exposure to natural hazards due to location in high risk areas, and dwelling design that often sinks the informal structure below the ground level. Hence, this also allows water to flow or seep up through the floor, leading to flooding inside homes. These high risks areas are those that have high water tables where water below the ground is close to the surface. When it rains the water seeps up into dwellings very easily (DMSLP, 2008). This type of flood is referred to as seepage flood. In addition some informal areas are close to retention ponds or near water courses or located in steep slopes which places them at a high risks from flash floods and heavy surface run-off when it rains (DMSLP, 2008).

Lewis and Mioch (2005:50) note that disasters are largely the result of "deficient urban management practices; inadequate planning, ill-regulated population density, inappropriate construction practices, ecological imbalance, and infrastructure dependency among others". Some informal settlements are experiencing leaking flooding where "rainwater leads to inside flooding through poorly constructed and inadequately flood-proofed structures often due to roofing and walls that cannot handle heavy rainfalls" (DMSLP, 2008:119). In most cases, floods are associated with winter months. Changing weather patterns usually result in heavy rainfall.

Napier and Rubin (2002) reported that approximately 2, 5 million people were affected by the floods in Mozambique in 2000 and it is also estimated that 250 000 people lost their homes. In addition, floods killed 900 people, washed away roads, destroyed schools, grazing land, agricultural land, crippled hospitals and ruined people's livelihood strategies (Napier and Rubin, 2002). The destructive flood event experienced in Mozambique displaced many people who took refuge in schools (Christie and Hanlon, 2001 in Few, 2003). Medved (2007) reported that, the heavy rains have transformed the Philippi informal settlements into a vast muddy pond and left people nowhere to sleep. Phola Park was faced with the similar situation where their roads and side streets were overflowing in the aftermath of the downpours (Medved, 2007). Informal settlements are more affected by floods due to their location and improper material used to build them. It is estimated that 6 000 people were affected by the flood event in Alexandra where, homes on the banks of the Jukskei River were washed away (Napier and Rubin, 2002). This is due to the fact that some of the

informal settlements are built near floodplains and rivers. Informal settlements are more vulnerable to flood risks.

Flood events do not only destroy the informal settlements but affect people in different ways. Floods disrupt crops, causing food scarcity, disrupting infrastructure and access to services and exacerbating health risks in the homes of the poor (Blaikie et al., 1994; Smith, 1996; Few, 2003). Furthermore, Few (2003) argue that flooding can increase risk from water-borne pathogens, insect-borne infections and snakebites. In Manila, the study of floods exposed people to respiratory infections, skin allergies and gastro-intestinal illnesses (Few, 2003). This indicates how much impact is caused by flood events to human health in certain countries. In addition, floods events are associated with the spreading of diseases, spreading of waste by flood water hence, creating breeding grounds for mosquitoes (Blaikie et al., 1994; Stephens et al., 1994; Few, 2003).

2.3.2.3 Waste Disposal

Municipalities are faced with the serious problem of solid waste disposal. Statistically, South Africa produces more than 566 million tonnes of waste per year (Lousber, 2005). In addition more than 90 of all waste in South Africa find its way into land fill sites *(ibid).* Waste disposal is a contributing factor to environmental risks in informal settlements. People get affected and the environment (land) is polluted. Waste disposal which is near people's houses and which is not well maintained cause health risks to people. It is also damaging the environment in the sense that some of the chemicals infiltrates to the soil which affects the environment negatively. People living in un-serviced settlements are likely to be exposed to diseases carrying vectors such as rats, mice and flies which proliferate in uncontrolled waste and refuse (Benidell, 2003).

A "lack of drainage, lack of waste removal, and lack of access to clean energy sources, mean that the wastes generated from human activities are not removed far from settlements" (Napier, 2003: 19). Large piles of flammable household waste and litter dumped near dwellings increases fuel load and create fire bridges between dwellings which results in severe informal settlement fires, loss of home and property and toxic fumes, (DMSLP, 2008). This is usually the case in informal settlements. Saturated soil from waste water can transmit diseases. The environmental pollution (waste) causes several diseases like intestinal, skin and breathing diseases (Blaikie et al., 1994; Bustillos et al, 2002; Few, 2003).

2.3.2.4 Indoor Air Pollution

In informal settlements where services are not provided, people rely on paraffin, gas, candles, wood and coal for energy. Due to poor ventilation some of these sources are posing a serious threat to public health especially on the indoor air quality. Some of these energy sources emit gases such as nitrogen oxide and carbon monoxide that are harmful to people's health.

Indoor air quality is widely regarded as a significant health, environment and economic problem (Brown, 1997). It affects person's health and well being. In informal settlements the most pressure of indoor air pollution is the lack of building ventilation and high emission from pollutant sources. These two pressures produce nitrogen oxide which results to people being more vulnerable to respiration illnesses such as asthma and others. Health effects from pollutants range from cancer risks, asthma and allergic responses (Brown, 1997). These health effects results from causes such as pollutants, poor ventilation, humidifier fever, poor thermal comfort, poor lighting, psychosocial factors (Brown, 1997).

2.3.2.5 Health Risks

Out of all the risks identified above the worse of all is health which is the result of exposure to the environmental hazards discussed. Rely et al (2007) argues that health services within informal settlements is beyond the control of residents. Poor living conditions in informal settlements are expected to magnify a number of health risks.

Most of the informal settlements lack sewage system and the health implications are enormous. Risks conditions accumulating in informal settlements, affects both human and ecosystem health. The main factors that increase environmental health risks in informal settlements are the inadequate delivery of basic services and individual behaviour that foster unsanitary practices, littering and neglect of infrastructure (DMSLP, 2008). This results in cholera, which is threat to people's health. Approximately 106 000 people contracted the disease in South Africa during new millennium (Lousber, 2005). In 2003 about 3.4 million people died of HIV/Aids in this region (Lousber, 2005). In South Africa approximately 160000 people are infected by tuberculosis (TB) every year *(ibid).* Unger and Rely (2007) argue that the absence of detailed or accurate data limits the ability of officials to detect healthy threats or appropriately allocate resources.

The urban living environment can threaten or support human health and it is determined by social factors (Kjellstromet et al, 2007). In informal settlements, health is affected by the social conditions in which people live such as poor sanitation, overcrowding, and poor water supply, little or no access to health services, unemployment and lack of political rights. "The concentration of poverty leads to social exclusion, which can reduce the availability of social support and access to health and social services" (Vlahov et al, 2007:21). This indicates that environmental health problems tend to be far more severe in conditions of poverty (Brown, 2009).

Standing water around taps is another factor that has the negative effect on human health. For example, children who play in this water tend to suffer from associated health problems. This may be the result of poor maintenance of taps or the large number of users. Unmanaged waste disposal increase numbers of disease spreading flies, rats and other vectors. Therefore, people living in informal settlements are likely to suffer from diarrhoea, acute respiration infection, malaria, measles and prenatal conditions (Blaikie et al., 1994; Bustillos et al, 2002; Few, 2003; Napier, 2002).

Furthermore, the built environment also influences health in informal settlements. Inadequate, overcrowded, or deteriorating housing or informal settlements, especially where tenure is insecure, is associated with injuries, respiratory problems, infectious diseases, and mental health problems (Vlahov et al, 2007). Socio-economic vulnerability conditions of informal settlements contribute to the HIV infection (Ambert, 2006). In addition, poor housing and settlement condition is linked with high HIV prevalence *(ibid).* The *l*ack of basic services such as water, sanitation and environmental health makes people with HIV more vulnerable to infections like TB. Such living conditions do not provide proper support and care to the infected people. Poor service conditions compromises the provision of home and community based care (Ambert, 2006).

2.4   MITIGATION STRATEGIES

Different strategies can be employed in mitigating environmental risks at a household level in informal settlements, which is the main aim of this study. At first, it is imperative to understand the root cause of environmental risks in order to come up with effective mitigation strategies. Strategies can range from planning strategies, political strategies, environmental strategies, economic strategies, cultural or social strategies and administrative strategies from households and municipalities. Napier and Rubin (2002: 8) say that "there should be better risk management to

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prevent increased exposure to disasters as a result of development, whether formal, state-led development or informal, popularly led development". This implies that in order to protect the poor from disasters and environmental hazard, management plays a crucial role. Mileti (1999) suggests that it is better to make use of preventive measures such as proper land use planning and other mitigation strategies than using the reactive measures of just dealing with the impacts of a disaster after it has occurred. Reactive decisions only provide temporary solution which further exacerbates vulnerability for the next disaster (Comfort *et al*., 1999). Collaboration between community members and meaningful participation can potentially contribute to sound community environmental planning (Ballantyne and Oelofse, 1999). Moreover, institutional support is necessary to enable this. Affected communities should be part of decision-making in their areas. There should be provision of multidisciplinary education and training relating to hazards and their mitigation.

Steps involved in sustainable hazard mitigation include building social networks, capacity and consensus for collaborative problem solving and integrating all policies pertaining to hazards and sustainability ensuring that they are consistent. Sustainable land use planning prevents encroachment in areas which are susceptible to hazards and maintains the natural preventive processes (Mileti, 1999).

2.4.1 Fire

It is imperative for each and every member of an informal settlement to take an initiative and be responsible in reducing fire risks. According to MacGregor et al (2005) fire severity might be reduced by enhancing a community's ability to respond immediately to fire. Working in collaboration as a community may minimize fire occurrences. The community must thus understand their risk and learn to manage it themselves. Community members should be involved in risks management plans. A practical example is the one of community of Imizamo Yethu in Cape Town. This community created a committee which was called 'street community' which ensured that drunken people do not cook (MacGregor et al, 2005). This was the community strategy in dealing with the problem of fire.

Education is also one of the key strategies that can mitigate fire hazards, for example, Department of Environmental Health can educate the residents about the cause and dangers of fire. Residents can be educated as to how they can prevent occurrences of fire risks and how to respond immediately as

fire occurs (Napier and Rubin, 2002). Numerous awareness and education programmes should be run within the community in order to reduce their vulnerability to fire (MacGregor et al, 2005).

Overcrowding increases the spread of fire, so it is significant for informal dwellers to leave minimum safe spaces between houses. Although some building standards do not allow informal settlements to be electrified but provision of electricity may reduce fire threat in informal settlements. One of the strategies used in Cape Town as stated by Napier and Rubin (2002) is the provision of water tanks in order to supply sufficient water to put out in any fire that may start.

2.4.2   Floods

Ways to deal with negative impacts of flooding can be employed before, during and after flood events. Few (2003) discusses structural and non-structural approaches to deal with flooding problem. Structural approach refers to "engineering interventions such as river channel modifications, embankments, reservoirs and barrages designed to control the flow of rivers and abate or control the spread of flooding". (Few, 2003:47). The rehabilitation strategies of natural disasters like floods differ from place to place. Napier (2002: 24) argue that,

> *"The focus on urban informal settlements would suggest that disaster preparedness should elicit a range of levels of response, from forward-looking urban planning for settlement on less disaster prone land, to safer forms of building and services, to building institutional capacity at community and local government level to respond to the needs of communities living in poverty."*

The non-structural approach reduces the short and long term impacts of the hazards (Few, 2003). People employ different coping strategies to different phases of the flood threat, from prediction to recovery after disastrous floods *(ibid)*. Davis and Hall (1999: 87) in Few, (2003) make an example of northern valleys that they employed traditional risks reduction such as tying ropes across fast-flowing rivers with bells attached to warn as the ropes broke when flash floods cascaded down the valleys. The other coping mechanism is the construction of houses on plinths, livelihood diversification and the mobilization of community based support networks to provide shelter and food (Few, 2003). Strengthening community based organizations should be the priority since they provide assistance at the first level when a floods strikes.

A study that was conducted in Mozambique shows that during flood, local people did not have strategy in place to cope with risks but African nations and First World governments sent food, money to support people in Mozambique (Napier and Rubin, 2002). Hence, it is hoped that in Mozambique, "when the policy finally does come into being, it will encompass not only mitigation and reactive strategies, but also proactive philosophies that take risk and vulnerability into account and include them into holistic and sustainable management practices" (Napier and Rubin, 2002:12).

Construction of adequate drainage might reduce the negative impact that might be caused by flood event. Relocating people from unfavourable living environments will reduce the loss that is caused by floods. There is a need to improve infrastructure and service delivery within the informal settlements.

Mileti (1999) proposes that disaster losses result from the interaction of the physical environment, human systems and the built environment. The complexity of this relationship is constantly increasing and making communities to be vulnerable. It is therefore important to develop mitigation strategies which recognise the interaction of the above systems and the differences in demographic characteristics of members of a community (Mileti, 1999).

Lastly, it has been realised that disasters stem from unsustainable development and they hinder sustainability hence it is important to develop mitigation measures which improve the community's social, economic and environmental adaptive capacity and governance (Mileti, 1999).

2.4.3 Waste Disposal

One way of mitigating or preventing waste disposal, is the provision of accessible, dependable solid waste collection and disposal. Proper waste management can minimize breeding diseases. Community education is also one of the strategies that can help in mitigating waste disposal. This can be done by relevant department within the municipality. De Boer (2008) suggested that there needs to be proper management of waste whereby there are mass campaigns for big clean ups.

Landfills are one of the solutions to waste problem. Lousber (2005) argues that in the landfill, solid waste is dumped on the ground and compacted. Furthermore, it is then covered with a layer of soil. The material in such a landfill is cut off from air, water, and this prevents the bacteria that normally

decompose the waste from working effectively. The problem with landfill therefore is more of the burial site than a location for recycling (Lousber, 2005).

Apart from landfill, recycling is another solution to the waste problem. The more the waste is recycled the less the material in the landfill. According to Lousber (2005:8), "recycling involves the extraction and processing of usable material, for example, glass, metal, paper, plastic and rubber, from waste".

2.4.4   Indoor Air Pollution

Less use of hazardous energy sources can mitigate pollution. Provision of electricity can also contribute in reducing indoor air pollution. In order to reduce the risks of indoor air pollution, one of the strategies is to improve house conditions by upgrading the informal settlements. Ventilation and opening of windows especially when using energy sources that are harmful to health will be another way of reducing risks. In the case where there are no windows or ventilation, it is imperative to rebuild the houses that will have enough windows to bring fresh air.

Improved stoves should be promoted and made accessible to the poor. Behaviour change campaigns should be undertaken to reduce the exposure of informal residence to smoke from biomass cooking fires (Bannister et al, 2007). Combustion equipment must be maintained to ensure less pollution.

2.4.5   Health Risks

Public education campaigns can reduce the level of health risks. Vlahov et al (2007) suggest that public health programmes should be implemented in informal settlements through the state of civil society which will influence its ability to protect the health of residents and promote social cohesion. Provision of basic services such as clean water and proper sanitation can also decrease the level of diseases such as cholera. Educating people to wash hands and to boil water collected from the streams or rivers can also make a great impact (Loubser, 2005, Rely et al, 2007). Access to clinics can help in treating the people suffering from different diseases.

Health risks in informal settlements can be mitigated by the improvement of living conditions of people within informal settlements. This can be done by improving the quality of life of the people

through the provision of basic services and access to them. Vlahov et al (2007) argues that good governance is an important determinant of urban health. Kjellstrom et al (2007:22) point out that "healthy urban governance, health services, and integrated approaches to interventions are key pathways to reducing health inequity". Furthermore, the systems, institutions, and processes that promote better and fairer distribution of health in urban settings are a key and critical pathway for reducing health inequity in cities (*ibid*). Unger and Rely (2007) argue that the interventions should not only treat the disease but also address the underlying social and living conditions of informal settlements. In addition, in most cases solutions will require multi-sectoral effort and resource mobilization.

2.5   PLANNING AND ENVIRONMENTAL RISKS MANAGEMENT IN INFORMAL SETTLEMENTS

It is understandable that development of informal settlement does not comply with the planning standards or regulations. Royston in Joffe (2007:2) states that "official registration of one's shack was often seen as an important step towards gaining access to an RDP house". In critique of RDP houses, the study that was conducted found that they (RDP) were not perceived to be much better, in terms of the overall quality of people's lives especially because they were often far from workplaces (Joffe, 2007).   According to UN-HABITAT (2009) addressing the issue of informal settlements, there is a need for the new approach to planning. Slums upgrading seem to be the good strategy to address the challenge of informal settlements. Planning has a critical role in designing the appropriate strategies to respond to the existing informal settlement's challenge (Tsevoka, 2008)

UN-HABITAT (2009) argues that planning can ensure that slum upgrading programmes are participatory. "Planning can also ensure that slum upgrading programmes are community led, negotiated and participatory in order to avoid conflicts and safeguard the livelihoods of the poor" (UN-HABITAT, 2009:13)**.** Vos (2007) asserts that, if the formalisation of informal settlement initiative is to be successful, it is crucial that the development planning procedures are implemented effectively, that proper consultation is done, as well as consultation with communities which will be affected. Otherwise there is the potential for violence and corruption. This can be done through IDP processes and use of the Housing Sector Plan. Besides the use of in situ upgrade the UN suggest the incremental process which will ensure better management of informal settlements through provision of infrastructure services and housing (UN-HABITAT, 2007).

Planning can also strengthen the capacity to manage natural and human-made disasters. There is a need for networking communities, governments and non-governmental organisations (NGOs) in order to address the hazards through increasing the capacity for disaster prevention and mitigation, and strengthen coordination (UN-HABITAT, 2009). Tsevoka, (2008) points out that the critical constraints related to these responsibilities are associated with the lack of institutional capacity and resources to effectively plan and manage.

Ackelman and Andersson (2008) suggest the supportive model that can be used. This model "implies that the authorities should support people's efforts of building homes, rather than providing them with houses" (Ackelman and Andersson, 2008:8). In addition, the production of houses should be decentralized, with the residents as an important actor and increasing the involvement of small, local builders and ordinary people (*ibid*).

2.6   THE ROLE OF POLICY

In South Africa there are increasing numbers of informal settlements. Napier (2002) argues that the reason might, either be that building and planning laws have not been followed or that land suitable for human settlement is scarce and or expensive. In response to such a problem there is a need for innovative planning legislative. This legislation and policies need to be implemented in order to ensure effective planning. Smith (1996:22) elaborates this view by arguing that "the goal to be achieved by planning is to improve the quality of life and general welfare of the community concerned. In addition, this embraces the creation of better environments, which is achieved through both development and conservation."

Policies shape the location and development of new settlements. Informal settlements tend to be located in areas where development is not conducive. Therefore in the case of illegal informal settlement development, it may be easier for the relevant authorities to address such issues. Napier and Rubin (2002) state that the other set of policies focuses mainly on the states response to disasters when they happen. The Constitution of South Africa gives people the right to have access to adequate housing. Policies are in place to ensure service delivery, access to housing to those who are in need and land delivery, hence managing the migration of people to cities and the growth of the existing urban population (Napier and Rubin, 2002). Different legislation has been put in place to ensure that planning standards are being followed especially in terms of location. The Integrated

Development Planning (IDP) process is one of the tools that drive the development of communities. It allows communities to participate in the creation of their settlements. Napier and Rubin (2002:8) argue that "in theory, the IDP should enable local authorities to plan according to local needs, thereby providing more appropriate development, which in turn will lead to more efficient use of resources". This has not been the case in most cities when it comes to implementation.

"By 2020 the eThekwini Municipality expects to enjoy the reputation of being Africa's most liveable city, where all citizens live in harmony. This vision will be achieved by growing it's economy and meeting people's needs so that all citizens enjoy a high quality of life with equal opportunities, in a city that they are truly proud of" (www.durban.gov.za). One of their goals is to strive towards the delivery of at least 16 000 to 24 000 housing units annually, yet, the municipality acknowledges that they have a housing backlog and little has been done in addressing it. The eThekwini municipality tends to adopt reactive approach in addressing the issue of informal settlements. Their strategy is based an ad hoc project by project basis. The eThekwini Municipality, UN HABITAT and the Department of Housing states that "it is clearly evident that a radical rethink of current policies and strategies is required for development of informal settlements" (UN HABITAT, 2007). This is an indication that, they are aware of the issue of informal settlements but their process in formulating strategies and policies to manage informal settlement is too slow. In this study the following Acts will be discussed as they inform this study.

2.6.1   Constitution of South Africa (Act No. 108 of 1996) - as amended

The South African Constitution is the overarching framework for all statutes promulgated in the country Bill of Rights. It gives rights to its citizens to have good life and have access to resources. This right is also given to people living in informal settlements. This section will only focus on chapter 2 of the constitution – the Bill of Rights, specifically section 24, 26 and 27.

- **Environment**

Section 24(a) of the Constitution obliges the state to ensure that people do not live in an environment that is detrimental to their health. From this section, one may be persuaded to submit that this includes all people in the Republic including those living in informal settlements. The same section creates a right to live in an environment that is protected from all forms of health hazards in order to safeguard the present and future generation's ability to live in a clean environment.

Development process and the right to environment result in tension. For example, informal settlements are not environmental friendly and the argument is that housing rights should take priority over environmental concerns. It is important for any development activity to take into account environmental factors. Planning and land use controls ought to be at the core of environmental concerns amid growing environmental awareness to ensure the minimisation of all forms of threat to the environment during and after development activities.

- **Housing**

As contemplated in section 26(1) of the Constitution, (as amended), everyone has the right to have access to adequate housing. However, a close look at this provision vis-à-vis the Lacey Road informal settlement, this appears to be a right that has been entrenched to meet a set of political aspirations. Perhaps it is an academic exercise that does not account for the plight of the marginalised black majority of colour in South Africa many who are in the informal settlements. Smith (1996:34) argues that "the right to housing could be interpreted as an aspiration or pragmatic political statement as a commitment to use for the benefits of all people and the progressive improvement of their lives". In this statement, Smith appears not to differentiate the right to housing and the right to basic housing. This indicates the significance of housing to people's lives.

However, the constitutional right of access to basic housing is subject to the state's available resources to meet this right. In other words, this can be interpreted negatively because it places no duty on the state or the government to provide houses since it talk about the right to access adequate housing but does not talk about the provision of housing. The wording, particularly, in section 26(2) of the Constitution does not provide consolidated structures and mechanisms that may accommodate the poor to participate in the process of having access to housing. This implies that assistance from the state is limited. This may also mean that the state can argue that it has limited resources to assist people living in informal settlements. Clearly, there is an internal limitation in order to justify the state's failure to deliver the basic services as a human right. This is the indication that there are no absolute rights. Smith (1996:35) argues that "the inclusion of the right to housing in the Constitution should strengthen the position of those who live in informal settlements, particularly against the threat of arbitrary evictions".

Furthermore, Smith (1996) state that many people do not need the state to build a house for them but what they need is basic services, access to land and access to clean water. The right to housing

should also include the provision of basic services other than the provision of housing. This goes with the right to life which also includes people living in informal settlements.

- **Health Care, Food, Water and Social Security**

Section 27 of the Constitution encapsulates that everyone has the right to access to basic services. This right is related to other rights reflected above that relate to the basic necessities of life. Furthermore, a closer look at this section may mean that, basic services includes, but not limited to the provision of basic housing, adequate supplies of clean water and sanitation. More often, and in practice, the provision of basic service has not been done in satisfactory, particularly for the informal settlements. The right to freedom and the security of the person includes the right of the person to be treated fairly like against the demolishing and eviction of people's settlements.

Access to health care services, sufficient food and clean water are important rights to be taken into consideration by the state. These rights have the important consequences for the residents of informal settlements. The issue is that, people living in informal settlements lack basic services and lack access to clean water. The question is that, how far is their right protected by the constitution? If there is internal limitation in terms of the constitution on the states side that means that problems like informal settlements will still remain.

2.6.2 White Papers and Acts

This chapter considers environmental risks and informal settlement within the context of the existing policy and legal framework. This section outlines the White Papers, policies and legislation regarding environmental risks in informal settlements in particular. Different policies are discussed in relation to living conditions in informal settlements.

2.6.2.1 *White Paper on Disaster Management (1999)*

Disasters results from natural and from human activities. The White Paper on Disaster Management outlines the new approach to disaster management. It focuses on risks reduction and prevention of disaster occurrences. Donohue et al (2010) argues that governments are key players in such prevention and mitigation. In addition, they exercise this role through legislation, resource allocation and rational planning and sustainable development (*ibid*). The key question is that to

what extent does the government contributes to the well being of South African citizens especially during disaster events. The White Paper addresses critical issues such as policy framework, organisational structure and financing. Furthermore the White Paper focuses on the link to development and reduction of vulnerability of communities and puts emphasis on prevention, mitigation and clear delineation of accountability and responsibility (2010). Disasters can be prevented through preparation, early warning and through swift responses which is the key concern of this White Paper.

The critical issue regarding the White Paper on Disaster Management is that it fails to recognize the lack of capacity to respond especially for informal dwellers. Due to lack of resources in informal settlements, it is difficult to respond when disaster occurs. There should be more appropriate and rapid responses during future disasters especially in informal settlements. A key concern is the implementation of these policies. With regards to the White Paper on disaster management, in most cases focus is put when the disaster has occurred rather than preventing it from occurring. Donohue et al (2010) argues that "successful disaster management is partly about enabling authorities to react quickly and with certainty that resources consumed in a rescue will be recouped; the White Paper is less reassuring in this regard and depends on a relatively still-too-clumsy process of disaster declaration". In this regard South African policy lacks the capacity to deliver on that policy and this need to be addressed.

2.6.2.2   Disaster Management Act (No. 57 of 2002)

The Disaster Management Act (Act No. 57 of 2002) is in line with the White Paper on Disaster Management. The Act aims to provide for an integrated and co-ordinated disaster management policy that focuses on preventing or reducing the risk of disasters, mitigating the severity of disasters, emergency preparedness, rapid and effective response to disasters and post-disaster recovery. This Act requires the national, provincial and municipal government to prepare the Disaster Management Framework which will be implemented to vulnerable communities (Disaster Management Act, No. 57 of 2002).

The objective of the National Disaster Management Framework is to "promote an integrated and co-ordinated system of disaster management, with special emphasis on prevention and mitigation by national, provincial and municipal organs of the state, statutory functionaries and other role-players

involved in disaster management and communities" (Disaster Management Act, 2002:16). In other words this Act recognises the spectrum of opportunities to avoid and reduce disaster-related losses through concerted efforts of all spheres of government, civil society and the private sector. It also endorses the need for uniformity of approach amongst the diversity of role players and partners.

The eThekwini Municipality has compiled a Disaster Management Framework which is in line with the Act. Their municipal Disaster Management Framework is based on the following key performance areas (KPA's):-

- Integrated institutional capacity for disaster risk management;
- Disaster risk assessment;
- Disaster risk reduction.; and,
- Response and recovery.

The framework is also based on the three enablers such as information management and communication, education, training, public awareness and research and funding arrangements for disaster risk management (Keeves, 2005). The eThekwini Municipality states that disaster risk management is promoted at schools and in vulnerable communities. In this case this Framework includes informal settlements.

2.6.2.3   *White Paper on Environmental Management (1997)*

The White Paper on Environmental Management was established in July 1997. The White Paper sets out the overarching policy framework for environmental management in South Africa (DEAT, 1997). It also identifies a set of policy principles which will underlie future environmental management activities (DEAT, 1997).

During the past environmental issues was of less priority amongst the government. In other words South Africa has a history of inadequate environmental management and protection due mostly to poor policy development. The White Paper on environmental management was established in order to come up with environmental policy which will address and take environmental issues in to consideration. Before the White Paper, the green paper on new environmental policy in South

Africa was released in 1996. The new policy on new environment management is aimed at addressing:

- the quality of people's lives;
- equitable access to land and natural resources;
- the integration of economic development, social justice and environmental sustainability;
- the sustainable use of social, cultural and natural resources; and
- public participation in environmental governance.

This White Paper integrates the economic, social (development) and environmental concerns. It aims at balancing all spheres and maintains sustainability in terms of use of environmental resources. In other words it is more concerned with the sustainable use of environmental resources while taking into consideration the economic and development aspect. It also integrates economic planning and decision making with environmental concerns. It creates environmental awareness and focussed on issues of governance. The South African constitution says that everyone has the right to environment that is not harmful.

2.6.2.4   *National Environmental Management Act (NEMA) (Act No. 107 of 1998)*

Being framework legislation, NEMA does not operate in isolation but requires to be applied in conjunction with other relevant legislation in order to curb and/ or prevent environmental risks. It is vital to note that the preamble to NEMA, inter-alia, acknowledges that many people in South Africa are living in environments that are unsuitable for human living. The legislator acknowledges that the conditions of living for many people need improvement in order to avoid health hazards. In the context of this study, it is paramount to read between the lines; on one hand, the preamble NEMA and its principles, and on the other hand the state of the affairs particularly the informal settlements which are increasingly faced with environmental problems thereby threatening the health of the inhabitants and their wellbeing. A closer look at these competing interests – the objectives of NEMA and the environmental situation in informal settlements, leaves one wondering whether or not the legislation is concerned with meeting the objectives of the law – NEMA and other environmental laws.

One of the concerns, particularly for informal communities is that, it is not the feasible for anyone to allude that NEMA as a framework legislation has in a way assisted this community since the status of

the environment has not been improved to meet minimum standards as required by section 24 of the Constitution. It may be true on paper that NEMA and other environmental statutes give effect to section 24 of the Constitution; however, in practice it seems there is a wide gap in the implementation to achieve the purpose for which these laws seek to achieve.

The NEMA principles as embedded in section 2 look good on paper but their implementation largely remains a cause of concern. The reason for this submission is based on the researcher's study of the state of the informal settlements where the environment has been heavily polluted, degraded and accumulation of waste due to uncontrolled human activities.

2.6.2.5   White Paper on Waste Management (1998)

Waste management legislation at present is fragmented, and ineffective with a resultant lack of control in all aspects of waste management. The purpose of the White Paper is to remedy the existing situation with regards to waste management legislation (DEAT, 1998).

One of the fundamental approaches of this policy is to prevent pollution, minimise waste, and to control and remediate impacts. The management of waste will be implemented in a holistic and integrated manner, and will extend over the entire waste cycle, from "cradle to grave", including the generation, storage, collection, transportation, treatment, and final disposal of waste (DEAT, 1998).

The government vision with regards to this policy is to develop, implement and maintain an integrated pollution and waste management system which contributes to sustainable development and a measurable improvement in the quality of life, by harnessing the energy and commitment of all South Africans for the effective prevention, minimization and control of pollution and waste (DEAT, 1998).

The requirements for sustainable waste management are the provision of efficient waste management systems for people (DEAT, 1998). The provision of these basic needs does not only mean the provision of waste collection services but also the empowerment of the people through public participation.

2.6.2.6   National Environmental Management Waste Act (Act No. 59 of 2008)

Managing waste is a necessary requirement of urban life and which is predominantly the responsibility of municipal authorities. High urban expansion leads to environmental problems and this is threatening the sustainability of cities and urban life in general. The Waste Management Act was finally gazetted on 10 March 2009. Its aim is to give effect to the White Paper on Integrated Pollution and Waste Management and the National Waste Management Strategy (NWMS).

Waste management practices in many areas of the Republic are not conducive to a healthy environment and the impact of improper waste management practices are often borne disproportionately by the poor. This has a negative impact locally and globally. Minimization of waste and pollution, recycle and reuse are key to ensuring that the environment is protected from the impact of waste (National Management Waste Act, 2008). According to the preamble, there is a need for strategies, norms and standards which seek to ensure best waste practices within a system of co-operative governance. Maintenance of waste in informal settlements should be ensured in order to minimize spread of diseases and unhealthy environment, in the case of this study the eThekwini Municipality.

2.6.2.7 The White Paper on Water Management- National Water Policy (1997)

The South African constitution says that everyone has rights to have access to sufficient water.
The core objective of White Paper on water management is that the principle of equity is central to the water law reform process. It pays special attention to addressing the needs of those who were historically denied access to water. The White Paper seeks to identify the policies, institutions and practices that will support the principle of equity and equitable access (DWAF, 1997)

This White Paper was developed through consultation. The principles on new water law were approved in 1996. The new water service bill was developed from the 1994 White Paper on water supply and sanitation. The bill on water service s was to address the issue off access to basic services and water resource management. The White Paper outlines the development of water law and water management systems. One of the key objectives of this White Paper is to promote the well being of all South African present and future. It also set out the policy of the government for the management of both quality and quantity of scarce water resources. So this White Paper is consistent with the South African Constitution.

South Africa has good policies but the problem is the implementation of those policies. White Paper on water management put emphasis on equitable access to water but that is not the case in informal areas. Some informal settlements lack quality water and some informal settlements do not have access at all to clean water. There is a need for appropriate and implementable policies which will be able to support poor communities.

2.6.2.8 *The White Paper on Water Supply and Sanitation Policy (1994)*

Like the White Paper on Water Management, the White Paper on Water Supply and Sanitation (1994) was aimed at addressing disparities in the water and sanitation environment imposed by the previous government. The purpose of the White Paper is to:

- provide some historical background regarding water supply and sanitation development in South Africa;
- explain the development approach which has guided policy formulation;
- put forward certain basic policy principles;
- outline the institutional framework proposed for water supply and sanitation services;
- provide standards and guidelines for basic service delivery;
- sets out policy for the financing of services;
- outline certain immediate initiatives which are being taken; and,
- provide supplementary policy and briefing information on important related topics.

This policy has principles which were adopted as core elements of the policy. The first principle states that development should be demand driven and community based (DWAF, 1994). Furthermore its states those basic services are human rights in order to provide a healthy environment. The principle, of "Some for All", rather than "All for Some" emphasise the equitable distribution resources (water and sanitation). The other principle argues that there should be equitable regional allocation of development resources. Furthermore, water has an economic value (DWAF, 1994). The "user pays" principle is a central principle to ensure sustainable and equitable development, as well as efficient and effective management. Finally, the policy principle encourages integrated development and environmental integrity (DWAF, 1994). It is imperative to ensure that the environment is considered during development (DWAF, 1994). The above policy principles emphasise the equitable and adequate access to water and sanitation. In addition, these principles emphasise that the policy should ensure service delivery in terms of sufficient water and sanitation.

2.6.2.9   National Water Act (Act No. 36 of 1998)

The preamble to the National Water Act recognises that water is a scarce and unevenly distributed in South Africa. It further states that the results of discriminatory laws and practices of the past have prevented equal access to water, and use of water resources. The purpose of this Act is to ensure that water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors, (National Water Act, 1998:18):

- meeting the basic human needs of' present and future generations;
- promoting equitable access to water;
- redressing the results of past racial and gender discrimination;
- promoting the efficient, sustainable and beneficial use of water in the public interest
- Facilitating social and economic development;
- providing for growing demand for water use;
- protecting aquatic and associated ecosystems and their biological diversity;
- reducing and preventing pollution and degradation of water resources;
- meeting international obligations;
- promoting dam safely; and,
- managing floods and droughts.

The factors outlined above fit the scope of the dissertation. This Act has similar objective or purpose with other legislation and White Papers related to water. The key aim is to provide accessible and sufficient water to the people including people residing in informal settlements.

2.6.2.10   Water Service Act (Act No. 108 of 1997) - as amended

One of the key objectives/ aims of the Act have been to redress past imbalances regarding the right to access to basic water supply and basic sanitation. From this aim, it is imperative to examine what is meant by 'basic water supply and basic sanitation'. In terms of Regulation 3 of Water Services Act Regulation (2001), the minimum standards for basic water supply services include the provision of 25 litres of water per person per day. This provision may imply that 25 litres of water per person per day in practical terms does not meet individual water needs. This provision is perhaps largely meant for every person in the Republic. If this is correct, it may be reasonable to state that by their nature

informal settlements have not been well serviced with adequate water supply; this would mean that, these settlements are most probable worst affected.

In any human settlement, it is imperative that the environment ought not to be harmful as enshrined in section 24 of the Constitution (1996) as amended. In this context human being are at the centre for all concerns for the environment (Rio Declaration, 1992) and therefore, it is mandatory for service providers like the eThekwini Municipality to provide basic services including, but not limited to basic sanitation.

2.6.2.1   *Housing White Paper (1994)*

Provision of adequate housing is one of the greatest challenges facing the South African Government.   The housing backlog is the result of the past polices and from the previous government. The main objective of the Housing White Paper was to redress the inequalities of the past by ensuring an inclusive and non discriminatory housing environment (DoH, 1997).

The approach adopted has been the search for the creation of an enabling environment. It aims to contribute to the certainty required by the market, as well as to give the Provincial and Local Governments capacity to fulfil their Constitutional obligations (DoH, 1997).

According to the new housing policy and strategy for South Africa, approximately 13.5% of all households (1, 06 million) live in squatter housing nationwide, mostly in free-standing squatter settlements on the periphery of cities and towns and in the back yards of formal houses. This form of housing remains the prevalent means through which urban households are accessing shelter in South Africa at present. It is estimated that approximately 150,000 new households per annum house themselves in this way. Policy responses from all tiers of Government have to be pro-actively responsive to this fact (DoH, 1997).   This policy does not address the challenge of informal settlement.

The preamble argues that "the housing programme must be designed to unleash that energy; not only to get the houses onto the ground, but also to give meaning to the notion of people centred development" (DoH, 1997). In other words people should be part of the whole process of their development.

2.6.2.12   Housing Act (Act No. 107 of 1997)

All legislation has to conform to the principles encapsulated in Bill of Rights and the national Constitution. According to section 26 of this Act, everyone has a right to have access to adequate housing. Smith (1996:35) argues that the inclusion of the right to housing in the Constitution should strengthen the position of those who live in informal settlements, particularly against the threat of arbitrary evictions. The Housing Act of 1997 aims to "provide for the facilitation of a sustainable housing development process, for this purpose to lay down general principles applicable to housing development in all spheres of government, to define the functions of national, provincial and local governments in respect of housing development" (Housing Act, 1997).

The Housing Act (1997) section 2 (e and f) says that there is a need to support and strengthen the capacity of municipalities to manage their own affairs, to exercise their powers and perform their duties in respect of housing development; and to promote consultation on matters regarding housing development between the national government and representatives of civil society, the sectors and sub-sectors supplying or financing housing goods or services; provincial and local governments; and any other stakeholder in housing development.

The Act prescribes the principles and defines housing related functions of each sphere of government. One of the principles of the Act gives priority to the poor in respect of housing development. The Act also sets the norms and standards maintaining the provision of services and the development of subsidized government houses. These norms and standards ensure that housing development occurs in a controlled manner and certain criteria are followed.

2.6.2.13   Breaking New Ground (BNG) Policy (2004)

Breaking New Ground was launched in 2004. This policy is a Comprehensive Plan for the Development of Sustainable Human Settlements. It is aimed at redressing colonial and Apartheid spatial planning and development through the development of socially, economically and spatially integrated housing delivery. Key objectives of the BNG are to alleviate poverty, create job opportunities and promoting upgrading of informal settlements. It is stated that the BNG Plan's response to informal settlements upgrading is that of co-operation and integration. Furthermore, it aims to provide housing in healthy and secure living environments, with communities having access to the services and goods produced by society (BNG, 2004).

It seems as if little has been done by the government in terms of this policy. There is still a high backlog in terms of housing provision. Housing is still a challenge especially in addressing or improving informal settlements. It is argued that "the development of Sustainable Communities is only possible if there is a concerted effort by the public and private sectors collectively" (BNG, 2004). The state and relevant government departments together with the people should work collectively in order to address the housing backlog (BNG, 2004). Conventional in situ upgrade is one of the strategies that are adopted by BNG policy to redress the issue of informal settlements. This plan seems to be in the process for most of the informal settlements especially in eThekwini.

2.6.2.14   *KwaZulu-Natal Elimination and Prevention of Re-emergence of Slums Act (2006)*

This is a provincial statute. The Slums Act appears to be the main legislation that controls the increasing number of informal settlements and aims to eliminate the increase of slums while upgrading the existing ones. There are measures set to prevent the emergence of slums. Measures like no one should occupy the land without getting the permission from the owner. Furthermore, any person who does not comply with the legislation may be evicted. This seems to contradict policy, which says that when the building has a roof it cannot be demolished.

In the case of informal settlements upgrading it is not clear with this legislation as to how the slums will be upgraded but focuses on the non-tolerance of new slums. Eviction of slum dwellers in Johannesburg left people homeless. This seems to contradict also with the constitution which gives people the right to have access to proper housing. This act seems to affect the lives and rights of shack dwellers. The Municipality sometimes relocate people to areas far away from their workplace or relocate people and do not provide basic services. This is the reason informal settlement dwellers do not want to be relocated. In terms of implementation, little progress has been done to address or improve the situation in informal settlements. Joffe (2007:2) argue that "the government should reconsider its policy of eradicating informal settlements as these play a critical role in enabling the poor to access land in urban areas, providing a route to formal housing for many poor people". Therefore, this Act has been found to be unconstitutional and therefore has been shelved. However, the importance of it was to indicate the shift in policy approach and legislation that was retroactive and similar to the approach used during the Apartheid era.

2.6.2.15 Local Government: Municipal Systems Act (Act No. 32 of 2000)

The preamble of Municipal Systems Act states clearly that the system of local government under apartheid failed dismally to meet the basic needs of the majority of South Africans. The Municipal Systems Act (MSA) provides a way in which the municipalities should conduct their duties in relation to each other within the broader development objective. It enables municipalities to move progressively towards the social, economic upliftment of local communities and also ensures equal access to services that are affordable to all. The Act also encourages community involvement during planning process, performance management and resource mobilisation (MSA, 2000).

It directs the municipalities to prepare Integrated Development Plans (IDPs). Municipalities are expected to use IDPs as a development tool. Integrated development planning is the process through which municipalities prepare both the IDP and a Strategic Development Framework or plan. It informs and guides all planning, budgeting, management and decision making in a municipality (MSA, 2000). The IDP has to identify all development plans for the particular municipality. It is a core to the delivery of housing and basic services.

The IDP incorporates a Spatial Development Framework of that particular municipality in this case eThekwini Municipality. In terms of the Act, it is imperative in order for the project to be implemented to have sector plans. For example the Regional Housing Department in KwaZulu Natal need to have sector plans for the housing project to continue of which this is a problem because this is an unfunded mandate.

The Municipal Systems Act (2000) comprehends the South African Constitution which is based on the right of people to live a decent life and have access to resources. The devastating issue is that, polices or Acts are there to support people but they are not implemented in certain areas. For example in informal settlement little has been done to address issues that they are faced with. The pace is too slow to address the service backlog and housing backlog in informal settlements. People are still staying in harsh conditions where there is a lack of service delivery.

2.6.2.16 Millennium Development Goals (MDGs)

Millennium Development Goals were adopted by world leaders in the year 2000. The Goals are as follows:

- Eradicating extreme poverty and hunger;
- Promote gender equality and empower women;
- Reduce child mortality;
- Improve maternal health;
- Combat HIV and AIDS, malaria and other diseases;
- Ensure environmental sustainability; and,
- Develop a global partnership for development.

The focus in this study is on goal number seven (7) which is based on ensuring environmental sustainability. The MDGs argue that development can be ensured only by protecting the environment and using its resources effectively (World Bank, 2009). Poor people depend on natural resources for their livelihood and they are the ones who are affected by environmental degradation and natural disasters.

The MDGs also call for improvements in the built environments. Service delivery is very slow and informal settlements are growing as more people move to urban areas. The aim of the MDG is to improve the lives of at least 100 million slum dwellers by 2020 (World Bank, 2009). This seems to be impossible because informal settlements are growing each and every year.

2.7 CONCLUSION

Understanding the dynamics of settlements is critical, if the present need and future growth of informal settlements within a coherent overall of urban strategy are to be addressed. Informal settlements are the result of Apartheid and current polices. They are characterized by poor building material, poverty, overcrowding and lack of basic services. Poor living conditions makes people more vulnerable to environmental risks such as fire, floods, environmental health risks, waste disposal and indoor air pollution. This is due to the lack of service delivery and lack of basic services such as sanitation and provision of clean water that is coupled by poverty among the informal residences.

Environmental risks cause threats to people living in informal settlements. Environmental hazards that are associated with informal dwellers are the results of the interaction between human and the environment. Different factors contribute in the occurrences of different environmental risks like, economic factors, social factors, physical factors, political factors and environmental factors. Diverse strategies can be employed in the household level in order to reduce different environmental risks. The emphasis of reducing environmental risks is on integration and the intervention of the community to take the initiative. Basic services and infrastructure provision are the keys to improving the living conditions of the poor especially those who live in informal settlements. Education and campaigns are part of the main strategies that could be used to mitigate risks within the informal residence. Upgrading of informal settlements is also one of the planning approaches that could be used to reduce risks and hazards in poor housing conditions. There is a need for effective planning legislation in order to control the use of land and the provision of services to the poor.

South African policies and legislations need to be implemented effectively in order to improve living conditions of people in informal settlements. There seems to be lack of commitment or limitations in some of the policies. From the policies and legislation discussed, little has been done in improving the lives of informal settlers. Having reviewed the literature of the study, the next chapter will look at the theory of vulnerability and political ecology.

CHAPTER 3:   CONCEPTUAL FRAMEWORK: POLITICAL ECOLOGY AND VULNERABILITY APPROACH

3.1   INTRODUCTION

Human activities tend to threaten the environment. This implies that, the relationship between humans and natural environment results to risks. People get to be exposed to environmental risks due to the occurrence of the hazards. Some of the households that are exposed to hazards tend to cope or apply certain mitigation strategies in order to reduce the risks. The conceptual framework of this study will be informed by political ecology and vulnerability approach. A fundamental way in which political ecology studies have been conducted was through the analysis of resources and human activity whereas the vulnerability approach identifies ways in which people cope with risks. In this case, the risks analysis is framed within the approach of political ecology and vulnerability. These two concepts will be used in order to understand the relationship between people and the environment in informal settlements and how communities cope with risks associated with living in such locales.

3.2   POLITICAL ECOLOGY APPROACH

The concept of political ecology embraces a range of definitions. Peterson (2000:324) argues that "political ecology began as a framework to understand the complex relationship between local people, national and global political economies, and ecosystems". This implies that human activities have a great impact on natural environment. Peterson (2000) further argues that political ecology study looks at nature as a passive object that is transformed by human actors. According to Bryant (1998: 79) "political ecology examines the political dynamics surrounding material and discursive struggles over the environment in the third world." Bryant in his definitions looks at political forces or situations as the contributing factor to environmental conflicts and degradation.

Peterson (2000:325) defines political ecology as "combining the concerns of ecology and political economy that together represent an ever-changing dynamic tension between ecological and human change and between diverse groups within society at scales from the local individual to the earth as a whole". This explanation explores the socio-economic and environmental changes that are related

to human behaviour. Hempel (1996) in Robbins (2004:6) defined political ecology as the "study of interdependence among political units and of interrelationships between political units and their environment". In addition, this definition is trying to explore and explain community-level and regional political action in the global sphere, in response to local and regional degradation and scarcity (Robbins, 2004). In general terms the political ecology approach is being utilized to explain environmental problems due to the interaction of bio-physical environment, humans and political systems. Bryant (1997) argues that another way in which to understand the role of power in conditioning the human environmental interaction is to consider the physical environment as a manifestation of power relations. Adger et al (2001:682) has defined political ecology as "a concern with tracing the genealogy of narratives concerning the environment with identifying power relationships supported by such narratives, and with asserting the consequences of hegemony over, and within, these narratives for economic and social development, and particularly for constraining possibilities for self-determination." This implies that that political approach considers the interactions and interrelationship of power relations and of human environmental interactions.

The theory of political ecology is one way "to understand the complex relations between nature and society through a careful analysis of what one might call the forms of access and control over resources and their implications for environmental health and sustainable livelihoods" (Watts, 2000 in Robbins, 2004:7). Offen (2004:22) concur with Watt's assertion is that "political ecology seeks to understand how local resource use and perception are mediated by a combination of regional bio-physical characteristics and processes, and the discursive-material manifestations of power that operate across geographic scales". Political ecology in this sense can be seen as the politicized study of human-environment relations and resource use (Herskovits, 1993).

Furthermore, the theorists of political ecology refer to how political, economic, and social factors affect environmental issues. Stott and Sullivan (2000) in Robbins (2004:7) define political ecology as an "identified political circumstances that forced people into activities which caused environmental degradation in the absence of alternative possibilities". For example, people living in informal settlements are sometimes forced by political systems or situations to live in vulnerable areas and degrade the environment in order to survive. Blaikie (1985) in Forsyth (2001) defined the concept of political ecology as an interface between politics and environmental degradation.

Blaikie and Brookfield (1987) in Walker (2005:74) argue that "political ecology" combines the concerns of ecology and a broadly defined political economy". Bryant (1991) in Lichtenthaler (2003:1) defines political ecology as "an inquiry into the political sources, conditions, and

ramifications of environmental change". Bryant (1997) further explores and argues that the only way that environmental problems can be resolved is through radical changes to the local and global economy. From the above set of definitions, it is clear that environmental degradation is influenced by political forces rather than being driven by human actions alone.

According to Kallis (2008:114) "political ecology analyzes environmental problems from the vantage point of power relations and distributional issues and with a critical eye on the uneven processes through which environmental problems are discursively and socially constructed". Bryant (1998:80) argues that in order to understand the study of political ecology, "politics should be `put first' in the attempt to understand how human environment interaction may be linked to the spread of environmental degradation". Pelling (1999) points out that in political ecology, it is significant to understand the interaction of key political actors and to identify the pressures that shape such interactions. In this study political ecology is defined as the study of how political influences affect human's interaction with the environment and about how communities make decisions about natural environment in the context of their political environment.

3.2.1   A Critique of Political Ecology

Environmental risks are not only driven by the physical system but by political ecology within which political, social and economic systems evolve (Pelling, 1999). Political ecology puts emphasis on political power and social organization in the shaping of the natural environment (Pelling, 1999). Pelling (1999: 259) argues that the "political-ecology approach has allowed social capital and institutional organisation to emerge as important local elements in shaping the distribution of assets and hence the production of geographies of vulnerability". It rejects assumptions about environmental change and human welfare (Bryant, 1991). "Rather, it explores how environmental change is incorporated into concrete political and economic relationships, and the ways that it may then be used to reinforce or challenge those relationships" (Bryant, 1991:166). Paulson et al (2003) argues that the significance of political ecology is to understand and participate in the collection of forces linking social change, environment and development. Furthermore, political ecology in this study is used to understand how human activities and political systems may be linked to the spread of environmental degradation and risks. Bryant (1998) asserts that political ecologists are keen to understand the dynamics and properties of a politicized environment.

Some scholars argue that nature plays an active role in shaping human- environmental dynamics. This is asserted by Watts and Peet in Offen (2004) where the role of the environment as an active constituent of human imagination is highlighted. Stonich (1993) in Nunez-Mchiri (2009:71) argues that "the political ecology approach is relevant for considering the roles of local, regional, national, and international social institutions in providing constraints and possibilities that affect human decisions, which in turn also affect those same institutions and the natural environment. Political Ecology links ecological themes with social struggles.

According to Oelofse (2003:271) "local government is tasked with providing environmental infrastructure and services that reduce risk in the urban environment". This observation is being used to understand decisions that communities make about the natural environment in the context of their political environment and how unequal relations in and among societies affect the natural environment, especially in context of government policy. Environmental problems are perceived to be the failure of the government to provide services. Bryant (1997:8) emphasizes that the "environmental problems are not simply a reflection of policy failure but rather are a manifestation of broader political and economic forces associated notably with the global spread of capitalism". He further argues that "the role of unequal power relations in constituting a politicized environment is a central theme, whereby particular attention is given to the ways in which conflict over access to environmental resources is linked to systems of political and economic control first elaborated during the colonial era" (Bryant, 1998: 79).

Pelling (1999) argues that political ecology puts an explanatory emphasis on political power and social organization in the shaping of the 'natural' environment, and encourages a historical examination of the processes that produce geographies of environmental and social distress. Moreover, political and socio-environmental analyses are placed at the centre of analysis in bringing a political ecology framework to the study of urban environmental risks (*ibid*). "Political ecology explanations of risks can be usefully drawn on human ecology school of hazards analysis which conceptualizes environmental risk as the coincidence of physical hazards and human vulnerability" (Pelling, 1999: 74). "A more detailed understanding of the Third World's politicized environment is to be found in the analysis of how unequal power relations are often linked to conflicts over access to, and the use of, diverse environmental resources" (Bryant, 1998: 85). This means that lack of access to resources and due to power forces, for example in informal settlements contributes to the degradation of the environment and to risks.

Some political ecology work utilizes the framework of the political economy to analyze environmental issues (Atkinson, 1991). A critical political ecology focuses on the construction of environmental knowledge through multiple social, economic, and political forces. Political ecology considers human action and the physical environment as inevitably interconnected. Robbins (2004:12) critiques the political ecology approach and argues that "it denaturalizes certain social and environmental conditions, showing them to be the contingent outcomes of power and not inevitable". Paulson et al, (2003:211) asserts that there are three basic challenges confronting political ecology today: "the first is to define politics and the environment in ways that facilitate a more thorough examination of the relationships between them; the second is to identify methods for carrying out and analyzing research that encompasses relations between politics and environment; and the third is to develop ways to apply the methods and findings in addressing social-environmental concerns". In contrast, Offen (2004:23) presents five elements that characterized political ecology approach:

- livelihood production and reproduction as the key investigative site;
- the relationship among social, economic, and environmental change;
- international, colonialist, state, and corporate intervention at the community level as well as the uneven consequences and responses (e.g., conflict over resource access, changing gender relations);
- causes and consequences of social-environmental marginalization and its remediation; and
- empirical field and historical research.

Political ecology represents a multidisciplinary approach to society- nature relations. It "serves as a guiding principal in the analysis of local resource use and the social, political, and economic organization involved in the transformation of natural resources such as land and water into commodities" (Nunez-Mchiri, 2009:71). Bryant (1998) argues that political ecology should attempt to understand how human and environment interaction may be linked to the spread of environmental degradation. It is within the various ideologies and discourses that the case study of Lacey Road will be evaluated and consideration of Bryant's claim to provide insight on environmental issues and the strategies created by people to cope more effectively. In using a political ecology framework, it is important to understand the interaction of key political actors and to identify the pressures that shape such interactions (Pelling, 1999). Furthermore, it is suggested that the political ecology framework should not be seen as an attempt to replace the established urban management paradigm, but rather to add a further dimension to our understanding of the production of risk that

highlights the need to view vulnerability as being deeply embedded in ongoing development policies and discourse (*ibid*). There is also an emphasis on why people act in a way that increases destructive physical process that in a long run impacts their own livelihood.

3.3   VULNERABILITY APPROACH

The term vulnerability can be used differently in various contexts and in different fields of study. Fields involved in risk and vulnerability studies include disaster management, various social sciences, economics, climate change and other natural sciences (Alwang et al, 2001; Brooks, 2003; De Sherbinin et al, 2007). Within these fields of academic study, different approaches can be employed to address similar problems of vulnerability. De Sherbinin et al (2007) and Kaperson, (2006) argue that "vulnerability in social sciences is typically identified in three elements: system exposure to crisis, stresses and shocks; inadequate system capacity to cope; and consequences and attendant risks of slow system recovery". According to Brooks (2003:32) the social scientists view vulnerability as "presenting the set of socio-economic factors that determine people's ability to cope with stress or change".   Nicholls et al, (1999) in Brooks (2003:2) argue that the "climate scientist view vulnerability in terms of the likelihood of occurrence and impacts of weather and climate related events". In general terms, vulnerability can be referred to as the potential for attributes of a system to respond adversely to the occurrence of hazardous events (Kaly et al, 1999). This definition focuses on the potential of the system to adapt. Bogardi (2004) identify vulnerability as a potentially detrimental social response to environmental events and changes. Borgadi's definition focuses on environmental and social vulnerability.

Vulnerability is the degree to which a system or unit is likely to experience harm due to exposure to perturbations or stresses (Brooks, 2003; Turner et al, 2003; De Sherbinin et al, 2007). This concept of vulnerability is aimed at examining risks and hazards and resilience (De Sherbinin et al, 2007), in this case, informal settlements. Central to this definition is the recognition that a focus limited to perturbations and stresses is insufficient for understanding the impacts on and the responses of the affected system components (Turner et al, 2003; De Sherbinin et al, 2007). Vogel (2005: 5) defines vulnerability as "the interface between exposure to the physical threats to human well-being and the capacity of people and communities to cope with those threats." Even though the vulnerability concept can be defined in different ways it generally encapsulates the strategies which people employ in order to cope with threats and impact disturbances like natural hazards.

According to Bustillos et al (2002: 13) "Vulnerability is defined as the probability that a community, exposed to the impact of natural hazards, can suffer damage according to the degree of fragility of its elements (infrastructure, housing, productive activities)". Odeh and Asce (2002) says that the vulnerability approach have been developed to address impacts of hazards on people and the environment. In this regard there is a need for the disaster mitigation strategies in or to reduce vulnerability in informal settlements. Weichselgartner (2001) says that vulnerability assessment alone will not reduce natural disasters but can work in tandem with strategies for disaster mitigation. He further argues that disaster mitigation is a social activity; a management strategy that balances current actions and expenditures with potential losses from future hazard occurrences (*ibid*).

Babar (2008:2) cites Chamber's definition of vulnerability as "a combination of defencelessness, insecurity and exposure to risk, shocks and stress." According to Babar (2008), this definition of vulnerability refers to the exposure to contingencies and stress and difficulty in coping with them. On one side being vulnerable means that individual or community is prone to numerous hazards, stressors and risks while on the other side, being vulnerable means that one lacks the ability to deal with (or cope with) the stresses imposed on it (Benidell,2003).

Sorensen et al (2006) argue that the definition of vulnerability is dependent on the context it is used in. According to Sorensen et al (2006: 12) vulnerability is being "prone to or susceptible to damage or injury". Human vulnerability to hazards results from a complex interplay of political, economic, social, and ideological practices present at a given locale and varies by a given hazard and by specific household characteristics (Blaikie et al. 1994). Although vulnerability is often considered in relation to a particular stressor or hazard, such as floods, it is becoming increasingly clear that it is generated and shaped by interacting biophysical and socioeconomic factors, (Drimie and van Zyl, 2005:5). From the above definitions, vulnerability in this chapter is understood as a function of both potential impacts and society's capacity to cope and adapt to these impacts.

Different literatures and scholar approach the vulnerability concepts in different ways. Some view vulnerability in terms of variations in exposure to hazards and those that concentrate on variation in people's capacity to cope with hazards. In contrast others view it in terms of the ability of people to adapt to risks. In negative terms vulnerability is portrayed as the susceptibility to be harmed (Adger, 2006). The IPCC (2001:995) defines vulnerability as "the degree to which a system is susceptible to or unable to cope with, adverse effects…" This definition is more concerned with the exposure to risks than the capacity to adapt. Similarly, ISDR (2002) in Borgadi (2004: 362) defines vulnerability as ''a set of conditions and processes resulting from physical, social, economical, and environmental

factors, which increase the susceptibility of a community to the impact of hazards''. Adger (1999: 249) in Few (2003) provides also a similar definition: "the exposure of groups or individuals to stress as a result of social and environmental change, where stress refers to unexpected changes and disruption to livelihoods". In contrast to the above definitions the term vulnerability is used throughout in this chapter referring to the exposure to risks and adaptation mechanism of the community to cope with hazards.

The various vulnerability definitions discussed above can be classified into social or biophysical vulnerability. According to Brooks (2003), social vulnerability can be defined as socio-economic characteristics of a community which determine the ability of humans to cope with change, perturbation or stress. It does not depend on the magnitude and frequency of the hazard but some properties of the system can make it to be more vulnerable to certain hazards than others (Brooks, 2003). Social vulnerability can therefore be used to describe all the factors which are independent of the hazard and mediate the impacts of the hazards (Brooks, 2003). Brooks (2003) further asserts that poverty, inequalities, marginalisation, food entitlements, access to insurance and housing quality determines social vulnerability. When the hazard interacts with the social vulnerability the product is an out-come which is generally measured in terms of physical or economic damage or human mortality and morbidity (Brooks, 2003).

Bio-physical vulnerability is defined as the nature and rate of recurrence of a hazard, exposure of humans to a specific hazard and the sensitivity of the system to the impacts of a hazard (Brooks, 2003). Thus bio-physical vulnerability is concerned with the ultimate impact of the hazard event and is perceived in terms of the amount of damage experienced by a system as a result of an encounter with the hazard (Brooks, 2003). For example the earthquake that took place in Haiti is measured by the harm it has caused to the people. So, it deals with the impacts of a hazard and can be measured in terms of the damage caused to the system. Biophysical vulnerability encompasses both the physical part associated with the kind of hazard and its physical impacts and the biological or social component which is associated with the characteristics of the affected system that acts to amplify or attenuate the impact of damage resulting from the impacts.

This chapter will focus more on social vulnerability which is discussed by Cutter et al, (2003:243) as "partially the product of social inequalities those social factors that influence or shape the susceptibility of various groups to harm and that also govern their ability to respond". These definitions look at vulnerability concept as caused by social inequalities, for example poor people

settle in vulnerable areas because they do not afford to pay rents. So, it explains how social factors contribute to people being vulnerable to environmental risks.

3.3.1   Risks and Vulnerability

Smith (1996:5) defines risk as "probability of a specific hazard occurrence". This definition refers to a particular hazard and the potential threat it may cause to human system. However, Downing et al (2001) define risk as the expected looses of lives, person injured, property damaged, and economic activity disrupted as the results of a particular hazard for given area at a particular time. The focus of the above definition is based on exposure and the potential damage that occurs at a particular time and the area. In general terms risks can be referred to vulnerability of the hazard to human and environmental life. Risks to the environment are any events or processes that can cause damage to ecosystem integrity such as human and natural events (Kaly et al, 1999). Satterthwaite et al (2007:11) argues that risks emerge from many sources and can "cascade through interacting human and environmental systems to create adverse consequences".

United Nations (2002) in Brooks (2003:8) separates risks factors into two components: "hazard determines geographical location, intensity and probability and vulnerability or capacity determines susceptibilities and capacities". Kasperson et al (2001) quoted in Brooks, (2003:8) states that it is "essential to assess vulnerability as an integral part of the causal chain of risks and to appreciate that altering vulnerability is one effective risks- management strategy".

There are three aspects of vulnerability as discussed by (Blaikie et al., 1994; Kaly et al, 1999; Alwang et al, 2001; Heitzmann et al, 2002; Brooks, 2003; Cutter, 2003; and Adger, 2006): exposure to risks, the ability to cope or the resilience to hazards and the integration of potential exposures and societal resilience. The most vulnerable group is low-income peoples, migrants and those living in overcrowded houses. In areas such as informal settlements with high population density, poor shelter, little or no access to resources such as safe water and public health services, and low adaptive capacity are highly vulnerable. Few (2003: 51) argues that a community's capacity to absorb the impact of a hazard event and recover from it is determined by its geographical location, the resistance of its physical structures and infra- structures, its economic capacity expressed in terms of asset levels, reserves and access to loans, its levels of social cohesion and organisation, its cultural vision of disasters and many other factors.

Ford et al, (2008: 46) argue that vulnerability at a local level is viewed as being conditioned by social, economic, cultural, political and climatic conditions and processes, operating at multiple scales over time and space. In order to reduce vulnerability there is a need to understand the outcome that is likely to be generated by a hazard and the means of managing the risks (Heitzmann et al, 2002). Adger (2006:273) concurs with Heitzmann et al (2002) by arguing that "understanding vulnerability lies on the interaction between social dynamics within a social-ecological system and that these dynamics are important for resilience". In a case where vulnerability is high then resilience will be low.

Alwang et al (2001) argue that households are vulnerable *to* suffering an undesirable outcome, and this vulnerability comes from exposure to risk. Furthermore, households respond and manage risks through formal and informal risks management depending on their access to assert (Alwang et al, 2001). Risk management could be taken before hazards takes place; this is referred to as ex ante. In a case where the risks management takes place after the hazard event is realised then that is referred to as ex post (Alwang et al, 2001). In other words there are proactive and reactive methods for managing risk and depending upon which strategy is used. The vulnerability of a household in a high risk area like informal settlement is greater. The main focus of this chapter is on household vulnerability because of the conditions they live in.

Alwang et al (2001) states that governments provide safety nets, such as public works programs and food aid, that help households to cope with risk like floods. Policies can also reduce the risk of hazards. It is argued that the set of available coping strategies or risks management is determined by it assets. "The magnitude, timing and history of risks and risk responses help determine the outcome" Alwang et al (2001:3). Chapin et al (2006) in Ford et al (2008) argue that Interventions to reduce vulnerability will be more successful if they are identified and developed in co-operation with local actors, as they are more likely to have the trust of the community and be meaningful to individuals and communities.

3.3.2   Adaptive Capacity and Coping Strategies

The capacity to cope is increasingly seen as a key component of a household's or community's level of vulnerability. (Few, 2003:51). In order to understand the adaptive and coping mechanisms, it is imperative to define first the concepts that are linked to it. Exposure is defined as a degree to which a system is exposed to hazards. Sensitivity refers to the degree to which a system is affected (IPCC,

2001; Brooks, 2003). Adaptive capacity is the "ability of a system to evolve in order to accommodate environmental hazards or policy change and to expand the range of variability with which it can cope" (Adger, 2006: 270). According to Brooks (2003:5) adaptive vulnerability is "the ability of a system to adjust to climate change to moderate potential damages, to take advantage of opportunities, or to cope with the consequences". This term also means "adjustments in a system's behaviour and characteristics that enhance its ability to cope with external stresses" (Brooks, 2003:8). From the above definitions, adaptive concept is one way of the system to reduce risks that is related to the hazards. According to Blaikie et al (1994:62) "Coping is a manner which people act within existing resources and range of expectations of a situation to achieve various ends" Furthermore, he argues that "coping strategies of all kinds are crucial elements in understanding vulnerability and designing interventions which provide sustainable self-help solutions to recovery and future disaster prevention" (Blaikie et al, 1994:70). The human capacity to adapt depends on the nature of the risks or hazards faced.

Benidell (2003:24) argues that poverty and coping strategies determine the levels and patterns of vulnerability. "Poverty is recognized as one of the most important causes of vulnerability to environmental threats, based on the fact that the poor seem to have much lower coping strategies" (UNEP, 2002 in Benidell, 2003:24). Sorensen et al, (2006:13) seem to support the idea by arguing that "Poor people may not only face greater exposure to hazards due to factors such as lower housing standards (poor construction material), location, and lack of access to information, but also have a lower capacity to cope". Coping strategies ranges from income generating activities, expenditure activities and getting assistance from external (Rakodi et al, 2000) in Benidell, (2003). Furthermore, these coping strategies were purely economic and highlight the importance of income in sustaining livelihoods and reducing vulnerability to environmental threats (Benidell, 2003).

In terms of coping and adaptation strategies, it depends on the nature of the hazards and the risks associated with it. Bogardi (2004) argues that social coping capacities, awareness and resourcefulness can reduce vulnerability for economic losses or social disruptions. This is because the adaptation level or mitigation strategies to reduce risks, for example, of Pretoria might not be the same as of Durban. Vulnerability also varies over time and space (degrees). This is due to that; some areas have high capacity to adapt compared to others. Brooks (2003) note that the system may have capacity to adapt to certain hazards but not to others and he further suggests that if the system has a high capacity to adapt that means, it is less at risk. In addition, "high level of adaptive capacity therefore only reduces a system's vulnerability to hazards occurring in the future" (Brooks, 2003:9).

This adaptive ability implies that the hazard occurs in future, it is the past experience and adaptive capacity that will determine the levels of vulnerability cause by such an incident. People especially in informal settlements tend to be more vulnerable due to the lack of assets. Perhaps also because they face extreme socio-economic pressures and so have fewer resources to draw upon when disaster strikes.

A household might be able to mitigate or cope with a risk or set of risks in a given period, but the process can result in limited ability to manage risk in subsequent periods especially when assets are degraded (Alwang et al, 2001; Holzmann et al, 2002). For example, households facing falling real incomes or rising prices for necessities generally have less capacity to cope or to adapt in ways that reduce risk (Satterthwaite et al, 2007).

In order for one to reduce vulnerability, there is a need for one to know the root cause. Satterthwaite et al (2007:10) argue that people's capacity to avoid the hazard, to cope with it and to adapt is influenced by individual or household resources and community resources. In addition, it is also so much influenced by the extent and quality of infrastructure and public services, especially for vulnerable populations. Weichselgartner (2001) underlines different factors that can be conducted when reducing vulnerability.   These factors are natural hazard analysis, exposure analysis, preparedness analysis, prevention analysis, response analysis and vulnerability analysis. It is within this framework in which one can look at the strategies to mitigate environmental risks. DFID (2000) in Napier (2002:4) says that "A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and the future, while not undermining the natural resource base".

3.4   LINKING POLITICAL ECOLOGY AND VULNERABILITY APPROACH

It is argued that, the aim of political ecology is to contextualize vulnerability at the local scale with any external or local pressures that may have an influence (Franklin, 2002). According to Michael (2000) in Franklin (2002:2) "Political ecology has the great merit of focusing on the social relations that shape practice, and in its sympathy with the poor and exploited, it addresses the plight of the vulnerable: both their abilities and their constraints." Political ecology tends to move to various aspect of vulnerability and has considered both resilience and adaptive capacity as part of the vulnerability to natural hazards, risks and environmental change. Political ecological approach assess when systems are vulnerable to natural and human disturbances. Peterson, (2000:335) argues that

political ecology offers the potential of identifying when political, ecological or economic intervention may be most successful in reorganizing the relationships between people and nature into a more sustainable form. "Political and socio-environmental analysis are place at the centre of analysis in bringing a political ecology framework to the study of urban environmental risk" (Pelling, 1999:74).

Furthermore, the political ecology approach draws analysis of urban risks into historical perspective and into an exploration of the processes and forces that shape human behaviour (Pelling, 1999:89). Pelling suggests that it is the socio-political processes by which people are made vulnerable that are most relevant to mitigation strategies. Vulnerability approach is considered in relation to a particular hazard but it is also shaped by interacting biophysical and socio-economic factors. It is developed to address the impacts of hazards on people and on the environment. Political ecology and vulnerability approach are related concepts and work together. This is because the political forces influence the human interaction with the environment and this in turn results in hazards that make people more vulnerable to risks. Political ecology contextualizes vulnerability approach and assesses when systems are vulnerable to natural and human disturbance.

3.5   CONCLUSION

Pelling (1999) interprets environmental hazard as a product of risk and human vulnerability. Vulnerability forms part of political ecology whereby they both look at human activities and political forces as the contributing factor to environmental threats. They are both concerned with adaptation and coping strategies of households to such environmental risks. Political ecology is used to explain environmental problems due to the interaction of biophysical environment, human and political systems. It puts emphasis on political power and social organization in the shaping of the environment. Human vulnerability to hazards results from a complex interplay of political, economic, social, and ideological practices present at a given locale and varies by a given hazard and by specific characteristics such as households (Blaikie et al. 1994). Vulnerability approach is used to address the impacts of the hazards on people and on the environment. It is imperative to understand the contributing factors or forces linking social change, environment and development. These approaches are the result of human relations with environment which may lead to hazards and makes people more vulnerable to risks. Having discussed the conceptual and theoretical framework of this study now one will move to the study area in the next chapter.

CHAPTER 4:   A CASE STUDY OF LACEY ROAD

4.1   INTRODUCTION

This chapter discusses the Lacey Road informal settlements in detail. It draws on published and unpublished material, newspapers reports as well as on researchers own experience and observation after visiting the study area several times. The chapter first illustrates the historical background of Lacey Road which is influenced by the interaction of political, social and economic forces. A historical perspective also accounts for the nature and problems experienced by people in Lacey Road informal settlement and how these have been influenced by their responses to service provision. The spatial context and the nature of the environment are discussed in this chapter.

4.2   BACKGROUND TO LACEY ROAD STUDY AREA[1]

This informal settlement started in 1986 and used to be called Thubalethu Gardens (Steiner, 2007). The Lacey Road Informal Settlement is a small portion of the area that falls within the formal residential area called Sydenham, within the city of Durban located in the province of KwaZulu-Natal (figures 2, 4, 5 and appendix A). Currently, this area consists of about 169 units and approximately 1500 people. The informal settlement is located at the intersection of Lacey and Randles Road on the Western side of Durban. It has an aerial extent of 22 526.22 m^2 which is approximately 2.253 hectares and acquired it name from Lacey Road which transects the settlement, but which is no longer used as a thoroughfare because it was closed down by the Municipality (Environmental Science, GIS, 2009). The area is predominantly occupied by people of mixed parentage[2]. This is the results of historical consequences of the Apartheid era. It is also near the busy intersection of Sparks and Randles Road (figures 4 and 5). From an administrative perspective, the area falls in the electoral boundary of Ward 25.

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[1]   This information has been gathered from interviews with local residents and verified by secondary reports.
[2]   In the Apartheid era people of mixed racial origins were termed Coloureds.
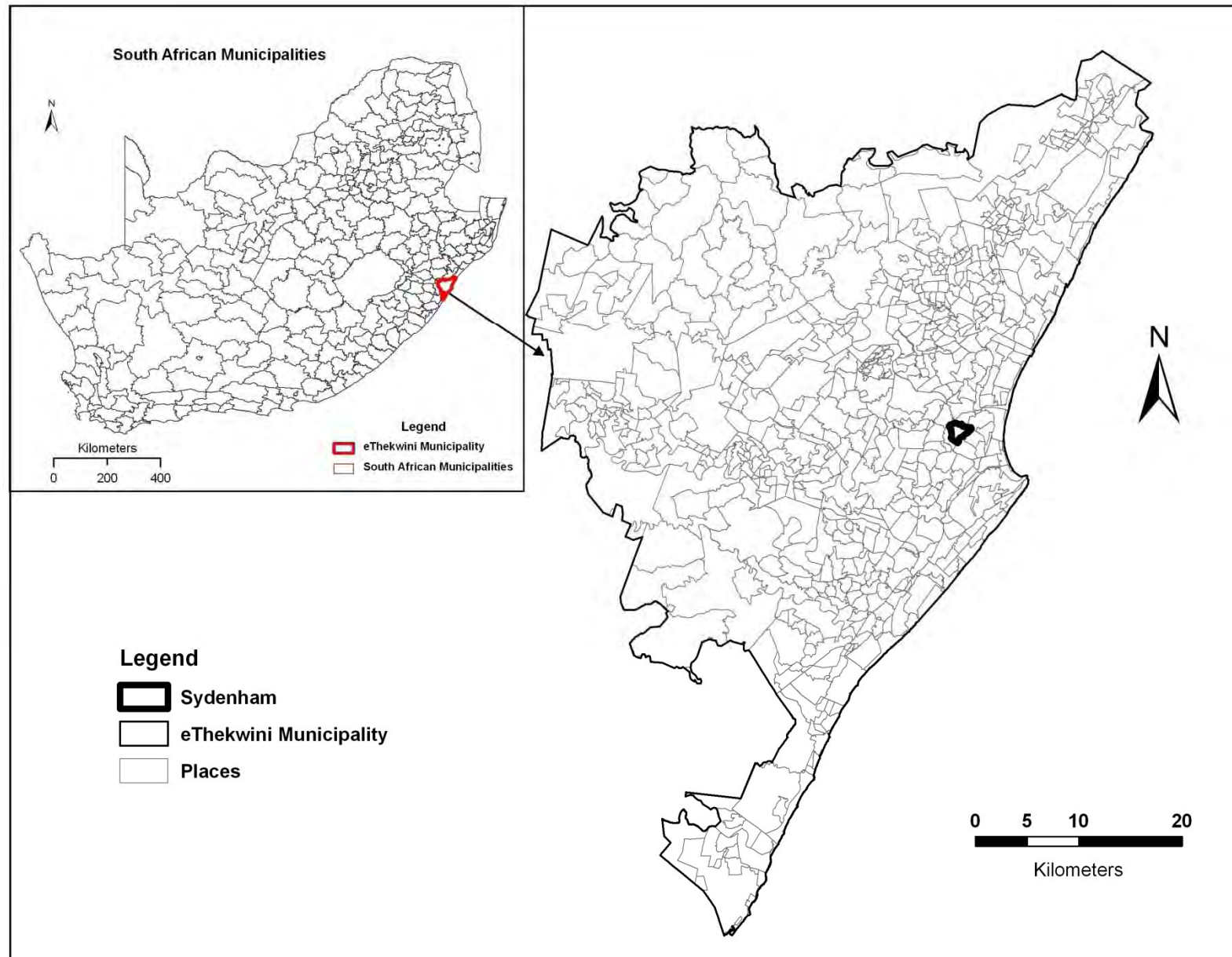
Figure 2: Map of South African Municipalities and eThekwini Municipality (Environmental Science GIS, 2009)

The land that is occupied by the informal settlement was originally a forest and there are still some trees within the area. People came and cut down the trees in order to settle there. They started to build their informal settlement illegally. The respondent (12/09/2009) reported that the municipality used to come and demolish the settlements until negotiations were made and attempts at removing the settlement ceased.[3]

4.3   SPATIAL CONTEXT

As indicated, the Lacey Road Informal Settlement is about 100 meters from a former main road called Randles Road where commercial and private transport is found including buses and taxis which commute to the Durban city centre. There is a commercial area in the close vicinity and that is where people from Lacey Road and the surroundings purchase commercial goods and groceries. A range of shops including supermarkets, pharmacies, restaurants, clothing shops, butcheries; bottle stores in this commercial area (figure 5).

There is a private hospital called Nu Shifa located directly outside Lacey Road informal settlement (figure 5). Most of the informal dwellers attend Sydenham Heights Clinic which is at short distance from the settlement. Steiner (2007) point out that it is ironic that people pass Nu Shifa Hospital when going to Sydenham Heights Clinic and they walk about fifteen minutes. So, this community prefers to attend public clinics as well as public hospitals (Eddington and King Edward). This is due to the high cost of private hospitals (doctors). The nearby doctor is mostly being attended by people settling in formal houses. Baseline costs are R500 for a doctors' visit (Nu Shifa Hospital) and R30000 for admission deposit to the general ward (Steiner, 2007). Furthermore, although free, public services but offer less than optimal care to residents of Lacey Road. The Sydenham Heights Clinic is only open from 07:00 AM until 03:00 PM from Monday to Friday and Wednesdays are reserved for pregnant women only (Steiner, 2007). In addition, the overcrowding of the public health care system compromises care in emergency situations (*ibid*). This indicates a need for the improvement of health care services at Lacey Road.

Even though this informal settlement is close to the services mentioned above for example, shops and means of transport, they lack other essential services such as the collection of garbage, a steady water supply, sanitation and health facilities because clinics are at a distance from the area. People have no electricity or other means that are safer than fuel using apparatus like paraffin stoves and

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[3]   Interview with respondent 9

lamps. Also the houses are made of materials that could pose a risk from the perspective of safety. They often combine different building materials that include flammable wooden planks, canvas sails, and mud and some are built with used concrete blocks (plate 1 and 6). Others are also covered by wall paper and cardboard in the interior as a form of insulation. That makes the situation even worse because a wall covered in paper is more combustible.

4.4   NATURAL ENVIRONMENT OF LACEY ROAD[4]

Lacey Road is a gravel surfaced area. The topography of the area is generally gentle in nature but in parts there is a mixture of steep and gentle slopes (figure 3). On steep slopes, development is difficult and there is high run off and on gentle slope, there is less runoff and the area is easily developable. These characteristics make the development of infrastructure difficult. In such conditions, agricultural activities are being eroded during heavy rainfall or storms. This makes the area or informal settlement more vulnerable to environmental risks such as floods. The soil that is found in Lacey Road is Natal sandstone (Environmental science GIS, 2009).
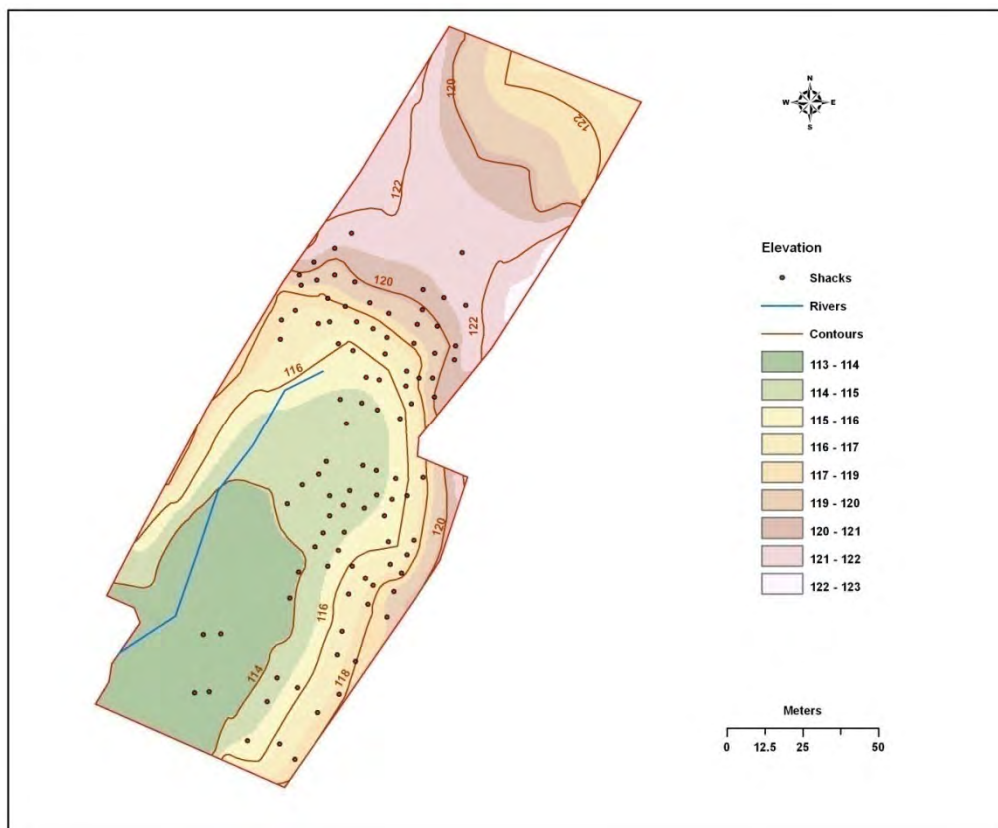
Figure 3: Contour lines and Elevation Map of Lacey Road (Environmental Science GIS, 2010)

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[4] The information has been gathered through observations, interviews and verified by secondary reports.

The steepness of the area does not affect the distribution of the informal settlement of the area (figure3). The variation of the height is from 114-116 (figure 3). The slope is decreasing towards the northern direction and also decreasing towards the southern direction while in the middle is a bit highly elevated relative into the north and south (figure 3).

Since Lacey Road Informal Settlement is in Durban, which has a humid subtropical climate, with relatively high rainfall. Rain is frequent during the summer months (August- December). In summer, temperatures are very high. Winter temperatures (March-July) are on average and rainfall is low. Current climate changes have brought with unseasonable winter rain. These climate conditions affect informal settlements, particularly Lacey Road. During heavy rains, informal settlements are affected by erosion and flooding. In the cold season, people in informal settlements use brazier (traditional heater) to warm themselves and shack fires are more common during this season.
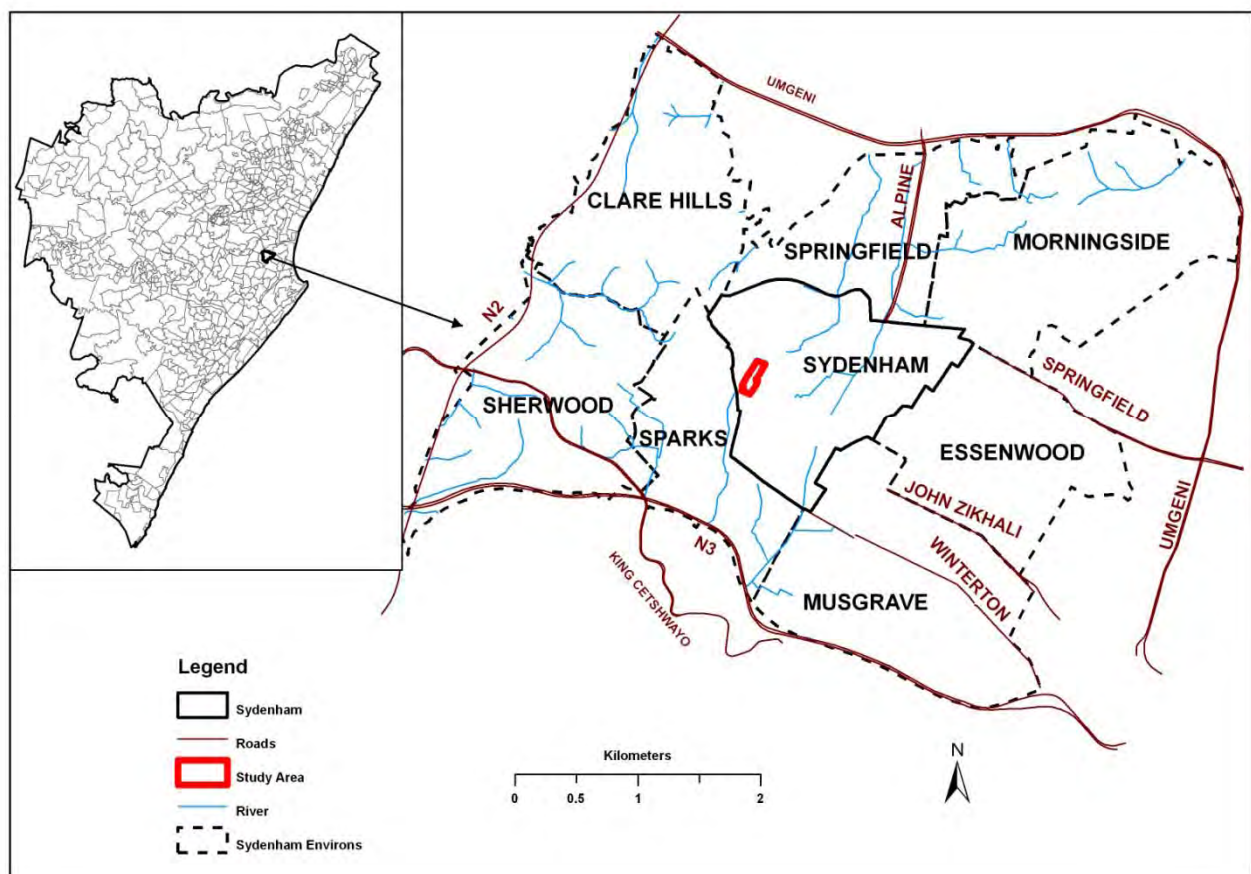
Figure 4:   **Location Map of Lacey Road in Sydenham (Environmental Science GIS, 2009)**

Within the study area, there are drainage lines and rivers that need to be considered (figure 4). The drainage lines that existed within the study area have been impacted upon by the houses (figure 5). The natural drainage line has been destroyed and reclaimed in favour of buildings. Due to the

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modification of natural river systems existing within the area, part of the area is muddy which cause health problems and threat during rainy season. This will also cause floods.

4.5   BIOPHYSICAL ENVIRONMENT

Deforestation or agricultural loss within this settlement is mainly due to erosion and urbanization. This development resulted in the destruction of indigenous forest trees species in an area. The settlement of Lacey Road has impacted negatively on the biophysical environments by removing vegetation and soil cover to prepare stands on which dwellings are built. The result has been the erosion of soil and the washing away of houses during heavy rains or flood conditions.

The main concern of ambient indoor air pollution in informal settlements is generally the use of gases. The common fuel that is being used in Lacey Road is kerosene (paraffin). The use of kerosene, wood and coal, especially in winter is a serious health concern (Mathee, et al, 1999 in Binedell, 2003) because the community inhale smoke which affect people especially their respiratory tracts.
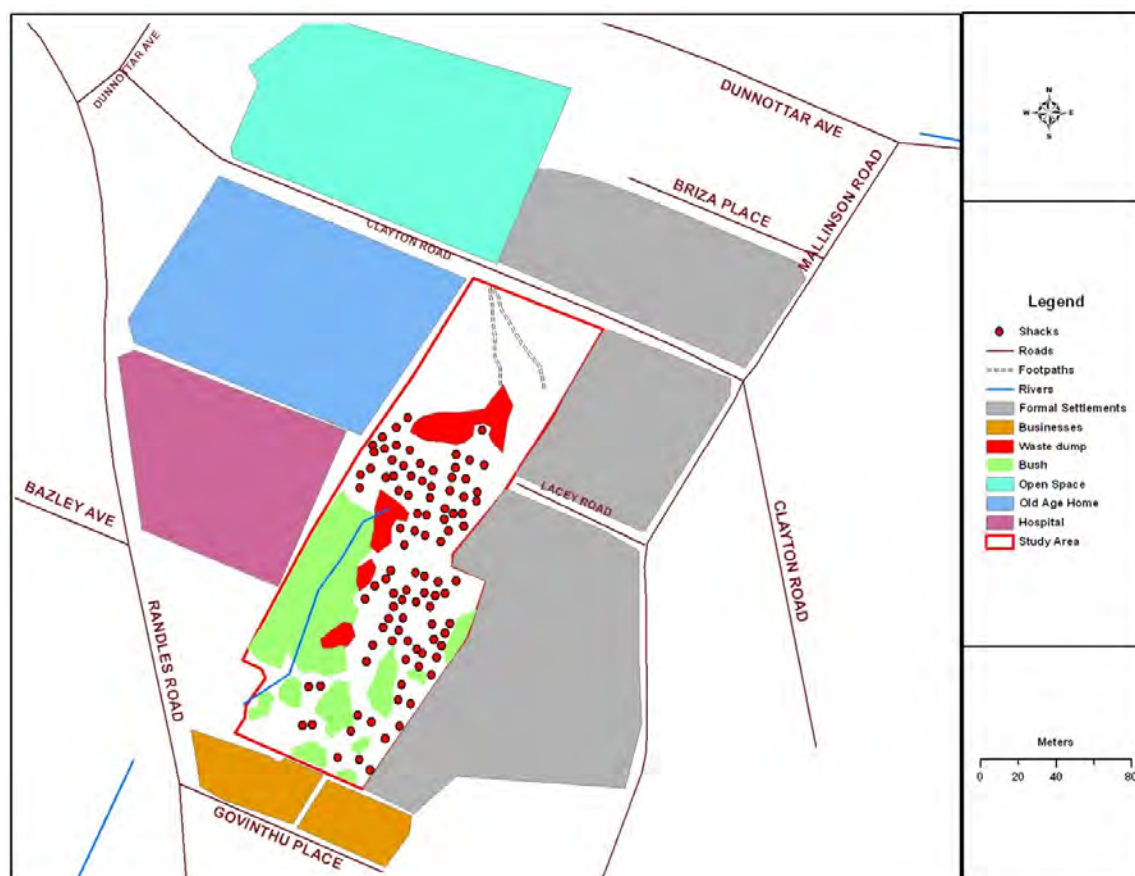
Figure 5:   **Land Use/Spatial map of Lacey Road in Sydenham (Environmental Science GIS, 2009)**

4.6   SOCIO-ECONOMIC ENVIRONMENT

Lacey Road is a diverse community which is between formal settlements. Binedell (2003) states that socio-economic factors which contribute to the quality of life to people are population, age, gender profiles, level of education, employment and levels of income. In terms of population, the number of informal settlement in Lacey Road is increasing every year. In 2007 population was around 700 but now it has increased to approximately 1500, more than doubled in three years.

From the interviews, there are a relatively high proportion of female-headed households in Lacey Road. Each household has got five to six members. The highest age profile of Lacey Road community is between the age group of 31 to 40. This shows that these individuals came to search for job opportunities and they end up settling in informal areas.

In terms of education level most of the people in Lacey Road informal settlement are illiterate. Most of them ended at primary or at best secondary levels. Few have gone to tertiary level of education. This indicates that in Lacey Road there is low level of education and thus lack appropriate skills for better job opportunities.

Economically, Lacey Road informal dwellers are low income earners.   There is high unemployment rate in this settlement. People rely on informal sector like domestic work being the most common informal activity. Others also rely on street vending.

Steiner (2007) states that there are high number of people in Lacey Road informal settlement who are suffering of HIV/AIDS and Tuberculosis. She further says that the home based care givers described the symptoms of their patients indicated that sick individuals in Lacey Road do suffer from symptoms related to HIV infection such as TB, diarrhoea, coughing and weight loss (*ibid*).

4.7   INFRASTRUCTURE

Lacey Road informal settlement is in the process of upgrading.   Housing consists of shacks constructed from various materials such as corrugated iron, plastics, iron sheets and so on (plate 1 and plate 6). Theses structures are made of waste material and they are crowded together next to each other.

Plate 1: Material used to build Informal Houses in Lacey Road

Source: Fieldwork (2009)

4.7.1   Water

The need for sufficient water in Lacey Road is a complex development issue. Steiner (2007) argues that sufficient water can be determined by different factors. This informal settlement is receiving free basic water; it does not pay for the water it consumes. The Lacey Road informal settlement has access to water services through community tap. There are four community taps or standpipes that are being utilized by the number of people within the settlement (plate 2). These four taps are scattered throughout the settlement. The first tap is in the entrance of the settlement, the other two are between the shack houses and the last one is at the end of the settlement. Since, the community

has to share community taps, they sometimes wait for a long time before it is their turn. This current delivery system is insufficient in Lacey Road informal settlement and there is a problem of ease of access for some households. Steiner (2007) stated that access to water service in Lacey Road is compromised by unreliability of the taps as they sometimes run dry.

From the historical point of view, eleven years ago households had no access to water within the community (Steiner, 2007). Residents had to purchase water from the garage adjacent to the entrance to the settlement (Steiner, 2007). Water used to cost R20 per bucket. After some time water became free. This was the result of the government policy of providing free basic water (Steiner, 2007). Although water is accessible within the community, for some households, it is at a distance. The municipality fixes the taps when they are broken or leaking but it takes about a week to act when a malfunction is reported (Interviews, 12/09/2009).

Plate 2: Some of the community taps provided in Lacey Road settlement
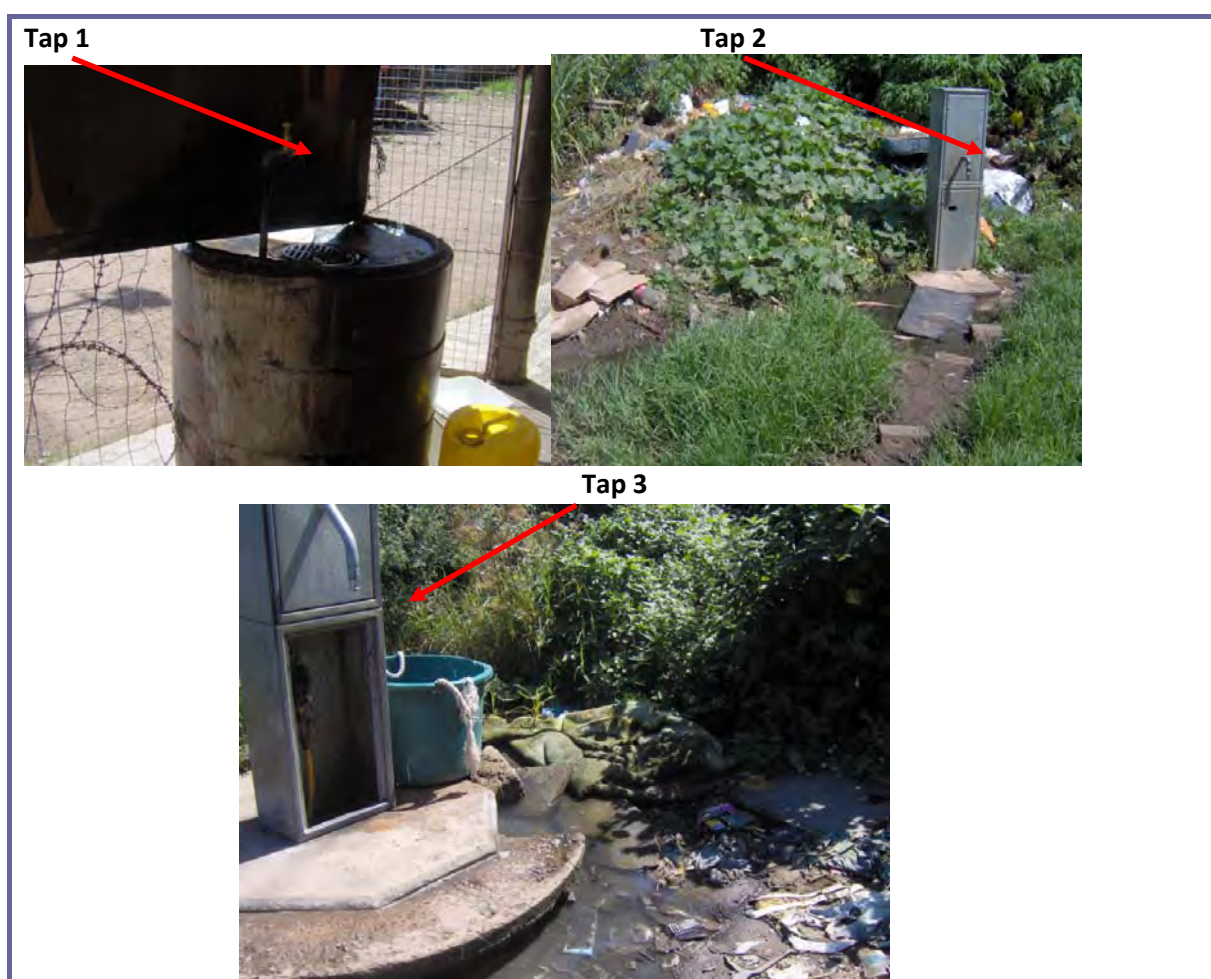
Source: Fieldwork (2009)

4.7.2   Sanitation

In terms of sanitation, a communal flush toilet is one of the forms of sanitation that is being used in Lacey Road (plate 3). This toilet facility goes with the communal shower which is located at the entrance of the settlement rather than at the centre (plate 3). Generally, there is poor sanitation within this informal settlement; even the shower and the toilet are very dirty.   The whole community was using one toilet before the municipality installed three more toilets in November 2009.   From the interviews the researcher finds that the toilets are locked up at 7 o'clock pm everyday. This has led to community members easing themselves behind their houses. This is proven by the smell within the informal settlement which has a negative impact on their health.   Another issue is that each household pay R5 per month for the toilets to be cleaned and each visitor is supposed to pay this amount when using the toilet. The new toilets that were installed in November 2009 were the ablution. Even though, more ablutions were put in place but there are not sufficient for the community of Lacey Road and there are not well maintained.

Plate 3: Sanitation being used in Lacey Road

Source: Fieldwork (2009)

4.7.3   Electricity

The informal settlement is not electrified. The community relies on candles and paraffin lamp to light their houses. They also use paraffin stoves for cooking. These energy sources increase the fire risks within the settlement. The fire that occurred in 2006 destroyed half of the settlements in Lacey Road (Pithouse and Patel, 2007).   This incident was the result of the candle which destroyed forty three shacks and left 250 people homeless (plate 4) (www.abahlali.org). This is a major incident that happened at Lacey Road. Settlements do get burnt occasionally mostly in small incidents. Hlongwa, a resident of Lacey Road in his article stated that

> "o*ur shacks get burnt down in fires because the City thinks that we don't deserve to have electricity. We are always losing our belongings in these fires and sometimes loved ones, especially children and old people, are lost*" (Hlongwa, 2007).

This is the indication that the energy sources the households of Lacey Road are utilizing are harmful to their well being.

Plate 4: showing fire incident which destroyed half of the Lacey Road informal settlement

Source: Richard Pithouse (2006)

4.7.4   Waste/ Water Disposal

The provision of waste removal services in Lacey Road is the responsibility of the eThekwini Municipality. A system is in place for waste collection on the weekly basis. Plastics bags are provided to residents by the Durban Waste Management. Even though such service is provided but there is clear evidence of the dumping of waste around the settlement[5]. This is due to the fact that a number of residents dump their bags before or after the collection time where animals forage and they spread the rubbish. Some residents do not put their plastics bags where they have to be collected but they have just opened their own dumping site next to the dwellings (plate 5, 7 and figure 5). Binedell (2003) argues that this creates and provides a breeding ground for disease carrying vectors such as flies, rats and cockroaches. Steiner (2007) argues that Lacey Road residents live in unclean environment and are particularly severe in locations where sufficient sanitation is critical for health.

Plate 5: Waste Disposal dumped within Lacey Road area

Source: Fieldwork (2009)

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[5] The information is based on the researcher's observation during her visits.

4.8   CONCLUSION

The small community of Lacey Road in Sydenham area is within the formal residents. This small community is vulnerable to risks since it lacks appropriate services such as poor sanitation, lack of electricity, waste removal and poor access of quality water. Exposure to health hazards is the results of lack of appropriate infrastructure within the settlement. The economic environment in Lacey Road is dominated by activities in the informal sector. High levels of unemployment exist which is exacerbated by the low levels of education. The social environment is characterized by problems concerning overcrowding and lack of proper housing. This chapter has discussed the background of Lacey Road informal settlement, it will now move to discussing findings and analyzing the data.

CHAPTER 5:   RESEARCH FIELD WORK AND FINDINGS

5.1   INTRODUCTION

This chapter presents the data and findings including the critical analysis guided by research goals and objectives of the study. The findings are discussed under several themes. The findings are based on household survey that was conducted at the community of Lacey Road during 2009 and the interviews that were done with different departments of the eThekwini Municipality. The survey and the interviews were done to compare and solicit various responses from the officials and the households' point of view. Another reason was to find out how the government (local government) assists the people living in informal settlements to mitigate or reduce environmental risks they are faced with. The Statistical Package for Social Sciences (SPSS) and Excel software programmes were utilised to analyse the data collected.

5.2   RESPONDENTS' BACKGROUND

A qualitative survey of households was conducted on the Lacey Road informal settlement (see appendix 1 for the questionnaire). The demographic of the study area is discussed, analysed with graphs and tables to show the percentages.

Table 5.2.1:   **Respondents' Gender**

Gender	Frequency	Percent
Male	15	37.5
Female	25	62.5
Total	40	100.0

Source: Dissertation Survey 2010

Table 5.2.1 shows the gender percentage of the respondents, where 62.5% are females and 37.5% are males. The results indicate that there are more women compared to men that live in the informal settlement (Lacey Road). The research revealed that most women come and settle in vulnerable areas in order to search for job opportunities. There are a number of female headed household in the Lacey Road settlement where they take on the roles of breadwinners and single parents as their husbands or boyfriends are nowhere to be found. Another reason for the predominance of women is that to settle in this informal settlement because they need to consider

accessibility. Most want to be near their place of work in which in more often informal employment prevails (domestic work and street vending).

Figure 6:   **Graph showing Gender Percentage Breakdown**
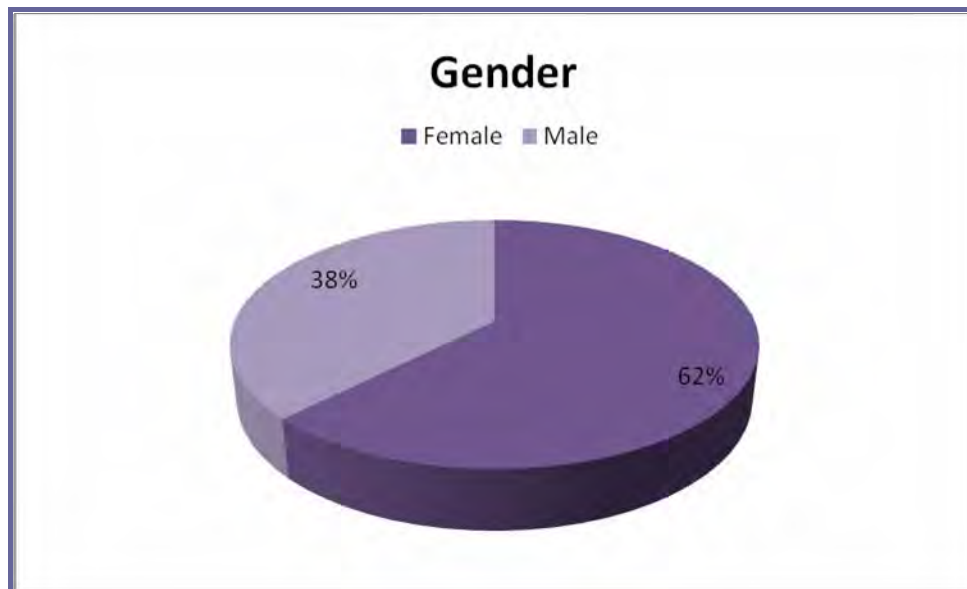
Source: Dissertation Survey 2010

The above chart shows that there are more females than males that settle in Lacey Road.

Table 5.2.2: Respondents' Age

Age	Frequency	Percent
Less than 20	2	5.0
21-30	7	17.5
31-40	16	40.0
41-50	11	27.5
51+	4	10.0
Total	40	100.0

Source: Dissertation Survey 2010

The details of table 5.2.2 show that 40% of the people falling within the age category of 31-40 years live in the Lacey Road informal settlement. 27.5% of respondents were in the age category of 41-50 years and 10% were in the age category of 51 years and above. Only 5% of respondents fall in the age category of 21-30 years. The results indicate that more people who are in the age category of 31-40 years settle in Lacey Road informal settlement. This is due to the fact that people within 30-

40 age cohorts find pressure to work for their children. This age group stay in vulnerable areas because they want to support their children and they cannot afford expensive accommodation. The age category of 21-30 years has the lowest percentage of 17.5%. They come to the city to search for jobs and they end up staying in an informal settlement as the first access point to the housing market.

Table 5.2.3:   Respondents' Marital Status

Marital status	Frequency	Percent
Married	10	25.0
Single	24	60.0
Divorced	2	5.0
Widowed	4	10.0
Total	40	100.0

Source: Dissertation Survey 2010

Table 5.2.3 illustrates that 60% of the respondents are single and 25% are married. It also shows that 5% of respondents are divorced and 10 % are widowed. The widowed people come and look for better life for their children because either husbands or wives are deceased. A large number of single respondents in the study finds themselves pressurized to migrate from other areas and look for better life in and around the city.

Table 5.2.4:   Respondents' Levels of Education

Level of education	Frequency	Percent
No schooling	5	12.5
Primary	12	30.0
Secondary	22	55.0
Tertiary	1	2.5
Total	40	100.0

Source: Dissertation Survey 2010

Approximately 55% of respondents have attended Secondary School and 30% never managed to get beyond the equivalent of a primary level of education (see table 5.2.4). 2.5% of the respondents had tertiary qualification and 12.5% had never visited school. Santosa (2002) argues that while the people are usually poorly educated, competition in the city is high and it is hard to find job. The results indicate that most members of Lacey Road are not skilled and are unable to access well paying jobs hence they settle in a low income and vulnerable types of settlement.

Table 5.2.5:   Respondents' Employment Status

Employment status	Frequency	Percent
Still Schooling	6	15.0
Unemployed	9	22.5
Employed	18	45.0
Self Employed	7	17.5
Total	40	100.0

Source: Dissertation Survey 2010

The table above illustrates that 45% of respondents are employed. Most of these people are active in an informal sector and many of them are domestic workers and cleaners. A few of the employed respondents indicated that they work as security guards.   Only 17% of respondents are self employed. From the interviews those who are self employed are street vendors and they do not make much profit on the sale of goods. 15% are still in school and 22.5% are unemployed. The unemployed group rely on pensions and child support grant "imali yeqolo" for survival.

These results show that the members of Lacey Road informal settlement are relying on informal jobs which have a lower level of income, whilst others depend on unskilled employment for their socio-economic survival. Considering the socio-economic challenges and hardships, in the informal settlement, most people have resorted to government grants as their principal source of income. This community is likely to be more vulnerable, exposed and locked in the vicious cycle of poverty because of the geographical area they live in and due to the fact that they rely on informal sector for survival. This situation is further exacerbated by the lack of skills due to illiteracy as the majority of the respondents never went to school or ended up either with primary education or secondary schooling.

5.3   THE LIVING CONDITIONS OF PEOPLE IN INFORMAL SETTLEMENTS

The pie chart presented on the next page reflects the living conditions of Lacey Road informal settlement.   Most of the respondents are not satisfied with their living conditions.   87% have responded that living conditions in Lacey Road are appalling as one of the respondents said that *"conditions in this informal settlement are not of human living"* (Respondent 8: 10/10/2009).

Figure 7:   Graph showing Living Conditions in Lacey Road

Living conditions

■ very bad ■ bad

13%

87%
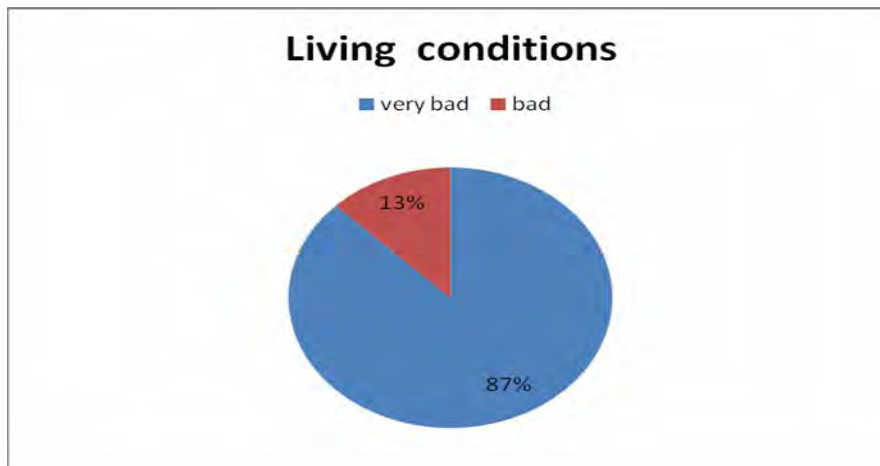
Source: Dissertation Survey 2010

Through observations and information gathered from the surveys, the community have used flammable materials to build their houses. Amongst these materials are cardboard, plastic, sail and wood (see plate 6).

The respondents indicated that there is no space to build more houses, hence there is overcrowding in their homes. Children share same room with their elders including sharing of bedrooms by both males and females. This indicates that they do not have privacy. They also do not have enough space to grow crops that will be a surplus to their livelihood. This gloomy situation is further complicated by the fact that the community members are not allowed to build their houses with proper building materials because the land does not belong to them as most of the land belongs to the municipality and while the other part of the land is privately owned. Some of the community members have been asked by private owners to vacate from their land. Consequently, community members had to destroy their shacks and rebuild them on the land that is owned by the municipality. This implies that people of Lacey Road have no security of tenure and there is a high level of uncertainty which contributes to being vulnerable and using building materials that can be easily transported.

From the information presented regarding the living conditions one can conclude that even though they have some services but people are poor and there is a need for improvement. This is not a health living conditions; there should be development that will reduce the vulnerability of people's livelihood.   These living conditions do not affect people's health only but also degrade the environment. Watts (2000) in Robbins (2004:7) uses political ecology as one way to understand the complex relations between nature and society through a careful analysis of what one might call the

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forms of access and control over resources and their implications for environmental health and sustainable livelihoods.

Plate 6: Typical Informal Dwellings in Lacey Road

Source: Fieldwork (2009)

5.3.1 Reasons for People to settle in Lacey Road

There are various reasons that drive people to settle in informal areas such as Lacey Road. Most people come and settle in this area because they did not have anywhere to stay. Many have their homes in rural areas but they came to the city in search for job opportunities and end up settling in this poor environment. Some of the community members found informal jobs in these areas, and hence they resorted to inhabit the available land close to their place of employment. Other households responded that the decision was prompted by their lack of finances to pay for decent accommodation such as flats in town. A few of the respondents reported that they settled in the area so that their children will be next to their schools. From the information gathered, one can conclude that most of the members in this area have come to settle in Lacey Road to search for better life in and around the city. The reality is that where there is land but no housing, people end up building informal settlements in unhealthy and vulnerable areas because they cannot afford the more costly alternatives in the city.

5.4 THE ENVIRONMENTAL RISKS AND VULNERABILITY IN INFORMAL AREAS (LACEY ROAD)

The environmental hazards and vulnerable locations of informal settlements mean that the effects of the hazards on informal communities are great (Santosa, 2002). The community of Lacey Road experiences various environmental risks. Figure 8 graph reveals that fire is the main risk that is being experienced in informal settlement (Lacey Road). This is due to the poor material that the people use to build their houses. From the observations they use mostly flammable materials like cardboard, wood off-cuts and sails. About 35% of the respondents said that Lacey Road is experiencing the problem of waste disposal which is being dumped by the community members all over the settlement (plate 7). Only 25% complain about floods especially during rainy season.

Figure 8: Graph illustrating Environmental Risks being experienced in Lacey Road
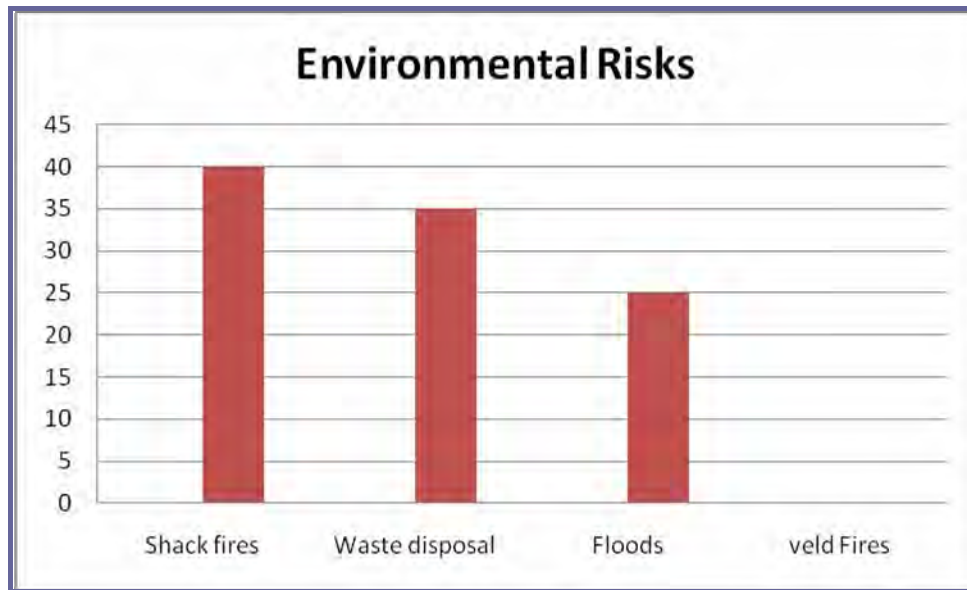
Source: Dissertation Survey 2010

5.4.1   Fire and Vulnerability

Fire is one of the major risks that are associated with informal settlements. From the interviews conducted in Lacey Road, this settlement had experienced fire risks on a regular basis but currently as small incidents. The respondents have commented that during fire incidents they loose all their belongings. One of the respondents said that *"fire incidents that occurred in past years made lots of people to suffer-losing their belongings and there are families who lost their loved ones"* (Respondent 9: 7/11/2009)*.* The article presented by Hlongwa (2007) indicates that half of the informal settlements at Lacey Road were destroyed by the fire which was caused by the candle which was not attended at night (plate 4). Fire easily spread from one shack to the other due to overcrowding and flammable material used when building them. For example the fire incident that recently occurred at Mayville informal settlement this year destroyed more than half of the shacks and people lost everything.

The community of Lacey Road mentioned different causes of fire risks in their informal settlement. Due to the fact that most people who live in this informal settlement are poor, they rely on paraffin stoves for cooking and also use candles for lighting. These types of sources for energy are potentially more hazardous generally and specifically in informal settlement. Some of the respondents mentioned that fire is also caused by the negligence of people living in this informal

community by their carelessness of throwing down cigarette that is still alight. Additional causes of fire are the leaving unattended stoves and candles by residents who are intoxicated and whose houses then catch fire and spread across the settlements. Pelling (1999) used political ecological approach in order to understand people's actions in a way that increases destructive physical process that in a long run impacts their own livelihood. People's livelihoods are destroyed due to the negligence of informal dwellers.

The information gathered from the interviews indicates that Lacey Road is vulnerable due to fire risk outbreaks. This is the result of cheap and hazardous energy sources. Fire risks in this community are also influenced by social factors and by the density of the dwellings. MacGregor et al (2005) argues that alcohol abuse and domestic violence are the primary cause of fire because people tend to be careless. The occurrence of fire results to loss of livelihood by the households, loss of life and possessions, severe injuries and leaves people devastated and hopeless. School children lose their books, school uniforms and sometimes even hope for the future. Furthermore, that results in social breakdown especially when people have to relocate to other areas or reinvest their meagre livings in building new houses. These challenges impact on the well being of the poor in informal settlement.

5.4.2   Floods and Vulnerability

The respondents mentioned that during heavy rains their houses are flooded or in some instances completely destroyed. Water gets into the roof and walls. Everything gets wet and their clothes, households and food are destroyed by the rain. The roofs are also blown away during strong winds which put people at risk and injury when their homes collapse.

A number of people have reported that when it rains, water just seeps up on the ground and that rising damp destroy some of their belongings. One of the respondents said that "*our furniture gets damaged by rainfall. Furthermore, her identity document book and her children birth certificates were destroyed*" (Respondent 7/11/2009)*.* In addition, constant damp also affects their health. Some people within the community suffer from pneumonia, TB and flu due to the dampness of their houses. Floods exacerbate health risks in the homes of the poor (informal settlement). Floods usually spread diseases for example respiratory infections. Furthermore through spreading of waste by flood water hence, creating breeding grounds for mosquitoes and other contagious disease. Some of the respondents said that *"rain is like a curse in this area".*

The results gathered indicate that people of Lacey Road are exposed to flood risks especially during heavy rainfall. After the incidents, people's property are destroyed or washed away by heavy rains. It is clear that floods cause devastation to human life. This is the results of high water table in this area. Water from the underground is close to the surface. This community is also exposed to flooding because of the inappropriate construction practices (buildings) and living conditions within this informal settlement. After flood incidents people are relocated or have to move to other places until they rebuild their homes. Lacey Road is vulnerable to flood risks. This is probably made worse because the rivers have been diverted and the houses are in the natural water course.

5.4.3   Waste Disposal and Vulnerability

Waste disposal is one of the key risks this community is exposed to. The researcher observed that the area is very dirty (plate 2). People throw their wastes all over the place. This makes people more vulnerable to diseases like diarrhoea, TB and so on. People's health is at risk.

The waste that is generated and scattered the place, it affects the people's health and also degrades the environment. The chemicals from the various waste material infiltrates into the soil and affect the environment. Few (2003) argues that the environmental pollution (waste) causes several diseases like intestinal, skin disease (scurvy) and contributes to respiratory diseases.

One of the respondents said that "*we live in a filthy area, garbage is scattered all over the place*" (Respondent 18: 14/11/2009). This is as portrayed by plate 7 taken during the survey period. The respondents mentioned that the Municipality sometimes does fetch the rubbish but not always. When the garbage collectors did not come to collect it then the household animals such as dogs and cats tear off the garbage plastic bags looking for food. Some respondents said that since the municipality is not consistent regarding fetching the wastes, then we opened our own dumping site within the informal settlement. Other respondents commented that as the waste is all over the place it is because we do not have proper dumping site. This is indicated by the dirt that is all over the Lacey Road community.

It is revealed in this research that Lacey Road informal settlement is vulnerable to diseases due to the waste disposal that is left unattended. In this condition children are likely to get diseases because they play where the rubbish is thrown. Some of the respondents reported that *"our children have sores which might be caused by the un-cleanliness of the area".* Benidell (2003) concurs with

the above statement by arguing that people living in un-serviced settlements are likely to be exposed to diseases carrying vectors such as rats, mice and flies which proliferate in uncontrolled waste and refuse. Since rats carry infectious and fatal diseases, Lacey Road people are at risk of contracting illnesses from the rodents. The waste disposal in this community might also increase the level of fire risks.

Plate 7: Dumping Sites within Lacey Road

The Northern part of the Settlement

The Main Entrance to the Settlement

Source: Fieldwork (2009)

5.4.4   Indoor Air Pollution and Vulnerability

As it is mentioned above, Lacey Road households rely on paraffin stoves for energy sources. Some people mentioned that they get affected through the use of those paraffin stoves. Most people are affected by diseases more related to respiration illnesses like Asthma and Tuberculosis (TB) due to

indoor air pollution. Brown (1997) states that indoor air quality is widely regarded as a significant health, environment and economic problem and this aspect is particularly relevant where there are poor living conditions. This was a least risk people of Lacey Road have mentioned.

In most cases, people are exposed to indoor air pollution due to poor ventilation in their informal houses. Using hazardous energy source like paraffin and with no ventilation poses a serious threat to their health. This is due to that; these gases emit nitrogen oxide and carbon dioxide which are a health risk. The results indicate that Lacey Road community is exposed to indoor air pollution due to the hazardous gases they use. It appears that this community do not have an alternative because they are poor and they do not afford better energy sources and they do not have electricity.

5.4.5   Health and Vulnerability

The above identified risks have a negative impact on people's health. Peoples' health is more vulnerable in this community due to indoor air pollution, waste disposal and floods risks. Stagnant dirty water around taps is another factor that has the negative effect on human health.   For example, children who play in this water tend to suffer from health problems such as diarrhoea, cholera, acute respiration infection and get sores. This might be the result of poor maintenance of taps or the large number of users (plate 2). Unmanaged waste disposal increase numbers of disease spreading flies, rats, cockroaches and other vectors.

The research further revealed that in informal settlements, peoples health are negatively affected due to the social conditions in which they live in, such as poor sanitation, overcrowding, and poor water supply, little or no access to health services, unemployment, lack of proper houses and lack of political rights. Satterthwaite et al (2007:11) concurs by arguing that risks emerge from many sources and can "cascade through interacting human and environmental systems to create adverse consequences".

The research indicates that Lacey Road is exposed to various health problems associated with different environmental risks. Poor living conditions in informal settlement are expected to magnify a number of health risks. The respondents have argued that health risks in informal settlement are due to the lack of adequate service delivery or basic services. DMSLP (2008) concurs with the respondents by arguing that the main factors that increase environmental health risks in informal settlements are the inadequate delivery of basic service and individual behaviour that foster

unsanitary practices, littering and neglect of infrastructure.   One can conclude by saying that environmental health problems tend to be far more severe in the conditions of poverty.

5.5   THE STRATEGIES TO MITIGATE ENVIRONMENTAL RISKS

In order to reduce vulnerability, it is imperative to know the root cause. It is argued that a community's capacity to absorb the impact of a hazard event and recover from it is determined by its geographical location (Blaikie et al. 1994).   Satterthwaite et al (2007:10) further argue that "people's capacity to avoid the hazard, to cope with it and to adapt is influenced by individual/household resources and community resources".

Even though people living in the informal settlement of Lacey Road are experiencing environmental risks, there are different strategies that are or may be employed to mitigate different type of risks and they are as follows:

5.5.1   Household Strategies

Chapin *et al.* 2006 in Ford et al (2008:47) argues that "interventions to reduce vulnerability will be more successful if they are identified and developed in co-operation with local actors, as they are more likely to have the trust of the community and be meaningful to individuals and communities." Kasperson et al (2001) quoted in Brooks, (2003:8) states that it is "essential to assess vulnerability as an integral part of the causal chain of risks and to appreciate that altering vulnerability is one effective risks- management strategy".

The community of Lacey Road have identified few strategies to mitigate the risks that they are experiencing. People especially in informal settlements tend to be more vulnerable due to the lack of assets such as proper housing. The members of the community have suggested that, the key problem is access to basic services. They argue that if the municipality can provide them with basic services such as proper houses, quality water, proper sanitation and electricity then risks will be reduced. Blaikie et al (1994:70) put forward that "coping strategies of all kinds are crucial elements in understanding vulnerability and designing interventions which provide sustainable self-help solutions to recovery and future disaster prevention".

5.5.2   Fire strategies

In terms of fire, the household's members sometimes have community meeting whereby they are reminded to ensure that they are careful when using their energy sources. They are also reminded not to leave stoves and candles unattended. Some respondents said that people should reduce the level of alcohol consumption as alcohol is blamed for most fire incidents. A harsh punishment was directed to the perpetuators of fire by the committee members in order to reduce fire incidents. During fire incidents the community help each other to extinguish the fire by bringing lots of water. Then after the incidents the community members try to find assistance those who lost their properties and who are in a dire need.

The research indicated that fire is one of the risks that are associated with informal settlement and the community of Lacey Road will try to reduce their exposure to fire risks. The various ways they have mentioned shows that they try to avoid the risks from occurring. They also have strategies they use in order for the fire not to spread over the informal settlement. Then they assist those who were affected after the incident. This is shown by the little number of major incidents that has occurred in this community in few years back.

5.5.3   Floods Strategies

Community members at Lacey Road do not have many strategies when it comes to prevent flooding. One of the respondents reported that *"they put something like a tent (canvas sail) on top of their roofs in order to avoid the leaking of the roofs"* (Respondent 28: 28/11/2009)*. Some of the respondents said that behind their houses they make a hole (tunnel) like a drainage line so that water will run through and do not affect the foundation of the house (plate 8).
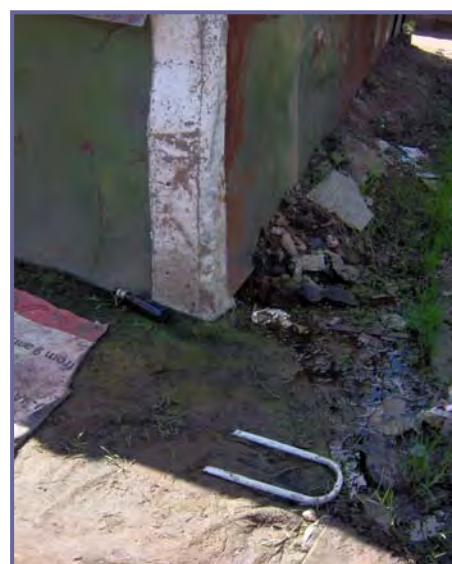
Plate 8: Own Made Drainage Line in Lacey Road
Source: Fieldwork (2010)

From the information gathered, the community of Lacey road is doing something to reduce their risks and exposure to flooding. Even though little is being done by the households but they are doing something to protect themselves. The strategies that the community are using are not sustainable. Some respondents argued that provision of proper houses can reduce the impact of natural disasters like floods.

5.5.4   Waste Disposal Strategies

Households reported that, they organise cleaning campaigns whereby the members of the community mobilise themselves to clean up their entire environment. The community members also mentioned that the Durban Solid Waste (DSW) sometimes do come to collect rubbish and the problem is that some of the community members do not put waste where they are supposed to then the waste is not collected.

The results indicated that this community is mostly exposed to waste disposal risks due to the fact that the rubbish is all over the place. The community members made it clear that the municipality do not come often to collect the rubbish. As a result waste end up being blown by wind all over the place. Cleaning campaigns is the only strategy that is being employed to reduce their exposure from different health risks caused by refuse.

5.5.5   Indoor Air Pollution Strategies

People of Lacey Road do not have many strategies they employ to mitigate indoor air pollution. The respondents have mentioned that they try to have small windows of which they open them when using their stoves. One of the respondents mentioned that "*they put mentholated spirit in the stove to reduce the smoke (smell) of paraffin when using it*" (Respondent 23: 28/11/2009). In this regard the community members suggested that if the Municipality can provide them with electricity then there will be less indoor air pollution.

The finding indicated that the community of Lacey Road is not doing much to alleviate indoor air pollution risks. This might be the reason that they are not aware of the indoor air pollution effects. Another reason is that they do not have alternative energy sources they can use other than the ones they are utilising now due to cost factors.

5.5.6   Health Strategies

The community of Lacey Road visit clinics like Sydenham Height Clinic and Overport Clinic. While others go to Addington Hospital and some go to nearby doctors for healthcare services in order to cure the diseases they are suffering from. Other than that nothing is done in order to address health risks associated with the poor environmental conditions associated with living in the settlement. Education and trainings can also reduce the level of health risks. One of the respondents stated that past years there used to be care givers from the settlement who volunteered to visits people who are sick and assist them (home base care). The information gathered shows that health risks is linked to all risks that discussed above. In this case, it is significant to address all the risks associated with informal settlement in order to reduce the level of health impact.

5.6   FINDINGS FROM THE MUNICIPAL OFFICIALS (INTERVIEWS)

The following section will discuss the findings gathered during interviews of the key informants. Interviews were done in order to compare the information given by the Municipal officials and the community of Lacey Road. This section also indicates what is it that the eThekwini Municipality has done or plan to do in assisting informal dwellers to reduce the risks they are faced with.

5.6.1   Municipality Officials' Diagnosis of the Situation

It is imperative to understand the contributing factors or forces linking social change, environment and development. Interviews were conducted with the various departments involved with informal settlements particularly with Lacey Road.   The following officials of different departments at eThekwini Municipality were interviewed:

- Human settlements Manager
- Environmental Health Officer
- Statistics Manager (Environmental Health)
- Disaster Management
- Senior Education Officer (Department of Water Affairs-Water and Sanitation)

According to the Human Settlement manager there are about 597 informal settlements within the eThekwini Municipality boundaries that are registered or that are in the Municipality's records

including Lacey Road. Living conditions in informal settlements are not good due to that those houses are clustered and overcrowded. In such conditions ablution facilities are not easy to provide. There is high unemployment rate which result to poverty. In all the informal settlements there are common risks. Lots of hazards results from lack of basic services or needs. Lacey Road seem to be better compared to other informal settlement. Department of Environmental Affairs confirms that *"Lacey Road is more vulnerable to fire, personal hygiene, waste management and paraffin problems" (Interview 1, 25/09/2009).*

5.6.2   Planning for Informal Settlements

The households of Lacey Road believe that if the Municipality can provide them with infrastructure and basic services like proper houses, high quality water, proper sanitation and electricity then the risks they are experiencing can be reduced. According to the Municipality's plans Lacey Road will be upgraded. So upgrading of Lacey Road informal settlement could be the best strategy to address some of the risks they are facing like fire. UN-HABITAT (2009) states that planning can ensure that slum upgrading programmes are participatory. UN-HABITAT (2009:13) posits that "planning can also ensure that slum upgrading programmes are community led, negotiated and participatory in order to avoid conflicts and safeguard the livelihoods of the poor"**.**

The officials have argued that one of the ways to prevent environmental risks is to do away with informal settlements. The issue is that, it is not possible not to have informal settlements in this world especially this country. Prohibiting informal settlements as a strategy will simply not work and there is clear evidence from the international and local literature to support this and yet this is a response that the municipality supports. In other words they illegalize the informal settlements and they are trying to stop the new occurrence or building of the informal settlements. The officials pointed out that RDP houses are built by the government and that is one way they are trying to deal with informal settlements. In addition, the problem is that informal settlements are increasing each day.

According to the officials, it is difficult to talk about mitigating environmental risks within informal settlements since people are more vulnerable and poverty stricken. One of the ways to lessen risks within Lacey Road informal settlement is to educate the community in terms of hazards like fire as to how they can reduce hazards that are susceptible to dangers. The officials have indicated that there are workshops that are being organised for people living in informal settlements. For example, in

the case of paraffin they do health education programmes which teach people the importance of keeping paraffin in a safe place especially for children.

With regards to the issue of fire, one of the officials said that the municipality tries to find the number of households that lost their belongings due to the occurrence of fire then assist them by providing temporal locations like tents and food or relocate them. There are some NGOs that also help by providing food parcels. There is an NGO called Red Cross which usually provides people with blankets. In this case the municipality also draws in the relevant departments to help like the Fire Brigades to come to the rescue in the scene to help extinguish the fire (Interview, 25/09/09).

One of the strategies the official suggested is to build houses with corrugated iron sheets. There is an area called Emathinini which is built with corrugated iron sheets in order to reduce fire threat (easily spread of fire) to informal settlements. The question to be posed is that, is it sustainable? The problem or the challenge that the people living in informal settlement have is that, they are sustainable depended especially to the local government to be provided with resources. They do not become innovative and take initiative to issues that concerns them.

The DSW manager suggested that one way to reduce risks is to:

- Educate people about associated risks;
- Proper building practice (houses);
- Have spaces between houses in order to avoid the easily spread of fire;
- Buy fire extinguishers so that if a fire breaks out the community members will easily get rid of it at an early stage; and.
- There should be sand buckets all over the community.

The other strategy employed by the municipality in order to reduce environmental risks is moving people to transect camps. These are temporal places which then later they are moved to starter homes or RDP houses. In terms of who get removed first, the environment determines who is going first. The size of the population also detects who should be moved or stays in informal settlements. Most people that are next to river banks, wetland areas and disable are the ones that are being relocated first (Interview, 25/09/09).

In terms of waste removal in Lacey Road, it is the responsibility of the eThekwini Municipality (DSW) to collect refuse. There is a waste vehicle that is usually being put in informal settlements in order for people to put their garbage in. Plastic bags are also distributed among people so that they are able to put their rubbish. The problem is that they throw their garbage all over the settlement which contributes towards degrading the environment and longer terms results in the spread of disease.

The municipality built more running water toilet which are called communal toilets. The official from the Department of Water Affairs stressed that there are new ablution facilities that they put in Lacey Road and they are planning to refurbish the old ones. In addition, the respondents indicated that this is an interim solution they provide while people are waiting for development. The survey shows that there are plans in place but they take much time to be implemented.

Consultation is significant when it comes to development issues. Community participation which is one of the key components of the IDP is crucial to be taken into consideration. The officials stated that community members are consulted but most of the time they do not come to their meetings. One of the responded who is in the committee of Lacey Road concurs by saying that not all of community members show up when there are community meetings. In this regard planning in informal settlements should be participative, community led and consultative.

5.6.3   Challenges Faced by the Municipality Regarding Informal Settlements (Lacey Road)

Informal settlements are increasing and it is difficult for the Municipality to keep up with their pace in terms of providing services to those areas. The municipal officials point out that they prioritise in terms of providing alternative and better houses to people in informal settlements. According to the Environmental Health Official Lacey Road is the least of their concerns because it is not situated in worse area. Furthermore, the municipality give priority to those people who are living for example near flood plains and in worse conditions. The challenge that is faced by the municipality is to deal with the increase of informal settlements. Hindson and McCarthy (1994) justify this by saying that Informal settlements are here to stay for the next decade and beyond. Lacey Road informal settlement dwellers are increasing every year. It shows that informal settlements have become the norm of urban existence (Rely et al, 2007) and have remained part of urban life. This is the result of economic, social and political forces. Bryant (1998:80) argues that "politics should be `put first' in the attempt to understand how human environment interaction may be linked to the spread of environmental degradation". Stott and Sullivan in Robbins (2004) argue that it is political ecology

approach that is identified as political circumstances that forced people into activities which caused environmental depletion in the absence of alternatives. Due to power relationships people are forced by situation to live in undesirable environment. So, planners need to take the initiative and formalise the informal.

The other challenge that is faced by the municipalities is the provision of basic services to these informal settlements. Since informal settlements are not planned, they are overcrowded and they do not have space for infrastructure such as proper sanitation and sewage. In such cases, it is difficult for the municipality to provide services for such community.

5.6.4   Comparative Reponses between Municipality and Lacey Road Members

Having discussed the findings from the Municipality and from the members of the community, both understand environmental problems associated with living in informal settlements. Community of Lacey Road and the Municipality are both trying to find ways to mitigate environmental risks being experienced in living in informal settlements. The community of Lacey Road agree that the municipality do provide some services for to them.

In contrast, the municipal officials argue that they provide different programmes to the community of Lacey Road so make them aware of the environmental risks and how they can minimise them whereas the community members says that there are no programmes or workshop conducted by the eThekwini Municipality. This contradicts with the information given by the community members because they mentioned that the officials came once and they have never done the follow up. The problem is that the officials pretend as if there is a lot that is done by the municipality in order to improve the lives of the people in informal settlements whereas there is less that is being done by them. Concentration is much more on the formal houses which are paying for rates and services that they are provided with. The poor are being left poor. In an article written by one of the residents of Lacey Road, Mduduzi Hlongwa (2007) he clearly asks the question "when will voices of the poor be heard?" This is due to the fact that poor people from informal settlements are not heard and they are not part of their development. The community of Lacey Road is concerned about that their rights are not met or taken to consideration.

5.7   CONCLUSION

The survey indicates that living conditions in informal settlements are very harsh. People are overcrowded and they lack basic needs such as potable water, electricity and proper sanitation. Due to lack of basic services people are exposed to different environmental risks such as waste disposal, floods and environmental health risks. In terms of mitigation strategies little has been done by the households as they are more concerned with their livelihood than the mitigation strategies.

People are aware of the condition they are living in. They are aware that they live in vulnerable areas but the issue is that they do not have an alternative option to resort to. It is clear that little has been done by the municipal government to support informal settlements especially in mitigating environmental risks. Living conditions in Lacey Road are not satisfying but affect the health of the people living in the area and also degrade the environment.

In terms of the officials they are aware of living conditions in informal settlements but little has been done to support the community or they have done little to address such conditions. They do have plans on how they can assist the community of Lacey Road but service delivery is too slow. The results show that there are contradictions in terms of information given by the officials and households. Official's plans are presented as if they have already implemented them. The municipality together with the councillor should work with the community of Lacey Road to address the risks that they are experiencing.

Having analysed the data collected, a conclusion and recommendations will be drawn from the findings.

CHAPTER 6:   RECOMMENDATIONS AND CONCLUSION

6.1   INTRODUCTION

The overall aim of this study was to understand the interface between environmental risk management and sustainable livelihoods within informal settlements in Lacey Road, Sydenham. Based on the purpose of the study the objectives were:

- To identify the environmental risks in Lacey Road informal settlement
- To examine the living conditions of people in the Lacey Road informal settlement
- To understand household strategies used to mitigate environmental risks

This chapter summarises findings based on the objectives above. It will also provide a conclusion for this study in relation to the findings. Recommendations are made in the light of the findings, which might be of use in the debates towards environmental risks and mitigation strategies in informal areas particularly Lacey Road in Sydenham. The overall conclusion will also be discussed in this section.

Planning and development of informal settlements are driven largely by financial and political constraints with little attention being paid to the social and environmental aspects of informal areas (Oelofse, 1999). People living in informal settlements they live in areas where it is not conducive for human settlements for example in steep slopes, near or on floodplains and so on. Lacey Road informal settlement has high water table which makes the community more vulnerable to flood risks. Population in Lacey Road is dense and people are overcrowded which makes them more vulnerable to environmental risks and diseases. A lack of service delivery also contributes to the harsh living conditions of this settlement.

Through this study, it has been concluded that informal settlements are vulnerable to risks. This is due to the lack of services or basic needs in informal settlements that results in a number of hazards or that are threatening people's lives. The community of Lacey Road is vulnerable to environmental risks like health risks due to the conditions they are faced with, within the area. The reason is that, most people in the community are using paraffin stoves and other fossil fuel which threaten their lives. This community is exposed to indoor air pollution due to the utilization of hazardous gases.

The use of these dangerous fuels also results to fire risks which is the key risks that is most common to all the informal settlements. Lacey Road informal settlement is also exposed to fire risks due to the carelessness of the members of the community. They leave candles and stoves unattended after they are drunk.

The Lacey Road community is also vulnerable to floods. From the findings, it apparent that a large parts of the area have high water table. So, during rainy season water seep up from underground and cause problems to the households. People loose all their belongings during flood incidents. Sometimes they have to relocate or rebuild their homes.

The results show that the Lacey Road households are exposed to waste disposal which is caused by a lack of attendance of it. Refuse in this community is sometimes not collected by the Department of Waste Management. The community has opened their own dumping sites within the area which are not managed. This has resulted to the negative impact of the community's health and the environment.

There are various strategies that the community are employing to reduce environmental risks they are exposed to. A lack of infrastructure and basic services like electricity, proper sanitation and high water table makes this community more vulnerable to different types of risks. So, it has been suggested that the provision of basic services to Lacey Road community can reduce their vulnerability. Effective and collaboration of the committee members, the councillor and the municipality working together with the members of the community to improve the area or to develop this community can also mitigate the risks this community is exposed to. From the Municipalities' side, education programmes and campaigns are the best strategies whereby informal dwellers are informed about risks they are exposed to and how they can prevent or reduce them. These strategies still need to be implemented by the various departments in the municipality.

From the literature, it is clear that informal settlements are here to stay. In other words informality is reality. What can be done in terms of accepting it and what can be done to make the city administration more inclusive and make life better for all? To what extent do the planners can deal with informality? Recommendation or proposition will assist in terms of answering the above questions.

6.2 RECOMMENDATION

The survey indicates that the Lacey Road informal settlement experiences different types of environmental risks. This is the results of geographical location of the informal settlement and lack of adequate provision of basic services. In addition, informal dwellers also contribute to their vulnerability to the risks they are exposed to, due to their activities they practice. The following recommendations are suggested in order to assist them to adapt, cope and mitigate the risks they are faced with.

6.2.1 Community Participation or Involvement

The participation of the community whose lives and property are at risks is imperative. The community feels it is someone else's responsibility to manage and reduce their risk. For sustainable management of risk the community needs to have control. The community of Lacey Road should be involved in any development that takes place in their area. Being involved and participating in the decision making will empower the community to be responsible in mitigating and adapting to any risks that they are faced with or exposed to. In other words community participation must be emphasised and therefore adoption of a participatory development approach is essential in accomplishing a vulnerability reduction plan. Community involvement will assist the municipality to deliver services that are the priority of the people in Lacey Road. So, there is a need for an integrated approach which will address physical, social and economic development needs of informal dwellers. An appropriate development intervention is crucial in order to reduce environmental risks in Lacey Road informal settlements.

Even where the community is involved in strategies to improve their quality of life, government, private and civil society should take initiative in mitigating risks and vulnerability in informal settlements. Furthermore, local government can try to find ways to organize the community and provide a channel through which to address the underlying causes of vulnerability through a community based risks management programme. At first they should understand the existing livelihood strategies of the people, so that resilience can be built in the long run. In other words the municipality should find means to strengthen resistance of the informal dwellers against negative impacts of environmental risks. In this regards, informal settlements communities should be part of the decision making process that will affect their lives.

Education and trainings programmes related to environmental risks at Lacey Road should be conducted by relevant departments and stakeholders. The municipality should promote self-management by empowering communities to administer their own settlement. This may include community control of the tenure system. There should be a creation of an effective governance framework that joins all key sectors across various fields and empowers voices of the marginalized group. There should be a promotion of strong community structures within settlements with a view to instilling systems and procedures that are aligned with the principles of development.

6.2.2   Provision of Basic Services

The results depicted that Lacey Road community lacks some of the basic services. Local government or the municipality should ensure that proper sanitation and provision of quality water exist in informal settlements. The Constitution says that everyone has a right to proper housing and to basic services. The Lacey Road informal settlement needs basic services in order to cope with risks that arise in the area. This implies that there should be proper provision of infrastructure to reduce vulnerability in future. Garbage should be maintained and be collected regularly each week. This will reduce the diseases that are caused by wastes that are left unattended and are all over the place.

The needs of the people in Informal settlements particularly in Lacey Road should be addressed. Informal settlements should be part of the government's priority to reduce vulnerability, people are exposed to. Job opportunities should be created for people living in Lacey Road informal settlement. For example, the local government can generate jobs opportunities for informal dwellers by assisting in providing municipal services such as solid waste removal. This can also increase independency among the people of Lacey Road.

6.2.3   Upgrading of Informal Settlements/ Relocation

One way of improving the Lacey Road informal settlement is through community led upgrading of informal settlement. At first glance, there is a need for inspection to ascertain if the area is suitable for development as a whole or in parts. Since the area has high water table, water might be drained to reduce flood risks. Smit (2006: 123) argues that "upgrading of informal settlements should not be

about the eviction or eradication of shacks, but should be about understanding people's existing circumstances and contributing towards improving people's lives in a meaningful way". Informal settlements are a manifestation of urban poverty; there is a need for regularization and upgrading interventions to focus more on the livelihoods of the urban poor and their coping strategies. Lacey Road informal settlement needs to be upgraded in order to ensure its sustainability. In addition, the municipality should recognize that housing initiative alone does not solve the problem but there is a need for them to create sustainable and integrated environments.

If the area is not suitable for development, the community of Lacey Road should be relocated in areas where there are less or no risks. Housing delivery has been very slow and not up to standard for living. Local government should come up with a plan that will deal with risks as well as developing programmes in solving housing backlog that the country is facing. People should be part of their development all the time. Where people are relocated, they should engage them throughout the whole process. This will benefit the community in terms of not to be located in remote areas and where there are no facilities and opportunities. The provision of services should be ensured and there should be placed in proper houses as the constitution gives them rights to be housed in appropriate houses. Risks can be reduced not only by limiting the encroachment of residential areas onto hazardous sites, but also by reducing the vulnerable settlements. In this case, relocating people should be the aim of making their lives better but not of worsening their situation. To keep people in the new settlements, the provision of appropriate infrastructure to support people's livelihoods is significant.

6.2.4   Planning Interventions

Addressing the problems of informal settlements requires better understanding of the driving forces contributing to their expansion and growth. Planning has a critical role in defining the appropriate strategies to respond to the existing informal settlement's challenge. It can also strengthen the capacity to manage natural and human-made disasters, increase the capacity for disaster prevention and mitigation, and strengthen coordination and networking among communities, non-governmental organizations (NGOs), governments and external support organizations in addressing disaster-related activities. In terms of planning intervention, planners have to take informal settlement into consideration. There is a need for the management of informal settlements in order to reduce environmental risks and improve their quality if life. Proper land use should be provided when planning for people living in informal settlements.

6.2.5   Effective Planning Legislation (Policy)

There is a need for effective planning legislation so that informal settlements will provide safe and secure shelters and the negative environmental consequences of informal settlements will be minimized. Planning legislation should be effective and implementable. In other words, effective planning legislation must be established in order to ensure that informal settlements are able to provide safe and healthy environments. Policy makers should move from responding to disaster but embarking on approaches that prevent disaster from occurring through risks and mitigation strategies that involve community members. Policy must prioritize vulnerability mitigation measures that address the root causes of vulnerability to hazards through a proactive way.   One other way to address problems associated with informal settlements is through the adoption of comprehensive integrated solutions and also applies a range of policy tools that comprise of social, economic, environmental, political and spatial planning simultaneously.

Government is the custodian of standards, so they need to revise their standards because they are not appropriate for our own realities (informal settlement). The government needs to ensure that they bring awareness, be inclusive and mobilize resources especially for people living in informal settlement.

6.2.6   Environmental and Planning Education

It is essential to provide settlement residents with information they need to prepare and respond to risks at a community and individual level. Environmental education equips the communities with necessary skills to make decisions as well as motivation to participate in environmental management. It makes people aware of the importance of their relationship with the environment with the hope that such awareness would lead to concern. The results have shown that the local departments have programmes and plans that might reduce risks in informal settlements. The problem is the implementation of those programmes. Provincial and local government departments need to ensure that programmes planned for informal settlements are put into practice so that risks can be minimized. Workshops which are meant to educate people in informal settlements should be implemented. People need also to be educated about the importance of the environment so that they will not degrade the environment. In other words knowledge, education and access to

information should be provided to people so that they will be able to minimize risks and impact to the environment.

Human beings are depleting their resources rapidly while the population increases at an alarming rate yet there is an utter lack of ecological education as part of a technical or social strategy in planning. It is the time to rectify the situation by implementing high quality environmental education. In other words environmental opportunities need to be maximized and constraints need to be minimized so as to reduce the vulnerability of Lacey Road informal settlement. Environmental management and social development should be integrated in development plans.

6.3   CONCLUSION/ OVERALL SUMMARY

Urbanization and migration have increased the number of informal settlements particularly, in cities. Informal settlements are the results of apartheid and current polices. People living in informal settlements usually live in harsh conditions. Most informal settlements are located in very sensitive areas. Materials being used to build informal dwellings are flammable, which makes them more vulnerable to fire risks. This is due to that these dwellings are established outside of the formal process. Since these settlements are unplanned people living in them are exposed to variety of risks. In most cases, informal settlements lack basic services such as quality water, electricity and proper sanitation. These problems associated with informal settlements have not been systematically addressed and responsibilities remain fragmented. Furthermore, people have been neglected in a wider urban and social development practices.

There is lack of effective and appropriate policies that deal with informal settlements. Napier and Rubin (2002) put forward the point that planning policies and practices that shape the location and amount of serviced urban land being released are failing to keep pace with demand, thus forcing many households to continue to settle on land which is exposed to hazards and live in settlements that are unsafe. This implies that there is lack in terms of policy implementation and effective policies that focused on improving living conditions of informal dwellers. There is a need to challenge the norms and standards which exclude the informality.

Lacey Road informal settlement is exposed to a number of risks. They are vulnerable to garbage, fire, floods, and indoor air pollution and associated health risks. This indicates that Lacey Road is associated with both natural and built environmental problems. Some of these risks are caused by

the geographical area they are living in. It is argued that a community's capacity to absorb the impact of a hazard event and recover from it is determined by its geographical location. Little has been done to mitigate these risks in this informal settlement. This is due to that people are poor so they focus more on their livelihoods compared to mitigating risks they are exposed to. Living conditions of informal settlements are known in terms of risks they are associated to but still there is lack of preparedness.

Political ecology and vulnerability approach informed this study. Political ecology approach was utilized in this study to explain environmental problems due to the interaction of biophysical environment, humans and political systems. Vulnerability approach identified ways in which people cope and adapt to risks. The relationship between human activities and environmental degradation reflects the way in which people affect the natural and social environment. This in turn results to poor quality of life of people. So, it is imperative to understand the contributing factors or forces linking social change, environment and development. These approaches are the result of human relations with environment which is a consequence to hazards and makes people more vulnerable to risks. Few (2003) argues that one key to enhance community capacity to reduce vulnerability to shocks, is to foster exchange of information and experience between communities.

Different factors contribute to the occurrences of different environmental risks like, economic factors, social factors, physical factors, political factors and environmental factors. The factors that exacerbate vulnerability and risks in informal settlement need to be taken into account and be addressed. Different strategies can be employed in the household level in order to reduce different environmental risks. The emphasis, as indicated earlier, of reducing environmental risks is on the integration and the intervention of the community to take initiative. In addition, local government needs to have better understanding of the means to strengthen resistance/resilience of the poor against the impacts of environmental hazards.

The research findings indicated that little has been done by the households and the municipality in the case of Lacey Road. Households are more concerned with their livelihoods since they are poor. The study shows that although the municipality does have plans in place, the problem is the implementation. There is a need for the municipality to stop being reactive and to become proactive. Current policy approaches and guidelines need to be reviewed and implemented effectively in order to improve the quality of life for informal dwellers particularly Lacey Road.

In terms of mitigation strategies there should be campaigns and workshops conducted by the municipality in relation to environmental risks being experienced in informal settlements. Provision of infrastructure and basic services can play a crucial role in the adaptation and reduction of vulnerability of informal dwellers. The upgrading of informal settlements is also one of the planning approaches that could be employed to reduce risks and hazards in poor housing conditions. There is a need for effective planning legislation in order to control the use of land and the provision of services to the poor. Furthermore, there should be planning intervention in areas where there are informal settlements. Early warning systems or rehabilitation strategies have to be carefully planned and the basic causes should be addressed.

It is acknowledged that every informal settlement has its own dynamics and this specificity needs to taken into account when considering environmental aspects of these settlements and how residents engage with them. The continued growth of informal settlement in cities is part of the current challenge being confronted by planners and housing specialists alike and needs to be viewed against the broader background of accepting urbanization. It is a complex issues and not one that can be addressed in this dissertation although aspects of the debate have been touched on. In the final analysis, this research set out to answer the question, how do households and the community at large in Lacey Road, informal settlement responds to environmental risks? It has shown that Lacey Road community has strategies that they employ to reduce their vulnerability to risks even though there are not much.

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APPENDICES

Household Strategies in mitigating environmental risks in informal settlements: the case study of Lacey Road in Sydenham, Durban

A.   COMMUNITY DETAILS

1. Name of an area_____
2. Location_____

B.   RESPONDENT'S BACKGROUND

1.   Gender

Male	1
Female	2

2.   Age

≤20	21-30	31-40	41-50	51+
1	2	3	4	5

3.   Marital Status

Married	Single	Divorced	Widowed	Other
1	2	3	4	5

4.   Home Language

Language	Zulu	English	Xhosa	Other
Code	1	2	3	4

5.   Highest level of Education

No schooling	Primary	Secondary	Tertiary
1	2	3	4

6.   How long have you been living in the area?

Years	Code
<5	1
6-10	2
11-15	3
16+	4

7.   Are you the registered owner of this house?

Yes	No
1	2

8.   If no what tenure arrangements do you have?

9. Employment Status*?*

Still at school	Unemployed	Employed	Self Employed	Other
1	2	3	4	5

10. Type of Work?

_____

C: THE LIVING CONDITIONS OF PEOPLE IN INFORMAL SETTLEMENTS

11. How are the conditions of living in this informal settlement?

Very bad	Bad	Satisfactory	Good	Very good
1	2	3	4	5

12. Explain in detail the living conditions.

_____
_____
_____
_____

13. Why did you come and settle in this area?

_____
_____
_____
_____

14. Are there any problems you are experiencing on living in this informal settlement?

Yes	1	No	2

15. If "Yes", please explain

_____

_____

_____

_____

16. If your answer to (13) is "No", please substantiate?

_____

_____

_____

_____

17. Do you have access to water, sanitation and electricity in the area? Explain?
_____

_____

_____

_____

18. How often are the awareness campaigns done on healthy living in your area?

Awareness Campaign	Once a year	Three Times a year	Often
Cleaning Campaign	1	2	3
Clean Water Campaign	1	2	3
Healthy Food Campaigns	1	2	3
Child Health Care Campaigns	1	2	3

19. Do you find them useful?

Yes	1	No	2

20. What measures have you taken to alert others about the dangers that might be caused by these environmental risks?

_____

_____

_____

_____

21. Are there any plans to upgrade this informal settlement?

_____

_____

_____

_____

D. The environmental risks in informal areas

22. What types of environmental risks exist in your area?

Environmental Risk	Yes	No	Code
Shack Fires			1
Diseases (Waste disposal)			2
Floods			3
Other natural disasters			4
Veldt Fires			5
Other/ Specify			6

23. What type of environmental risks you have experienced since you started to live in this area.

_____

_____

_____

_____

24. What are the causes of those environmental risks?

Environmental Risk	Code
Shack Fires	1
Diseases (waste disposal)	2
Floods/ Natural disasters	3
Veldt Fires	4
Other/ Specify	5

_____

_____

_____

_____

25. What are the impacts of these risks at a household level?

_____

_____

_____

_____

27. To what extent do these risks occur?

More likely	Likely	Less Likely
1	2	3

E. The Strategies to Mitigate Environmental Risks

26.   Who should be responsible for the mitigation of the environmental risks in your area?

_____

_____

_____

_____

28.   In what way do you respond to risks that you have experienced in your area?

_____

_____

_____

_____

27.   In what way do you respond to risks that you have experienced in your area?

_____

_____

_____

_____

28.   What can be done to avoid those risks from accumulating?

_____

_____

_____

_____

29. How can planning interventions improve or reduce environmental risks in informal settlements?

_____

_____

_____

_____

30. What changes would make your area safer?

_____

_____

_____

_____

Thank you for your cooperation

APPENDIX C: INTERVIEWS

Interview Questions

1.   What are the conditions in informal settlements particularly Lacey Road.

_____

_____

_____

_____

2.   Are there any problems they are experiencing?

_____

_____

_____

_____

3.   What measures has been taken to deal with those problems?

_____

_____

_____

_____

4.   Do they have access to water, sanitation and electricity in the area? Explain?

_____

_____

_____

_____

5. Are there any plans to upgrade this informal settlement?

_____

_____

_____

_____

6. What types of environmental risks exist in informal settlement (Lacey Road)?

_____

_____

_____

_____

7. What are the causes of those environmental risks?

_____

_____

_____

_____

8. Who should be responsible in mitigating those risks?

_____

_____

_____

_____

9. What is the department's intervention in assisting people to reduce their vulnerability?

_____

_____

_____

_____

10.   What can be done to avoid those risks from accumulating?

_____

_____

_____

_____

11.   How can planning interventions improve or reduce environmental risks in informal settlements?

_____

_____

_____

_____

Thank you for your cooperation