IMPROVING INTEGRATED WASTE MANAGEMENT WITH COMMUNITY EDUCATION PROGRAMMES: THE CASE OF NEW BRIGHTON IN THE NELSON MANDELA BAY MUNICIPALITY

By

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DECLARATION

I, Bulelwa Avril Adams, student no 210040092, hereby declare that the work contained in this dissertation is my own original work and that to the best of my knowledge this work has not been previously submitted in full or partial fulfilment of any equivalent or higher qualification at any recognised institution.

Signature:

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Date: January 2015

DEDICATION

This dissertation is dedicated to my late parents Nompumelelo Tryphina Ngwabeni and Edmund Bhongolakhe Ngwabeni who did not live long enough to share the joys of their toils. May their souls rest in peace. ‘’Ndiyabulela Mazikhali, Jojo, Tiyeka nawe Msuthu, Gubevu, Nokhala, Maduna.”

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ABSTRACT

Municipal solid waste management is gradually becoming a major challenge that is confronting governments in all spheres. This can be attributed to urbanisation and startling population escalation. Each and every member in a community is a contributor to this dilemma and a generator of waste. The essence of this study is to investigate whether the utilisation of education programmes can assist to improve how communities handle and dispose their household waste and its contribution to the effectiveness of the integrated solid waste management system for the New Brighton Township in the Nelson Mandela Bay Municipality.

A theoretical framework is developed using the systems theory in trying to address the challenge. The study used the qualitative research method. Data were gathered using questionnaires and face-to face interviews.

The empirical survey was employed for the purposes of the study and the interpretation of the research findings were analysed and described. As a metropolitan municipality, it is envisaged that this research will assist the NMBM, to identify how to manage solid waste efficiently and effectively and thus enhancing service delivery that will ensure communities of their well-being and dignity. Various recommendations are presented, based on the findings of the study.

It is hoped that these recommendations If are adopted, the NMBM will be able to deal more effectively and efficiently with the challenges that the NMBM is faced with in dealing with waste management issues thereby enabling the NMBM to deliver the most basic need to the communities of the New Brighton Townships.

LIST OF ABREVIATIONS

NMBM	Nelson Mandela Bay Municipality
IDP	Integrated Development Plan
DEAT	Department of Environmental Affairs and Tourism
MSW	Municipal Solid Waste
ISWM	Integrated Solid Waste Management
NEMA	National Environmental Management Act
NEMWA	National Environmental Management Waste Act
NDWCS	National Domestic Waste Collection Standards
EPA	Environmental Pollution Act
IWMP	Integrated Waste Management Plan

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CHAPTER ONE

OVERVIEW OF THE STUDY

1.1 INTRODUCTION

This study investigated the utilisation of education programmes to improve community handling and disposal of household waste and its contribution to the effectiveness of integrated solid waste management system for the New Brighton Township in the Nelson Mandela Bay Municipality. Managing household solid waste in a community as an integrated system includes the co-ordination of various processes and stages that are interdependent for effectiveness. The responsibility of communities and households on waste reduction, proper handling of generated waste, the collection and final disposal management by the municipal authority are important parts of any effective integrated municipal waste management system. According to the *White Paper on Integrated Pollution and Waste Management for South Africa* (2000) modern integrated waste management requires education and information sharing including the adoption of a set of appropriate technologies. It can therefore be inferred that the process requires partnership between communities and the municipality for the effective management of household waste.

According to the NMBM IDP (2013-14:270) the municipality renders refuse collection services as part of the integrated waste management system to all residents of the metropolitan municipal area in accordance with the *National Waste Management Act* 2008 (Act 59 of 2008) by providing *inter alia* the following services:

i. Weekly kerbside black bag collection services in medium to high income areas;
ii. Bi-weekly kerbside wheely-bin collection services in low to medium income areas; and
iii. Weekly communal collection services in informal areas.

The NMBM IDP (2013-14:270) document states that ten bags are provided to households every two months, and in addition, the municipality undertakes the removal of illegal dumping on municipal owned land as well as the removal of carcasses within residential areas. There are factors that directly or indirectly influence the integrated waste management system in a municipality, these include: natural environmental concerns, social norms and associated concerns, economic factors, historical influences, political contexts, local, regional and national legislation, institutional factors, educational factors, technological developments, human resource deployment and financial constraints. These, combined, bring to the fore the challenges associated with achieving an effective integrated waste management system in the municipality and specifically in the New Brighton Township. Information sharing, education, public engagement to encourage not only compliance with legislation, but also waste minimisation, handling and proper disposal of household waste could stimulate partnerships and engagement with various communities, needs to be formalised as part of the integrated waste management system.

According to the NMBM IDP (2012-2014) the New Brighton Township area falls within the classification of low to middle income area which receives fortnightly kerbside wheely-bin collection service. However, journalist, Lizeka Tandwa, in an article in the Port Elizabeth Express (May 14, 2014:1-2) states that '*The (Nelson Mandela Bay) Municipality has decided to increase the frequency of refuse collection in the low to medium income areas as the fortnightly service the areas currently receive does not cater adequately for the average amount of waste generated by the households*' (See Annexure 6).This article in the newspaper also reports incidents of 'illegal dumping' of waste in the communities and children playing in such dumping sites.

The Metropolitan Municipality's response is to increase the frequency of collection and the acquisition of more refuse collection trucks. It is argued that in an integrated system of waste management, the traditional 'end-of pipe' approach which tends to focus on managing the disposal of generated waste is not adequate. It is also necessary to give more attention to community education and the avoidance and reduction of waste generation, handling by households and the manner of disposal in

communities as an integral part of the hierarchy of integrated waste management. Using the New Brighton Township as the area of study, this research intends to examine how education and awareness programmes would improve the effectiveness of the integrated waste management system in the Nelson Mandela Bay Municipality.

1.2 CLARIFICATION OF CONCEPTS

The following concepts are explained and clarified as they will be used in this research:

1.2.1 Solid waste

According to Moeller (2005:217) solid waste is defined as “any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities”.

1.2.1.1 Municipal Solid Waste

Municipal Solid Waste (MSW) is the garbage that citizens produce in their homes and where they work. The word “municipal” means anything that is operated and controlled by elected local officials such as a city or county government. Usually MSW refers to what we throw away each day in our cities and towns. MSW contains all kinds of garbage including newspapers, yard waste, old appliances, household garbage, used furniture and just about anything one can think of that people throw away at home, schools and business (www.tnswep.ra.utk.edu).

1.2.1.2 Illegal dumping

Illegal dumping refers to the dumping of large items of rubbish in public areas such

as roadsides or illegal landfills- private land where waste is dumped without Council's approval (www.unep.or.jp/ietc/publications/spc/iswmplan).

1.2.1.3 Management

Management is defined as the execution of planned controls to achieve the desired outcome (Fuggle & Rabie 1992:11).

1.2.1.4 Environment

According to Hugo 2004:26, the environment is defined as the sum of surrounding elements, influences and situations which affect the life and the habitat of both an individual organism and a collection of organisms.

1.3 WASTE CATEGORIES

According to Reddy (2011:4-9), solid waste generated by communities can be categorised as follows:

1.3.1 Household Waste

These waste categories could be hazardous or non-hazardous. Non-hazardous household solid waste consist of garbage or rubbish (cans, bottles, clothing, compost, disposables, food scraps, packaging, newsprint, food, yard trimmings) that originate from private homes or high density housing areas. Hazardous household wastes are items such as fluorescent bulbs, batteries, some cleaning detergents, electronic waste, paints, pesticides and oils.

1.3.2 Industrial Wastes

These are non-hazardous solid materials discarded from manufacturing processes and industrial operations, and are not considered as municipal wastes. However,

solid wastes from small industrial plants and ash from power plants are frequently disposed of at municipal landfills.

1.3.3 Hazardous Wastes

The waste that is dangerous or potentially harmful to human health or the environment which can be in the form of liquids, solids, gases or sludge.

1.3.4 Medical Wastes

Refers to waste materials generated at health care facilities, such as hospitals clinics, physician's offices, dental practices, blood banks and veterinary hospitals or clinics. E-waste: is referred to the end-of-life of electronic and telecommunication equipment as well as consumer electronics. These are computers, laptops, television sets and mobile phones.

1.4 PROBLEM STATEMENT

This study, however, specifically concentrates on the generation, handling and disposal of household waste in the community as part of the overall waste management system. The problem for this study relates to the utilisation of education and awareness programmes to improve the minimisation, reduction, handling and disposal of household waste in the New Brighton Township of the NMBM as part of the integrated waste management.

1.5 RESEARCH QUESTIONS

The main research question is the extent to which education programmes on appropriate handling of household waste can be utilised to improve the effectiveness of proposed system of integrated waste management in the Nelson Mandela Bay Municipality.

1.5.1 Secondary research questions

The following secondary research questions are also proposed:

- What influence does uncontrolled and indiscriminate disposal of household waste have on the New Brighton communities?
- The reasons as to why the community and households indiscriminately dispose of household refuse?
- Are there monitoring and evaluating strategies in place?
- How can Integrated Solid Waste Management be improved in NMBM?

1.6 AIM OF THE STUDY

According to Punch (2005:138) the aim of a study is a process to assess the effectiveness of the different actions in meeting the needs or solving problems. In this study, the aim is to analyse the implementation of the integrated solid waste management policies in the Nelson Mandela Bay Municipality and offer recommendations thus enhancing service delivery and increasing community satisfaction.

1.7 SIGNIFICANCE OF THE STUDY

Among the concerns identified by the researcher was the perception of improper management of waste and an increase in illegal dumping and littering in the Port Elizabeth townships, specifically the New Brighton Township. Therefore, the outcome and recommendations of the study will assist the Nelson Mandela Bay Municipality improve their mechanisms in managing solid waste. Secondly, it will assist the Municipality to identify the gaps and improve service delivery. Thirdly, the citizens as stakeholders will receive the service they deserve. Effective and efficient solid waste management will lead to cleaner and healthier environments in the NMBM.

1.8 OBJECTIVES OF THE STUDY

The following objectives have been set for this study:

i) To determine and analyse the processes and the hierarchy of integrated waste management system and its implementation in the Nelson Mandela Bay Municipality;
ii) To investigate and evaluate the handling of household waste and examine the reasons for inappropriate handling and disposal of household waste in the New Brighton Township of the Nelson Bay Metropolitan Municipality.
iii) To analyse the scope for the utilisation of education programmes on waste management and how this can influence community behaviour and attitude towards the handling and disposal of household waste.
iv) To draw conclusions and make recommendations on the utilisation of education programmes to improve the handling and disposal of household waste in the New Brighton Township.

1.9 LITERATURE REVIEW

According to Burns and Grove (2005:93), as quoted by Brink, van der Walt and van Rensburg *(*2012:70), a literature review is an organized written presentation of what has been published on a particular topic by scholars. It is further stated that the purpose of the review is to convey to the reader what is currently known about the topic of interest. In addition, a literature review explains and justifies how a topic investigated may help to answer some of the questions or gaps in the research area.

A review is a new examination of something with the possibility or intention to change it, if this is considered desirable. A literature review in a research study is generally prepared to put a research problem in context or to identify *gaps and weaknesses* in prior studies so as to justify a new study (Polit & Hungler, 1993:439). It is used to indicate the conceptual (and where required the legislative) and theoretical perspective as a framework within which the research problem is

analysed with view to making recommendations for solution or adding to the existing theory.

Reddy (2011:2) defines waste as any garbage or refuse or other discarded material including solid, liquid, semi fold, or contained gaseous material arising from domestic, community, industrial, commercial, agricultural or human operations. The sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility is also considered as waste. According to Moeller (2005:217) solid waste is defined as any garbage, refuse, sludge, from waste treatment plant, water supply treatment, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities.

(Kreith, 1994:17) describes solid waste as any of a wide variety of solid materials, as well as some liquids in containers, which are discarded or rejected as being spent, useless, worthless, or in excess, including contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from activities.

According to Hargerty, Pavoni and Heer (1973:4) solid wastes are classified as domestic, commercial, industrial, due to construction and demolition, agricultural, institutional, and miscellaneous. Many times domestic and commercial wastes are considered together as so called urban wastes. Included in this category are the garbage materials which results from food preparation both in the home and in restaurants, and also the rubbish which is produced in residences and commercial establishments. Hagerty *et al*. (1973:4) further argue that generally the garbage consists of rapidly decomposable materials while the rubbish is either slowly decomposable or non-degradable.

In order for the municipality to deal with the problem of waste management it needs to use the selection of a combination of techniques, technologies and management programs to achieve waste management objectives, this is called integrated waste management (El-Haggar 2007:2). According to Lens, Hamelers, Hoitink and Bidlingmaier (2004:6) the main waste handling technologies presently used are still

based on practices applied already in the past which are, waste separation, landfilling, combustion or incineration, biological treatment, and recovery for use in agriculture and in industry.

Reddy (2011:10) postulates that waste should be managed by different methods according to its characteristics. He further argues that the preference of the options represents the hierarchal structure. Thus, prevention, re -use and recycling are given the highest preference, while open burning is unacceptable. The hierarchy is designed to improve the environmental aspects of integrated solid waste management. The indication is that waste management is not a very new problem and that it is not unique to only developing countries but to developed countries as well. In fact waste management has become an international problem.

1.10 LEGISLATION ON WASTE MANAGEMENT IN SOUTH AFRICA

The list of statutes and policy instruments below indicates the importance of appropriate management of waste communities in the country and wide-spread nature of waste management. Generally, the objective of the suit of applicable legislation applicable to waste management is appropriate handling and disposal of waste.

Constitution of the Republic of South Africa, 1996
National Environmental Management Act 107 of 1998
National Environmental Management: Waste Act 59 of 2008
National Water Act 36 of 1998
National Health Act 61 of 2003
National Roads Traffic Act 93 of 1996
Hazardous Substances Act 15 of 1973
Atmospheric Pollution Prevention Act 45 of 1965
National Environment Management: Air Quality Act 39 of 2004
Local Government: Municipal Finance Management Act 56 of 2003
Local Government: Municipal Structures Act 117 of 1998
Local Government: Municipal Systems Act 32 of 2000

Occupational Health and Safety Act 85 of 1993

National Road Traffic Act 93 of 1996

Other Policies, Regulations and Standards

Minimum Requirements for waste disposal by landfill, 2nd Edition DWAF 1998

South African National Standards 0228

National Waste Management Strategy 2009

The discussion below will look at some of the legislations and their objectives. South Africa has made great strides in terms of environmental legislation since the 1980's by placing increasing emphasis on environmental sustainability and subsequent introduction of comprehensive environmental laws and regulations to simultaneously protect the environment and the public (Paralegal Advice, 2002; Visser, 2005). The most influential and widely referred to MSW legislation thus far has been the Environment Conservation Act No 107 of 1998 NEMA and the Municipal Systems Act no 32 of 2000. These augmented by the Department of Water Affairs and Forestry (hereinafter referred to as DWAF) guidelines for the minimum requirements for waste disposal by Landfill (1998) together with the white paper on integrated pollution and waste management for South Africa (2000), which still continues to exert considerable influence on MSW as a waste management policy (DEAT, 2000).

In South Africa there are a number of legislations and declarations that have been enacted to act as a guide to the waste management process in the country. First and foremost, the *Constitution of the Republic of South Africa*, 1996 (hereinafter *Constitution*, 1996) states that the people of South Africa have a right to live in an environment that is not detrimental to their health. It also ensures that this law is respected and is known by each and every citizen of the country. According to the *Constitution* 1996, local governments are responsible for waste management programmes within the various regions in the country (*Constitution*, 1996). This statement therefore clearly indicates that local governments are thus compelled to keep their environments clean at all costs.

1.10.1 The South African Constitution

The South African Constitution is the Supreme law of the land (Constitution of the Republic of South Africa, 1996). Section 24 of the Constitution guarantees everyone the right:

- To an environment that is not harmful to their health or wellbeing; and
- To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that;
- Prevent pollution and ecological degradation;
- Promote conservation; and
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

1.10.2 White Paper on Environmental Management

On 15 May 1998, the Department of Environmental Affairs and Tourism (DEAT) published the White Paper on Environmental Management (the Policy Document) being the government's national policy on environmental management. The policy document was published in Notice 749 of 1998 (Government Gazette No. 18894 of 15 May 1998). The purpose of the Policy Document is to inform the public of government's objectives in relation to environmental management; how it intends to achieve those objectives; to inform government agencies and state organs what their objectives are and to guide them in developing strategies to achieve those objectives. The word "environment" as it is used in the Policy Document refers to the biosphere in which people and other organisms live.

The environment consists of:

- Renewable and non-renewable natural resources such as air, water, land and all forms of life;
- Natural ecosystems and habitats and

- Ecosystems, habitats and spatial surroundings modified or constructed by people, including urbanised areas, agricultural and rural landscapes, places of cultural significance and the qualities that contribute to their value.

The Policy Document also seeks to ensure that environmental sustainability, health and safety are not compromised, and that natural and cultural resources are not endangered.

1.10.3 White Paper on Integrated Pollution and Waste Management

This White Paper was published in the General Notice 227 of 2000 (17 March 2000). The policy represents formal government policy regarding integrated pollution and waste management. Within this framework of the overarching goal, the following strategic goals apply:

- Effective institutional framework and legislation;
- Pollution and waste minimisation, impact management and remediation;
- Holistic and integrated planning;
- The incorporation of integrated environmental management principles and methodologies in spatial development planning as it relates to pollution and waste management;
- Making timeous and appropriate provision for adequate waste disposal facilities;
- Developing management instruments and mechanisms for the integration of pollution and waste management concerns in development planning and land allocation.

1.10.4 The National Environmental Management Principles in terms of NEMA

The principles set out in Section 2 of the National Environmental Management Act (NEMA) include the following:

- Environmental management must place people and their needs at the forefront of its concern and serve their physical, psychological, developmental, cultural and their social interest equitably;
- Development must be socially, environmentally and economically sustainable;
- Sustainable development requires the consideration of all relevant factors including the following;
- That waste is avoided or, where it cannot be altogether avoided, is minimised or re-used and recycled where possible and otherwise disposed of in a responsible manner.

1.10.5 National Environmental Management Waste Act (NEMWA 59 of 2008)

The National Environmental Management: Waste Act (59 of 2008) (NEMWA) was promulgated on 01 July 2009, marking a new era in waste management in South Africa (with the exception of a number of sections which will be brought into effect at dates still to be gazetted). The Act covers a wide spectrum of issues, including requirements for a National Waste Management Strategy, IWMPs, the definition of priority wastes, waste minimisation, the treatment and disposal of waste, Industry Waste Management Plans, licensing of activities, waste-information management, as well as addressing contaminated land.

1.10.6 National Domestic Waste-Collection Standards (NDWCS)

The NDWCS aims to provide a uniform framework within which domestic waste should be collected in South Africa. This comes after a consultative process with provinces, municipalities and the general public, in order to redress the past imbalances in the provision of waste-collection services. These standards aim to guide municipalities on how to provide acceptable, affordable and sustainable waste-collection services for the maintenance of human health and the environment.

1.10.7 Municipal By-laws

The Draft Municipal Sector Plan (Notice 182 of Government Gazette 34167) was

published by the Minister – for public comment on the 30 March 2011. Section 3.3.9.5 motivates that the enforcement of municipal waste by-laws is required to address ineffective collection systems, through the enforcement of available resource-based controls, which would improve the situation at community level. Enforcement should further be placed with a dedicated section, with trained Environmental Management Inspectors, in line with Chapter 7 of the National Environmental Management Act, 1998 (Act 107 of 1998).

The above paragraphs demonstrate that South Africa has made tremendous progress in drafting waste management legislation, policy and guidelines, which places specific roles and responsibilities on the local authorities to provide waste-collection services, storage and disposal, and also to facilitate recycling, and to manage waste.

1.11 THEORETICAL PERSPECTIVES

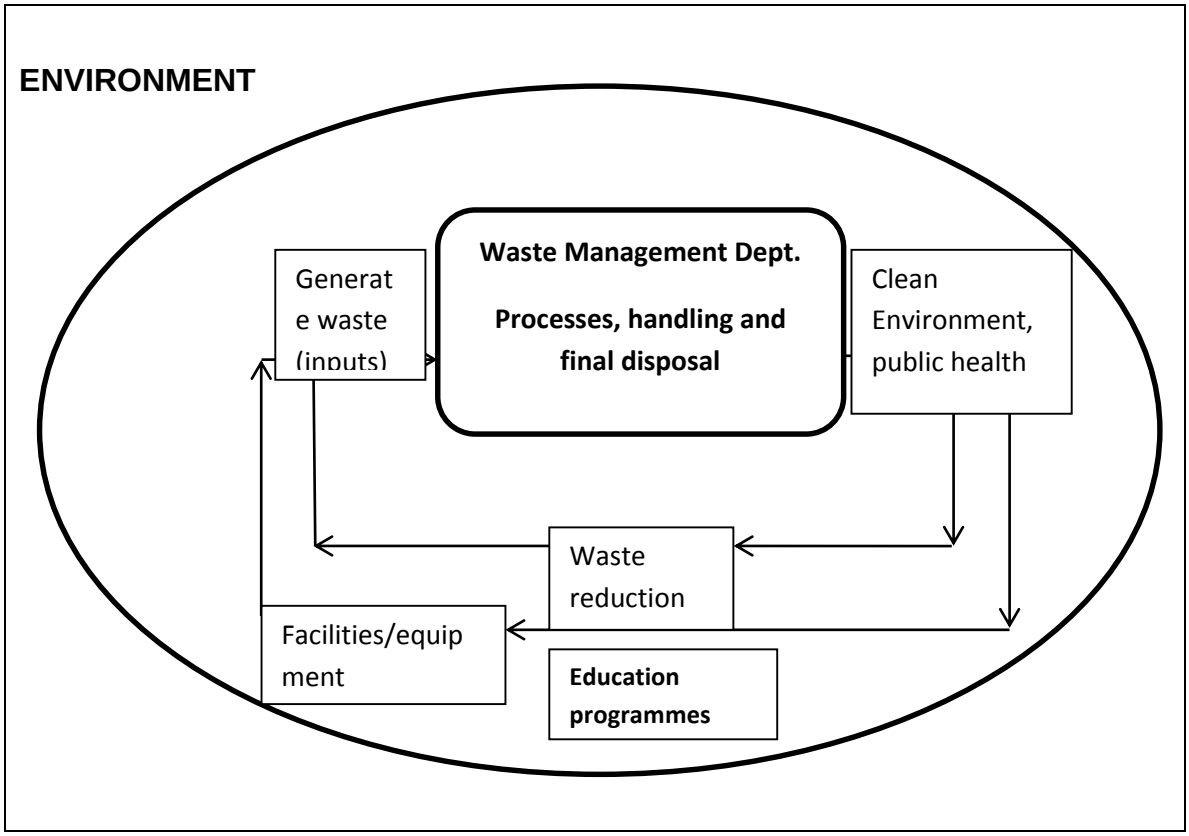
In this study, the systems theory approach will be utilised to analyse with the view to explaining the importance of education programmes in the hierarchy of integrated waste management systems. Systems analysis, originally associated with physics and cybernetics, represents an approach to solving problems by diagnosing them within a framework of inputs, transformation processes, outputs and feedback, requires adaptation from the industrial and cybernetics tradition for utilisation in contemporary management (Asmah-Andoh, 2012:43-44). A system has certain characteristics and offer public management different methods of approach and conceptualisation of programmes, instruments and ways for analysing management problems and can be used to evaluate waste management processes. Systems are interrelated sets of components, parts and processes with an identifiable boundary, working together for some purpose (Hoffer, George & Valacich, and 2005: 575).

Integrated waste management system as envisaged in the suit of legislation and in applicable NMBM by-laws included the adoption of a more strategic or results-oriented efficiency, effectiveness as part of the overall environment health management (NMBM IDP 2012-2014). The analyses of management as a system

include setting objectives, inputs, processing, outputs, communication and control as processes of an institution. Thus integrated waste management system functions will also be explained as sub-systems within larger systems of environmental and public health management for the community of New Brighton Township and the NMBM.

Each of these, the larger total overall environmental and public health functions as a system and each sub-system, has a purpose to which all its parts are designed to contribute the management of solid waste (Kroontz & O'Donnell, 1964:36). Viewing municipal integrated waste management as a system according to the input-output process unit of interrelated parts, in which education programmes are utilized, would lead to better handling and disposal of household waste and would thus also lead to an improvement of the effectiveness of waste management. An adaptation of the systems analysis for integrated waste management is shown below:

Figure 1.1: An adaptation of the Systems Theory for Integrated waste management system



Source: Du Toit, Knipe, Van Niekerk, Van der Waldt & Doyle (2002: 87)

1.12 RESEARCH DESIGN AND METHODOLOGY

In every research project it is important to determine exactly what methods are to be used to collect data and what factors will influence the collection. The research design spells out the strategies and techniques that can be adopted to develop information that is accurate, objective, and interpretable. Hofstee, (2006:120) writes that the research design provides a theoretical background to the methods to be used in the research.

1.12.1 Research Design

Trochim (2006) defines research design as the *structure* of research, that is, the "glue" that holds all of the elements in a research project together. A research design is a strategic framework for action that serves as a bridge between research questions and the execution or implementation of the research (Terre Blanche & Durrheim & Painter, 2006). According to du Plooy (2002:81) a research design is a plan of how the research is going to be conducted, indicating who or what is involved, and where and when the study takes place. It can be argued that the research design depicts elements of the research methodology, their interrelationships, data collection and data analysis to ensure that the final report answers the research questions (Babbie and Mouton, 2007).

The research design for this study therefore refers to the researcher's overall plan for obtaining answers to the research questions and for testing the research hypotheses. It is used to provide the framework and to introduce the reader to the overall plan for executing the research. From the definitions outlined, it can be said that the research design is the overall plan for conducting the whole research study.

Booth (2004) as quoted in Moule and Hek (2011:55) recognises the need for research to build on what is already known. Booth further suggests that using a framework or frame of reference allows researchers to follow the thoughts of previous researchers. Babbie and Mouton (1998:84) suggest that the design for a

type of research depends on how much data is already known in the problem area to be studied.

Permission has been sought and granted by the municipal authority to conduct the research. A permission letter was attached to the Application for Ethics Clearance.

1.12.2 Research Methodology

A research approach or design can be qualitative, quantitative or a mixed method approach depending on answers sought by the researcher to the following three questions as suggested by Creswell (2003:5)

- What knowledge claims are being made by the researcher (including theoretical perspective)?
- What strategies of inquiry will inform the procedures?
- What methods of data collection and analysis will be used?

For the purposes of this study the qualitative research method was considered as being suitable. Dzimbo (1995:17), states that the qualitative research method is referred to as the interpretative ethnographic model of social science research. This is because it focuses on understanding the people deriving meaning from their world. Hammersly and Atkinson (1983:24) further contend that qualitative research then is most appropriate for those projects where the goal is a deep narrative understanding. This research method was also chosen because it studies issues in their natural settings, attempting to make sense of, or interpret phenomena in terms of the meanings people bring to them.

1.12.3 Area of study

This study was conducted in Port Elizabeth focussing in the New Brighton Township. Port Elizabeth is South Africa's sixth largest city, situated on the coast in the Eastern Cape. This city has a population of 1.1 million and estimated population by 2020 is 1.24 million (IDP 2011-2016: 3). Port Elizabeth's best known and oldest township is

New Brighton. It is a home to about 50000.00 people, who live in a mixture of wooden, and corrugated iron shacks, and more substantial government-built housing. Poverty is a major issue, with an unemployment rate of around 80%. The residents in these townships face familiar challenges in the form of poverty, unemployment, service delivery and about 30% of people living with them have HIV/Aids.

This area was chosen due to the fact that, in terms of NMBM IDP 2012-2014 the communities include the classification of low and middle income households. It may be inferred that whilst the incidence of improper handling and disposal of household waste may be low in the high income communities because of education and income, the obverse could be true in the New Brighton Township area. Thus it is here that a study could be undertaken to examine how community education can assist in improving the effectiveness of the integrated waste management.

1.12.4 Population

De Vos (2001:190) defines a research population as a set of entities for which all the measurements of interest to the researcher are present. For the purposes of this study, the research population was comprised of two senior managers from the Waste Management sub Directorate within the Public Heath Directorate, a ward Councillor, and identified members from the community.

1.12.5 Sampling methods

The study was conducted in New Brighton in the Nelson Mandela Bay Municipality. Purposive sampling was utilised for the purposes of this study. The purposive sampling of people or other units is chosen for a particular purpose (Leedy and Ormrod, 2001:219). This type of sampling was chosen due to the nature of the study as well the belief that the sample had the necessary information and thus accorded insight to the study. The sample of the study was comprised of a total of a thirty-six (36) participants consisting of: two (2) senior managers from waste management department at the Nelson Mandela Bay Municipality, one (1) ward councillor, eight

(8) ward committee members and twenty-five (25) ward members (residents). Thirty-six (36) questionnaires were administered to thirty-six (36) participants.

1.12.6 Data collecting methods

For this study, the proposed instrument for data collection was by means of a mailed self-administered questionnaire. A questionnaire is defined as “a set of questions on a form which is completed by the respondent in respect of a research project’’ (De Vos, 2001:152). This data collection instrument was chosen because it is more cost effective and easy to administer as respondents may be more readily to respond truthfully to sensitive questions. It was also chosen due to the nature of the study and the time needed to complete the project.

1.12.7 Data analysis

Brink *et al*. (2012:201) state that the researcher should give an account of the methods and processes that were used for analysing the data. The purpose of any research includes the collection of data from which deductions can be made. To enable the researcher to answer questions meaningfully, the collected data needs to be processed and analysed in an orderly and coherent manner so that patterns and relationships can be discerned. The data was analysed with the assistance of statisticians from the Mathematics and Statistics Department of the Nelson Mandela Metropolitan University.

1.12.8 Delimitation of the study

The delimitation of a study is used to describe the study’s scope by delineating the geographical and theoretical boundaries of the study. The scope of a study refers to the extent of matters to be dealt with within a specific geographical area. It is used to explain the study’s limits and boundaries by stating explicitly what falls inside the boundaries of the study and thus avoid possible criticism (Punch, 2006:69; Creswell, 2003:148).

The scope of this study was concentrated in the New Brighton Township of the Nelson Mandela Bay Municipality. This study's theoretical scope focused on the management of waste for environmental management which forms part of the policy implementation function in the discipline of Public Administration.

1.13 ETHICAL CONSIDERATIONS

Permission was sought and granted by the municipal authority to conduct the research. A permission letter was attached to the Application for Ethics Clearance.

Research ethics refers to the way the participants are being treated in the study and how the data are being handled after collection (Vanderstoep and Johnston, 2009:12). Babbie and Mouton (2003:520) contend that ethical issues arise out of interaction with other people, other beings (such as animals), and the environment, especially where there is potential for, or is, a conflict of interests. The aforementioned authors further argue that ethical conduct entails conforming to the standards of conduct of a given profession or group. It can thus be stated that, fundamentally, ethics is concerned with morality, that is, what is right or wrong.

This study was conducted in line with the regulations and guidelines stipulated by the Nelson Mandela Metropolitan University. According to Neuman (2004:48-50 & Babbie *et al*., 2007:312), researchers have an ethical responsibility to recognise and protect the rights of human research respondents. In this study those principles were upheld as well. Principles that were considered during this study were: voluntary participation, informed consent, deception, no harm to participants including anonymity and confidentiality.

The research adhered to the following:

1.13.1 Voluntary participation

The researcher needed to recognise the fact that respondents were to participate at their own free will. He or she needed to ensure that no participant was coerced to

participate and that the participant was allowed to withdraw anytime during the research (Babbie, 2010:64).

1.13.2 Informed Consent

The purpose of the study and risks involved were clarified to the respondents so that they were able to decide whether they wanted to participate or not. Also the respondents were informed that if they felt uncomfortable during the study and wished to withdraw from the study, they were at liberty to do so. They were requested to sign a consent letter for confirmation (Babbie 2010:66).

1.13.3 Deception

The researcher identified herself and informed the respondents about why the research was undertaken. The researcher also furnished the respondents with all the necessary documents and explained the purpose of the study so as to ensure that the respondents understood why the study was being undertaken (Babbie 2010:65).

1.13.4 No harm to participants

The study was not to expose the respondents to any harm, be it physically, psychologically or emotionally. The researcher ensured that the information required from the respondents was embarrassing and did not have a potential of endangering their lives (Babbie 2010:65).

1.13.5 Anonymity and confidentiality

The research was conducted in such a manner that the respondents were not in any way be associated with given responses. The letter of consent emphasized that the respondents had the not disclose their names if they felt uncomfortable to do so (Babbie 2010:67).

1.14 OUTLINE OF RESEARCH

This study is comprised of five (5) chapters and they are organised as follows:

CHAPTER ONE This chapter provides the general orientation as well as the background to the study. The problem that is being investigated, the aim and significance of the study are also introduced in this chapter. Lastly the significance and objectives of the study are catered for and not excluding the research questions that the study will ultimately answer at the end of the study.

CHAPTER TWO From the various sources consulted this chapter was used to create a literature framework within which the research problem was analysed with the view to arriving at a conclusion and making recommendations.

CHAPTER THREE In this chapter the research methods that were employed in the study were outlined. The qualitative method, population, sampling methods, data collection methods and the data analysis were also presented in this chapter.

CHAPTER FOUR This chapter was used for analysis and interpretation of the data gathered through the various data collection techniques.

CHAPTER FIVE a summary of the findings and recommendations based on the findings were provided for in this chapter.

1.15 CONCLUSION

The foregoing discussion provides an outline of the direction the researcher wishes to take and the objectives that require fulfilment. The introductory section gives a brief background for the education programme as an important link in the system of

integrated waste management and provides the first motivation for the research study. A problem statement which is intended to guide the study is also provided. A theoretical perspective as well as a legislative framework underpinning the study has been dealt with in this chapter. The research methodology has been provided and it depicts how the study will be undertaken. This chapter is therefore used to indicate how the study was undertaken and it therefore gives a clear idea as to what will be achieved, how answers will be generated to address the research questions and contribute to providing solutions to the effectiveness of integrated solid waste management in the Nelson Mandela Bay Municipality. Lastly, the breakdown of chapters was also accommodated in this chapter.

CHAPTER TWO

THE CONCEPTUAL PERSPECTIVE AND LEGISLATIVE FRAMEWORK FOR INTEGRATED WASTE MANAGEMENT

2.1 INTRODUCTION

This chapter is used to provide a conceptual explanation and the existing suite of legislation on integrated waste management in municipalities in South Africa, with specific reference to the Nelson Mandela Bay Municipality. There are various legislations that exist but only a few pertaining to waste management will be discussed for the purposes of this study. Within this chapter a framework will be developed within which the problem of this study will be analysed. The problem of this study is the utilisation of education and awareness programmes to improve the minimisation, reduction, handling and disposal of waste in the New Brighton Township of the Nelson Mandela Bay Municipality. The historical development of what has come to be known as integrated waste management as part of the conceptualisation will also be provided for within this chapter. Waste as a concept will be discussed including the waste hierarchy, classification of waste in general as well as how waste is classified in South Africa.

Existing literature pertaining to integrated solid waste management will also be examined within this chapter and the historical background on the processes and practices currently used for integrated solid waste management. The study will also discuss Integrated Solid Waste Management from an International perspective, African perspective and lastly the South African perspective will be looked into with a special focus on the Port Elizabeth municipality to establish the status of community education programmes utilised to improve integrated waste management in the Nelson Mandela Bay Municipality.

It has been observed that solid waste management is an environmental issue and it has now become an integral part of daily living, however the public at large is oblivious of the need for adequate environmental protection measures. This kind of

attitude as well as the uncontrolled spread of waste materials, inevitably leads to environmental and health problems. First and foremost waste as a concept will be discussed hereunder.

2.2 WASTE AS A CONCEPT

Waste may be described to include any garbage or refuse or other discarded material including solid, liquid, semi-solid, or contained gaseous material arising from domestic, community, industrial, commercial, agricultural or human operations. The sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility is also considered as waste (Reddy, 2011:2). McDougall, White, Franke and Hindle (2001:1) further add that waste is a by-product of human activity and contains the same materials as found in useful products; it only differs from useful products by its lack of value.

According to Bilitewski, Hardtle, Marek, Wissbach and Boeddicker (1997:21), the term waste is defined in the German Waste Act of August 27, 1993, as portable objects that have been abandoned by the owner (subjective definition of waste). Within the same breath, waste can also be used in reference to the orderly disposal of garbage as required for the protection of public health and, in particular, of the environment (objective definition of waste). Additionally, Bilitewski *et al.* (1997:21) attest that in the United Kingdom according to the 1995 Environment Act, waste is defined as ‘any substance or object which the holder discards or intends to discard’. A ‘holder’ means the producer of the waste or the person who is in possession of it, and ‘producer’ means any person whose activities produce waste, or any person who carries out pre-processing, mixing or other operations resulting in a change in the nature or composition of this waste (Williams, 1998:55). It can thus be deduced that waste could mean anything or something that is not needed by someone at any particular given moment. A question might arise as to where waste originates from; hence in the following section the history and evolution of waste will be addressed.

2.3 HISTORY AND EVOLUTION OF WASTE MANAGEMENT

Waste generation is as ancient as history itself and like all other creatures; humans have also been producing solid waste as a component of life. According to Vesilind, Worrell and Reinhart (2002:1), when humans abandoned nomadic life at around 10,000 BC, they began to live in communities, resulting in the production of solid waste. Another contributory factor to waste generation is the rapid migration of rural populations to urban centres in search of better opportunities of livelihood, which has resulted in an overwhelming demographic growth in many cities worldwide (Reddy, 2011:1). Reddy (2011:2) further postulates that Africa is experiencing a high rate of urbanisation at 4 to 5% per annum. This high rate of urbanisation can thus lead to serious environmental degradation as well as health problems in the cities world-wide. The increase in population also necessitates the urgent need for waste management to be given serious attention.

Since the days of primitive society, human beings have used earth's resources to support life and then disposed of waste (Tchobanoglous, Thiesen & Vigil 1993:51). Tchobanoglous *et al.* (1993:51) further reason that historically, the amount of waste generated by the human population was very insignificant. This was due to the small size and the wide spread of population around the world. There was also very little exploitation of natural resources.

Waste disposal conundrums can be traced back from the time when humans began to congregate in tribes, villages and communities. At first ad hoc disposal onto streets and the countryside led to the breeding of vermin and odour. This situation of medieval Europe can be likened to the situation in most developing counties today. Lastly, Tchobanoglous *et al.* (1993:51), acknowledge that mass movements of people to the cities led to the increasing amounts of waste being generated.

Further attempts to manage waste came in the 19th century. By the 1800s, households and industries began to have ash pits or ash heaps where onsite open burning of commercial and industrial waste was practiced (Hickman & Elderedge, 1999:75). The link between filth and diseases was made in England in 1842 and in

1888, the English parliament barred waste disposal in public waterways and ditches. The Public health approach was then adopted as the motivation to remove waste from the human habitat. In the United States of America the first incinerator for waste treatment was built in 1889 (Barbalace 1999:25).

In the 1920s, landfills with semi- controlled burning became a popular method of waste disposal. However, as stated by Hickman *et al*. (1999:27), “A smoking dump is like a smoking gun. It is clear that a crime is being or has been committed” Hickman *et al*.(1999:27) further point out that the burning dumps’ impact on local air quality, was the primary reason that early efforts after World War II were directed towards putting out the fires to control the problem of dumps. Various methods were employed to try and curb illegal dumping in the 1950s including incineration, composting, recycling and the sanitary landfill. From the 1960s onwards private contractors were used to assist in waste management by forming partnerships with government for the collection of waste (*www.wastewatch*). According to various literatures on waste management, waste is classified according to what is termed waste hierarchy. This will be discussed hereunder so as to put the waste management concept into perspective.

2.4 CLASSIFICATION OF WASTE

Solid wastes are classified as domestic, commercial, industrial, due to construction and demolition, agricultural, institutional, and miscellaneous. Many times domestic and commercial wastes are considered together as so-called urban wastes. Included in this category are the materials which result from food preparation both in the home and in restaurants, and also the rubbish which is produced in residences and commercial establishments. Generally the wastes consist of rapidly decomposable materials as well as slowly decomposable or non-degradable (Hargety *et al*., 1973:4).

Hagerty *et al.* (1973:5) further introduce a second major category of wastes as industrial, the refuse produced by industrial processes. Generally the character of the refuse produced in any manufacturing or processing operation will depend very

much on the mechanics of that particular manufacturing operation. Furthermore it is argued that no comprehensive statements can be made about the type, amounts, or the character of wastes produced by industry. According to Hagerty *et al.* (1973:5), the wastes produced by steel manufacturers will differ considerably from those produced in the chemical industry.

However, several very general statements can be made. Usually the wastes produced in any food-processing operation will closely resemble the garbage produced in residential areas. In addition, the waste materials from the paper and plastics industries are similar to the paper and plastic packaging materials found in domestic rubbish. On the other hand, the metal-processing industry will obviously generate metallic wastes, but in addition will also create large quantities of slags, processing chemicals, and other residues, many of which are produced in air-pollution-control and water-pollution-control activities. The wastes produced by chemical industries and other more specialized industries will in general depend upon the particular end product of the manufacturing process (Hagerty *et al.,* 1973:5).

According to Vesilind *et al*. (2002:30) municipal solid waste can be further defined as having the following components:

- Mixed household waste;
- Recyclables, which may not be limited to the following;
- Newspapers, aluminium cans milk cartons plastic soft drink bottles;
- Steel cans, corrugated cardboard and other material collected by the community;
- Household hazardous waste;
- Commercial waste;
- Yard (or green) waste;
- Litter and waste from community trash cans;
- Bulky items (refrigerators, rugs, etc.); and
- Construction and demolition waste.

However, Vesilind *et al.* (2002:31) further state that refuse does not include the following:

- Construction and demolition debris;
- Water and wastewater treatment plant sludge;
- Leaves and other green waste collected from community streets and parks and
- Bulky items such as large appliances, bulks of old cars, tree limbs, and other large objects that often require special handling.

The table below shows the different types of wastes generated including the source as well as the typical location of the waste.

Table 2.1: Types of waste generated

Source	Typical Location	Type Of Solid Waste
Residential	Single-family and multifamily dwellings, low-medium, and high-rise apartments.	Food wastes, rubbish, ashes, special wastes
Commercial/ Municipal	Stores, restaurants, markets, office buildings, hotels, motels, print shops, auto repair shops, medical facilities and institutions.	Food wastes, rubbish, ashes, demolition and construction wastes, special wastes, occasionally hazardous wastes
Industrial	Construction, fabricant, light and heavy manufacturing, refineries, chemical plants, lumbering, mining, demolition.	Food wastes, rubbish, ashes, demolition and construction wastes, special wastes occasionally hazardous wastes.

Open areas	Streets, alleys, parks, vacant plots, playgrounds, beaches, highway and recreational areas.	Special wastes, rubbish
Treatment plant sites	Water, wastes water, and industrial treatment processes.	Treatment plant wastes, principally composed of residual sludge.

Adapted from: Tchobanoglous et al. (1993:52-53).

2.4.1 Waste classifications in South Africa

Waste in South Africa is divided into two classes based on the risk it poses – general waste and hazardous waste. “General waste” means waste that does not pose an immediate hazard or threat to health or to the environment, and includes:

- Domestic waste;
- Building and demolition waste;
- Business waste and Inert waste.

“*Hazardous waste*” means any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment (http://www.s-ge.com). Naturally humans produce waste (natural bodily waste!) and one’s household rubbish bin and how much one throws away every day (http://www.greenworks.co.za).

In addition to household waste, there is also waste from litter and street sweepings, the commercial sector (like shops, restaurants, hospitals etc.), industrial sector (like manufacturers), agricultural sector, construction and demolition sector, mining sector and energy producing sector (http://www.greenworks.co.za).

From the above discussions it can thus be concluded that waste is any material, whether solid, liquid, gas or radioactive, that can be sometimes disposed of into the

environment simply because it has become unusable or unwanted by the individual owner. Also it can be argued that waste generation is part and parcel of human existence. It would also be important to look at how waste is generated so as to be able to manage it.

2.4.2 Waste generation

Waste generation is seen by Zia and Devedas (2008:61) as the first element of waste management. Furthermore, it is a prerequisite to any waste management plan to have adequate knowledge of the generators of waste, its physical and chemical characteristics.

Hoornweg, Lam and Chaudhry (2005:46) are of the opinion that current global Municipal Solid Waste generation levels are approximately 1.3 billion tonnes per year, and are expected to increase to approximately 2.2 billion tonnes per year by 2025. Furthermore, Hoornweg *et al.* (2005:46) contend that the annual waste generation in East Asia and the Pacific Region is approximately 270 million tonnes per year. This quantity is mainly induced by waste generation in China, which makes up 70% of the regional total. Per capita waste generation ranges from 0.44 to 4.3kg per person per day.

In Eastern and Central Asia, the waste generated per year is at least 93 million tonnes. It is believed that the per capita waste generation ranges from 0.29 to 2.1 kg per person per day, with an average of 1.1 kg/capita/day.

In the Middle East and North Africa, solid waste generation is 63 million tonnes per year. Per capita waste generation is 0.16 to 5.7 kg per person per day, and has an average of 1.1kg/capita/day. In South Asia, approximately 70 million tonnes of waste is generated per year, with per capita values ranging from 0.12 to 5.1 kg per person per day and an average of 0.45 kg/capita/day. South Africa on the other hand generates about 70 million tonnes of waste per annum with, 9 million tonnes being generated form food waste annually (McKenzie, 2012).

In South Africa, according to (DWAF 1997) over 42 million cubic metres of general waste is generated every year across the country, with the largest proportion coming from Gauteng province (42%). Subsequently more than 5 million cubic metres of hazardous waste is produced every year, mostly in Mpumalanga and KwaZulu-Natal (due to the concentration of mining activities and fertiliser production in these two provinces). The average amount of waste generated per person per day in South Africa is 0.9 kg. According to Muzenda (2014:109) this figure is closer to the average waste produced in developed countries (0.73kg in the United Kingdom and 0.87 in Singapore. Furthermore Muzenda (2014:109) compares this to the average of developing counties like Nepal (0.3kg). These figures are further broken down according to contribution resulting in the biggest contributor to the solid waste stream being the mining waste (72.3%), pulverized fuel ash (6.7%), agricultural waste (6.1%), urban waste (4.5%) and lastly sewage sludge at 3.6% (Muzenda, 2014:109)

Waste can also be generated from food as depicted from the figure below:

Figure 2.1: Sources of food waste in South Africa (McKenzie, 2012)

The foregoing section has given insight as to how much waste is generated in developing as well as developed countries even though only a few examples were highlighted. The selected few show the stark difference between developed and developing countries in waste generation. Another interesting factor in this section

was also to see that food can also be a source of waste. Having said this, the question that remains to be answered is how can this tonnage of waste that is generated be managed? This area that follows will give insight to this question.

2.5 WASTE HIERARCHY

Muzenda (2014:107) is of the opinion that the conceptual approach to waste management is underpinned in the waste hierarchy, which was introduced into the South African waste management policy through the White Paper on Integrated Pollution and Waste Management for South Africa (2000). According to Muzenda (2014:107), the essence of this approach is to group waste management measures across the entire value chain in a series of steps which in turn are applied in a descending order according to their priority.

South Africa supports the waste hierarchy in its approach to waste management. This is done by way of promoting cleaner production, waste minimisation, reuse, recycling and waste treatment with disposal of waste seen as a last resort (http://mhtml:file://). The foundation of the hierarchy, and the first choice of the measures in the waste management is, waste avoidance and reduction. In the event that waste cannot be avoided, it should be recovered, reused, recycled and treated. Waste should only be disposed of as a last resort (Muzenda, 2014:107).

According to Reddy (2011:10), waste hierarchy proposes that waste should be managed by different methods according to its characteristics. The preference of the options represents the hierarchal structure. Thus, prevention, reuse and recycling are given the highest preference while open burning is unacceptable. The waste hierarchy is an accepted key element of ISWM. The waste management plans are to derive the most useful benefits from products and to generate the minimum amount of waste. McDougall *et al.* (2001:24) on the other hand argue that a rigid use of a priority list for waste management options has limitations and cite the following elements:

- The hierarchy has little scientific or technical basis. There is no scientific reason for example, why materials recycling should always be preferred to energy recovery.
- The hierarchy is of little use when a combination of options is used, as in an Integrated Waste Management (IWM) system. In an IWM system, the hierarchy cannot predict, for example, whether biological treatment combined with thermal treatment of the residues would be preferable to materials recycling plus landfilling of residues. What is needed is an overall assessment of the whole system, which the Hierarchy cannot provide.
- The Hierarchy does not address costs; therefore it cannot help assess the economic affordability of waste systems.
- The Hierarchy cannot account for the wide variety of specific local situations where waste management systems must operate effectively, such as small islands, sparsely populated areas, or popular tourist destinations, where large increase in the population occur on a seasonal basis.

The hierarchy is based on environmental principles which propose that waste should be handled by different methods according to its characteristics, meaning that, a certain amount should be prevented either by reducing the content of waste or by reusing the waste; another share of the waste stream should be converted into secondary raw materials; some parts can be exploited for composting purposes or used as a source of energy, and the remainder may be landfilled. Begum further reason that reality does not adhere to this environmentally based sequence (http:www.coe.mse.ac). Observations in developing countries reveal that large quantities of waste are dumped in an uncontrolled manner, or sadder still, burned in the open air. Obviously, these options do not belong to the waste hierarchy because of their unacceptable high levels of environmental damage (http://ww.coe.mse.ac).

This section centred on the waste hierarchy and it is evident that waste should be managed as effectively as possible and that South Africa does support the waste hierarchy approach.

2.6 THE NEED FOR INTEGRATED SOLID WASTE MANAGEMENT

Solid waste management has become an issue of increasing global concern due to the fact that urban populations continue to surge resulting in the change of consumption patterns (Marshall and Farahbakhsh, 2013:988). Henry, Yongsheng and Jun (2006:92) further propose that the primary purposes of solid waste management strategies are to address the health, environmental, land-use, aesthetic, resource and economic concerns that are associated with the improper disposal of waste.

Historically, South Africa followed the 'end-of-pipe approach to waste management. This meant that generated waste was collected by the municipalities and disposed of in landfill sites. The focus, at the time, was on finding more space for more landfill sites. This move is also endorsed by the report in the South African Waste Information Centre (SAWIC) data bank which was established in 2004 wherein it is stated that, waste disposal in South Africa has been increasing since then due to the betterment of the living standards for most South Africans, thus resulting in an increased number of disposal sites (Muzenda, 2014:109). Environmental issues have now become a matter of public concern and environmental awareness is growing resulting in pressure to change from this behaviour. Waste disposal remains the predominant means for managing waste in South Africa (http://www.s-ge.com). Due to the population increase now, an integrated solid waste management system is seen as a solution to this prevailing predicament.

Solid waste professionals recognise that issues relating to managing solid waste must be addressed using a holistic approach. For example, if more waste is recycled, this can have negative financial impact on the landfill because less refuse is landfilled. Since many landfill costs are fixed (there is a cost regardless if any refuse if landfilled), a drop in the incoming refuse can have severe economic ramifications. The various methods of solid waste management are therefore interlocking and interdependent (Vesilind *et al*., 2002:23).

Recognizing this fact, the Environmental Pollution Act (EPA) has developed a national strategy for the management of solid waste, called the Integrated Solid Waste Management (ISWM). The intent of this plan is to assist local communities in their decision making by encouraging those strategies that are the most environmentally acceptable. The EPA ISWM strategy suggests that the list of the most to least desirable solid waste management strategies should be:

- Reducing the quantity of waste generated
- Reusing the materials
- Recycling and recovering materials
- Combusting for energy recovery
- Landfilling

Due to the change in the waste generation patterns and population increase and notwithstanding the pressure exerted on the South African government to manage waste, it is now crucial for the government to accelerate the provision of a sustainable integrated solid waste management system. Due to globalisation and these environmental problems South Africa has to adopt new waste reduction management strategies and systems. One of these systems is the Integrated Solid Waste Management System which will be discussed in the following section.

2.7 INTEGRATED SOLID WASTE MANAGEMENT

Waste generations vary from one country to another, but many previous studies indicated that as gross domestic product (GDP) per capita increases, per capita municipal solid waste (MSW) generation and other types of wastes also increases. It can thus be deduced that waste management is a must for the conservation of natural resources as well as for the protection of the environment in order to approach a sustainable development (El-Haggar, 2007:1-2). In order to achieve the latter, the municipalities need management processes, skills and knowledge to make the exercise a sustainable one. McDougall *et al*. (2001:15) defines Integrated Waste Management (IWM) as systems that combine waste streams, waste collection, treatment and disposal methods, with the objective of achieving environmental

benefits, economic optimisation and societal acceptability. McDougall *et al*. (2001:15) further attest that these solid waste management systems should be sate and sustainable. A sustainable solid waste management system will thus lead to and ensure a better quality of life for the present as well as future generations. This will lead to a practical waste management system for any specific region. Integrated solid waste management according to www.epa.gov is said to involve a combination of techniques and programs to assist in managing the community's waste stream. El-Haggar (2007:2) also attests to this and sees IWM as the selection of a combination of techniques, technologies and management programs to achieve waste management objectives. According to El-Haggar (2007:2) integrated solid waste management is defined as a system for waste management that has control over:

- All types of solid waste materials. The alternative of focusing on specific materials, either because of their ready recyclability (e.g. aluminium) or their public profile(e.g., plastics) is likely to be less effective, in both environmental and economic terms, than taking a multilateral approach,
- All sources of solid waste. Wastes such as domestic, commercial, industrial, institutional, construction and agriculture. Hazardous waste needs to be dealt with within the system, but in a separate stream, focusing on the source of material (on packing or domestic waste or industrial waste) is likely to be less productive than focusing on the nature of material, regardless of its source.

El-Haggar (2007:3) further expands that an integrated system would include an optimised waste collection system and efficient sorting, followed by one or more of the following options:

- Materials recycling will require access to reprocessing facilities.
- Biological treatment of organic materials will ideally produce marketable compost and also reduce volumes for disposal. Anaerobic digestion produces methane that can be burned to release energy.
- Thermal treatment (such as incineration with energy recovery) burning of Refuse-Derived Fuel (RDF) and burning of Paper and Plastic-Derived Fuel (

PPDF) will reduce volume, render residues inert and should include energy recovery.

- Landfill. This can increase amenity via land reclamation but a well-engineered site will at least minimise pollution and loss of amenity.

To manage all solid waste in an environmentally effective way requires a range of the above treatment options. Landfill is the only method that can manage all types of waste; since recycling, composting and thermal treatment all leave some residual material that needs to be landfilled. In a land filled the organic fraction of solid waste can be broken down if the appropriate conditions for the growth aerobic and then the anaerobic bacteria occur (McDougall *et al*., 2001:18-19).

The relatively uncontrolled biological processes can take several years to start in a landfill and continue many decades after the landfill has been closed. Methane emissions arise from the breakdown of organic material and groundwater pollution may occur due to leaching of toxic materials from the solid waste. Landfill operations also require large amounts of space. Use of the other options prior to landfilling can both divert significant parts of the waste stream and reduce the volume and improve the physical and chemical stability of the final residue. This will reduce both the space requirement and environmental burdens of the landfill (McDougall *et al*., 2001:18-19).

Managing solid waste is a complex exercise as the already discussed sections showed that waste management is not new and that it can be generated and classified in many ways. The increase in its generation is proving to an enormous task as population grows. Combating this prevalence cannot rest on the government's shoulders alone, but all the relevant stakeholders need to come together. A silo approach situation to this challenge can increase it further. An integrated approach seems imperative as well as the introduction of educational programmes to educate the citizens especially in the affected areas. How are other countries handling their waste? This question is addressed in the following section, where a comparison will be made. It is to be noted that only a few countries will be selected for the purposes of this study in order to provide a basis for a better

understanding of the concept of waste, its classification as well as the hierarchical ordering of waste for effective management.

2.8 INTERNATIONAL PERSPECTIVE ON INTEGRATED SOLID WASTE MANAGEMENT

2.8.1 Germany

In Germany the national solid waste management policy was shifted to resource management by shifting responsibility and using incentives through the passing of the German Packaging Ordinance in 1991 (Spamer 2009:17). According to Halpert (2001:96), German companies have since 1991, been responsible for their packaging materials throughout the life cycle, including recycling costs after disposal by consumers. This practical application of the “polluter pays” principle requires German (private) industry to be actively involved in waste management throughout the product life cycle and to integrate these costs into the product and packaging costs. Furthermore, Halpert (2001:96) appends that the German Product Recycling and Waste Management Act of 1994 splits responsibilities between private and municipal waste management systems, with the private taking responsibility for waste for recovery and the latter being responsible for waste for waste disposal. The German industry has been allowed to determine specific implementation mechanisms to take back its products and packaging at the end of its useful lives instead of Government interference (Halpert, 2001:96).

2.8.2 Turkey

Solid waste in Turkey is regulated by the Solid Waste Control Regulation of 1991 (Turan, Coruh, Akdemir, & Ergun, 2008:7). A study of solid waste management in Turkey in 2003 indicated an average household waste generation rate of 0.6 kg per capita per day and average Municipal Solid Waste of 0.95 kg per day with the organic component in excess of 50% (Metin, Eröztürk & Neyim, and 2003:17). Like in other countries the composition of solid waste seems to vary depending on the source (residential or commercial) as well as the season of the year with the majority

of waste comprising of cardboard and paper and glass and plastics ranking second and third respectively.

2.8.3 The Netherlands

The Waste management policy in the Netherlands since 1995 was implemented on National, Provincial and Municipal level by a waste management council appointed by the National government (The Chartered Institution of Wastes Management, 2005:2). Initiatives to achieve a 60% recycling target by 2000 were made statutory and were implemented, making municipalities responsible for the collection of organic and other household waste as well as separate collection of glass, paper, textiles and hazardous waste.

Municipalities are responsible for the collection, treatment and disposal of waste, including the funding of these processes. However, due to the high costs involved, Municipalities work together to finance and operate facilities on a regional level. Collection of recyclable waste remains the responsibility of local authorities up to an agreed transfer point, but becomes the responsibility of producers from that point thereafter. Producers are responsible for the costs of transport, treatment, reprocessing and sales and cannot refuse to accept these materials. Similarly, they cannot charge local authorities any fees for accepting the materials (The Chartered Institution of Wastes Management, 2005:2).

2.8.4 Denmark

According to Hjelmar (1996: 389) as early as 1993, Denmark had already recycled 50% of waste and incinerated 26% with energy recovery and landfilled 26%. The Danish Environmental Protection Act regulates waste management with the principal objective to reduce waste and its impact on the environment. A hierarchy of waste management options exists with waste minimization, recycling and reuse, incineration and controlled landfilling being the sequence of priorities. Additionally a system of special subsidies and grants are provided for to encourage and promote recycling and cleaner technology projects (Hjelmar, 1996:389). Furthermore,

according to Hjelmar (1996:390) national taxes and municipal levies are used to support the waste management strategy and to cover the costs of waste treatment and disposal. Local authorities are responsible for waste collection and disposal of both household and commercial waste, but private contractors may be used. Paper, cardboard, food wastes, oil and chemical waste must be collected from wholesalers, retailers, industrial kitchens and public institutions by the municipalities too.

2.8.5 The United States of America

In the United States, The Environmental Protection Agency (EPA) regulates all waste under the Resource Conservation and Recovery Act (RCRA) which has the subsequent overall goals:

- to protect society from the hazards of waste disposal;
- to reduce or eliminate waste;
- to conserve energy and natural resources through recovery and recycling;
- to clean up spilled or improperly disposed waste;
- to address Municipal Solid Waste (“garbage”) and
- to address industrial waste

However, medical and animal wastes are not managed by the EPA but through other State agencies. The EPA distinguishes between two types of solid waste i.e. Municipal and industrial solid waste. According to the US EPA, MSW totalled 251 million tons in 2006 and industrial solid waste a staggering 7.6 billion tons (Environmental Protection Agency, 2009b). This equates to a per capita waste generation rate of nearly 2.1 kg per day.

The most important provision of the RCRA is the prohibition of open dumps (Solid Waste Disposal Act and Resource Conservation & Recovery Act, United States, 2007).

The EPA’s preferred order of waste management practices are:

- Reduction of waste at source
- Recycling / composting
- Disposal in waste combustors with energy recovery
- Disposal in landfills(Environmental Protection Agency, 2009a):

A report on MSW in the USA is published biennially. The latest report, Municipal Solid Waste in the United States: 2007 Facts and Figures, contains information based on data collected since 1960 (Environmental Protection Agency, 2008). The report discussed Municipal Solid Waste generation, recovering and disposal and supplies information by material type and also by product type (split into durable and non-durable goods as well as containers and packaging). This strategy helps in providing information with regards to trends of waste generation and how it is managed. Research conducted in this country has revealed that there were 88 waste-to-energy plants in operation combusting more than 25million tons of Municipal Solid Waste which accounted for 7.4% of Municipal Solid Waste treated compared to 64% by landfilling and 28.5% by recycling (Psomopoulos, Bourka & Themelis, 2009:1718).

It is evident from the above discussion that in these countries the main motivation for waste management is legislation, environmental and societal protection from risks associated with toxic waste or materials. Public/ private partnerships to manage waste seem to be the order of the day in these countries. Khatib (2011:46) sums up this debate by emphasizing that, countries now have no alternative but to plan for a sustainable development process that will acknowledge the importance of encountering the problems in persistence and facing the development challenges with an active participation of stakeholders including the public. Furthermore, these countries have acknowledged the fact that, the best approach for dealing with solid waste sector, is by implementing an integrated and sustainable management approach which will ensure the good health of the society and that of the environment (http://intechopen.com). Additionally, the use of educational programmes as well as awareness campaigns in communities can assist in changing the attitudes and behaviours in maintaining a healthier and a cleaner environment.

Having examined waste management at an International level, it is only proper to now to look at Africa as well as South Africa with specific emphasis on Nelson Mandela Bay Municipality in Port Elizabeth.

2.8.6 Africa

According to Encap Africa (2009: 1) reliable waste information is not readily available but the average waste generation rate per capita is estimated to range between 0.5 and 0.8 kg per day of which approximately 70% is organic Another estimate by Achankeng (2003:25) ranges between 0.3 kg and 1.9 kg per capita per day in selected African cities. A generation rate per capita per year of 290 kg of which 69% is disposed of in Municipal Solid Waste dumps was reported in by Pipatti and Vieira (2006:5). This report also indicated that food wastes accounts for between 40% and 55% of Municipal Solid Waste in all regions except Southern Africa with only 23%. Paper and cardboard also represents significant portions of Municipal Solid Waste in Northern, Central and Southern Africa with fractions in excess of 15%.

The figures above indicate that the bulk of waste in the African countries and settlements is domestic or household waste. This links up with the focus of this study. The South African situation is generally analogous to the situation in many other African communities.

2.8.6.1 South-Africa

South Africa is faced with waste management challenges left by years of inequitable development and service delivery under the Apartheid rule (Muzenda, 2011). This has resulted in huge backlogs and a struggle to sustain existing services as far as service delivery is concerned and waste management is amongst those. According to The General Household Survey of 2007, it was revealed that 39% of households in South Africa were not receiving a regular municipal waste collection service but it was acknowledged that the municipal waste collection had improved by 2.3% (CSIR, 2009). Contained in this report was a study commissioned by the Department of

Environment, wherein it was revealed that 54% of the national backlog in waste service delivery was found in metropolitan and secondary municipalities.

The Mogale City Report (2003) cites some of the challenges faced by Municipalities in South Africa as follows:

i) volume increase in domestic waste;
ii) cost increases for waste disposal services;
iii) deficient systems and integrated planning employed by municipalities in waste management;
iv) insufficient funding for waste programmes and
v) Improvement of waste management is not seen as a priority to municipalities or the government.

According CSIR (2009) there are other challenges facing South African municipalities with regards to waste management, namely:

i) Financial management
ii) Equipment management
iii) Labour (staff) management
iv) Institutional behaviour (management and planning).

One could not agree more because due to the fact that the South African cities are growing at an alarming pace and so does the waste that is being generated and it requires management. With the growing population, so are the changes in the human consumption patterns and notwithstanding the changes in the structure of economic activities and lastly the standard of living in urban areas results in more waste being generated. One can ascribe this enormous growth to urbanisation. The latter leads to a high housing demand as inhabitants erect makeshift houses wherever there is an open space. This also increases the service delivery demand on the government. Due to these areas being densely populated as a result of the unplanned settlements, waste management becomes a conundrum. Waste is then dumped into open spaces, on access roads and waterways (Coffey and Coad, 2010:992). This waste then clogs drains which results in blockages thus culminating to sewer spillages. This is where disease vectors breed and can give rise to

contaminated water, soils, food and serious environmental erosion with life-threatening health implications. This then culminates to the need for municipalities to employ appropriate waste management systems.

According to DEAT, 2002, waste management and utilization in South Africa is in a bad state. Additionally it is also noted that municipal solid waste management constitutes one of the most crucial health and environmental problems facing the three levels of government. Having said all of the above, now the researcher will look at how waste is managed in South Africa.

Waste management in South Africa is based on the principles of the *White Paper on Integrated Pollution and Waste Management* (IP & WM) as well as the *National Waste Management Strategy* (NWMS) that was published by the Department of Environmental Affairs and Tourism in 1999 and 2000 respectively (http://www.environpaedia.com). As mentioned earlier on in the chapter, South Africa supports the waste hierarchy in its approach to waste management and also recognises the importance of a broad hierarchy of preferred options that look at the waste stream in a "cradle –to-cradle approach as per the Institute of Waste Management of Southern Africa being:

- Waste avoidance: The reduction of waste at source. Through a deliberate policy of minimising the creation of waste within an industrial process not only to reduce waste but also to reduce the need for virgin resources to be exploited;
- Resource recovery: The recovery or retrieving of recyclable materials out of the waste stream or the collection of recyclable materials before they enter the waste stream –for the purposes of re-use or recycling;
- Re-use: The utilisation of a waste product without further transformation (e.g. the use of old newspapers as wrapping material or using glass jars for storage);
- Recycling: The manufacturing of a product that is made from waste materials. This can only be done by a business that is technically equipped to change properties of a former waste material into a new product (e.g. making plastic

pellets out of plastic waste, melting waste glass to make new bottles, melting beverage cans for new metal appliances;

- Treatment: The processes of changing the physical and/ or chemical properties of a waste product by compaction and incineration and
- Disposal: The final and least desirable step in the hierarchy involving land filling of wastes in a controlled manner.

2.8.6.1.1 Port Elizabeth

According to the Nelson Mandela Bay's Municipal Integrated Waste Management Plan (2012:29) there are no up to date waste generation rates available. However, according to the previous Integrated Waste Management Plan it was reported that the citizens including companies in the Nelson Mandela Bay Municipality generated between 300 000 and 350 000 tons of general or otherwise non- hazardous waste per annum.

In the 2009/2010 annual report, it was stated that approximately 500 000 tons of waste was generated on an annual basis, this figure included hazardous waste as well. It is further argued in the Integrated Waste Management Plan (2012:29) that landfill tonnages for the year 2010 were in excess of 570 000 thus coming to the conclusion that waste generated in the Nelson Mandela Bay Municipality was in excess of 600 000. It can also be mentioned that while there were numerous recycling initiatives that were undertaken, there are still no significant initiatives to reduce initial waste generation. Neglecting the management of waste leads to indiscriminate dumping and this can have dire consequences as far as the citizen's health is concerned.

In the city of Port Elizabeth waste collection is done on a weekly and bi-weekly basis. In the affluent suburbs it is weekly and in the townships it is collected on a bi-weekly basis, sometimes it can be collected after 4 weeks. This information was obtained during a pilot survey by the researcher. According to CSIR (2011) the purpose of waste collection service is to separate the generated waste from the community for health reasons. Moreover it is mentioned by CSIR (2011); the preferred frequency

for collection services to households is once a week. Landfilling is utilised a lot with the Arlington landfill cite, in Walmer Township and the Koedoes Kloof in the Despatch/Uitenhage area (IDP-NMBM). The usage of landfills is further reiterated in the CSIR report stating that there are many well operated landfill sites in South Africa in line with international best practice.

2.9 LEGISLATION ON WASTE MANAGEMENT IN SOUTH AFRICA

In South Africa there are a number of legislations and declarations that have been enacted to act as a guide to the waste management process in the country. First and foremost, the *Constitution of the Republic of South Africa, 1996* (hereinafter *Constitution*, 1996) states that the people of South Africa have a right to live in an environment that is not detrimental to their health. It also ensures that this law is respected and is known by each and every citizen of the country.

South Africa has made great strides in terms of environmental legislation since the 1980's by placing increasing emphasis on environmental sustainability and the subsequent introduction of comprehensive environmental laws and regulations to simultaneously protect the environment and the public (Visser, 2005). The most influential and widely referred to Municipal Solid Waste legislation thus far has been the *Environment Conservation Act No 107 of 1998, National Environmental Management Act 107 of 1998 (NEMA) and the Municipal Systems Act no 32 of 2000.* These augmented by the Department of Water Affairs and Forestry (hereinafter referred to as DWAF) guidelines for the minimum requirements for waste disposal by Landfill (1998) together with the white paper on integrated pollution and waste management for South Africa (2000), which still continue to exert considerable influence on MSW as a waste management policy (DEAT, 2000).

The list of statutes and policy instruments below indicates the importance of appropriate management of waste communities in the country and wide-spread nature of waste management. Generally, the objective of the suit of legislation applicable to waste management is appropriate handling and disposal of waste.

*Constitution of the Republic of South Africa, 1996, National Environmental Management Act 107 of 1998, National Environmental Management: Waste Act 59 of 2008,National Water Act 36 of 1998, National Health Act 61 of 2003,National Roads Traffic Act 93 of 1996,Hazardous Substances Act 15 of 1973,Atmospheric Pollution Prevention Act 45 of 1965,National Environment Management: Air Quality Act 39 of 2004,Local Government: Municipal Finance Management Act 56 of 2003,Local Government: Municipal Structures Act 117 of 1998, Local Government: Municipal Systems Act 32 of 2000, Occupational Health and Safety Act 85 of 1993; National Road Traffic Act 93 of 199*6, Other Policies, Regulations and Standards; Minimum Requirements for waste disposal by landfill, 2nd Edition DWAF 1998, *South African National Standards 0228 and the National Waste Management Strategy 2009*. For the purposes of this study, only those legislations that are pertinent to solid waste management will be discussed starting with the *South African Constitution.*

2.9.1 The South African Constitution

The South African Constitution is the Supreme law of the land (*Constitution of the Republic of South Africa, 1996*). Section 24 of the *Constitution* guarantees everyone the right:

- To an environment that is not harmful to their health or wellbeing; and
- To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that;
- Prevent pollution and ecological degradation;
- Promote conservation; and
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

2.9.2 White Paper on Environmental Management

On 15 May 1998, the Department of Environmental Affairs and Tourism (DEAT) published the White Paper on Environmental Management (the Policy Document)

being the government's national policy on environmental management. The policy document was published in Notice 749 of 1998 (Government Gazette No. 18894 of 15 May 1998). The purpose of the Policy Document is to inform the public of government's objectives in relation to environmental management; how it intends to achieve those objectives; to inform government agencies and state organs what their objectives are and to guide them in developing strategies to achieve those objectives. The word "environment" as it is used in the Policy Document refers to the biosphere in which people and other organisms live.

The environment consists of:

- Renewable and non-renewable natural resources such as air, water, land and all forms of life;
- Natural ecosystems and habitats and
- Ecosystems, habitats and spatial surroundings modified or constructed by people, including urbanised areas, agricultural and rural landscapes, places of cultural significance and the qualities that contribute to their value.

The Policy Document also seeks to ensure that environmental sustainability, health and safety are not compromised, and that natural and cultural resources are not endangered.

2.9.3 White Paper on Integrated Pollution and Waste Management

This White Paper was published in the General Notice 227 of 2000 (17 March 2000). The policy represents formal government policy regarding integrated pollution and waste management.

Within this framework of the overarching goal, the following strategic goals apply:

- Effective institutional framework and legislation;
- Pollution and waste minimisation, impact management and remediation;

- Holistic and integrated planning;
- The incorporation of integrated environmental management principles and methodologies in spatial development planning as it relates to pollution and waste management;
- Making timeous and appropriate provision for adequate waste disposal facilities;
- Developing management instruments and mechanisms for the integration of pollution and waste management concerns in development planning and land allocation.

2.9.4 The National Environmental Management Principles in terms of NEMA

The principles set out in Section 2 of the *National Environmental Management Act* (NEMA) include the following:

- Environmental management must place people and their needs at the forefront of its concern and serve their physical, psychological, developmental, cultural and their social interest equitably;
- Development must be socially, environmentally and economically sustainable;
- Sustainable development requires the consideration of all relevant factors including the following;
- That waste is avoided or, where it cannot be altogether avoided, is minimised or re-used and recycled where possible and otherwise disposed of in a responsible manner.

2.9.4.1 National Environmental Management Waste Act (NEMWA 59 of 2008)

The National Environmental Management: Waste Act (59 of 2008) (NEMWA) was promulgated on 01 July 2009, marking a new era in waste management in South Africa (with the exception of a number of sections which will be brought into effect at dates still to be gazetted). The Act covers a wide spectrum of issues, including requirements for a National Waste Management Strategy, IWMPs, the definition of priority wastes, waste minimisation, the treatment and disposal of waste, Industry

Waste Management Plans, licensing of activities, waste-information management, as well as addressing contaminated land.

2.9.4.2 National Domestic Waste-Collection Standards (NDWCS)

The NDWCS aims to provide a uniform framework within which domestic waste should be collected in South Africa. This comes after a consultative process with provinces, municipalities and the general public, in order to redress the past imbalances in the provision of waste-collection services. These standards aim to guide municipalities on how to provide acceptable, affordable and sustainable waste-collection services for the maintenance of human health and the environment.

2.9.4.3 Municipal By-Laws

The Draft Municipal Sector Plan (Notice 182 of Government Gazette 34167) was published by the Minister – for public comment on the 30 March 2011. Section 3.3.9.5 motivates that the enforcement of municipal waste by-laws is required to address ineffective collection systems, through the enforcement of available resource-based controls, which would improve the situation at community level. Enforcement should further be placed with a dedicated section, with trained Environmental Management Inspectors, in line with Chapter 7 of the *National Environmental Management Act, 1998 (Act 107 of 1998).*

The above paragraphs demonstrate that South Africa has made tremendous progress in drafting waste management legislation, policy and guidelines, which places specific roles and responsibilities on the local authorities to provide waste-collection services, storage and disposal, and also to facilitate recycling, and to manage waste.

Municipal Solid Waste impacts both directly and indirectly on human and environmental welfare and can have detrimental consequences on human health when poorly managed through the proliferation of vectors such as rats and flies, and the spread of disease through the contamination of natural sources such as air, soil

and groundwater. The continually increasing volumes of Municipal Solid Waste further compounds environmental problems such as global warming and climate change through the release of methane gas upon its decomposition, especially at landfill sites However, through the responsible management of MSW including recycling, mechanisms for poverty alleviation can be crated for the poverty-stricken. Legislation needs continual monitoring, thus advocating the need for stringent control measures for on-going assessments and revision.

2.10 ILLEGALLY DUMPED DOMESTIC WASTE

"*Illegal dumping is the unlawful deposit of waste larger than litter onto land, that is, waste materials dumped, tipped or otherwise deposited onto private or public land, where no license or approval exists to accept such waste*" Department of Environmental Affairs and Tourism (DECC, 2008:7).

The DECC (2002:2) identified waste as the most common issue affecting communities, and illegal waste dumping was highlighted as a particular problem that is on-going and highly visible. Municipalities, together with communities, should stop illegal dumping from happening; and they could clean up illegally dumped waste by understanding the impacts of illegal waste dumping on the city. They could develop partnerships to tackle waste dumping, by identifying: by whom, what for, and why, it is dumped (DECC, 2008:2).

Another contributory factor to indiscriminate dumping is echoed by Khatib (2011:46) where it is stated that" with the growth in urbanisation Municipal Solid Waste services are becoming one of the most challenges which if not properly and sustainably dealt with, will adversely impact all other development sectors".

Illegal dumping is very rife in the Port Elizabeth area as can be seen depicted in the attachments 1, 2, 3, 4 & 5 from the Herald and Port Elizabeth Express respectively. Sadly innocent children become the victims of this despicable act. It can also be observed from attachment 2 that even medical waste is dumped indiscriminately in

residential areas. These actions are a proof that those that dump are not educated as to the consequences of their actions.

2.10.1 The consequences of illegal dumping

The NSW DECC (2002:3), believes that Illegally dumped waste can poison the soil and kill vegetation, including medicinal plants; it can destroy bush land, and prevent the vegetation from regenerating, and animals from returning; and some waste, such as tyres and certain chemicals could even be a fire hazard, whereby it could alter the normal way water runs over the land – by blocking watercourses – and causing the soil to erode more quickly. In poverty-stricken areas people are in direct contact with this waste, creating a health hazard for their communities.

According to http://dx.doi.org illegal dumping can contaminate land and pollute water bodies. Moreover, communities are more than likely to dispose of their waste illegally if they lack appropriate waste disposal and recycling facilities. Illegal dumping is a crime; and the penalties for dumping are significant. The *Protection of the Environment Operations Act 1997* is the main legislation used by DECC and local Council to protect the environment, and to prosecute illegal dumpers. Fines or penalties are imposed on people and companies to deter them from illegally dumping waste. Some forensic research could be used in RSA, where refuse is searched for incriminating evidence, such as addressed mail (PEOA, 1997:6).

From the above discussion it can be deduced that there is a lack of knowledge as far as the effects of illegal dumping. The provision of education to these communities could assist in curbing the scourge of this illicit act. This debate then questions the role that the Nelson Mandela Bay Municipality is undertaking in this issue, bearing in mind that all municipalities are tasked with the service delivery and provision of a safe and healthy environment.

2.11 THE ROLE OF MUNICIPALITIES IN WASTE MANAGEMENT IN SOUTH AFRICA

Ali and Ahmed (2004:468) view solid waste management as an important environmental health service which is also an integral part of basic urban services. Maluleke (2014:2) views waste management as the collection, transport, processing or disposal, managing and monitoring of waste materials. Generally, waste management tends to treat all waste materials as a single class, whether solid, liquid, gaseous or radioactive substances, and attempt to reduce the harmful environmental impacts of each through different methods.

The municipality is bound by *Municipal Systems Act* to deliver waste collection services. In delivering the service, role players are required to practice “Batho Pele” principles which aim at putting people first (DEAT) The eight Batho Pele Principles are:

- Consultation which binds the municipality to consult with residents about the level and quality of service.
- Service standards: people should be informed what services they are entitled to receive and what options are available.
- Access to services: The services must be equally available to all, including disadvantaged communities.
- Courtesy: Treat everyone with consideration and respect.
- Information: Always provide residents with full and accurate information about services they are entitled to receive.
- Openness and transparency: Be honest and open about how municipalities are managed, the cost involved and who is in charge.
- Redress: Respond to complaints speedily, apologise if you have not delivered a promised service, and offer an explanation.
- Value for money: Eliminate wastage and always provide services that give the best value for money.

It is also the duty of the Municipality to ensure that its citizens are educated as far as managing their household waste. The Municipality should implement programmes that continuously educate and create awareness with regards to the implications of ill- managed household waste. The citizens should be made partners in Solid waste management and need to be part of the decision making process regarding their areas.

2.12 CONCLUSION

Solid waste management is proving to be a major challenge in the Nelson Mandela Bay Municipality as in other governments in developing countries. This challenge is further aggravated by the exponential growth in the city's population due to urbanisation. It is hoped that these challenges can be solved by use of an integrated solid waste management approach where educational programs should be introduced to the communities affected in order to prevent indiscriminate or illegal dumping of waste. The foregoing discussion has given insight to the fact that uncollected or illegally dumped waste constitutes a disaster to human health thus leading to environmental degradation. It is hoped that educational programs will only form a component in ensuring that the solid waste challenges are addressed in such a manner that will ensure a healthy and a safe environment for all.

In the next chapter the theoretical framework will be examined inclusive of the study area so as to put into perspective why this study was undertaken.

CHAPTER THREE

THEORETICAL FRAMEWORK AND AREA OF STUDY

3.1 INTRODUCTION

South Africa is one of the developing countries challenged with poor solid waste management systems despite the introduction of legislations, laws and by-laws to promote a healthy environment for all, as prescribed by the South African Constitution. It is stated in the *Constitution*, 1996, that “everyone has a right to an environment that is not harmful to their health and well-being”. This is specified to ensure that the environment is conserved and protected for future generations.

In this study the systems theory will be applied in consideration of the management of waste due to the fact that managing waste has various components that are interrelated and the process takes place in a specific environment. In each system there is an input, process, impact and feedback and the environment.

3.2 LOCAL GOVERNMENT IN THE MODERN STATE

Local government, or the municipality, is established to deliver efficient and effective services in collaboration with the citizens. A municipality is a constituent part of the modern constitutional state and relates to a city, town or village and has delegated authority for own local self-government (Craythorne, 1996:10).

In terms of Chapter 7 of the *Constitution*, 1996, municipalities as constituent parts of local government have the authority and sources of income to render specific local services, and to control and manage the social and economic development of defined local areas. Section 152 of the *Constitution* 1996 enjoins, *inter alia,* ‘to promote a safe and healthy environment, and to encourage the involvement of communities and community organisations in the matters local government’. In addition, the principle of local democracy posits that local government exists to bring government and local governmental processes close to citizens, and to encourage

the participation of citizens in the efficient provision of services that meet the citizens' expectations

Citizens of a municipality constitute one of the most important stakeholders in the management of programmes in the municipality, especially because it is for and on behalf of the citizens that services are rendered by the municipality. It follows that educating the citizens to be involved in the processes of public administration and management activities, including the various activities in integrated waste management systems, is necessary in order to orient the programmes towards community needs and to build public support for efficient and effective performance standards (Fox and Meyer, 1995:20).

The provision of services in the municipality is based on the theoretical framework and the practice of public administration. Henry (2010:3) writes that public administration and management is a broad ranging combination of theory and practice whose purpose is to promote more understanding of government and its relationship with the society it governs. Management is seen as a facet of public administration in government institutions and cannot take place if the administrative functions are not carried out (Meiring, 2001). Pollit and Hungler (1993:3) also write that management is a distinct organisational function and one that plays a crucial role in planning, implementing and measuring the necessary improvements in productivity.

In the light of the above, it is argued that a governmental unit such as a municipal authority is established to perform the functions that promote the well-being of the citizens through institutions and programmes that are more responsive to the needs and expectations of the municipal inhabitants. In the performance of these functions, these institutions are expected to institute management practices that are aimed at achieving efficiency and effectiveness in the utilisation of resources and in meeting the needs of the citizens.

3.3 THEORETICAL PERSPECTIVE ON MANAGEMENT IN THE DISCIPLINE OF PUBLIC ADMINISTRATION

Although there is lack of clarity in definitions and perspectives on administration and management in certain literature, writers on classical public administration describe management as a group of functions with the primary goal of efficiency in the utilisation of resources (Meiring, 2001:171). Consequently, in Public Administration literature, management is related to achieving efficiency and effectiveness in terms of strategically determined objectives through the utilisation of available resources. Theories of management are most often linked to the analysis of the new public management philosophies, which emphasise efficiency as being one of the paramount values to be strived for in the delivery of public services (Cox III, Buck & Morgan, 2011:16). The concept of management in the discipline of Public Administration is the development, or the application, of methodical and systematic techniques (often employing measurements and comparisons) that are designed to analyse and make the implementation of programmes more efficient and effective (Henry, 2010:114).

The collection, transportation, treatment and disposal of municipal waste, administered by the local government in most countries, are described as components of integrated waste management systems. Hence a study of holistic municipal waste management with the view to improvement could utilise an adaptation of the system theory as means of analysing the various parts and processes of the system.

It is therefore deduced that a municipal authority enables the maintenance of a healthy environment through by-laws which provide the necessary resources for the achievement of predetermined goals of waste management, the achievement of which is evaluated and monitored by the responsible department; in this case it would be the NMBM Waste management department. Accordingly, an integrated waste management system, as part of the growing sophistication of operational functions in public administration, is analysed through the theory of management in

the practice and study of public administration as part of the efforts to improve the delivery of services to citizens.

3.3.1 Public administration and management

Public administration as a study and practice posits that administration is found in all purposeful action and that, as an ingredient of all social activities, it is universal and found in all spheres of human activities (Cloete, 1986:2). Therefore it can be argued that the processes and activities of municipal integrated waste management systems, as purposeful action, can be studied in the theoretical framework of public administration discipline and practice.

Hughes (2003:6) states that public administration focuses on processes, procedures and propriety, while public management involves achieving results (with managers taking responsibility for doing so). Essentially, according to Cloete (1986:2), administration refers to enabling whilst management deals with utilising the resources to achieve pre-determined objectives. In the performance of these functions, especially at the local government level that is closest to the people, there is a need for effective communication and a regular flow of information to educate citizens and improve citizens' participation in order to enhance the provision of services (Van Der Waldt *et al*., 2014).

3.4 DEVELOPMENTAL LOCAL GOVERNMENT

Municipal authorities in contemporary South Africa are coming under increasing pressure to provide basic and other services to citizens as part of the objectives of the democratic government. This includes the provision of water and electricity, roads and other infrastructure, housing, sanitation and a healthy environment. In order to be able to deliver these, local government is being re-conceptualised as being developmental.

The *White Paper on Local Government* (1998) defines developmental local government as local government committed to working with citizens and groups

within the community to find sustainable ways to meet their social, economic and material needs and improve the quality of their lives. This requires the municipality to co-ordinate all developmental activities within their respective areas, including educating citizens to enable maximum effective participation in matters of local government. According to Van Der Waldt *et al*. (2014:17), development describes the kind of leadership that municipal councils must provide and the kind of relationships that municipal authorities need to build with communities through education and collaboration, which can contribute to improving the general well-being of citizens.

One of underlying themes of the conceptualisation of developmental local government, as stipulated in the *Constitution*, *1996*, is local government working together with local citizens to achieve developmental outcomes. It can be argued that citizens and communities are concerned about the areas where they live and about access to basic services. This would include the maintenance of a clean and healthy environment that is impacted upon by the handling and management of domestic waste. Municipalities, as constituent parts of the local sphere of government in South Africa, are responsible for integrated waste management within their area of jurisdiction.

The main administrative and management problems for municipalities in the conduct of waste management include the increasing accumulation of waste and its handling, and the indiscriminate and illegal use of open dumps that could lead to and spread health problems. The settlement patterns in urban fringes and informal areas, with their related high population growth and low economic circumstances, greatly accelerate the generation and open dumping of waste.

Clearly, developmental local government also aims at socio-economic development and community and citizen empowerment directed at the poor and marginalised, who generally live on the urban fringes and in informal settlements. Municipalities need to empower these communities to understand and practice waste reduction and appropriate handling of waste as part of the improvement in the provision of services such as integrated waste management processes. Empowerment initiatives could include stakeholder education, and information and awareness raising efforts

focused on communities in informal settlements and urban fringes to also enhance active participation in local government (see *White Paper, 1998*). The approach should consist of presentation of education and information-related measures on municipal waste management systems in terms of waste generation, handling, collection and disposal. This is the basis for this study.

3.5 MUNICIPAL INTEGRATED DEVELOPMENT PLANS (IDPS)

According to the *White Paper on Local Government*, *1998*, the *Local Government: Municipal Systems Act*, 2000 (Act, 32 of 2000) and other relevant statutes, local government is responsible for the provision of household infrastructure and services, understood as essential components of social and economic development of the municipal area. The services and infrastructural development include the provision of water, sanitation, refuse collection and electricity. To achieve the developmental outcome envisaged in the concept of developmental local government, municipalities are required to develop strategic frameworks in the form of Integrated Development Plans for the short, medium and long term (*White Paper on Local Government* 1998:27).

The underlying argument to the requirements is that integrated development planning and strategy is vital to ensure the co-ordination of local government activities, as well as engagement between the citizens and various stakeholders, to achieve holistic socio-economic development. Viewing integrated development planning as a strategic co-ordinated process has some implications for an integrated waste management system in a municipality such as the Nelson Mandela Bay Municipality. According to Van Der Waldt *et al*. (2014:112) a change in the process in any phase will affect several other parts or phases with reciprocal information flow.

The objective of this study is to analyse the scope and the use of information sharing and education of households and communities on reduction of waste generation and handling of house hold waste to improve the effectiveness of the management of waste, using the New Brighton Township as the area for study. The argument here is

that the integrated waste management system follows a similar logic and flow as the integrated development planning.

3.6 MUNICIPAL INTEGRATED WASTE MANAGEMENT AND SYSTEMS THEORY

Waste generation and handling in a municipal area is integrated because it consists of a set of interdependent components that form a whole. Smith and Cronje (2002:25) write that a realisation of the interdependence of a programme also gives rise to holistic management.

A system has been described as parts which are interrelated or interdependent elements forming a complex and unified whole that has a specific purpose to accomplish an objective or a set of goals (www.thefreedictionary.com/system). General systems theory emphasizes the way in which organised systems (human and non-human) respond in an adaptive way to cope with significant changes in their external environment so as to maintain their basic structures intact.

According to Caiden (1971:236), systems theory directs attention to the relationships between component parts in the administrative system. At one level, the relationships between the administrative system and other systems are explored in terms of input-output energy transformation models. At another, the same relationships are described in structural-functional terms—that is, the objectives of the administrative process or societal functions and their institutionalized forms. Alternatively, administration and organization are viewed as closed systems with authority structures, status symbols, common working rules, differently composed groups, conflicts, self-correcting mechanisms, and internal dynamics.

A democratic, public process of SWM goal formulation is essential to determine the actual needs of the citizens, and therefore to be able to prioritize limited municipal resources in a just manner. Policy weaknesses are consequently some of the critical causes of failed SWM systems in many low-income countries, as inadequate formulation and implementation of realistic policies is common (Konteh, 2009:72). While developed countries addressed their SWM needs by putting in place effective,

functioning policy measures, in many cities of the developing world remedial measures have been elusive; efforts are unco-ordinated or ad hoc, and the resources invested in the sector inadequate (Konteh, 2009:72).

The various phases of a municipal integrated waste management system are a set of interdependent components that constitute a whole. The activities of waste management are typically characterised as a system of processes that include, the generation and disposal of household waste, handling of waste by the municipal authority including collection from households and designated centres, and treatment and disposal (Schedule 5 part B; *Constitution,* 1996). These activities and the processes they comprise can be described conceptually as a system made up of interrelated parts that can be analysed as a unit. It can therefore be argued that an analysis of waste management can also be structured into a single and relevantly aligned system for evaluating the effectiveness for the citizens in the form of better services.

The description above provides the basis for utilising the systems theory as a conceptual and theoretical instrument for the study. In this dissertation waste management is thus studied as a system of interrelated parts, emphasising the importance of the links between the various activities relating to the handling and management of household waste in a municipal community. It can be stated that the application of the systems approach to the study of municipal waste management is intended to provide policy makers and municipal executive departments tasked with implementation with an increasing ability to make better decisions in the use of the municipalitie's resources, communication and educational methods for the reduction of waste generation.

3.7 THE NATURE AND PLACE OF SYSTEMS THEORY IN PUBLIC ADMINISTRATION

Systems analysis, originally associated with physics and cybernetics, was introduced to sociology and politics principally by Talcott Parson in 1937 and David Easton in 1953 (Asmah-Andoh, 2012). The approach looks at a problem in its entirety, taking into account all the facets of the problem and all the intertwined parameters. It seeks

to understand how the parts interact with one another and how they can be brought into proper relationship for the optimum solution of the problem. Asmah-Andoh (2012), further states that parts and processes of a system are interdependent, to the extent that a change in one part of the system has an impact on the expected objective to which all its parts are designed to contribute. It can therefore be argued that a systems approach can be used in management studies to analyse service delivery programmes (such as waste management), evaluative management studies, programme performance, monitoring and evaluation of policy or programmes with respect to achieving objectives (Keeling, 1972; Pollitt *et al*., 1993; Wildavsky, 1977; Meggison, 1977).

Utilising systems analysis for human services delivery, however, requires adaptation of the approach from its original industrial and cybernetics tradition. Systems are interrelated sets of components, parts and processes with an identifiable boundary, working together for some purpose (Hoffer, George & Valacich, and 2005:575). In this instance integrated waste management system has a distinct boundary of it being a specific service provision programme. Raising and maintaining the standards of living in a municipal community is dependent on the effectiveness of infrastructure services and the provision of basic services. Infrastructure services such as water, electricity, transportation, waste generation and management are typically indispensable for households and for the health of citizens. How these services are provided is particularly important as a policy objective whose implementation should meet their needs and expectations.

In a democratic community intervention and improvement of efficiency is contingent upon availability of information about the quantity and quality of services produced and delivered. In this sense, a mechanism for analysing and evaluating performance in the provision of services is a central factor in ensuring adequate provision of crucial services and, ultimately, in supporting higher standards of living (Hanekom, 1992:89). This is one of the advantages of the utilisation of the systems approach in public administration study. For example, public policy evaluation can be represented in a structured form of the systems approach where policy determination, policy implementation and policy evaluation are analysed as stages in an interrelated and integrated system to find out if the policy has really worked. In

other words, the policy stages in the policy process can be identified and analysed in a sequential system for an assessment of policy content, implementation, and impact, with a view to ascertaining whether the policy makes any difference (Hanekom, 1992:89).

Any system can be improved or managed in a better way, but it takes analysis of information, of the needs of managers and of how to provide for this for improvement to be realised. Systems analysis offers the opportunity for alternative suggestions to solve management and service delivery problems within the Nelson Mandela Bay Municipality. In the systems approach, the focus is on the analysis and a reasoned and integrated, rather than a fragmentary, look at problems, as distinct from total focus on the components or the parts. The systems approach to management represents an approach to solving problems by diagnosing them within a framework of inputs, transformation processes, outputs and feedback (Slocum, 1996:55). Viewing a municipal management system according to the input-output process describes it as a unit of interrelated parts in which an increase in input would thus also lead to greater output.

A systems approach has long been used to monitor and manage waste streams, optimizing waste collection, minimization of waste, reuse, recycling, treatment and disposal of waste (Bridgewater, Clark & Sundberg, 1994). It is shown here also to be a useful tool in understanding the governance challenges facing a municipality or a country. A diagrammatic representation of a systems approach to integrated waste management, as envisaged in this study, is given below:

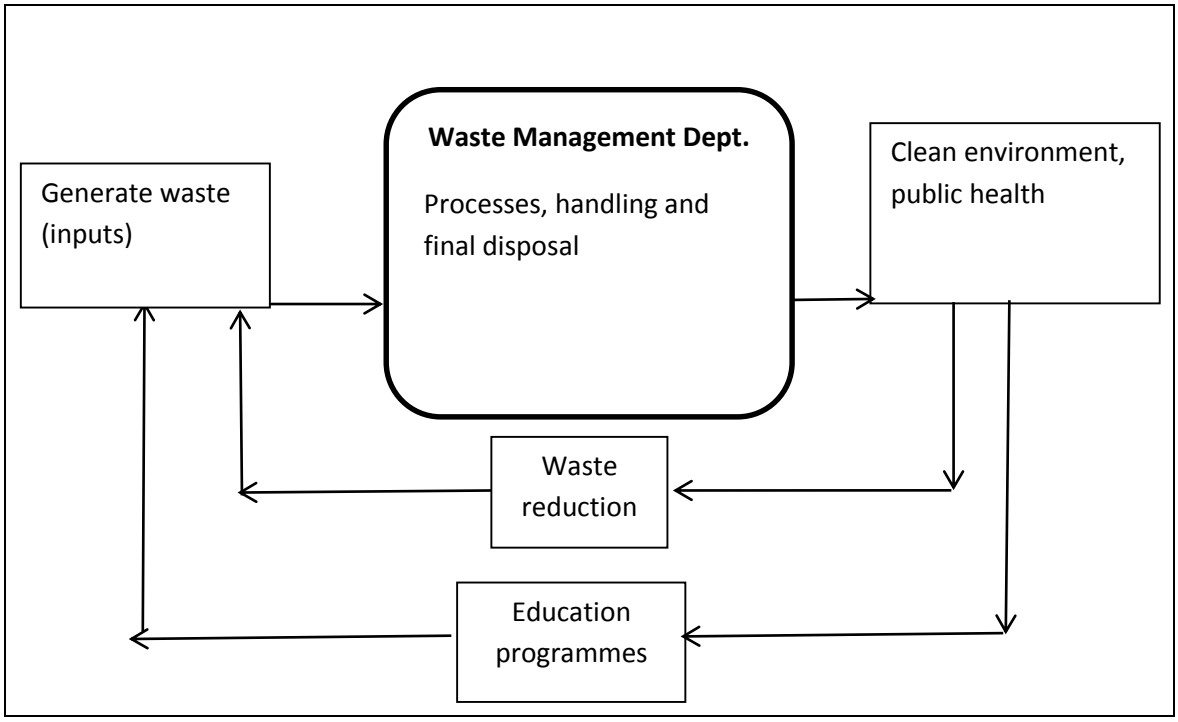


Figure 3.1: The Systems Approach (Source: Adapted from Du Toit *et al*. (2002: 87)

3.7.1 The environment of the system

With reference to this study, the settlements in the New Brighton Townships are the environment of the system. The open spaces in these settlements form part of the environment, and are the places where most of the time indiscriminate dumping and littering occurs (see Annexures 4 and 5). These actions have a detrimental effect, polluting the environment that the communities live in. This leads to an increase in diseases, and provides a breeding ground for rats, mice and rodents.

3.7.2 Inputs

The households or communities generate waste, which can also be referred to as “inputs”. Generation of waste can thus be seen as the first element of waste management and it is a very crucial element to any waste management plan. Communities should be educated or equipped with knowledge as to the waste they generate and how to separate it according to biodegradables, hazardous, non-hazardous and recyclables.

3.7.3 Processes, handling and final disposal

Presently, waste in the NMBM is generated at alarming rates in the New Brighton Townships as can be seen from Annexures 1-5, it is therefore a prerequisite that the NMBM implements a system that can deal with the situation effectively, as mandated by the *Constitution*, 1996. When solid waste is well managed, it leads to the reduction or elimination adverse impacts on the environment, including human health. This can also be seen as a means to supports economic development and improved quality of life of the citizens as envisaged by the *Constitution*, 1996. There are various processes that are utilized to manage waste effectively and efficiently for a municipality. These processes include monitoring, collection, transportation processing, recycling and finally, disposal of the generated waste.

3.7.4 Output

As all the activities of waste management are interlinked in a system, the failure of any activity can bring the whole system down. The goal of the systems approach is to deliver an output at the end of the system processes. In this instance the output would be a clean and a healthy environment. This final stage can be achieved with the assistance of introducing educational programs to the communities on how to reduce waste generation as households, how to handle the generated waste, and the impact of indiscriminate dumping or littering.

3.8 THE UTILISATION OF THE SYSTEMS THEORY FOR EVALUATIVE STUDIES

The literature focusing on the utilisation of the systems approach for analysing and evaluating public services provision is relatively small, but there is a vast literature concerning public services in general that can be applied to the utilisation of the systems approach to the provision and evaluation of public services. Zarate, Slotnik and Ramos (2008:2546) are of the opinion that managing waste is a complex task that requires appropriate technical solutions, sufficient organizational capacity, and co-operation between a wide range of stakeholders.

Accordingly Seadon (2010), argues that the interdisciplinary and multi-sectoral considerations needed for the proper management of, for example, solid waste-manufacturing, transportation, urban growth and development, land use patterns, and public health, highlights “the interaction and complexity between the physical components of the system and the conceptual components that include the social and environmental spheres. When waste is seen as part of a system, the relationship of waste to other parts of the system is revealed and thus the potential for greater sustainability of the operations increases.

The conventional solid waste management approach is reductionist and not tailored to handle complexity. Interacting systems and their elements are divided into ever-smaller parts. System processes, such as waste generation, collection, and disposal operations, are considered independently, though each is interlinked and influenced by the others (Seadon, 2010). Techniques therefore tend to focus on dealing with one type of waste at a time, leading to a focus on single technologies instead of waste management systems. It has been widely recognized that waste management systems that ignore social components and priorities are doomed to failure. The issues of public acceptance, changing value systems, public participation in planning and implementation stages, and consumer behaviour are equally as important as the technical and economic aspects of waste management (Carabias, Winistoerfer & Stuechel, 1999).

Complexity of systems is an underlying premise to the systems theory. Poch, Comas, Rodrigues, Sanchez-Marre & Cortes (2004:872) state that *“Environmental problems are complex in the ecological domain and usually controversial in the socio-economic domain*”. According to Fiehn and Ball (2005),

> “*Waste and the management thereof is a complex system of interrelated activities which require the input from a number of sectors, involves a wide spectrum of waste types and requires that collection, storage, handling, recycling, treatment and disposal be conducted in various different ways*”.

Waste management is typically about more than technology, collection and disposal; it involves institutional, social, legal and financial aspects, and is dependent on both

intra- and inter-organisational collaboration, and engagement with civil society it requires taking cognisance of local social, economic and environmental conditions (Zurbrugg, 2002).

According the Churchman (1979:4), given the complexity of a problem, very often one is uncertain where to begin when trying to solve a problem. The problem and its sub-problems are interconnected and overlapping, so that the "*solution of one* [problem] *clearly has a great deal to do with the solution of another*." A systems approach is therefore seen as a means of describing "*the complex interaction of the individual elements of the system*" (Silvern, 1973:1).

Environmental governance is often complex in nature, involving ecosystems and institutions, functioning within a socio-economic climate. A systems approach, which examines the linkages, interactions and interdependencies between the elements that make up the entirety of the system, provides a useful means of unravelling the complexities of environmental governance, and in particular effective waste governance. It can therefore be argued that the systems approach can be utilised for the study of integrated waste management in the New Brighton Township of the Nelson Mandela Bay Municipality who's demographic and socio-economic characteristics are described below.

3.9 AREA OF STUDY: NEW BRIGHTON TOWNSHIP

The settlement patterns of municipalities in South African cities display diversities that should be understood as a critical factor for policy making and for programmes of integrated waste management. According to the *White Paper on Local Government* (1998:12), settlement dynamics have a major influence on the resource demands made, particularly in respect of the demand for and delivery of basic services, such as refuse and waste removal and management infrastructure. Factors such as population densities and demographics, and socio-economic and educational circumstances as part of the settlement conditions need to be taken into account in any analysis.

The area chosen for the study, New Brighton Township, is characterised in the *White Paper on Local Government*, 1998, as, on the one hand, an informal settlement of unplanned and largely un-serviced residences with a minimal local economic base and, on the other hand, an urban fringe existing within the boundaries of the Nelson Mandela Bay Municipal area (See Annexure 8-11).

The Nelson Mandela Bay Municipality is located in the Eastern Cape. It covers an area of about 1,952 square kilometres. This municipality is home to the city of Port Elizabeth and has an estimated population of 1,152,115 (IDP Nelson Mandela Bay Municipality, 2008-2012), Port Elizabeth was incorporated into the Nelson Mandela Bay Municipality in 2001, along with the neighbouring towns of Uitenhage and Despatch, as well as the surrounding semi-rural areas. The NMBM coordinates the delivery of services to the whole area (IDP 2008-2012 of the NMBM).

The Nelson Mandela Municipality (NMBM) area has an estimated population of 1.3 million, who reside in approximately 260 000 households. Fifty-two per cent of the population comprises females. Of interest, the NMBM has a relatively youthful population, of which 37% is below the age of 20 years – indicating that matters such as education and job-creation require serious consideration and urgent attention (IWMP, 2010: 21).

3.9.1 Situational analysis of New Brighton Township

- Population - 1,152,115 (2011 Census)
- Household (formal) - 276 850 (2011 Census)
- Area covered - 1 950 km (sq.)
- Unemployment rate - 36,6 % (2011 Census)

The composition of the above is detailed in the Tables below:

	Female	Male	Total	% of Population
Black African	361518	331220	692738	60.13
Coloured	141873	129593	271466	23.56

Indian or Asian	6335	6502	12837	1.11
White	85608	79816	165424	14.36
Other	3787	5860	9647	0.84
Total	599121	552991	1152112	100.00
%Total	52.00	48.00	100.00	100.00

Table 3.1: Population group and gender for NMB

(Source: Stats SA 2011 Census)

Table 3.2 shows the total of the different households in NMBM. These range from formal, informal, flats, rooms in backyards and other forms of households.

Type of Household	Total
Formal Households	276850
Informal Households	30202
Households/flats/Rooms in back-yards	6890
Informal Households in back-yards	8862
Other	1488
Total	324292

Table 3.2: Demographic information for Nelson Mandela Bay Municipality, indicating type of households

(Source: Stats SA 2011 Census)

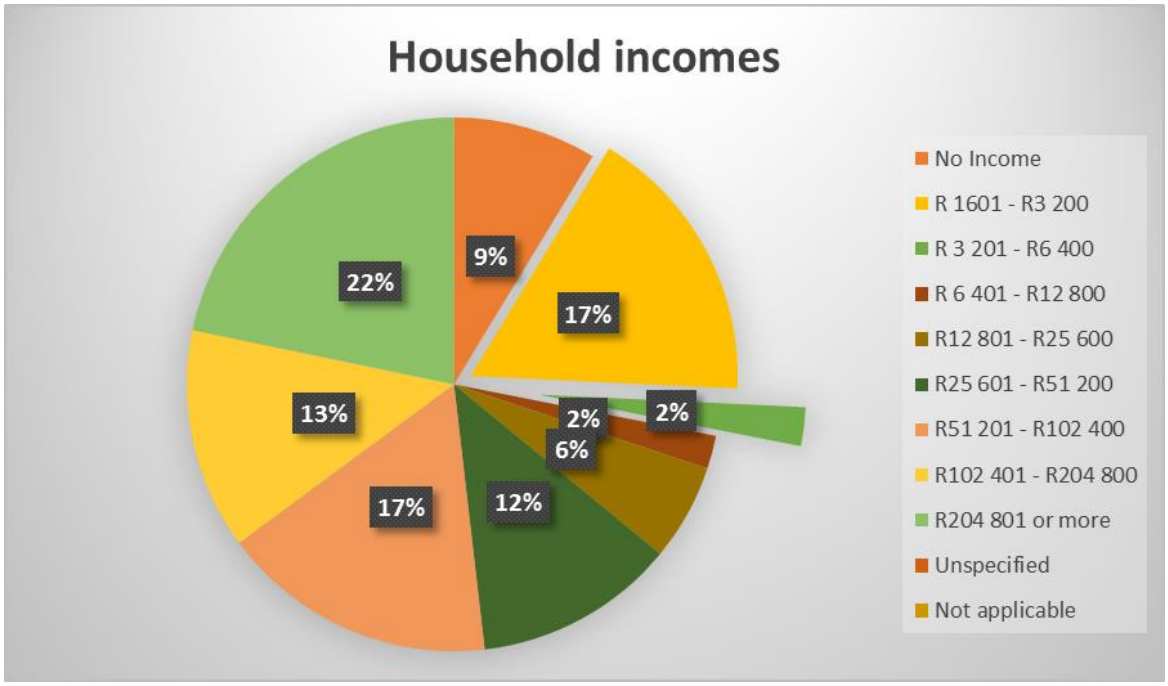


Figure 3.2: Household incomes (2011) in the NMBM

(Source: Stats SA 2011 Census)

Figure 3.2 indicates the spread of household incomes in the NMBM.

3.9.1.1 Demographic information

Port Elizabeth is South Arica's sixth largest city, situated on the coast in Eastern Cape Province. Known as PE and nicknamed 'the Friendly City', it is part of the Nelson Mandela Bay Metropolitan Municipality. New Brighton, which was established in 1903, is a township of Port Elizabeth, and was the first officially black residential area in Port Elizabeth. Today it is home to around 40,000 people, who live in a mixture of wooden, and corrugated iron shacks, and more substantial government-built housing. Poverty is a major issue, with an unemployment rate of around 80% (NMBM- IDP 2008).

An extremely wide range of incomes in the urban areas is evident. This is largely correlated with population group. Thus, whereas only 45% of the white population recorded incomes of under R1000 per month, some 84% of the black, and 70% of the coloured population did so. Only 0.3% (1396) of the blacks and 0.7% (1558) of

the coloured population earned over R6000 per month, compared with 8.6% (8159) of whites (IWMP, 2010: 21).

Due to the extensive nature of the geographical area of the Nelson Mandela Bay Municipality, this research is focused exclusively on the New Brighton Townships.

3.9.1.2 Educational levels

Twenty-nine per cent of the residents older than 15 years have successfully matriculated or have post-school qualifications. Only 4.2% of the adults have degrees, while 8.5% of the residents over 15-years old are functionally illiterate (IWMP, 2010: 21).

3.9.1.3 Household Incomes

In the NMBM there is a high unemployment rate especially in the New Brighton area. There is also a very high income disparity as can be seen in figure 3.2. According to Matsuso and Takeuchi (2008:20), an increase in the unemployment rate has a positive impact on illegal dumping in that illegal dumping occurs more frequently in municipalities with a higher unemployment rate. The NMBM is no different. Added to this situation occurring in New Brighton, is the fact that the frequency of illegal dumping is also explained by the socioeconomic conditions of the New Brighton Townships.

3.10 CONCLUSION

This chapter presented the theoretical framework within which the study is undertaken. Systems theory was discussed at length as well as its place and its utilisation in the Public Administration discipline. The profile of the Nelson Mandela Bay Municipality and that of the New Brighton Township was also presented so as to give a picture to the reader of the area being studied. The research design and methodology will be discussed in the next chapter.

CHAPTER FOUR

RESERCH DESIGN AND METHODOLOGY

4.1 INTRODUCTION

The aim of this chapter is to describe the research methodology that was used during the empirical component of this study. This study investigated the utilisation of education programmes to improve community handling and disposal of household waste and its contribution to the effectiveness of the integrated solid waste management system for the New Brighton Township in the Nelson Mandela Bay Municipality. Aspects of the design, together with the underpinning methodology, will be discussed in order to justify the quality and significance of the procedures that were applied. This will be achieved by addressing the following:

- The term methodology will be explained and the steps in the process will be defined,
- The research methods to be followed, and
- Survey method: data collection instrument will be discussed, and the chosen method for this study will be explained in greater detail.

In the field of social sciences there are two approaches that are frequently used for research purposes. These approaches are known as quantitative or qualitative. Leedy (1989:91) describes methodology as operational framework within which the facts are placed so that their meaning may be seen more clearly. Babbie and Mouton (2001:103) on the other hand, define research methodology as whom or what will be studied in order to collect information, identification of subjects. A research methodology can thus be seen as a system that a researcher utilizes to collect, analyse and interpret that data thereby realise the objectives of the particular study that is being undertaken. Lastly the chapter will be concluded by demonstrating how the data was analysed.

4.2 RESPONSE RATE

Thirty six (36) questionnaires were prepared as follows:

- Two (2) NMBM senior managers from the waste management department,
- One (1)ward Councillor,
- Eight ward committee members, and
- Twenty five (25) ward members (residents).

Thirty questionnaires (94%) were completed and returned.

4.3 RESEARCH DESIGN

According to Burns (2000:145) a research design is a plan or a strategy that is aimed at providing answers for the research questions. Yin (2003:21), describes research design as a plan that guides the investigator in the process of collecting, analysing and interpreting observations. Frankfort-Nachmias and Nachmias (1997:99) see research design as a blueprint that enables the researcher to come up with solutions to problems as well as guiding the investigator through the several phases of the research. Terre Blanche *et al*. (2006:37) reason that a researcher in essence takes decisions along the following four dimensions:

- The purpose of the research;
- The theoretical paradigm informing the research;
- The context or situation within which the research is carried out; and
- The research techniques employed to collect data.

A research design can also be defined as a plan according to which a researcher obtains research partakers and then collects information from them (Welman and Kruger, 2005:46). According to Labovitz and Hagedorn (1981:42), a research design can be viewed as logical procedures that if well executed, can enable the researcher to obtain evidence in order to determine the degree to which the researcher was right or wrong or whether it was really “X” and not “Y” or even something else that

had led to poor solid waste management in the New Brighton Townships of the Nelson Mandela Bay Municipality. Furthermore a research design as attested by Patton (2002:15) can be described as “the glue" that holds the research project together. Patton (2002:15) thus views a research design as a means used to structure the research, to show how all the major parts of the project, the samples or groups work together to address the central research question. Of most importance is that, the researcher should understand the relationship between designs so as to make design choices that are suitable to the particular research project and forgetting to take into consideration the strengths and the weaknesses of the different designs (Holiday, 2007:123).

4.4 RESEARCH METHODOLOGY

The term “method” is derived from the Latin term “methodus”, meaning the way in which the scientific researcher must select a method permitting access to the phenomenon (Landman, 1993:70). The selected research method will also be influenced by the nature of the said phenomenon. Additionally research methodology constitutes a systematic way and a set of methods employed for the collection and the analysis of the research data (Morse, 2002:96). Brynard and Hanekom (1997:25) further argue that research methodology is also referred to as a strategy for research, which in turn indicates the methods of data collection.

Bhattacherjee, (2012) reasons that in a scientific approach to research, the researcher uses standardised methods for obtaining empirical answers to certain questions. Proper planning and preparation are of outmost importance for any successful scientific research project. This means that the researcher needs to include the following:

- The careful choice of a research strategy,
- The demarcation of the population, and
- The selection of a specific sampling procedure, as well as the use of appropriate statistical methods for data analysis (Bhattacherjee, 2012 :).

Babbie *et al*. (2001:53) are of the view that the qualitative researcher focuses on the naturalistic observation rather than the controlled measurement as well as the subjective exploration of reality from an insider's view [point which is not so with the quantitative research concept.

From the above discussion it can thus be concluded that methodology refers to the rationale and the theoretical assumptions that underlie a particular study relative to the method used. Based on the foregoing facts, methodology can refer to theoretical analysis of the ways of investigation appropriate to a field of study or to the body of inquiry. These are underpinned by the principles particular to a branch of knowledge. This enables the researcher to choose the most suitable design and method to produce valid and reliable data.

4.5 QUALITATIVE RESEARCH

Welman *et al*. (2005:186) are of the opinion that qualitative research is orientated towards exploration, discovery and inductive logic. Data is collected through observations, interviews and other qualitative methods. The product of the research is a new model, theory or hypothesis (Welman *et al*., 2005:5) According to O' Sullivan and Rassel (1999:36), a qualitative research method produces verbal data, which is difficult to convert into numbers. It is defined by its extensive use of verbal information and its preference for developing full information. However, Merrian (1998) views qualitative researchers as being concerned primarily with process, rather than outcomes. The researcher physically goes to the people, setting, site or institution to observe or record behaviour in tis natural setting. Welman *et al*. (2005:15) noted the following about qualitative research:

- The data is in the form of words from documents, observations or transcripts;
- Theory can be causal or non-causal and is often inductive;
- Hypotheses are frequently undeclared or merely in the form of a research goal.
- Concepts are in the form of themes, generalizations and taxonomies, as well as the fact that

- Research procedures are particular and replication is very rare.

Leedy and Ormrod (2005:9495) also note the following characteristics with reference to the qualitative research paradigm:

- Qualitative researchers make considerable use of inductive reasoning (moving from the particular to the general): They make many specific observations and then draw inferences about larger and more general phenomena.
- The qualitative approach is used to answer questions about the opinions, perceptions and people's points of views, with the purpose of describing and understanding the phenomena from the participants' point of view. The qualitative researcher seeks thus a better understanding of complex situations. Their work is often exploratory in nature.
- The research process is more holistic and "emergent", with the specific focus, design, data collection methods and interpretations developing and possibly changing along the way.
- A qualitative study is more likely to end with tentative answers or hypotheses about what was observed. These tentative hypotheses may form the basis of future studies designed to test the proposed hypotheses.

Additionally, (Welman *et al.,* 2005:5) contend that the verbal encounter between the researcher and the respondents relies heavily on interviews that are usually unstructured and those that concern mainly open ended questions and in-depth probes Denzin and Lincoln's (1994) concur that the skilled social researcher carefully chooses the most appropriate approach to a particular problem. Denzin *et al.*(1994:) further emphasize the fact that a qualitative research uses sources that exist prior to research and also uses primary sources e.g. annual reports strategic plans, legislation, minutes of meetings Integrated Development Plans, budget, interviews, questionnaires and own experience.

In this study the qualitative research method was employed. According to Bogdan and Biklen (2003:14), qualitative research is descriptive, in that, the data collected

takes the form of words or pictures rather than numbers. Bogdan *et al*. (2003:14) further postulate that the data collected may include interview transcripts, personal documents and other official records. It is worth mentioning that the written word is very important in qualitative research, both for recording purposes as well as for the dissemination of findings. Another very important aspect of qualitative research is that nothing is taken for granted as much as there is no statement that can escape scrutiny (Bogdan *et al*., 2003:14). Leedy *et al*. (2005:94) on the other hand emphasize that qualitative research is typically used to answer questions about the complex nature of a phenomenon with the purpose of describing and understanding the particular phenomenon from the participant's point of view.

Qualitative research produces descriptive data of the participants by the written or spoken word. Furthermore qualitative research involves the identification of the participant's beliefs and values that underlie the phenomenon (De Vos, Strydom, Fouche & Delport 2002:79). De Vos *et al*. (2002:79) further assert that qualitative research is idiographic and holistic in nature as well. The qualitative approach aims to understand the social life and meaning that people attach to their everyday lives.

The qualitative research method was particularly appropriate when gathering socially dynamic information related to human behaviour and the interaction of people. That is how people make sense of their lives, experiences and their structure of the world (Abiche, 2004:9). Abiche further states that qualitative research helps the researcher to better understand complex relationships; to find out about the reasons for people preferring particular strategies over others in solving their problems; and to be ready for the unexpected that may trigger a new set of questions to ask (Abiche, 2004:9).

In this chapter as indicated earlier, the qualitative research method was used as a method of data collection from the respondents. The interviews as well as the questionnaires used will be discussed at length

4.6 DATA COLLECTION METHODS

According to Mouton (1996:107) the data collection method refers to the way in which data has been collected or some of its intrinsic properties or it can also be referred to as the way a researcher is going to collect data. Brynard *et al*. (1997:28) mention four most commonly used techniques as a means of data collection, these are: questionnaires, relevant literature, observation and not excluding interviews. In this study data was collected through the use of questionnaires, document study, interviews and a survey.

These techniques are discussed hereunder.

4.6.1 Documents Reviewed

For the purposes of this study, the researcher reviewed various documents pertaining to waste management. Documents reviewed included relevant books, publications, journals and legislation. Some of the legislation that was consulted included the *Municipal Systems Act 32 of 2000*, the *White Paper on Local Government, 1998*, the NMBM's Integrated Solid Waste Management Plan as well as the Integrated Development Plan was consulted for additional information. Reviewing documents for research purposes has advantages as well as disadvantages. These challenges are discussed in the following section as noted by Bailey (1994:295-298):

4.6.1.1 Disadvantages of document study

- Most of the time impossible to ascertain critical factors such as the origin or the date of documents;
- In some fields of study, documents are simply not available because records were never kept. In other cases records were kept, but are classified or inaccessible for security reasons.
- More often than not, the records, historical documents and some reports are incomplete, thus creating problems in finding the missing information.

4.6.1.2 Advantages of document study

- The respondents here are not aware that they are being observed or studied, which is what happens with surveys and/ or experiments;
- The type of document(s) that is being studied and the distance that needs to be covered in order to obtain the documents is relatively more affordable than, for instance, a comprehensive survey;
- The most important advantage of document study is it is the only method whereby the researcher does not necessarily make personal contact with the respondent or respondents.

4.6.2 Population and Sampling

Brynard *et al*. (1997:43) suggest that population refers to subjects, objects, phenomena, cases, events and activities which the researcher would like to study in order to gain some new insights. Babbie *et al*. (2001:100) define population as the group of participant's form whom conclusions are to be drawn. Welman *et al*. (2005:46) further suggest that population is the study object which may be individuals, groups, organizations, human products and events or conditions to which they are exposed. The size of the population usually determines the practicality of whether to include all members of the population or not. Issues like time and costs determine if it is possible for the researcher to involve all member of the population in a research project, this situation often leads the researcher to select a sample from which to obtain data.

The research population was purposely selected for this study. According to Marshall (1996:523) purposive sampling allows the researcher to actively select the most productive sample that can answer the research questions. For the purposes of this study senior officials from the waste department, a ward councillor, ward committee members as well as residents, were selected. The respondents were targeted based on their knowledge and first-hand experience of the problem under

investigation. Data collected form all the respondents will be analysed and interpreted in the next chapter.

4.6.3 Survey

Generally it is known that a survey is a method of collecting data in the social sciences. According to Moore (1993:10), the primary function of surveys is to collect information which can then be analysed to produce conclusions. Moore (1993:10) further attests that surveys can be divided into two broad categories, namely the questionnaire and the interviews. Questionnaires are usually paper and pencil instruments that the respondent completes whilst interviews are completed by the interviewer based on the responses of the respondents. In the section below questionnaires and interviews will be discussed as data collection methods in research and why they were preferred to gather data for this study.

4.6.4 A Questionnaire as a research tool

Key (1997:1) describes a questionnaire as a data-collecting instrument that can be structured or unstructured. A questionnaire is also said to be a written or printed form used to gather information on some subject or subjects consisting of a list of questions to be asked to one person or more people (Key, 1997:1)

Mouton (1996:107) outlines a questionnaire as a set of questions on a form which is completed by the respondent in respect of a research project. According to Legotlo (1998:21), the method of data collection depends entirely on the purpose of the study. For the purposes of this study, a questionnaire was utilised as a data collecting tool as it is mostly used as an instrument to collect data in surveys. Legotlo (1998:21) further attests to this by adding that a questionnaire is a device that enables respondents to answer questions posed to them. Lastly, according to Legotlo, (1998:21), if a questionnaire is well designed, it can enhance the validity as well as the reliability of the data to satisfactory levels of tolerance.

However, Denscombe (2003:159) on the other hand suggests the following as some of the advantages of questionnaires:

4.6.4.1 Advantages of Questionnaires

- Questionnaires are economical – Questionnaires are economical in the sense that they can supply a considerable amount of research data at relatively low cost in terms of material, money and time;
- Easier to arrange – Questionnaires are easier to arrange than for example, personal interviews. They can be simply be delivered unexpectedly to the respondent;
- Questionnaires supply standardized answers – Respondents are propounded with exactly the same questions, with no scope for variations to slip during face to face contact with the researcher. Data collected is unlikely to be contaminated through variations in the wording of the questions or the manner in which questions are asked.

However, like anything in life, there are disadvantages or limitations of questionnaires like any other data collection tool, as well and these are discussed hereunder.

4.6.4.2 Disadvantages of Questionnaires

Labovitz *et al.* (1981:68) propose the following as major disadvantages of questionnaires:

- The population under being studied is restricted because the respondents must be able to read and write;
- There is a high degree of self-selection leading to a comparatively low response/ return rate (a 30% return is not uncommon);
- The questionnaire must be restricted in length and scope due to the fact that respondents may lose interest or become fatigued and lastly

- There is a lack of depth interviewing or probing for the meaning of the statements.

The following section will look at individual interviews that were also conducted in this study.

4.6.5 Interviews

In this study interviews were used with the sole purpose of soliciting information from the respondents.

Interviews are qualitative, in-depth and can be viewed as being semi-structured; this view is held by Clark and Sartorius (2004:15). Furthermore, Clark *et al.* (2004:15) argue that interviews rely on interview guides that list topics or questions on a particular phenomenon that is being studied. Nevertheless, Labovitz *et al.* (1981:68) contend that the interview guide comprises of questions that can be structured or unstructured, which are asked and completed by the interviewer in a face to face situation with the respondent (s). This type of data collection method is hailed as being able to allow the interviewer to communicate with the respondent by asking questions using voice, facial expressions and body language. These also allow the interviewer to formulate his or her responses using the voice, facial expressions as well as body language (Schnetler, Stoker, Dixon, Herbst & Geldenhuys, 1989:16).

4.6.5.1 Advantages of Individual Interviews

According to Bless and Higson-Smith (1995:111) the following are the advantages of individual interviews:

- This data collection method can be administered to illiterate respondents as the interviewer can read the questions and then transcribe the responses. This then means that the respondent does not have to be able to read and write.

- The interviewer can explain a question further should the respondent exhibit signs of not understanding the question, thus giving clarity.
- The interviewer can ensure that all posed questions are answered and that tough or demanding questions are not left out. The fact that the interviewer is personally administering the question is also an advantage in itself. This also results in high response rate, collection of additional information to assist in the study, fewer incomplete questionnaires and most importantly, misunderstood questions can be clarified on the spot as well as eliminating inappropriate responses.

4.6.5.2 Disadvantages of interviews

This method of data collection is seen as being time consuming as an interviewer can only handle a limited number of interviews per day (Jackson, 1995:122). Furthermore, Jackson (1995:122) argues that using this method as a means of data collection is very expensive.

For the purposes of this study, having weighed the challenges and advantages mentioned above, the researcher utilised both the questionnaires and individual interviews. Questionnaires were limited to the waste management senior officials. For the Ward committee members as well as the residents individual interviews were conducted and this was informed by the fact that the interviews enabled the researcher to adapt to the formulation including the terminology befitting the background and educational levels of the respondents. Interviews according to Moore (1993:27) allow the researcher to use probes to clear up vague responses and ask for clarification of incomplete answers as the researcher reads the questions and records the responses personally.

Lastly, Moore (1993:27) emphasizes that interviews are more personal than questionnaires and tend to produce a better response rate as well as providing the researcher with more control over the survey thus making it possible to collect information at precise times.

4.7 LIMITATIONS

During this study certain challenges were experienced, however the researcher was not deterred. The following were the limitations to the study:

- Lack of available literature: Most of the literature consulted was International literature thus making it difficult to make inferences to the South African context.
- Lack of prior research studies on the topic conducted in the Nelson Mandela Bay was not available to make comparisons,
- Poor responses and delays from municipal officials, and
- High expectations from respondents

4.8 DATA ANALYSIS

When a researcher undertakes to do a study, the purpose of that particular study is to solicit information from the data that has been collected and thus make informed deductions. Research is not undertaken just to have information and then ends there. Once this data has been collected from the respondents it has to be analysed, interpreted and then presented. A researcher can only make sense of the data collected by organising and arranging the data into manageable form (Vithal & Jansen, 1997:27).

Data analysis is undoubtedly one of the characteristics of qualitative research that distinguishes it from quantitative research. When it comes to data analysis, the first thing that the researcher does is to explore the data. The initial analysis in qualitative research consists of investigating the data, writing down the ideas, and thinking about the organisation of the data in text segments or themes (Creswell, 2003). According to Lindlof and Taylor (2002:195), qualitative data analysis is first and foremost an inductive process of organising the data into categories and identifying patterns or relationships between the categories Furthermore, the process of qualitative data analysis is an on-going cyclical process integrated into all phases of qualitative research. It is an inductive process in which categories and patterns

emerge from the data rather than being imposed on data prior to data collection as argued by Stenbacka (2001:123).

Neuman (2011:507) points out that, to analyse data means to systematically organize, integrate and examine; this is done in order to search for patterns and relationships among the specific details. Neuman (2011:507) further asserts that when a researcher is analysing data, he/she needs to connect particular data to concepts, advance generalizations, and identify broad trends or themes. In the final analysis, it can thus be said that, analysis allows researchers to improve understanding, expand theory and add to the body of knowledge

4.9 CONCLUSION

In this chapter an analysis of the methodology used to conduct this study was presented. The qualitative methodology was used as a method to conduct the study. Questionnaires and face to face interviews were used as the main instruments of data collection so as to allow the respondents to explain their responses and obtain clarity from the researcher where it was necessary. These data collection instruments were also used due to their advantages for this particular investigation. The next chapter will present the data analysis and interpretation.

CHAPTER FIVE

DATA ANALYSIS AND INTERPRETATION

5.1 INTRODUCTION

The previous chapter discussed the research methodology and the research design of the study. This chapter seeks to present, interpret and analyse the findings from the research based primarily on the literature review and the results that emanated from the empirical study. Data was collected as per the methods described in the previous chapter. The techniques that have been used to collect data were emailed questionnaires.

Data was collected to describe details about people, actions and events in social life as stated by Neuman (2011:507). Data analysis and Interpretation is a process where data is collected and analysed. After the data has been collected it needs to be presented, interpreted and analysed. Therefore, this chapter seeks to present the data that has been collected throughout the research, interpret, analyse and describe it.

Results of the empirical study were analysed in this section in order to achieve the set objectives. The section below will provide the results of each statement as presented by respondents in terms of figures and percentage and inferences are also drawn of the responses. The chapter is outlined as follows: Firstly, qualitative research method, qualitative data analysis will be discussed followed by data about personal details of the respondents will be outlined in relation to the demographic factors as contained in Section A of the questionnaire. Secondly data will be presented based on Section B of the questionnaires. Last but not least, the conclusion of this chapter will be presented.

5.2 QUALITATIVE RESEARCH METHOD

Qualitative Research Method is used when a researcher is confronted with information or data that cannot be quantified. Mouton and Marais (1990:175) write that qualitative research is characterized by the fact that the researcher is trying to get multiple meanings and interpretations rather than impose one dominant interpretation. There are some kinds of information that cannot be adequately recorded using quantitative data. In many cases language provides a far more sensitive and meaningful way of recording human experience. In these cases, words and sentences are used to qualify and record information about the world. The research is Qualitative in nature (Bless & Higson-Smith, 2006:44)

Jakatyana (2010:91) also asserts that the qualitative research paradigm arises from an antipositivistic, interpretative approach, is idiographic and holistic in nature and its goal is to understand social life and the meaning that people attach to everyday life. It elicits participant accounts of meaning, experience or perceptions and generates descriptive data in the participant's own written or spoken words.

5.3 QUALITATIVE DATA ANALYSIS

The profile of the respondents will be outlined in a graphical format in order to describe the survey group. The purpose of the graphical format is to provide a visual illustration of the sample. Demographic details of the respondents include the gender, age, length of service of respondents and the level of education. The data is presented below:

5.4 ANALYSIS OF QUESTIONNAIRES

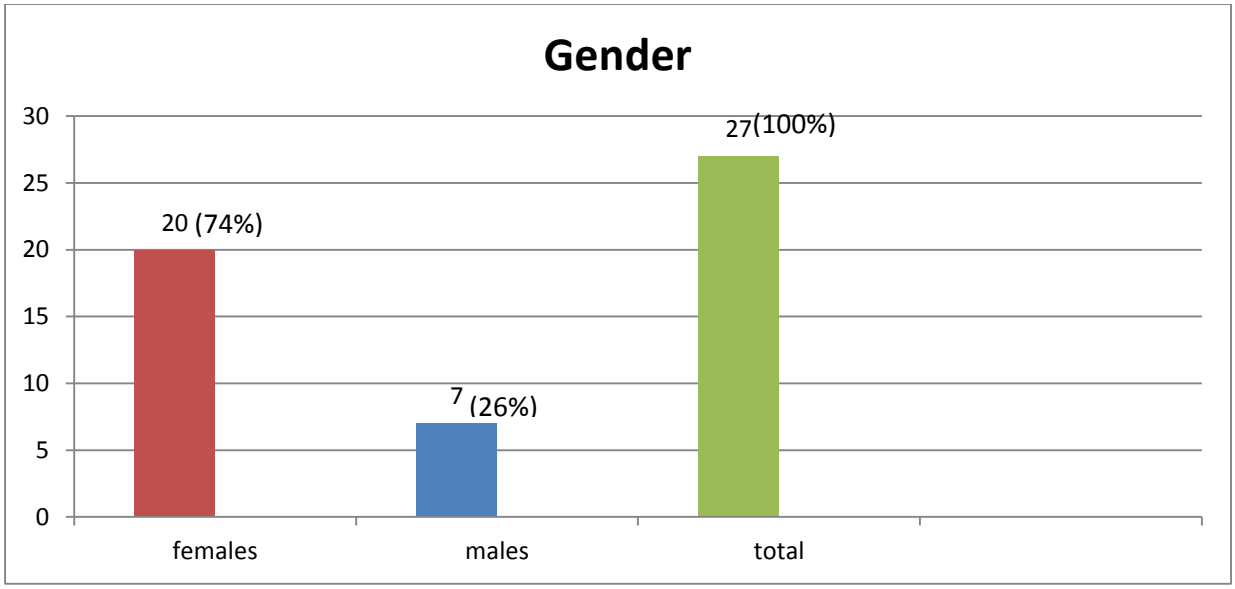
5.4.1 Section A

The respondents used by the researcher consisted of both males and females. Within the respondents that returned their filled questionnaires, it was observed that 20 respondents comprised females and 7 respondents comprised males. This then translates to 74% of female respondents and 26% of male respondents. Female

respondents dominated the male respondents. The table below illustrates these figures:

5.4.1.1 Demographics: Residents

	Number and %		Total
Gender	Males	Females	
	7 (26%)	20 (74%)	27 (100%)
Total	7	20	27



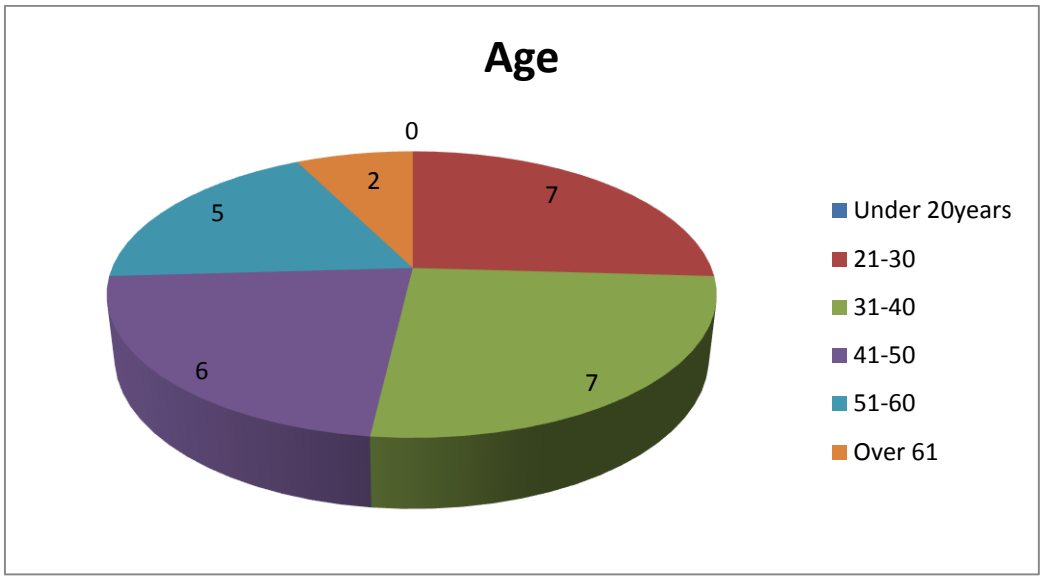
Graph 5.1: Gender

5.4.1.2 Age

As much as gender was characterized, so were the different age groups of the 27 respondents. The age groups were broken down as follows: under 20yrs, 21- 30, 31-40, 41-50, 51-60 and those over the age of 60. There were no respondents under 20 years, 7 respondents (21-30), 7 respondents (31- 40), 6 respondents (41- 50), 5 respondents (51- 60) and there were no respondents over the age of 60. Most respondents were between the ages of 21 to 50.

Below is the diagrammatic representation of these figures:

	Ages						
	Under 20 years	21-30	31-40	41-50	51-60	Over 61	Total
Years	0	7	7	6	5	2	27



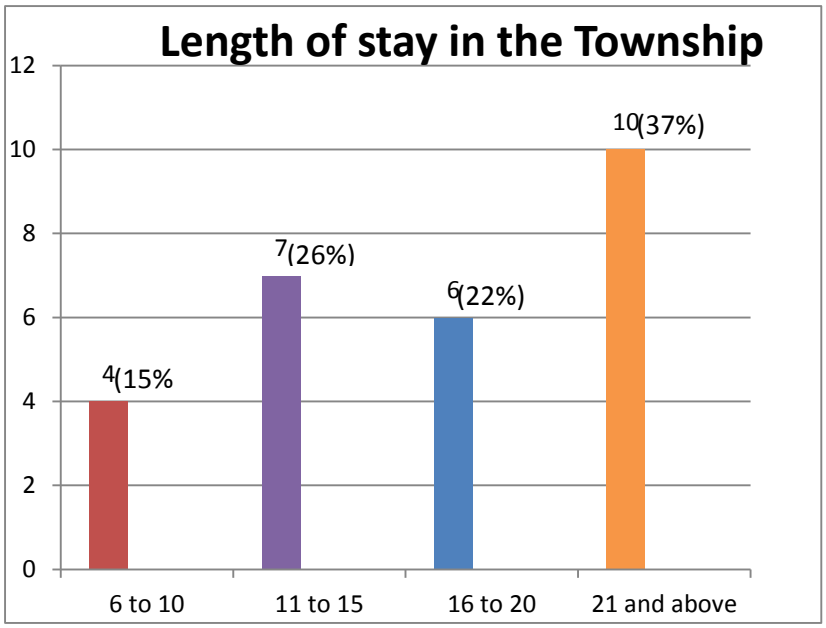
Graph 5.2: Age

5.4.1.3 Length of stay in New Brighton Township

The length of stay of the respondents was grouped as follows: From 0-5 years, 6-10 years, 11- 15 years, 16- 20 years and above 21 years. Nil for 0-5 years, 4 respondents (6- 10), 4 respondents 7 (11-15 years), 6 respondents (16- 20) and 10 respondents 21& above.

A diagrammatic representation follows hereunder:

	Number and %					Total
Years	0-5	6-10	11-15	16-20	21 and above	
	0 (0%)	4 (15%)	7 (26%)	6 (22%)	10(37%)	(100%)
Total	0	4	7	6	10	27

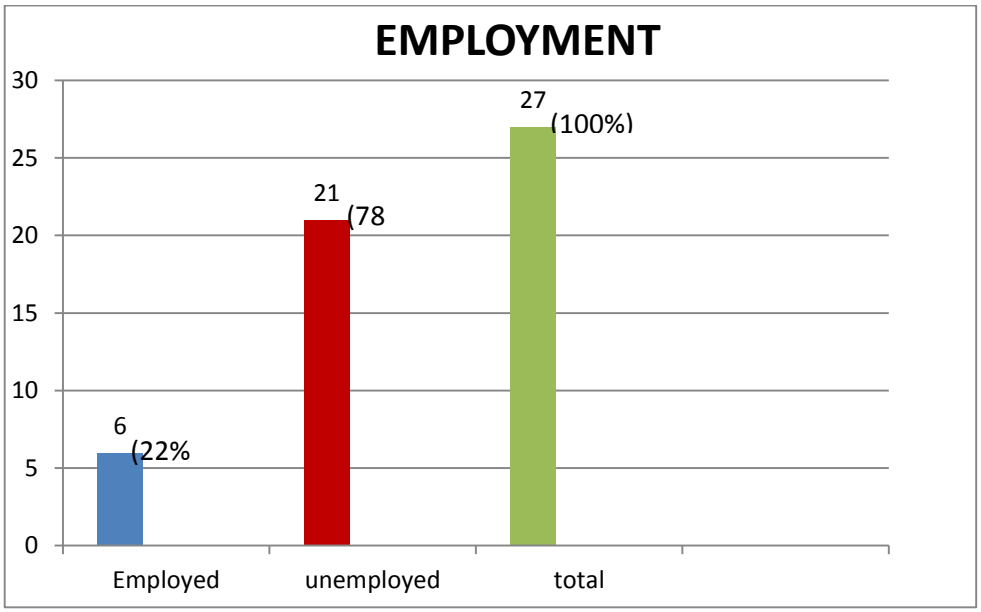


Graph 5.3: Length of stay in the Township

5.4.1.4 Employment

Out of the 27 respondents, 6 respondents were employed and 21 respondents were unemployed. This is illustrated hereunder:

	Number and %		Total
Employment	Employed	Unemployed	
	6 (22%)	21 (78%)	27 (100%)
Total	6	21	27

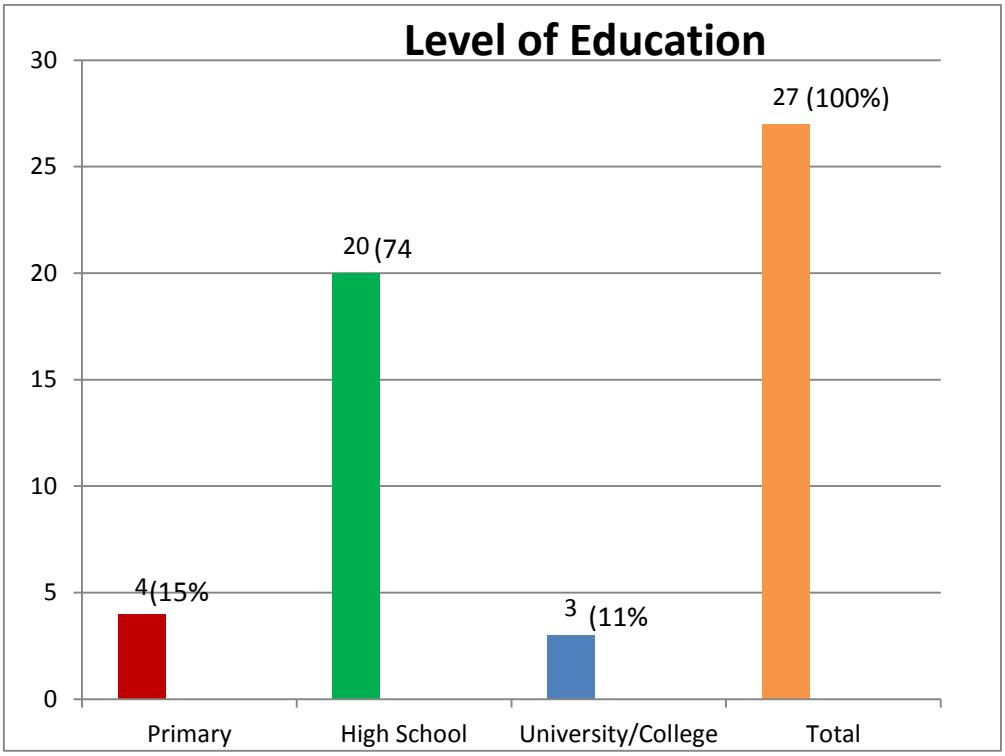


Graph 5.4: Employment

5.4.1.5 Level of education

With regards to the level of education of the respondents, 4 respondents only had Primary School level of education, 20 respondents had High School level and only 3 respondents had University or college level of education. This presented here below:

	Number and %			Total
Level of education	Primary	High	University/College	
	4 (15%)	20(74%)	3 (11%)	27 (100%)
Total	4	20	3	27



Graph 5.5: Level of education

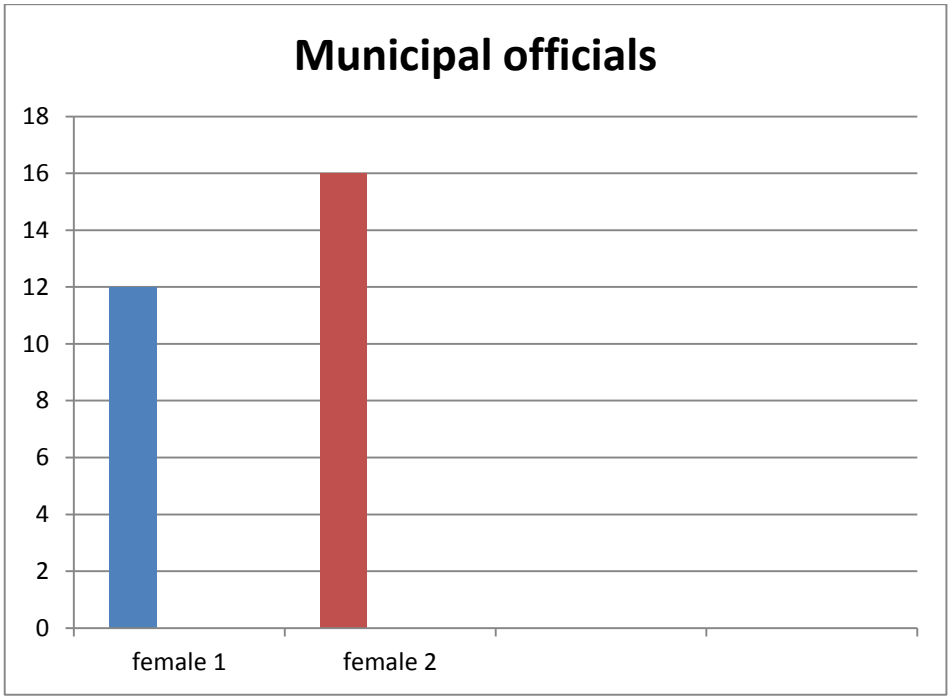
5.4.1.6 Municipal officials

Two senior officials from the waste management departed were selected as previously mentioned in the first chapter and both responded to the questionnaires.

Both managers have been employed in this department for more than 10 years. The one manager has been with the department for 12 years and the other one for 16 years meaning that they have experience and knowledge of the subject matter.

The gender as well as the length of service of these officials in the NMBM is represented in the table and graph below

Number of years employed	0 - 5	6 -10	11 - 15	16 – 20	21 and above
Female 1			X		
Female 2				X	



Graph 5.6: Gender & length of service at NMBM

5.4.1.7 Ward Councillor

The researcher had opted to interview one ward councillor as mentioned in chapter one (1). She was born and bred in the area being studied and has been involved

with community activities even before she became a councillor meaning that she has a wealth of knowledge of the study area and surrounds.

5.5 RESIDENTS RESPONSES

5.5.1 Section B of the questionnaire for residents

Section B of the questionnaire dealt with waste management challenges facing the New Brighton Township residents.

The responses are discussed hereunder.

5.5.1.1 Are you aware of the illegal dumping of household waste in New Brighton?

All respondents are aware of the illegal dumping of the household waste in the area of New Brighton. Respondents argue that they do not dump in the open spaces but residents that live in the neighbouring areas.

5.5.1.2 How does this affect you as a resident?

Most respondents acknowledged the fact that illegal dumping had a bad effect on them, mentioning things such as, bad smells, that the dumping creates and attracts flies, insects and rodents; the dumping is a health hazard. Causes sicknesses such as asthma, vomiting skin rashes etc., Children and the elderly are the most affected. Other respondents highlighted the fact that some children are raped, foetuses dumped into the open spaces and there are reported cases of such occurrences.

5.5.1.3 In your opinion what could be the reasons as to why the community and households indiscriminately dispose of their household refuse?

All of the respondents had similar reasons as to why. Reasons such as, ignorance, the fact that the place id an open space, that most people are not aware or don't have enough knowledge as to how much harm the dumping could cause, that

residents have no say to such matters, selfishness. Most respondents shared the sentiments that the residents have no deeper knowledge of the impact of their actions.

5.5.1.4 Are you aware of any educational programmes on appropriate handling of household waste taking place in your community?

Out of the 27 respondents only 3 respondents were aware of any educational programmes on appropriate handling of household waste taking place in the community and 24 respondents were not aware of any such programmes.

5.5.1.5 How can this practice of illegal dumping be solved?

The respondents mentioned similar solutions to the problem of the illegal dumping such as: the area should be closed up and maybe a vegetable garden should be put in place, and that residents should be more educated and programmes should be put in place so that residents know better,

5.5.1.6 In your opinion is the Municipality doing enough to address this problem?

When asked whether the respondents think that the municipality is doing enough to address the problem, 20 respondents said NO simply because the removal is irregular and not effective, delayed responses to residents requests and lack of educational programmes, 7 respondents said that the Municipality is doing enough to address the problem.

From the above discussion it can thus be deduced that the residents are not aware of any educational programs on waste management offered by the municipality. It was also evident that ineffective waste management is posing health threats on the residents as well as the environment. Introduction of educational programmes can assist in equipping the residents with knowledge and thus reduce ignorance and assist in promoting a clean and safe environment for all in the area.

5.6 MUNICIPAL OFFICIALS RESPONSES

5.6.1 Are you aware of the illegal dumping of household waste in the New Brighton Townships? What suggestions can you make to alleviate this problem?

Both municipal officials are aware of the illegal dumping in the New Brighton Township. Both officials suggest that the frequency of waste collection should shift from fortnightly to weekly. They also suggest an erection of transfer stations or drop off centres closer to the communities. Another suggestion is that of introducing massive education and employment of more law enforcement officials thus enforcing municipal by-laws.

5.6.2 What are your views about this problem?

Both officials agree that this problem creates unpleasantness, is harmful to the environment. Residents should also take responsibility for their areas.

5.6.3 Presently, how is waste managed in the New Brighton Township?

Both officials cite the fortnightly collection of wheelie bins.

5.6.4 Are there monitoring and evaluating strategies in place as far as waste management is concerned? If yes, which ones can you remember? If no, can you give any reasons why there are not?

Both officials agree unanimously that there are strategies in place citing: Waste collection strategy, Waste management plan (done every 5 years), weekly monitoring of waste retrieval.

5.6.5 Which of the above mentioned strategies are effective in your opinion? Kindly give reasons for your answer.

Both officials agree that all the strategies are effective except the challenge of

fortnightly refuse removal.

5.6.6 Which Department in the Municipality is responsible for monitoring the disposal of waste in your opinion are they doing an effective task? Please support your answer with reasons.

Both officials agreed that Public Health Directorate is responsible for monitoring Waste Management Sub directorate.

5.6.7 Is the community educated about illegal dumping and its consequences? Provide reasons for your answer.

Both officials are in agreement that there is continuous education and awareness campaigns regarding the problem at hand.

5.6.8 In your opinion, what influence does uncontrolled and indiscriminate disposal of household waste have on the New Brighton communities as well as the municipality?

Both officials agreed that these occurrences have a bad influence as the physical environment is deteriorating and there are outbreaks of diseases associated or linked to illegal dumping of waste.

5.6.9 What do you think are the reasons for the indiscriminate disposal of household waste by these communities?

Both officials agreed that frequency of collection which is fortnightly. Misuse of wheely-bins, lack of awareness and education as well as lack of law enforcement.

5.6.10 Are there policies in place to support waste management? If yes, mention them. Are they implemented effectively? Support your answer with reasons. If no, give reasons

Both officials agreed that there are policies to support waste management namely: Waste Management By-laws and *Waste Management Act, 2008* and *National Environment Management Act, 2008.*

5.7 COUNCILLOR'S RESPONSE

5.7.1 Are you aware of the illegal dumping of household waste in the New Brighton townships?

The councillor is aware of the illegal dumping of household waste in the New Brighton townships.

5.7.2 What are your views as a councillor for this ward about this problem?

The councillor views the problem as very frustrating and that it has a negative impact on the ward.

5.7.3 Are you aware of the monitoring and evaluating strategies in place as far as waste management are concerned?

The councillor is aware of the monitoring and evaluation strategies that are in place as the councillor works closely with the municipal officials in the waste department.

5.7.4 Who is monitoring the disposal of waste?

The councillor cites the waste department within the municipality.

5.7.5 Is the community educated about illegal dumping and its consequences? If yes, how? If no, why?

According to the Councillor the community is educated about illegal dumping and its consequences. The Councillor together with the Ward Committee members holds "gap-tap" meetings to educate the community but most of them do not attend.

5.7.6 What suggestions can you make to alleviate this problem?

The Councillor suggests that open spaces should be utilised in order to prevent indiscriminate dumping of household waste.

5.7.7 What influence does uncontrolled and indiscriminate disposal of household waste have on the New Brighton communities as well as the municipality?

The indiscriminate dumping of household waste in the New Brighton area has health implications for the communities and has a bad reflection for the municipality as far as service delivery is concerned.

5.7.8 What do you think are the reasons for the indiscriminate disposal of household waste by these communities?

Some of the reasons mentioned by the Councillors are that:

- The communities are angry due to the fortnightly pickups;
- Communities feel that they are creating job opportunities for the unemployed;
- Uncaring attitudes and
- Uncertainty of time for refuse collection as refuse sometimes is not picked up at scheduled days and time.

5.7.9 What suggestions can you make to alleviate this problem?

To alleviate this problem the Councillor suggests that:

- There should be more public awareness campaigns regarding the disposal of household waste;
- Youth participation;
- Change of mind set by the communities with regards to keeping the environment clean and healthy and
- Municipality to increase the fortnightly refuse pick –up to weekly

5.8 CONCLUSION

The foregoing chapter presented the data analysis and its interpretation. The research methods utilised in the study were also discussed, namely, the qualitative research methods, qualitative data analysis as well as the analysis of the questionnaires were also discussed at length. It is evident from the responses of the residents that there are no educational programs in place equipping them with knowledge as far as illegal dumping is concerned. The municipal officials do agree that there is a challenge with regards to waste management in the NMBM New Brighton Townships. The Ward Councillor is aware of this problem and together with the ward committee members is trying to get the communities to see the impact of indiscriminate dumping of household waste. The NMBM officials, the Ward Councillor as well as the residents are in agreement that the forthrightly waste collections are not adequate and suggest a weekly waste collection. Affluent areas within the NMBM receive a weekly waste removal service. The last chapter will focus on the conclusions and recommendations of the study.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter is intended to summarize the findings of the study, offer recommendations as well as a conclusion. The main objective of the study was to ascertain whether educational programmes can improve the management of integrated solid waste management in New Brighton in NMBM.

For the purposes of this study, a literature study was conducted which included a broad analysis of a variety of sources comprising, official documentation, unpublished theses, as well as relevant legislation. The findings revealed that for an effective waste management system there has to be an integrated system, due to the fact that all the activities for waste management are interrelated. This study established that the current level of knowledge about solid waste management in the New Brighton Township was a concern and that residents needed to be educated on how to handle and dispose household waste.

6.2 SUMMARY OF THE STUDY

Chapter One: Chapter one of the study presented the purpose of the research, the problem statement, the significance of the study, research questions, definition of key concepts, literature review as well as the Legislations on waste management in South Africa. The theoretical framework, within which the study was undertaken, was also presented.

Chapter Two: Chapter Two reviewed the conceptual perspective and legislative framework for integrated waste management. The history of waste management was presented from an

International perspective through to Africa and South Africa with a special focus on Port Elizabeth.

Chapter Three: Chapter Three presented the theoretical framework, the Systems theory and why it was selected for the study. The area of study was also dealt with in this chapter.

Chapter Four: Chapter Four reviewed the research design and methodology employed for purposes of the study. The qualitative approach was selected for the study

Chapter Five: Chapter Five the data collection techniques usetelised were explained in detail. The data analysis and interpretation were also presented in this chapter.

Chapter Six: Chapter Six presented the summary of the study as well as recommendations.

The responses have revealed that there is a break in the chain of waste management. Refuse collection is done fortnightly instead of weekly as promised. Some of the households have been provided with “wheelie” bins, whilst others are given refuse bags. The communities feel deprived of basic human rights, that of a clean and healthy environment as prescribed by the Constitution.

6.3 RECOMMENDATIONS

Based on the findings of the study, the following recommendations are proposed:

- Increase public awareness of proper solid waste management through educational programs with a special focus on children using the media (radio, newspapers and television) and community gatherings,

- Convert open spaces into income generating projects through the introduction of Municipal Solid Waste programs these programs need to focus on waste reduction,
- Imposing of heavy fines by Town Rangers on those found to be littering or dumping illegally, and
- Further research studies on solid waste management in the NMBM need to be undertaken.

6.4 CONCLUSION

The aim of this study was to analyse the scope for the utilisation of educational programs on waste management and how this can influence the communities' behaviour as well as attitudes towards the handling and disposal of household waste and to make recommendations. The study investigated how the utilisation of educational programs can improve the handling and disposal of household waste as part of effective integrated solid waste management system in the New Brighton Townships of the NMBM.

It is hoped that the proposed recommendations can assist the NMBM deal with the challenge of managing solid waste in an effective and efficient manner and thereby be able to deliver the most basic service to the New Brighton residents.

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APPENDICES

APPENDIX A: APPROVAL FOR RESEARCH FROM NMBM

.5 Goodwin Street
Sydenham
Port Elizabeth
6001
26 May 2014

The Municipal Manager
Nelson Mandela Bay Municipality
City Hall
Vuyisile Mini Square
Port Elizabeth
6001

Dear Mr Mbambisa

I am currently registered for an MA degree in Public Administration (student no. 210040092) with the Faculty of Arts, in the department of Public Management and Leadership, at the Nelson Mandela Metropolitan University. I would like to request permission to conduct a research study in fulfilment of the said degree.

The title of the study is: Improving Integrated Waste Management through Community education Programmes in the Nelson Mandela Bay Municipality, in the New Brighton area of the Metro.

Below are the details of my study leader:

Dr Asmah Andoh
Room 506: Main Building
NMMU
Tel no: 041 5044534
Fax no: 0866865509
E-mail: Kwame.asmah-andoh@nmmu.ac.za

Your favourable consideration would be appreciated.

Yours faithfully

.....
B.A. Adams
RESEARCHER
076 292 4765 (C)

APPROVED / NOT APPROVED
SIGNATURE OF EXECUTIVE DIRECTOR
CORPORATE SERVICES

APPENDIX B: ETHICS APPROVAL

Nelson Mandela Metropolitan University
for tomorrow

SOUTH CAMPUS
FACULTY OF ARTS
Tel . +27 (0)41 5042855 Fax. +27 (0)41 5041661
Noxolo.mngonyama@nmmu.ac.za

• PO Box 77000 • Nelson Mandela Metropolitan University

Ref: H/14/ART/PGS-0013

19 AUGUST 2014

Ms BA Adams
5 Goodwin Street
Sydenham
PORT ELIZABETH
6001

Dear Mrs Adams

IMPROVING INTEGRATED WASTE MANAGEMENT WITH COMMUNITY EDUCATION PROGRAMMES: THE CASE OF NEW BRIGHTON IN THE NELSON MANDELA BAY MUNICIPALITY

Your above-entitled application for ethics approval served at the FPGSC Higher Degrees sub-committee of the Faculty of Arts Faculty Postgraduate Studies Committee.

We take pleasure in informing you that the application was approved by the Committee.

The Ethics clearance reference number is **H/14/ART/PGS-0013**, and is valid for three years, from 19 AUGUST 2014 – 19 AUGUST 2017. Please inform the FPGSC, via your supervisor, if any changes (particularly in the methodology) occur during this time. An annual affirmation to the effect that the protocols in use are still those for which approval was granted, will be required from you. You will be reminded timeously of this responsibility.

We wish you well with the project.

Yours sincerely

Mrs N Mngonyama
FACULTY ADMINISTRATOR
cc: Promoter/Supervisor
HoD
School Representative: Faculty FPGSC

APPENDIX C: ARTICLES

ARTICLE 1

PORT ELIZABETH EXpress
90 000 COPIES WEEKLY
30 YEARS • JAAR
in the heart of our community
WEDNESDAY May 14, 2014 | ☎ 041 503 6111 | E-mail express@media24.com | peexpress.mobi | www.pe-express.co.za
EDITOR: BETTIE GILIOMEE

Kids have to play in filth due to illegal dumping

LIZEKA TANDWA

The municipality has decided to increase the frequency of refuse collection in low to medium income areas as the fortnightly service the areas currently receive does not cater adequately for the average amount of waste generated by the households.

This after months of these residents having to live among dangerous illegal dumpsites with children forced to play in these areas.

Municipal Spokesperson, Mthubanzi Mniki, said, during the 2012/13 financial year, funding was provided on the capital budget to purchase the truck that would be used for the frequency change.

"The suppliers could, however, not supply in time, and funding was rolled over to the 2013/14 financial year. Three trucks have been received to date and the remainder will be delivered by 30 June 2014," he said. Mniki said the frequency change would take place in three phases. The Northern areas and the Ibayi area would be part of the first phase and implementation would start during the later part of 2014.

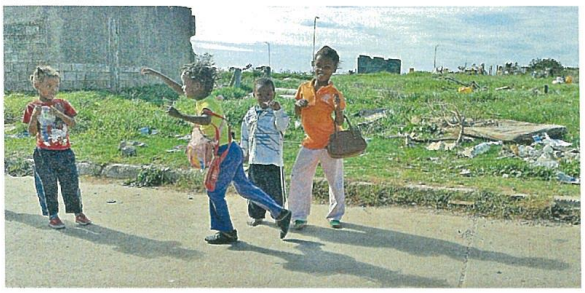
Someone needs to fight for these kids instead of making promises of a better future for all. They deserve better
- DOLLY NEL (ACVV RAINBOW SCHOOL)

PE Express learnt that pre-school children in Balfour Heights, Missionvale, had been forced to play under dangerously unhealthy conditions near a dumping site which has not been cleaned for months on end.

Continued on page 2

Dancing queens hit the stage

Candice Johnstone and her Dance Academy will present *Queen of Dance* at the Opera House on June 13 and 14. Read more about it on page 8. Pictured are dancers from Candice Johnstone's Dance Academy. Front left are Courtney Warwick and Emma Kirsten, (middle from left) Juliette Bradshaw and Louise Daniel. Back from left is Lauren Morton, Gemma Bisseker and Tara-Joan van Greunen. PHOTO: PAULA ARCHIBALD



Children playing near the dangerous illegal dumpsite. PHOTO: SUPPLIED

Children exposed to filth at dumping sites

Continued from page 1

Dolly Nel, who has been involved with ACVV Rainbow which is close to the dump site, said she had observed children in the community playing in the illegal rubbish site daily.

"We have seen very dangerous objects lying amongst the rubbish: broken bottles, rusted tins, nappies, and broken appliances. The stench itself is terrible on very hot days. Every week we phone the municipal offices, and the ward councillor but to no avail. No one seems to care that besides the obvious health hazards the dumping is causing, it has serious, dangerous consequences to small children playing there," said the disgruntled Nel.

"Someone needs to fight for these kids instead of making promises of a better future for all. How much self-worth do these children grow up with thinking that this is normal way of living? They deserve better," she added.

DA Ward 31 Councillor, Penny Naidoo, said she was aware of the problem in the area and had alerted the municipality countless times of the issue related to illegal dumping sites in her ward.

Naidoo said the municipality does not collect refuse in the area and the community only receives black plastic bin bags from her office to collect their rubbish on Mondays and Tuesdays.

"Unfortunately the issue of illegal dumping is affecting the whole of the Metro. I have spoken to the municipality asking them to make plans to eradicate the illegal dump site in the area but nothing has been done yet. We currently do not have litter-picking trucks coming to the area which is one of the reasons this problem has persisted," said Naidoo.

Responding to Naidoo's claims, Mniki, said Ward councillors are responsible for such issues as they have to come up with innovative ideas and ward-based plans so the municipality can allocate a budget for them in the IDP.

"It is not only the job of the municipality but of councillors and the community to ensure that solutions are created in the wards. Councillors are encouraged every year to come up with ward-based plans which allow us to create enough funding to ensure that the community is allocated enough money in the budget for all their needs," said Mniki.

Mniki said other wards in the townships with similar problems had (with the help of the municipality) converted the dumping sites into playing parks for the children in order to curb the problem of illegal dumpings.

Mniki said he encouraged concerned citizens such as Nel to call the municipality's 24-hour call centre at ☎ 0800 2050 50 which would deploy an official to access the problem and find immediate solutions.

ARTICLE 2

Medical waste dumped

Health and safety concerns as residents battle new hazard

Lee-Anne Butler
butlerl@timesmedia.co.za

RESIDENTS of Jongilanga Street in Veeplaas are losing the battle against illegal dumping as hazardous medical waste is now also being discarded outside their homes, posing a serious health and safety threat to their children.

They say illegal dumping has been an ongoing problem for the past 15 years but nothing has been done, despite pleas to the ward councillor and letters to the municipality.

Vakele Bukani, of adjacent Hani Street, said he feared for the safety of his four grandchildren, aged between two and 10 years, who played near the dumpsite.

He said a child in the area had already eaten some tablets discarded at the dumpsite, but fortunately there had been no serious reaction to the medication.

"All kinds of medication are dumped here, from old syringes to asthma pumps. I have written many letters to the municipality over the years but there has been no response," he said. "I have been struggling with this problem for years, but no one cares.

"We also have a broken sewerage pipe and water running into our yards. But since 2008 no one has come to fix it."

Lungiswa Majiki, who has lived in Jongilanga Street with her two children for 10 years, said she was concerned about the sewage running into her yard and about her children's exposure to medical waste.

"I want a clean environment for my children but no one comes to clean up our area," she said.

Provincial Health Department spokesman Sizwe Kupelo said the illegal dumping of medical waste was a serious issue which should be investigated by the municipality's health and environmental services unit.

"The disposal of medical waste from governmental facilities is done by private companies that are contracted to do so and done in a safe manner. If medical waste is being dumped then it is being done by private practitioners and this has been found to happen in the past," he said.

These private practitioners should be brought to book, Kupelo said.

"This cannot be our waste. It is the responsibility of the municipality's health and environmental services to investigate and remove the waste."

Ward 30 councillor Mike Tofile said the broken sewerage pipe had been reported to him and he had, in turn, reported it to the municipality.

> **"There is no budget . . . to finance a strategy [for tackling] dumping**

"No one reported anything to me regarding medical waste. That is a serious issue and if I had known I would have seen to it immediately," he said.

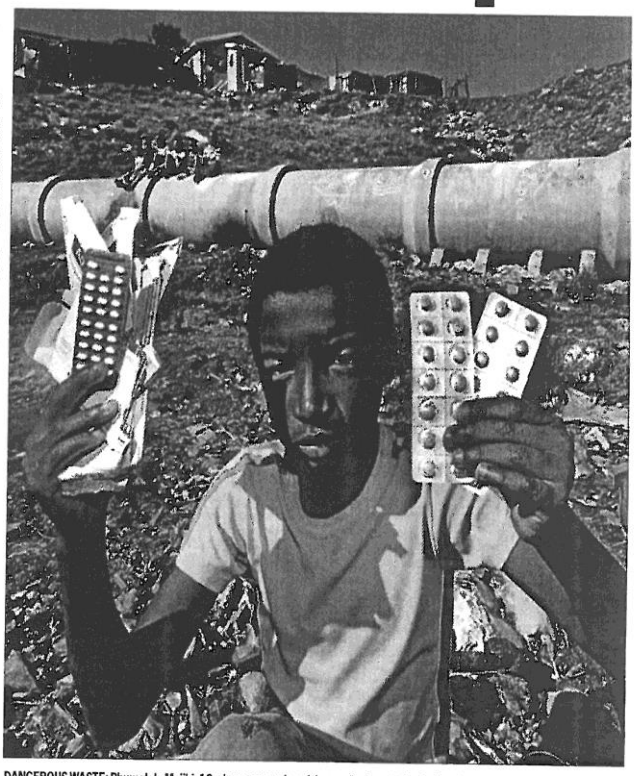
Tofile said illegal dumping was a major problem throughout the metro, not just in Veeplaas.

"However, there is no budget for this financial year to finance a strategy [for tackling] illegal dumping."

Municipal spokesman Mthubanzi Mniki said: "As the municipality we acknowledge the challenge of illegal dumping in our communities. As a result, two months ago an elimination-of-illegal-dumping strategy was launched, which seeks to address the issue.

"The strategy deals with the community being at the centre of dealing with the challenge, in forming community-based cooperatives and awareness campaigns.

"In the meantime, people who are experiencing difficulties can call the municipality's 24-hour service. Their calls will be forwarded to the relevant sub-directorate within the public health directorate."



DANGEROUS WASTE: Phumelela Majiki, 13, shows examples of the medical waste that is found at this illegal dumpsite outside his home in Jongilanga Street, Veeplaas
Picture: MIKE HOLMES

APPENDIX D: MAPS AND PICTURES OF AREA OF THE STUDY

ANNEXURE 1: PICTURE FROM AREA OF THE STUDY

ANNEXURE 2: PICTURE FROM AREA OF THE STUDY

ANNEXURE 3: PICTURE FROM AREA OF THE STUDY

ANNEXURE 4: PICTURE FORM AREA OF THE STUDY

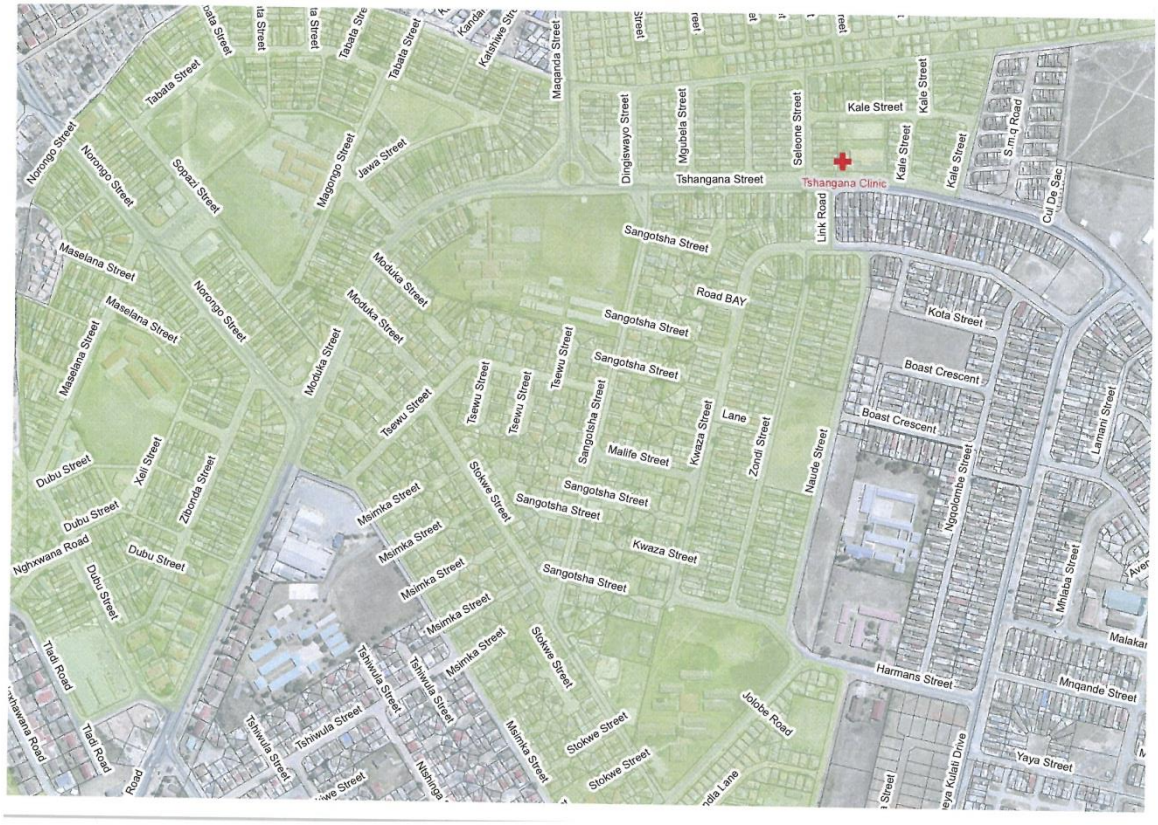
ANNEXURE 5: PICTURE FORM AREA OF THE STUDY

ANNEXURE 8: MAP OF AREA OF THE STUDY

ANNEXURE 9: MAP OF AREA OF THE STUDY

ANNEXURE 10: MAP OF AREA OF THE STUDY

ANNEXURE 11: MAP OF AREA OF THE STUDY



Dear Bulelwa

This email serves as confirmation that I have edited Chapters 1, 2, 3, 4 and 5 of your Master's Degree dissertation (Public Administration) entitled

IMPROVING INTEGRATED WASTE MANAGEMENT THROUGH COMMUNITY EDUCATION PROGRAMMES IN THE NELSON MANDELA BAY MUNICIPALITY

which you submitted to me in January 2015. I did not edit Chapter 6 nor the Reference List.

The editing was done in my private capacity, and as an editor on the Nelson Mandela Metropolitan University list of approved editors. I edited the document for spelling and punctuation, grammar and vocabulary, and sentence construction. I completed the edit in track changes and using text boxes. Recommendations for possible changes were given, where considered appropriate.

Kind regards
Vicki Igglesden (MSc)
v.igglesden@polka.co.za
072 432 2260
044 356 2638