The practical applications of solid waste management for base camps during peacekeeping operations in Africa

by

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Submitted in partial fulfillments of the requirement
for the degree Masters of Arts (Geography)
in the Faculty of Humanities
(Department of Geography, Geoinformatics and Meteorology)
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Pretoria, South Africa

April 2012

“we are the cosmos made conscious…
life is the means by which the universe understands itself…
our true significance lays in our ability and desire to explore and understand this beautiful universe”

Professor Dr. Brian Edward Cox (2010)

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ABSTRACT

While it has become the United Nations (UN) responsibility to peacekeep the world's most conflict ridden countries, so too has their impact on the physical environment increased. Large numbers of personnel require equally vast amount of logistical requirements and equipment for the sustainment of operations. Base camps are the focal points from which operations are managed in the field. The ability of peacekeeping base camps to handle their solid waste, both on-site and off-site in low capacity environments, has gained greater attention as environmental concerns have increased globally. Interviews conducted with the South African National Defence Force (SANDF) (acting as a current Troop Contributing Country (TCC) to the United Nations (UN) peacekeeping mission in the Democratic Republic of the Congo) determined the problems facing appropriate solid waste collection, treatment and disposal methods utilized in and outside peacekeeping base camps and their specific limitations. It was found that there was inefficient monitoring and follow up processes involved with solid waste contracting providers; that there is a need for the inclusion of focused solutions during the operational planning stages; and, there is a deficiency in placed responsibility both from within a TCC and between the UN as to how and whom should manage the solid waste emanating from within base camps. This MA dissertation achieved the understanding that there must be greater focus placed on the delineation of responsibility for the management of solid waste within base camps in the documents that initially structure operations between TCCs, the UN and host nations, thereby limiting the impact on the physical environment from peacekeeping to the furthest extent possible.

ACKNOWLEDGMENTS

The author wishes to express his appreciation to the following persons and institutions who have contributed immensely towards the success of this research project:

- A special thanks to my family Valerie Durant and Brian Tkachuk, for without their love and support this MA dissertation would never have been possible;

- Thank you to Professor Hannes Rautenbach, the study promoter for his support in the project when things got rough. He is greatly appreciated for his provision of a conducive and suitable working and learning environment at the University of Pretoria;

- I would like to thank the all of the Fordred family, but in particular Brigadier General Ian Fordred who assisted in helping to connect me to various contacts at the South African National Defence Force (SANDF);

- Thanks to other members of SANDF:
  - Major Ladon Botha at Joint Support Operations, Pretoria;
  - Lt. Colonel Potgieter and Colonel Plessis at the Armaments Corporation of South Africa, Pretoria; and
  - All those who partook in the interviews at 43 Brigade;

- Thanks to Ingrid Booysen in the Department of GGM for assisting to create the most amazing GIS maps for my project; and

- Andre Daniels in the Department of GGM; for helping me every time my computer decided to self destruct in the middle of the writing process.

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African Union Mission in Somalia	AMISOM
Democratic Republic of the Congo	DRC
Department of Peacekeeping Operations	DPKO
Director of Administration/Chief Administrative Officer	DA/CAO
Environmental and industrial health hazards	EIHH
Environmental Impact Assessment	EIA
Environmental Management System	EMS
Environmental Officer	EO
European Union	EU
International Standards Organization	ISO
Memorandum of Understanding	MoU
Occupational Health and Safety	OHS
Operational Plan	OPLAN
Peacekeeping Operations	PKO
Solid Waste Management	SWM
South African National Defence Force	SANDF
Status of Forces Agreement	SOFA
Swedish Research Defence Agency	FOI
Troop Contributing Country	TCC
United Nations Environment Programme	UNEP
United Nations Operation in the Congo	ONUC
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United Nations Organization Stabilization Mission in the Democratic Republic of the Congo	MONUSCO
United Nations Mission in the Sudan	UNMIS
Waste-to-Energy Technology	WET

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CHAPTER 1:

INTRODUCTION

1.1. Introduction

Peacekeeping Operations (PKO)[1] brought about a dramatic increase in UN troop deployments worldwide after the collapse of the Soviet Union in the early 1990s. The decline in intra-state conflict[2] (Regan, 2000) can be directly accredited to the increase in UN PKO's (Fearson et al., 2004). During the post-cold war years, there have been as many as nineteen peacekeeping missions deployed simultaneously, while missions worldwide at present spend approximately USD $7.84 billion a year when compared to the entire world's military expenditures in 2009, that amount is less than half of one per cent (UN Fact Sheet, 2012). Troop numbers declined to as low as 12,084 in June of 1999. However, they have subsequently risen to an incredible 99,016 personnel (troops, police and observers) in December 2011 (UN Fact Sheet, 2012). Additionally, there are 18,379 civilian support staff and 2,347 UN Volunteers contributing to a total of 16 Department of Peacekeeping Operations (DPKO) led peace-operations (UN Fact Sheet, 2012). The UN currently manages the second largest overseas force in the world following the United States, however, when normal troop rotations are included, DPKO manages around 200,000 troops, far outweighing the North Atlantic Treaty Organization's overseas deployments of about 65,000 (CIC, 2009; Groenwold, 2009). The importance of peacekeeping is widely acknowledged as being invaluable maintaining international peace and security as well as the promotion of development. Yet, wide criticism towards PKOs include "inducing inflation, dominating the real estate markets, co-opting the best local talent and drawing the most capable people away from both government and the local private sector" (Carnahan *et al.*, 2006:iii). An area of research that appears to be in great shortage is the impact of peace operations on the environment, health and sanitation for those involved in and around the locale of a PKO. Today it has been determined that waste is the biggest environmental concern resulting from a PKO (UN AMISON HQ, 2010).

[1] PKO refers to missions and operations that fall short of military combat between clearly recognizable enemies. PKOs are United Nations sponsored military contingents comprised of multinational forces. These forces are deployed to conflict zones, often quite rapidly, under the consent of the states they are needed in. Their purpose is to mitigate conflict and their level of military engagement depends on the UN Security Council's final approval

[2] Armed, sustained combat between groups within state boundaries in which there are at least 200 fatalities

The number of PKOs and personnel is growing substantially alongside their impact on the environment. The large number of personnel deployed in missions over the years use and produce a significant amount of energy and commodities in their daily operations, therefore producing significant amounts of solid waste (waste can be considered any substance, material or object which is thrown away, or intends to be thrown out, or is abandoned). Operating practices in a base camp for a PKO become problematic in areas lacking sufficient infrastructure and services for the management of their solid waste. The consequences of solid waste produced during a PKO is now being highlighted by the UN sponsored website *Greening the Blue*; various well researched documents from the Swedish Research Defence Agency (FOI) (Hull, *et al.*, 2009 and Martinsson, *et al.*, 2010); and a 2009 audit report by the UN's Office for Internal Oversight Services (UNMIS, 2009) on the management of waste disposal and environmental protection activities for the UN Mission in Sudan (UNMIS). Present day peacekeeping is faced with the need to be extremely reactionary to crises as they happen, deploying quickly, often for short time frames, and withdrawing rapidly as a mission is completed. However, since there are sixteen current operations on five continents and an overall fifty-one completed missions that precede them, PKO's operate for several years and have left an indistinguishable impact or legacy on the socio and physical environment. Mission objectives prioritize security as their initial concern, while the physical environmental impact of an operation is given lesser attention. The dichotomy between *on-site* (the solid waste management systems employed to manage solid waste within the walls of a PKO base camp) versus *off-site* (the management of waste beyond the walls of a base camp, usually by the use of private civilian contractors) solid waste management (SWM) practices become of huge importance as a peacekeeping's operational requirements and their by-products will impact base camp security and efficiency (Livingstone, 2009). Waste management of solid materials refers to collection, transport, recovery and disposal, and includes the supervision of ongoing operations, as well as after-care or recovery of disposal sites. Lack of known environmental conditions and often damaged or non-existing infrastructure are likely to increase the occurrence of negative impacts on the local ecology. The build up of solid waste from years of operations can become an environmental, health and political liability (SERDP, 2010).

Operational mandates vary, specifically when looking at the changes in mission mandates between previous UN peacekeeping missions to the Democratic Republic of the Congo (DRC). These post-conflict mandates require different resources and therefore, produce varying amounts and varieties of solid waste. For example, the mandate to perform aggressive operations requiring combat forces can leave behind vast amounts of hazardous waste in the form of decommissioned equipment, destroyed arms and ammunition, ration

pack wrappers and plastic water bottles. Consequently, the impacts from aggressive operational mandates have their own sets of environmental considerations and should highlight the need for base camps to have their own Environmental Management Systems (EMS) an orderly system for managing a base camp's environmental issues and prospects, in this case solid waste. Direct impacts on the ecosystem due to solid waste produced in base camps can more commonly originate from used tyres, scrap metals, fluorescent light bulbs, batteries and battery acid, clinical wastes, construction wastes, electronic waste, paper, and especially food waste cans and bottles (both plastic and glass). Base camps therefore, generate a great deal of military and civilian related waste and pollution.

Health concerns for local populations and PKO personnel can result from mishandled solid waste, for example, from the incineration of solid waste, by building informal landfills or dumps leaching pollution into water tables, streams and rivers, as well as health hazards towards informal waste collectors. Informal waste collection in developing countries is well documented and provides a good example of the problems that would emerge from the collection of waste from private and informal waste collection during a PKO (Furedy, 1993; Wilson et al., 2006; Zerbock, 2003). These impacts can easily damage landscapes and local economies by leaving a false impression of stable development. For example, towards the end of 2010 the UN peacekeeping mission in Haiti (United Nations Stabilization Mission in Haiti - MINUSTAH), the fifth designated mission since 1993, was blamed for an outbreak of cholera that quickly spread and killed over 1,100 Haitians by the end of the year. It was said that the cause of the outbreak came from a poorly maintained sewage system at the back of a base camp housing 454 Nepalese peacekeepers (Enserink, 2011). Yet, not an issue of solid waste pollution it is provides a good example of how these management systems can go awry. The impact of this mismanagement is expected to affect hundreds of thousands of Haitians for years to come. The political implications from such a mishap can reverberate to other missions around the world and could affect relations between host countries and the UN who are there to assist with security and development. This example lends to the assumption that in places that require a peacekeeping force, despite available policy or legislation for solid waste management, the capacity to enforce it will not be present. Until now the standard practice in which PKOs have managed their solid waste in base camps varied widely and on an ad hoc basis with the availability of environmental guidelines originating from the legislation of Troop Contributing Countries (TCC). Such is the case with the South African National Defence Force (SANDF) who contributes to the mission in the eastern DRC (Sills *et al.*, 1999). Many negotiated Status of Force Agreements (SOFA) and the Memorandum of Understandings (MoU) with a host country, or countries do not

reference instructions or mandates regarding the environment, let alone the management of solid waste. (UNMIS, 2010; Sills *et al.*, 1999).

A lack of UN policy has led to the use of unspecified local service provisions by informal contracts and an absence of follow-up and monitoring of waste disposal and treatment outside of base camps. The UN Procurement Division hands out large waste disposal contracts of 'Purchase Order Awards for Field Missions' to international companies totalling in the tens of millions of US dollars every year. Adversely, the use of local waste services presents itself with a multitude of hurdles such as determining the extent of possible treatment methods, language problems, distrust, security issues, as well as poorly developed economic conditions, which together reduce the range of an agreement with service providers (Martinsson, 2010). Along with the recent movement toward identifying the problems facing SWM and development of operational procedures, the UN's Millennium Development Goals (particularly on sanitation), Climate Neutral UN targets 21 and the Basel convention helps control the transboundary movement of hazardous waste. Hazardous waste carries a high risk and probability of harm or damage to individual's health and the physical environment if improperly collected, treated or disposed.

In June of 2009 DPKO published it first official guidelines for dealing with environmental considerations throughout the life cycle of its operations. These guidelines are intended to assist field staff, police and observers to assess and address environmental issues. Excluding this document, there does not seem to be a significant indication that enough research is being initiated in order to help reduce the rigid logistical, economic and environmental problems facing base camp SWM for peacekeeping missions. Given the need for the UN and PKO's in our globalized society well into the conceivable future, DPKO must seek to limit its operational footprint in the base camp if it is to continue into the twenty-first century as the world's principal peace-enforcement organization. Serious consideration must be given towards the impacts that SWM can have on the physical environment and health of military personnel and local civilians so as to prevent improper disposal and treatment at the operational level.

1.2. The physical environment: the Democratic Republic of the Congo

The DRC is situated at the center of the African continent and is estimated to cover an area of 6,073,154 sq kilometers (CIA World Fact, 2012). The DRC encompasses two thirds of central Africa making it the second largest country on the continent after Algeria. The equator runs through the northern part of the country it is predominantly land locked

aside from the mere forty kilometre length of access to the Atlantic Ocean between Angola and its northern counterpart Cabinda. Here is where the capital of Kinshasa is located.

The Congo River basin drains almost the entire country as it curves its way throughout the eastern, central, and north-western regions. The river acts as a major trade route despite falls and rapids' reaching almost all the way to what is known as the 'copper belt' in the far south. Together with the Lualaba River, it stretches a total of 4,630 km, covering one-third of the DRC's total land area. Climate varies from constant high temperatures, excessive humidity, and torrential seasonal rains. Alongside these weather conditions are immensely dense tropical forests that give way to various disease causing insects and parasites making it extremely inhospitable for the people that live there, as well as peacekeepers to operate as malaria is a constant threat. North of the equator, the wet season runs from April until October, and the dry season from December until February. South of the equator, the wet season runs November to March, and the dry season April to October. The country can be divided up into five different major geographical areas strongly based on the altitude and water basin regions. 1) the Congo basin which contains a significant portion of the Congo River and its tributaries 2) the Northern Uplands, which borders the Central African Republic and South Sudan and is arid compared to the rest of the country 3) the Eastern Highlands containing the Mitumba Mountains and the Great Lakes of Albert, Edward, Lake Kivu and Tanganyika 4) the Southern Uplands, which is the largest of all five regions. Rich in copper minerals, the capital Kinshasa resides within the Cristal Mountains 5) the Coastal Lowlands, which is a mere 45kms wide between the Republic of the Congo and Angola it is the DRC's only access to the ocean.(McDonald *et al.*, 1971).

Figure 1.a: The Democratic Republic of the Congo (DRC) – The DRC resides at the center of the African continent. The country borders a total of nine countries including Angola, Zambia, Tanzania, Burundi, Rwanda, Uganda, South Sudan, the Central Africa Republic, and the Republic of the Congo (not to be confused with the DRC itself).

1.2.1. Eastern highlands

The Eastern Highlands of the DRC as a major geographical region contains the highest points found anywhere else in the country, ranging from approximately 900m to over 4,000m. The region characterised by its ruggedness, extends the length of the eastern part

of the country (some 1,000 kilometres), from the southern border of the Sudan in the north, to the Luvua River which runs out of Lake Mweru along the northern Zambia border. It also encompasses five provinces: Oriental, North and South-Kivu, Maniema and Katanga and stretches along the South Sudan, Uganda, Rwanda and Burundi borders. The eastern portion of the country runs almost the entire length of Lake Tanganyika, the second deepest fresh water lake in the world, and Lake Kivu both of which drain via the Congo River and into the Atlantic, while Lake Albert and Edward in the north drain into the Nile basin (McDonald *et al.*, 1971). The Eastern Highland system of lakes is part of the Rift Valley which forms a natural eastern boundary and geological border. These lakes are separated from one another by many high altitude plains which then abruptly slope easterly into the Rift Valley plains. Here the border passes through the Mitumba mountain range and the Rwenzori range rising to 5,105 meters farther north which never recedes below 900m (McDonald *et al.*, 1971). These divergent changes in elevation bring important alterations in climate and vegetation, and therefore, wildlife habitats are extremely variable. There are also several active volcanoes throughout the Virunga Mountains north of Lake Kivu where in 2002 the Nyragongo Volcano erupted. The Eastern Highlands are a rugged and diverse climatic region moderated by the altitude of its mountain ranges found throughout. The tropical climate of the equatorial lowlands is moderated by the altitude of the east. The mountainous region of the tropical highlands in eastern areas, above 2,000 meters, sustains a moist river valley climate, while its temperature varies narrowly (McDonald *et al.*, 1971). Cooler temperatures prevail in the alpine areas, but humidity can build to saturation points with the increase in altitude giving most slopes a nearly constant falling mist.

1.2.2. North-Kivu

The province of North-Kivu covers a surface area of 59,483 kilometres squared and contains a population of 4.5 million. Its capital is the town of Goma, right on Lake Kivu. Nord-Kivu boarders the countries of Burundi, Rwanda and Uganda. The state capital Goma sits at the top of Lake Kivu and has a total of six districts 1) Walikale 2) Rutshuru 3) Masisi 4) Lubero 5) Goma and 6) Beni. The province is forested and hilly with few roads or viable infrastructure, such as paved roads which makes it extremely difficult for transportation of goods and peacekeepers. Volatility in the region has been present since 1994 when the Rwandan genocide gave way to millions of Hutu's crossing the border into the DRC. Conflict in North-Kivu has produced over two million internally displaced people since that time (United Nations, 2011). The instability in the region has been directly linked to resource depletion, particularly illegal logging and deforestation, mining and poaching. Infrastructure poses a major problem for the development of the whole of the DRC not just for the eastern

portion of the country. Roads, for example, are in extremely bad shape, increasing transport times by 40% during the rainy reason, which the DRC can last up to six months (Ulimwengu *et al.*, 2009). Kinshasa is the only province that can boast a consistent power supply (Ulimwengu *et al.*, 2009). However, there have been rehabilitation projects headed by the World Bank and the British Government to improve approximately 1,800 km of needed roads increasing priority road ways by 40% throughout the DRC (Ulimwengu et al., 2009).

1.2.3. Natural resources and environmental issues

There is a number of pressing environmental issues facing the DRC today. The DRC has a population of over seventy-three million people (CIA World Fact, 2012). This high number mixed with instability and conflict has created a good deal of environmental problems, particularly in North-Kivu. DRC is said to possess about 80% of the world's reserves of coltan minerals, which are used in mobile phones and electrical gadgets, while the diamond industry is estimated to be about $870m. The DRC ranks among the largest producers of industrial diamonds in the world. The Central African copper belt which runs through the DRC contains one tenth and one third of the world's copper and cobalt reserves respectively. The mining of minerals (copper, coltan, diamonds, zinc, gold and bauxite) is causing a significant amount of environmental degradation throughout the country. Cyanide is an extremely poisonous chemical used in the separation process of mining gold which in turn easily makes its way into the fresh drinking water, creating a swath of health related problems for humans and animals alike. Other environmental issues, much of which are illegal in nature, comprise of deforestation, and poaching, both of which greatly diminish and threaten wildlife populations. Much of these resources assist in the support of ongoing conflict and have become a major focal point of concern for PKOs because of their capacity to perpetuate violence in the region. The large numbers of refugees in the eastern DRC are predominantly responsible for a great deal of the country's deforestation for fuel, which leads to soil erosion, and wildlife poaching. Five national parks are listed by United Nations Educational, Scientific and Cultural Organization as world heritage sites and are home to rare wildlife including mountain gorillas, white rhino and savannah giraffe. It is said that the DRC's rivers could generate sufficient hydroelectric power for the entire continent of Africa. Numerous logging companies during the '90s were from Europe, yet today illegal timber charcoal trade exports are estimated to have reached more than $1 billion USD; the main importer of wood from the DRC is China (United Nations, 2011). Tropical rain forests play an important role in the global carbon cycle and hence global climate change. Land use change from tropical deforestation practices in the DRC is estimated to contribute to 6-17% of all the anthropogenic greenhouse gas emissions, which is equal to approximately 5.5(+-) 2.6

petagrams (Pg) of carbon dioxide per annum (Scharlemann *et al.*, 2010). Rebel groups are also largely to blame for the destruction of the physical environment through the illegal extraction of resources that are then being used to fuel conflict. While the degree to which rebel-held and influenced areas in North-Kivu being exploited is alarming, internally displaced people are scattered throughout the region adding to the degradation of the physical environment, such as deforestation. Many rebel-held mining operations are in national parks, along rivers, and are threatening the natural wildlife of the region.

1.3. Population and conflict

While DRC boasts over 200 African ethnic groups of which the majority are Bantu the largest tribes (all Bantu) are Mongo, Luba and Kingo. The Mangbetu-Azande (Hamatic) constitutes approximately 45% of the total population. The DRC has over 200 languages, but the dominant are officially French, Lingala (a lingua franca trade language), Kingwana (a dialect of Kiswahili or Swahili), Kikongo and Tshiluba, and in the north Sudanese dialects are spoken (CIA World Factbook, 2011). The ethnic complexity of the Congo, coupled with its troubled colonial rulers who split the population on an ethnic basis and then again on one another, has provided the foundation for successive conflict and the numerous wars that have ensued since the beginning of its independence in 1960. Using a policy of economic exploitation the Belgians left the country unable to govern itself. Immediately following the country's independence, five years of brutal civil war ensued. In 1965, Joseph Mobutu Sese Seko seized power and kleptocratic rule ensued in the DRC for his 32 year reign. With the end of the Cold War and the 1994 genocide in Rwanda, foreign rebels finally expelled him from power in 1997 (International Crisis Group, 2010). Up until the later nineties the country was called Zaire then renamed itself the DRC to set itself apart from its neighbour to the north. However, ongoing internal conflict ensued in the east, and at the time, President Laurent Kabila sought assistance from its neighbours - Angola, Zimbabwe and Namibia against rebels backed by Uganda and Rwanda. For five years all countries involved fought proxy wars that decimated the country's natural resources, which came to an end in 2003 (International Crisis Group, 2010). It is widely acknowledged by the international community that all sides used the cover of war to steal natural resources.

It is estimated that more than 5 million people have died in the ensuing disorder that resurfaced in 1998 and has been referred to as Africa's 'first world war' because of the wide spread destructiveness and the ongoing involvement of many surrounding countries. For example, in the eastern DRC there still remains more than two million Hutu's who have fled

the Rwandan genocide of 1994, afraid to return home and face punishment for their genocidal crimes they waged in an ongoing war for control of land and minerals (Crisis Group, 2010). The richness in resources linked with malicious warlords, kleptocray, corrupt government officials, and corporations with a disregard for human rights abuses, have been key ingredients in the continuation of war and conflict in the DRC since 1960.

All of this background information is important in order to show how so many years of war have left a country such as the DRC with an enormous deprivation of societal capacity. The scarcity of capacity is what PKO's face when managing solid waste off-site in post-conflict environments. Environmental legislation pertaining to the management of solid waste was difficult to find for the DRC. Furthermore, if regulations were available the fact remains that PKOs are found in war torn countries and are there as a primary means to stabilize the security situation. Therefore, it can be assumed that sound SWM practices are out of reach for the societies in these types' of security deprived situations. There is little hope that SWM legislation would be considered in a situation where local governments do not have the capability to provide even basic security for its citizens. Yet, that does not mean a PKO with all its available capacity can afford ignore the environmentally sound management of its own solid waste.

1.4. Purpose of study

Positive results will occur from the engagement of a strong strategy towards the environment on behalf of the DPKO. Benefits may include local job creation, the promotion of sustainable development, wildlife protection, the reduction in operational costs, improved health and sanitation, the creation of a positive image for peacekeeping in the eyes of the local populace and the support for local economic development. The establishment of environmental doctrine will facilitate PKOs with useful insight during operations, as well as subsequent stages of a peacebuilding mission and post-conflict recovery and development stages that generally follow the conclusion of an operation. While the quantity of literature on environment and peacekeeping is emerging, the availability of academic writing specifically on SWM in peacekeeping base camps is again completely insufficient. As for the importance to the field of geography, there are many. The study of solid waste management is a highly researched discipline on both the developed and developing world. Additionally, the linkages between health, waste and sanitation is an important issue and one that is certain to grow in size if PKOs are to increase along with a sustainable ecological footprint. The main contribution of the study will have addressed issues of solid waste reduction, private service contracting, and demonstration of a mission's commitment to achieve sustainable operations

and environmental stewardship, and ultimately the responsibility to do the right thing and leave a country is legacy free from operations and in a healthier condition than when forces first arrived. There is a considerable lack of information on the different types of waste treatment and disposal methods, particularly the use of waste-to-energy technologies in the field and the monitoring of civilian contracting in the disposal of solid waste off-site from base camps. The protection of the environment and health of those immediately affected by the actions of a PKO is of great importance. If the UN, a force meant for good, does not comprehensively address its own impacts on the physical environment, then it will only increase the difficulty it has to maintain its reputation as the world's custodian for peace and security.

1.5. Aims and objectives

The aim of this research project is to determine the practical applications of SWM systems in base camps for PKOs by examining the complexities of maintaining on-site versus off-site SWM systems. Recommendations are intended for the people responsible for implementing SWM services at DPKO as well as TCC's. Achieving the following objectives will help solve the main research problem and answer the thesis question.

1.5.1. Objective 1

To examine the literature pertaining to SWM, and the perspectives of peacekeeping, SANDF and on-site and off-site camps services.

The literature analyses and defines systems theory pertaining to SWM, as well as UN and SANDF policy for SWM and the intended application for field operations.

1.5.2. Objective 2

To evaluate solid waste collection, treatment and disposal methods employed in on-site base camps and devise solutions.

Through interviews with various experienced members of SANDF, *verification was achieved in appraising the systems implemented in on-site base camps.*

1.5.3. Objective 3

To determine the benefits and solutions from the use of base camps off-site private contracting practices.

Interviews and questionnaires were utilized in order to determine solutions facing SWM infrastructure at the operational level while providing results and solutions for addressing off-site private service contracting.

1.6. Organization of the report

The study mainly examines the practicality of SWM systems utilized in base camps during a PKO. Providing a background to waste management systems, it also examines the relationship a TCC has with peacekeeping and their responsibilities with SWM while during a mission. The content and results are intended to guide experts in the field of a PKO on improving SWM practices on and off of base camps.

Chapter 2 is the background on the peacekeeping mission in the DRC, and more clearly defines the concept of a "base camp". The chapter considers the concept of unintended consequences resulting from a PKO, and ultimately the role of DPKO as an environmental steward within the context of the UN's military missions. It first discloses the available policy and guidelines pertaining to the environment from a multinational perspective, the UN, and finally DPKO itself. The chapter then explores the issues surrounding the use of private contractors to manage solid waste, and finally, the environmental policy that has driven SANDF in its role as a TCC in peacekeeping missions.

Chapter 3 provides the theoretical backdrop on SWM systems. It defines and analysis EMS and how they are applicable to a PKO, as well as the workings of waste management hierarchy and practices. Estimated levels of solid waste produced n base camps are calculated while various waste-to-energy technologies (WET) are discussed.

Chapter 4 gives details on the methodology used to accomplish the objectives set out for this MA dissertation.

Chapter 5 provides findings, and discusses what was discovered from the structured interviews and questionnaires with member of SANDF.

Chapter 6 consists of a discussion that seeks to assemble the results and solutions as recommendation in line with the aims and objectives and concludes with the dissertations accomplishments alongside a discussion on the future of SWM with peacekeeping research.

CHAPTER 2:

UNITED NATIONS PEACEKEEPING OPERATIONS

2.1. Defining peacekeeping

There are differing terms which are used broadly to refer to missions and operations that fall short of war between clearly recognisable enemies such as 'peacekeeping', 'peace support operations' and 'peace operations'. The term 'peacekeeping' can be considered with two different meanings. Again, peacekeeping can refer to UN peace operations in the most general sense, whereas peacekeeping is used to describe all UN peace operations. However, the term can also refer to traditional or robust PKOs which includes military personnel, police, military observers, United Nations Volunteers, civilian, and both international and local staff.

Various techniques developed by the UN to resolve disputes have been preserved in the UN Charter. Peaceful settlement relies on Chapter VI of the Charter and ranges from bilateral negotiations between disputants to formal adjudication by third parties. The three pillars that provide guidance for UN staff include 1) the consent of the conflicting parties, 2) impartiality, and 3) prohibition of the use of force. The principle of volunteerism or consent underlines Chapter VII which assists conflicting parties by "seeking a solution by negotiation, enquiry, mediation, conciliation, arbitration, judicial settlement, resort to regional agencies or arrangements, or other peaceful means of their own choice" (UN Charter, 1945:8). Chapter VII differs through enforcement measures and empowers the UN Security Council to take action by air, sea or land forces as may be necessary under Chapter VII to "maintain or restore international peace and security" and make member states available to the UN armed forces, assistance and facilities as may be necessary for the purpose (UN Charter, 1945:9; Thakur, 2006; Reynaert, 2011:10). It is left to the UN Security Council to decide if the conflict can be resolved in a peaceful manner, and if that is not the case, it will determine if "the existence of any threat to the peace, breach of the peace or act of aggression", the UN will again utilize Chapter VII resort peace and security (Reynaert, 2011). Furthermore, when peacekeepers are deployed as a Chapter VII, they have "the right of individual or collective self-defense if an armed attack occurs" (UN Charter, 1945:9). It has become more prevalent in recent years for various deployed UN operations to mandate a Chapter VII in order to meet the demands of volatile missions. According to Ramesh Thakur, because of the highly compressed timeline of peacekeeping during the last couple of decades, operations have little 'precedence' to go by, meaning each successive mission has to learn

from what he considers their own mistakes. However, lessons learned can help to better the design of mandates and the resources needed to succeed.

2.2. Peacekeeping missions in the Democratic Republic of the Congo

The UN has a long and active history in the DRC. Peacekeeping can be broken down into three phases/missions beginning with the UN Operation in the Congo (Opération des Nations Unies au Congo, or ONUC) from 1960-1964; the United Nations Organization Mission in the Democratic Republic of the Congo (MONUC) from November 30, 1999 to June 30, 2010; and the current United Nations Organization Stabilization Mission in the Democratic Republic of the Congo (MONUSCO) beginning on July 1, 2010.

The UN's first mission ONUC, ran from 1960-64. It was to help facilitate the withdrawal of the Belgian force, help the Congolese government restore and maintain the political independence and territorial integrity of the DRC, help it maintain law and order throughout the country, and to assist with training and technical assistance. UN Security Council resolution 143 (1960) of 14 July 1960 provided the initial mandate, but was later extended to include UN Security Council resolution 161 and 169 (1961) which gave further responsibilities, including the use of force if necessary. ONUC was a land mark mission for peacekeeping in the responsibilities it assumed, the size in area it operated, and the manpower it controlled which peaked at 20,000 personnel (UN DPKO website, 2011). In February 1963 the phase out of forces began with the stabilization of the Katanga province, and the mission was completed on June 30 1964.

The second UN operation occurred on the November 30, 1999. Initially deployed as a relatively small observation mission, MONUC was eventually authorised as a Chapter VII mission reaching nearly 20,000 military personnel at its peak. Its mission was to restore peace to the Great Lakes Region. During its height MONUC was bigger and more comprehensive than any other UN mission to date. In December 2008 MONUC became the first UN peace operation ever to designate civilian protection as its top priority, making its mandate list (consisting of approximately 40) go beyond that of any other mission (Reynaert, *2011*). Rife with criticism, the mission was requested by the Congolese Minister of Communication, Lambert Mende in March 2010 for a full withdrawal. However, the Minister's request was later agreed upon by reducing the force by 2,000 peacekeepers, maintaining a similar but condensed mandate.

MONUSCO has taken over MONUC from July 2010. It was done in accordance with UN Security Council resolution 1925 as of May 28th that same year to reflect a new phase reached in the country. The new mission has been authorized to use all necessary means to carry out its mandate relating, among other things, to the protection of civilians, humanitarian personnel and human rights defenders under imminent threat of physical violence and to support the Government of the DRC in its stabilization and peace consolidation efforts. As of February 28, 2011 MONUSCO maintained a total of 18,928 uniformed personnel, 16,854 military personnel, 703 military observers, 1,371 police (including formed units), 983 international civilian personnel, 2,820 local civilian staff and 614 from the United Nations Volunteers department (DPKO, 2012). These large number of UN personnel largely reflect the land area of the country which is twice the size of all five Nordic countries taken together. MONUSCO has recently (May 2010, Resolution 1925) been transformed into a stabilization force converting resources from peacekeeping to peacebuilding, changing the mandate and the commodities required once again.

Base camps in the North-Kivu province are located in extreme volatility areas. The SANDF has been involved in a variety of peacekeeping missions since 2000 where the organization led efforts to assist in “stabilising the country's internal politics, reconstruction and development of infrastructure and trained DRC troops” (Nibishaka, 2011:5). During this time, SANDF has also been part of a number of other peacekeeping missions, being one of the first to deploy military forces to Burundi in 2003 along with troops and military observers in other countries, such as Darfur in Sudan and Nepal, as well as various African Union peacekeeping efforts (Nibishaka, 2011).

2.3. Base camp Solid Waste Management

Base camps vary in size and purpose as is indicated in a UNEP pilot assessment on the resource-demand and operating practices of two base camps proposed for the African Union Mission in Somalia (AMISOM), in Mogadishu, Somalia acting as the Head Quarters Camp, and Mombasa, Kenya as the support base. Each camp was calculated to support 200 persons over a time period of approximately 10 years (UNEP/AMISOM, 2010). The accessibility of space to store waste, for example, has the planning aspects differ depending on characteristics of the physical environment (SERDP, 2010), while operational mandates and objective will influence the type of waste produced in the camps. In December of 2009, the UN’s peacekeeping mission in the DRC maintained that three different types of base camps were being operated, and are defined by DPKO as follows:

2.3.1. Joint Protection Teams

Joint Protection Teams (JPT), comprised of experts from MONUC's Civil Affairs, Political Affairs, Human Rights and Child Protection sections, were first deployed in February 2009 in the Kivu provinces. By bringing MONUC civilian and military components together on the ground, they help to improve community relations, intelligence, and the early warning capacity of threats to civilians. The location of all MONUC military deployments in the field is reviewed according to the threat assessment, which includes the reports from JPTs (DPKO Maps, 2009).

2.3.2. Temporary Operating Bases

Temporary Operating Bases (TOB) are Military Operating Bases composed of up to 40 military personnel. They are deployed for a short time in one area for a maximum of two to three weeks (DPKO Maps, 2009).

2.3.3. Mobile Operating Bases

Mobile Operating Bases (MOB) are MONUC military deployed in the field, composed of up to 160 military personnel (company strength), with the ability to move as the situation demands (DPKO Maps, 2009).

Figure 2.a: SANDF - Mpati base camp (A Company HQ) aerial view: The structures within the red box are Mapati A Company HQ (149 personnel) from the 7th South African Infantry Brigade and is deployed in the furthest Northern base from Goma in the SANDF area of operations. (Brigadier Gen. Fordred, 2011)

Figure 2.b: SANDF - Mpati base camp (A Company HQ) cooking area: The photo shows the area where the cooking is done for the members at the Mpati TOB. Because the 150 man gas cookers are broken, they are cooking on open fires. Also present in the photo is a sole garbage bin to the immediate right of the two personnel walking, while in the far back are a row of ablutions (Brigadier Gen. Fordred, 2011).

Figure 2.c: SANDF - Ngungu base camp (B Company HQ) aerial view: Ngungu TOB camp sits atop a ridge which houses of 148 personnel. (Brigidier Gen. Fordred, 2011)

Peacekeeping base camps are complex and vary in size and purpose (mission mandates) and while they do consist of similar solid waste types, they vary just as much. It

remains a significant challenge to incorporate environmental considerations, such as SWM, into contingency operations for off-site collection for a number of reasons including low capacity, lack of infrastructure, lack of appropriate collection and disposal equipment, and lack of follow up with disposal. Contributing as a TCC to the MONUSCO mission, SANDF operates in the North-Kivu managing four company bases throughout the province, and one Battalion Head Quarters camp in Goma, which maintains the largest number of military personnel of any SANDF camps. Between HQ and Munigi there is a total of 630 personnel. The map below shows these base camp locations. In the same location as the Munigi camp is A Company. Further to the west Company C and D base camps can be found - Kalembe TOB and Pinga respectively. North of these bases is B Company, Ngungu base camp. All these company base camps house the same number of personnel, roughly 149. While SANDF has personnel stationed around the country, the North-Kivu province holds the majority totalling 1076. These company base camps are all categorized as TOBs, but maintain much larger numbers of military forces then the UN has defined for these types of camps. This discrepancy show a clear disconnect between the UNs policy and what is actually happening on the ground.

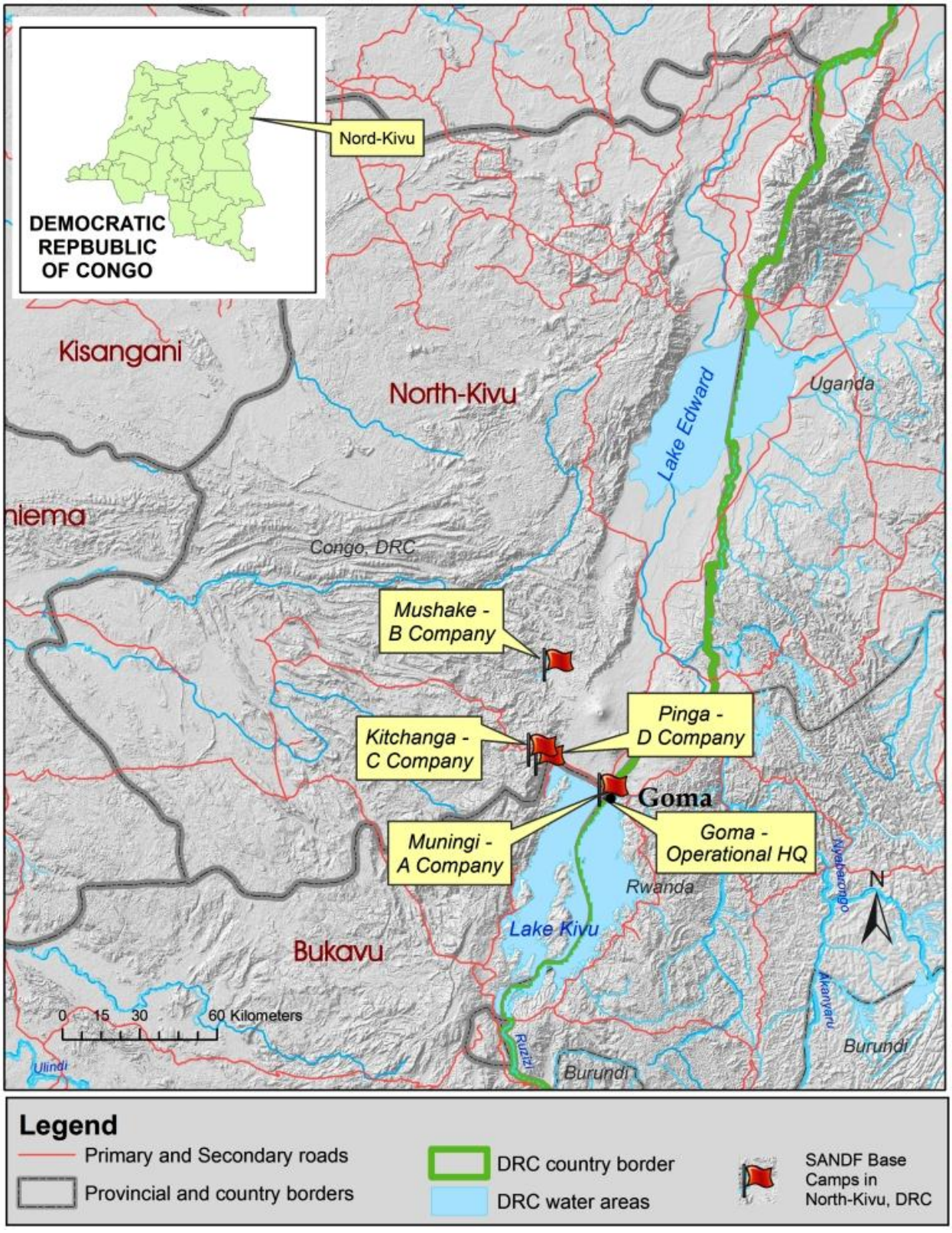

Figure 2.d: SANDF Base Camps found in North-Kivu, DRC (January 2012) - Number of SANDF personnel which total 823 and company titles. The red flags indicate the location of each SANDF base camp in the region of North-Kivu.

2.4. Environmental protection and United Nations peacekeeping

Protection of the physical environment is now beginning to be included in the objectives of UN peacekeeping missions. Practice and external influences have moulded policy and guidelines to form the perception held by the UN DPKO on environmental protection. The international environmental movement began in 1972 at the United Nations Conference on the Human Environment. The UNEP was created the following year. Successive UN conferences followed, such as the Earth Summit in Rio de Janeiro in 1992, the Kyoto Protocol in 1994 and the MDG, which in 2000 built on to the experience of decades of previous conferences. MDG number 7 'Ensure environmental sustainability',[3] is set to expire in 2015 but it has helped to create a like minded organization sensitive to the various issues impacting the environment as a whole (MDG Goal 7, 2010). International humanitarian law also maintains conventions and treaties that protect the environment during conflict. Thus, the acknowledgement of 'doing the right thing' for the environment transcends itself into the theoretical perspective of what is known as 'environmental stewardship', thereby empowering PKOs to take on the responsibility of fulfilling their role along with sustainable development – an important point that this thesis seeks to disclose. The progression towards this concept has happened over the course of decades and there is now academic as well as military organizational documentation, all of which undoubtedly influences the doctrine of the DPKO's perspective on the matter. There are a number of documents that stand out and merit review when approaching the issue of environmental protection and its correlation with UN Peacekeeping.

2.5. Unintended environmental consequences and stewardship

Whilst the *Pearson Papers Vol. 12* (Livingstone, 2009) covers a variety of environmental issues pertaining to building peace as the title states, there are two articles in particular that are of relevance to the study of environmental considerations during a PKO. The first paper by Annica Waleij, and Birgitta Liljedahl from the Swedish Defence Research Agency, *The Military as Environmental Steward in Peace Operations* examines the role that the military can and should engage itself in acting as an environmental steward, a custodian during each and every operation. The material footprint of a PKO can have a substantial impact on the perception of the operation in the immediate community. A day-to-day routine will have the most significant impacts, such as oil spills or solid waste produced and managed, while the "lack of contractor supervision and oversight has had short and long-term health impacts on the local environment" (Waleij *et al.*, 2009:62). As such, the

[3] MDG 7: Ensure Environmental Sustainability – Target – "Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources"

environment must be considered in the planning phase to ensure that the physical environment is considered. Challenges that often limit environmental stewardship include time constraints, lack of or the absence of local infrastructure, limited environmental awareness, and therefore, the lack of understanding over the importance for considering the well being of the physical environment, as well as the misguided intentions of projects that can become counter-productive and cause more harm than good. That being said, a more holistic approach is suggested, and greater coordination between organizations and agencies can help disseminate these complex cross-cutting issues.

As Waleji (*et al.*, 2009) state, there are a number of advantages a military organization can benefit from if it addresses environmental concerns early on. The military's ability to incorporate various skills and tasks into operational planning should allow it to respond to a variety of environmental concerns such as "information and intelligence gathering on environmental crimes; capacity building... for monitoring and enforcement of environmental regulations for local and remote communities; and the development of contingency plans for environmental disaster mitigation, relief operations, and conservation monitoring and enforcement, through alliances and partnerships" (Waleij *et al.*, 2009:64). While operational planning is important, strategic level planning must also be achieved so that strategic thinking will become central to a military organization.

Finally, the paper recommends mainstreaming environmental considerations into current and future operations by including environmental considerations in the objectives and mandates of a PKO. As is indicated by Waleij (*et al.*, 2009), even the European Union has regulations on chemicals, but lacks environmental protection policies and guidelines. There must be more done to mainstream environmental considerations during a PKO such as:

> *"individualized training and awareness... tailored towards rank and responsibilities of the personnel... identification and documentation of lessons identified during the life cycle of an operation; operational and tactical-level planning needs to integrate environmental considerations; active and dedicated leadership... [made] responsible for the integration of environmental considerations during the planning and training for a military mission as well as during the conduct of operations within their area of responsibility; and policy and doctrine... reviewed on an ongoing basis, based on experiences gained, and may be updated to ensure their relevance to actual needs and issues in the field missions"* (Waleij *et al.*, 2009).

The theoretical disposition of environmental stewardship by the military is multifaceted and requires a comprehensive response as the article mentioned here has argued. Global climate change is adding to the list of threat multipliers making it more

important to consider the environment during a PKO. The article provides the measures needed to accomplish such objectives and reveals that peace operations can in fact embrace environmental stewardship if it so chooses.

Many working in peace operations face physical environmental damages of war. The paper *Medical and Environmental Intelligence in Peace Operations and Crisis Management* addresses the concerns related to the health of military personnel deployed in peace operations, but also attends to some aspects related to environmental vulnerabilities and environmental protection measures. Non-combat hazards that personnel will encounter are called diseases and non-battle injuries and can include respiratory problems from open-pit burning of waste. In addition to unintended environmental consequences coming from poor waste management which affect the health of personnel and local populations, the social impacts include a difference in cultural norms such as the employment of women in non-traditional gender roles. False economies often occur from the influx of foreign wages pushing up the cost of goods and services. The “do no harm” or “build back better” principle sometimes referred to as “light footprint” or “zero footprint,” is an effort to mitigate these [diseases and non-battle injuries] problems” has driven the concept of environmental stewardship and created the policy and guidebooks stressing the need for environmental information as early in the planning process as possible (Liljedahl *et al.*, 2009:78). The Swedish military has, for example, included its environmental policy into its medical intelligence framework. It considers the cross-cutting connections between the health protection of PKO force and physical environmental protection.

The UN Integrated Mission Planning Process (IMPP) deems that form should follow function, when considering mission tasks, chain-of-command structure and mandate; every operation and mandate must adapt to the context. It discusses the fact that during a PKO, information regarding mission-specific environmental aspects is not appropriately shared. There is a lack of coordination and overlap on environmental assessments, which can require sizeable economic resources. Environmental and Industrial Health Hazards (EIHH) have been addressed to improve information exchange during a biannual workshops consisting of researchers, military and civilian personnel at the strategic, operational, and tactical levels related to the discipline of environmental health. The EIHH now includes environmental protection and environmental vulnerability expertise. Such inclusion is important because of the connection between the environment, security, and development issues addressed in the UN DPKO principles and guidelines. One of the findings is the need to increase the flow of information among different actors present over time in an area of operation (Liljedahl *et al.*, 2009). Lessons learned in the field are not easily accessible, but

the Swedish medical and environmental intelligence (MedInt/EnvInt) database was under development at the time this report was written. Finally, operational risk management must balance "environmental health risks with other battle space hazards and wider operational imperatives" as health risks might be both immediate and long term (Liljedahl *et al.*, 2009:85). Information sharing and agreed upon standards for systems and tools should be practiced to improve the connectivity between military and civilian actors during field missions and therefore, improve health and environmental issues before they arise.

The unintended consequences of PKOs on the physical environment are varied and are beginning to become better documented as policy and doctrine is increasing. The FOI is a leading research group in the field of peacekeeping and environmental considerations, particularly with regards to SWM in base camps, which will be elaborated on further in this chapter. Yet, this study, *Managing Unintended Consequences of Peace Support Operations* (Hull *et al.,* 2009) aims to examine the negative unintended consequences facing PKOs; special focus is on the impact of host economies, sexual exploitation and abuse, the spread of HIV, and degradation of the physical environment, the latter of which will be focused on in this chapter. The FOI report evaluates how the UN and other PKOs manage the negative unintended consequences with special attention given to the practices of Swedish Forces. While recommendations are predominantly weighted toward Swedish Forces, other TCC are considered because PKOs can be conducted by the UN, NATO, the African Union and the EU.

Acknowledging that peacekeeping does more good than harm, there still remains a growing list of damaging effects from PKOs (particularly failures to deliver, as well as the deployment of the mission itself), and addressing them will help to mitigate the possibility of turning some of the negative consequences into positive ones. Less attention has been focused on the negative consequences; the main focus has instead been on increasing the efficiency and the effectiveness of the PKO. A common feature of unintended consequences facing PKOs is to sensitize states and organizations involved to the negative effects of operations; this allows for more effective operations. It must be highlighted that no one "intervention in a complex system such as a human society can have only one effect" (Hull *et al.*, 2009:16). Any one alteration in a complex system will create change whether the initial plan was intended to bring about the changes or not. The article refers to Aoi, *et al*. (2007) who states "all those reactions that fall outside the scope of the response we wanted to elicit are the unintended consequences of our intervention", which are operations that were not foreseen or intended when a field mission's authorization was determined and later commenced (Hull *et al.*, 2009:16). Distinguishing between unintended consequences and

the failure to achieve the intended consequences needs to be realized. Unintended consequences are therefore about the gap between intentions and outcomes. The study's scope is limited to the unintended consequences which negatively impact the host country of local population and their communities.

Natural resources can at times be under competition during a PKO, exacerbating already contested and negative environmental impacts. A debate regarding the inclusion of environmental protection in peacekeeping mandates and environmental stewardship is ongoing. Despite the intentions of a PKO to do the right thing, they have the responsibility to ensure that their presence has a minimal ecological foot print, more so when the environment is an element of the conflict. A PKO's unintended consequences depend on the extent and stage of a field mission, and also how it will affect the natural, cultural and historical resources in a host nation (Hull *et al.*, 2009). Areas the article highlights of concern include:

- *Planning and setting up of logistic arrangements for the mission* must take into consideration location (geological and topographic characteristics), numbers of occupants, duration of the mission, construction materials, and even building design to ensure sound planning in such tasks as choosing the storing and handling solid wastes while limiting environmental impacts. Procurement is a challenge for environmental sustainability of a PKO as the lowest bidder outweighs the notion of environmentally-friendly sustainable purchasing and contingency owned equipment which can sometimes be found to not comply with environmental regulations.

- *Maintenance and operations of the mission* face similar challenges that municipalities might often come across, such as SWM. Most host countries do not support the infrastructure to deal with the flow of solid waste from PKO's due to widespread conflict. In the DRC's case this conflict has been waging for many years, leaving the country without the capacity to support even the most rudimentary forms of SWM systems. While local civilian contracting has become more prevalent, so too has the lack of acceptable disposal services in accordance to international environmental standards. This makes contracting oversight and supervision part of environmental policy and guidelines; examples of this will be seen later in the chapter when examining the DPKO's own stance on the issue.

- *Close down and withdrawal of the mission* requires the decommissioning of base camps and is crucial to environmental protection during field missions. The

movement, remediation and restoration of wastes, equipment, and facilities are not usually handled according to an organization's own doctrine. Awareness is needed so that operations can 'green' themselves and avoid unintended consequences. A reoccurring theme in the lack of financial and human resources, mandates, and commitment from senior staff remain as hurdles to overcoming these environmental problems.

The recommendations and responses of the article are solely focused on how Sweden handles unintended consequences – they are usually handled with a developed and professionalised army. Many peacekeeping TCCs are from developing countries and may not have the necessary resources to tackle negative problems in the field. Even if the UN is to support TCCs technically and/or financially with issues as they arise, they may still lack the capacity and comprehension (field experience and lessons learned) to manage a problem. It is noted that ad hoc solutions dominate past and also ongoing peacekeeping missions. However, despite staff being often aware of environmental problems facing a mission, the lack of standing operating procedures prevent coherent solutions from taking shape. Defining and understanding the dichotomy between unintended and intended consequences is important for framing the issues contextually facing SWM in base camps during a PKO.

There are three international conventions in particular that help address the issue of waste management created to protect human health and the environment from hazardous chemicals and waste. These conventions are the Basel, Rotterdam and Stockholm Conventions. Each is legally separate from the other and is governed by their individual Conference of Parties. These parties are tasked with upholding the commitment to manage hazardous materials during the complete lifecycle, from production to disposal attempting to minimize, and or replace products with alternatives. Highlighting the Basel Convention's core objective is that of environmentally sound management of hazardous wastes. Particularly important to the issue of peacekeeping and waste management is Article 4, section 2, under General Obligations of the Basel Convention. The section requires each signatory to take the appropriate measures to ensure environmentally sound management of hazardous chemicals and other wastes, including: the availability of disposal facilities; the reduction of transboundary movement of wastes to a minimum; prevention of exportation and importation particularly to and from parties belonging to developing countries; the belief that SWM will be done in a safe and environmentally sound manner; information made readily available about proposed transboundary movements of wastes and then provided to States concerned; and cooperation with other parties to continue the improvement of prevention against illegal

traffic (Basel Convention, 1989). The section is of particular importance mainly due to the process of backloading that some TCCs must undertake in order to ensure their solid wastes produced during a field mission are managed in an environmentally sound manner. However, it should be noted that the treaty has not been signed, and or ratified by every country. This could make the transport of certain wastes difficult especially in the case of the UN mission in Haiti; a country who has signed , but has not ratified the treaty.

The *Environmental Guidebook for Military Operations* (Waleij *et* al., 2008) was created with the intent to act as direction for practitioners to follow when in the field. With collaboration between experts from Finland, Sweden, and the United States, a working group established the document. The guidebook seeks to reduce the environmental impacts experienced during multinational military operations, as well as the impact on the health and safety of a deployed force by providing operational planners with the right set of "overarching principles, guidelines, templates, and examples... to incorporate environmental considerations... into operational- and tactical-level planning... throughout the life cycle of the operation" (Waleij *et al*., 2008:iii). The document is not sanctioned as any one specific country's own doctrine, but what it does is emphasize the environmental management responsibilities, practices, standards, and preventive measures. The guidebook examines thoroughly each section of the life cycle of military operations:

- The *planning phase* advises environmental analysis for the Operational Plan (OPLAN), and Environmental Protection developed and prioritized Course Of Action (COA); the outputs are then used for the Concept of Operations (CONOPS) and Statement of Requirements (SOR) in order to help establish the resources required for the OPLAN.

- The *pre-deployment phase* requires preliminary surveys before troop mobilization and deployment, so as to authorize COAs and the OPLAN. Risk management assessments are a necessary element of pre-deployment EP and are conducted to "identify and quantify the risks to military personnel arising from conditions within the proposed area of operations" (Waleij *et al*., 2008:10). Importantly, the risk assessments verify how the mission might impact the environment and therefore, the well-being of local communities. Environmental Baseline Surveys, environmental health site assessments, environmental sampling, environmental awareness training and education, and finally, outreach to the host nation, including local community leaders and experts for the purpose of Environmental Consideration in Base Camp Planning. Environmental surveys and any necessary follow-on assessments are

required in this camp planning process. For the importance of this research project, the base camp planning provides a checklist for the selection process in order to ensure environmental sustainability and the aim of a zero footprint camp.[4]

- Within the *deployment phase* (execution and force rotation), the most important process is the development of the Environmental Management Plan. The Environmental Management Plan acts as the backbone of the operations EP as it must constantly "communicate the roles, responsibilities, and standards for effective environmental management, and to maintain records of site assessments, decisions made in the field, environmental incidents, and specific actions taken" in order to ensure ongoing advancement in environmental concerns and custodianship (Waleij *et al.*, 2008:17).

- The *rotation of forces, redeployment, site transfer and site closure phase* provides a plan for all four actions called the Environmental Site Closure Process (Assessment and Action Plan). The first phase of this plan and subsequent report consists of the desk study, site visit, and a preliminary report of all information collected in the examination processes. The second phase requires a site survey, environmental assessment, and a final report in order to reveal any existence of contamination within the base camp site and to determine necessary actions if need be. The last phase of the site closure process is to plan and carry out any necessary actions in order to make the site environmentally safe and to ensure the closure/transfer prerequisites are assured (Waleij *et al.*, 2008).

- Finally, the *post-deployment phase* consists of all the necessary actions to be taken once all the forces have withdrawn completely. These actions include archiving important documents, reviewing the operational environmental management experiences, and most importantly, collecting lessons learned, which is paramount to the success of future EP during operations. Monitoring the environmental status in the area of responsibility might be necessary to ensure environmental damage has not been overlooked.

The *Environmental Guidebook for Military Operations* is one of the most comprehensive project management guides created for managing the environment during a

[4] The guidebook defines the "Zero Footprint Camp (ZFC) as a concept developed in the United States to improve overall force readiness by reducing the logistics footprint, improving force protection, and minimizing environmental impacts from base camp development."

multinational military operation, such as a PKO. Provided templates can give operational planners the best advantage in ensuring that all aspects pertaining to the environment are considered during the operational life cycle of a military operation. While it does not touch specifically on the role of SWM in base camps, particularly in capacity deficient areas (as is found in the following UNEP document on Liberia), it certainly provides the means to addressing such matters in an operational setting. In particular, it addresses the design of the base camp process, which is useful in the creation of space for SWM collection, disposal (if on site through the setup of a composting location, landfill or waste-to-energy technologies), and possible treatment.

2.6. The United Nations focus on peacekeeping: environment and waste

The UNEP conducted the *Assessment of the Management of Solid Waste in Liberia*. This assessment provides a great window into the condition of SWM in a country emerging from post-conflict. Of particular interest within the documents findings are the overlapping roles and responsibilities to deliver SWM to Liberian citizens. The Environmental Protection Agency sets out guidelines, while three ministries have overlapping mandates to guide, inspect and deliver waste services. Even the municipalities, through the Public Health Law of 1975, have been given mandates to collect, dispose and treat waste it is noted that financial transfers from the federal level were not taking place at the time of this document. The assessment concludes that the weakness in institutional capacity resides predominantly as a shortage "in both human and financial resources to operate a viable system... [while] the human resources, the technical expertise of the various ministries, including the Environmental Protection Agency, are collectively very low, or on occasion non-existent" (UNEP, 2007:7). Private contracting of disposal services was found to be strongly favoured by key government ministries, particularly because of the failure from the government to provide waste management services on their own. It highlights the importance of the African development model and states that Community Based Organizations might possibly play a role in the management of solid waste through pre-collection to recycling and composting services allowing the government to focus on enforcement of services, and monitoring of roles. However, user pay fees might be needed, and in many developing countries, where poverty is endemic, collection of such fees is most likely impractical. Finally, the raising of public awareness and community involvement is necessary for ensuring sustainable SWM schemes. In order to do so, educational programmes and enhancing the role of women within the waste sector would greatly increase public awareness. It is cleverly recommended that the hidden cost of poor or absent services – such as the cost related to ill-health and sickness versus comprehensive waste management programmes, should be promoted as it

can act as a powerful argument for the support of the latter. While the assessment does not focus on the military, it helps juxtapose the problems of SWM in capacity deficient regions where peacekeeping takes place and highlights similar issues facing many developing countries.

The *Environmental Profile of the United Nations System Organizations* (Inomata *et* al., 2010) is an assessment/review of the environmental policies and practices of the UN's overall organizational system. For the sake of the literature review, focus will be placed on peacekeeping and EMS in relation to SWM. However, it is important to see how the UN organization, and its various branches, approaches the issue of environmental protection in order to give a holistic view to SWM during peacekeeping missions. Within the document's main findings, it clearly indicates that the UN is not without mechanisms for improvement on environmental issues it states:

> *"the United Nations system lack a formal and systematic framework for an integrated in-house environmental management system based on explicit legislative mandates and applicable environmental norms and standards, as well as administrative and managerial leadership at the senior level. Many secretariats of United Nations system organizations are still far from their commitment to "practice what you preach" as they are not sure whether and how they should apply the multilateral environmental agreements (MEAs) which their Member States have adopted"* (Inomata, 2010:iii).

In 2001, the Environmental Management Group, an inter agency coordination body was established to create guidelines, manuals, and internal management guidebooks on sustainable procurement. It recommends that the execution of any EMS should follow suit with the ISO 14001 series on the management of waste and other resources (Inomata, 2010). Since then, the group has ventured to endorse comprehensive programmes to complement in-house waste disposal and energy saving schemes (Inomata, 2010). However, senior management indicated through review that their staff lacked the capacity to implement environmental obligations. Adversely, staff indicated that senior management was not providing the necessary support and that the implementation of environmental conventions was lacking. For example, a natural moral obligation for organizations should easily stand in applying the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal to their own in-house management, but it was found not to be the case. Many organizations are strongly pushing for the implementation of the ISO 14000 series in order to provide EMS for monitoring, continuous measuring, and improvement in environmental performance within their respective departments. Under the development of environmental policy in commonly supported areas, UNEP and the UN

Office in Nairobi collaborated to produce findings that addressed the immediate environmental impacts occurring from conduct on the Compound in Nairobi. Impacts indirect to the environment had taken place outside, such as waste management (Inomata, 2010). Such findings are important when addressing SWM in peacekeeping base camps. DPKO and Department of Field Support's Environmental Policy for United Nations Field Missions developed with UNEP, contains conditions for minimizing the impact on the environment through the operational planning and establishment process, as well as providing the necessary tools for the management of solid waste. DPKO/ Department of Field Support provides what the review claims to be as the best practices to have reproduced during field missions for all organizations, which include (Inomata, 2010:21):

- Environmental issues at the mission will normally be subject to national laws and regulations governing the environment in general.
- Where there are no relevant national laws and regulations governing environmental issues, international obligations under international environmental treaties to which the host country is a party will provide the standards of conduct with which the mission will need to comply.
- International environmental treaties, and environmental norms and standards agreed at the United Nations or at intergovernmental conferences organized by the United Nations will provide practical information for the mission to establish minimum standards to achieve its environmental objectives.
- References listed in section E (of the policy) should be the minimum standards that missions considered when establishing environmental objectives and procedures.

Section 142 genuinely identifies a commitment and enthusiasm throughout the UN system by all levels of staff and administration who desire the systematic address of environmental issues. More specifically it builds construction and management and sustainable procurement. Yet, in 2008, the Joint Inspection Unit (JIU), the same organization to conduct the review declared that system-wide policies had not been adopted by member agencies of the Environmental Management Group particularly on the matter of waste disposal (Inomata, 2010). In another instance, the review could not indentify in-house environmental expenses, leading to important information not being used in calculations for improvements in financial and administrative issues.

Each of the review's recommendations support in one fashion or another the coordination, knowledge sharing, accountability, and capacity building between and within the UN organization, whether it be top down, or increased ability from the bottom, to ensure sustainable environmental policies and doctrine continues to 'green' the organization as a whole. The document is important because of its specific review of the UN's organizational

impacts on the environment and how each is affected and works together to provide the correct movement towards environmental considerations and ultimately a zero-footprint from ongoing and future missions.

2.7. Department of Peacekeeping Operations perspective

In 2008 DPKO along with the Department of Field Support released the *United Nations Peacekeeping Principles and Guidelines* (United Nations, 2008) which has become commonly known as the 'Capstone Doctrine'. The document was written to convey experiences from the many past field missions so as to help shape and guide planners, practitioners, and the doctrine of each and every individual TCC, training and pre-deployment programmes - all those working in UN peacekeeping missions. As it is a DPKO/Department of Field Support internal document, it is intended to act as the highest-level doctrine framework for UN peacekeeping. Because it reflects the complex nature of current PKOs, the need to address the environment is crucial to the integrity of the document.

A strong concern raised by policy makers is the perceived impact by a PKO's human and thus, 'material footprint' on the physical environment. For example, the various negative impacts incurred through poor waste management, such as solid waste being taken off-site by local contractors and dumped illegally without follow-up, stress the possibility of significant impacts to a host economy by placing demands on competition over service contracts and materials that can be found in the waste which can be traded for money (DPKO, 2008). It can also affect the health of people who sort through the waste and become sick from exposure to hazardous materials. Furthermore, negligent waste management practices are seen to have the ability to create a negative perception and reduce credibility and legitimacy for an operation by eroding popular support if not managed appropriately by command (DPKO, 2008). It is the responsibility of the mission personnel to make sure their actions are managed swiftly and efficiently so as to minimise any operational damage. A mission should be made aware of its side-effects, including the environmental impact from poor waste management practices (DPKO, 2008).

The environmental side-effects of waste produced during a mission are addressed by UN PKOs through a mix of civilian contracted services procured by the UN, and military support capabilities that are provided through 'lease' arrangements between the UN and individual TCCs (DPKO, 2008). Usually, contingents arrive with supplies meant to last for 30 to 90 days to maintain self-sufficiency. During that initial arrival period, the UN must engage

private service contracting to make the necessary supplies available for a mission. Supplies would include water, rations, laundry, transport services, and particularly waste disposal. The UN pays for the lease of equipment brought by an individual TCC this is based on pre-determined reimbursement rates (DPKO, 2008). Finally, the Capstone Doctrine acknowledges that the 'support component' of a PKO is crucial to providing logistics and sustainment services, the absence of such services would mean not being able to enact the operation's "core functions in an effective, coordinated and timely manner consistent with the regulations and procedures prescribed by the United Nations" (DPKO, 2008:18). Therefore, because the operations core function is dependent on private service contracting, the provision of such services has become synonymous with PKOs. The Capstone Doctrine addresses the issue of waste management and its probable side-effects if not managed appropriately, but it could go much farther to suggest standards for an EMS appropriate to the operational environment of a peacekeeping mission.

DPKO has developed their own guidelines and policy to address the issue of environmental protection during a PKO, and importantly, attends to the issue of waste management.

2.7.1. Policy for United Nations field missions

The *Environmental Policy for UN Field Missions* (United Nations, 2009) document is set to provide guidance for DPKO and field missions on environmental matters; environmental objectives and control measures are to be established and implemented throughout the mission life-cycle. That which is most important is the responsibility it places on senior personnel and staff included in all field missions. More specific information is found in greater detail in the *Environmental Guidelines for UN Field Missions* (United Nations 2009). Yet, stated under the policy's Basic Components of the Environmental Objectives of a Mission (Solid Hazardous Waste), Section 35, offices or units generating waste will make certain that segregation at source, based on characteristics, is done to ensure waste minimization, which is to be in accordance with procedures delivered by the field mission's Director of Administration/Chief Administrative Officer (DA/CAO). Therein, the DA/CAO is responsible for creating the standing procedure and approval for waste collection, recycling or reuse, and disposal. Where these actions are undertaken by private contractors, contracts will be made to hold contractors accountable for the protection of the physical environment in accordance with the environmental objectives of the mission (DPKO, 2009).

2.7.2. Guidelines for United Nations field missions

The *Environmental Policy for UN Field Missions* (United Nations, 2009) provides more specific direction for UN field missions addressing basic information on what has been determined as the most pertinent environmental issues found during field missions. The guidelines are there to help implement the environmental policy for PKOs by establishing mission specific baseline studies, environmental action plans, and Standard Operating Procedures. However the guidelines stop short of providing in-depth technical details in those areas which are found at the end of each section. Each section is appropriately structured to include the Key Issues surrounding the management issue, the Description of the Problem, followed by the minimum and common standards to be applied to the type of waste. Recommended actions outline the collection, storage, monitoring and disposal options to take place. Assigned responsibilities provide the onus for who should manage what part of the process, whether it be engineers, or the Environmental Officer (EO) who should be placed with each field mission.

Within the Environmental Objectives, Section 17 requires each mission to establish its own aims. More specifically, line 17.7 demands the reduction of noise and waste generation. Under the guideline section, waste management comes in section 4. Under key issues it stresses segregation of waste as a top priority. Since segregation is seen as crucial to the decision making process of on-site versus off-site management (the very issue at the heart of this thesis study), considering the destination of waste it is best done before determining exactly what kind of storage and types of containers will be used (DPKO, 2009). It goes on to suggest that if proper disposal does not exist, then developing a method to allow for a number of recovery options must be accomplished. The separation of materials is crucial - depending on the disposal options, recovery is made much easier and less dangerous if it is controlled when a field mission is being planned out from the beginning.

Section D.4.2 goes into more depth on the issue of SWM. Key issues include a solid waste audit which must determine the types and amounts of waste generated in managing the waste stream specifically. The investigation into the potential for local site selection of disposal sites includes only suggestions for landfills and composting. WETs are not found in the immediate text. The objective of proper disposal, and/or recycling where possible for solid wastes is reflected in recommended actions such as source reduction, recycling, treatment, and disposal, for the EO to ensure are handled indubitably. SWM standards are coupled with the EU Landfill Directive [1999/31/EC], which seeks to improve European standards for design operations, durable care, and waste separation for landfills (DPKO,

2009). References follow the end of the section for further information on incineration and recycling methods, and again it is here where further technical details can be found.

Sections D.4.1 and D.4.2 establishes guidance on SWM for the rest of the guide as nearly half of the document addresses specific kinds of wastes likely to be found during a field mission. Solid waste categories include: industrial type wastes and hazardous wastes; waste engine/gear oils; batteries and battery acid; used tyres; scrap metals (damaged vehicles, used vehicle parts); old office, clinic, and other equipments; clinical wastes; construction wastes (including asbestos). Regrettably, there is no mention of ammunition, or biodegradable wastes such as food scraps or plant clippings from grounds keeping.

In terms of the responsibility senior management is entitled to fulfill, under the environmental action plan – monitoring of progress and implementation section in which monthly reports must consist of a rundown on the environmental protection activities enacted, the results achieved and include the actions where increased support was given from those addressed. The report is to be prepared for the DA/CAO, the Force Commander and the Police Commissioner. It is then up to the DA/CAO to ensure the mission conducts an Environmental Baseline Survey, creates an Environmental Action Plan and establishes an Environmental Log for easy access by other mission heads (DPKO, 2009). The training and awareness section assigns responsibilities to the Under-Secretary-General for peacekeeping missions through the DPKO's Environmental Policy to properly inform the Head of Mission or Special Representative to the Secretary General (SRSG), the DA/COA, the Force Commander and the Police Commissioner found within each mission. The Under-Secretary General is also responsible for the provision of environmental training and understanding for personnel in the mission (DPKO, 2009). Such clearly defined responsibilities will certainly support providing needed checks and balances for securing core principles of environmental integrity during a field mission

The *Environmental Guidelines for UN Filed Missions* (United Nations, 2009) does exactly what it is intended to do by giving a solid outline for the management of waste and natural resources by an EO stationed in a field mission. The reference sections provide a respectable amount of additional information such as orientation on ISO 14000 standards, and added familiarization on the Basel Convention guidelines for practitioners. Yet, it appears as if it is up to the Environmental Office to decide how to move forward with implementation while taking into consideration the limitation/parameters of the field mission. It is stressed that senior leadership from the military, police, and civilian sectors are made to ensure information pertaining to environmental awareness is made available for all aspects

of a mission (DPKO, 2009). The policy previously examined only goes as far as to state that within each individual operation, it consigns accountability to senior staff first, as well as all personnel across the board (DPKO, 2009). It is the EO who at the end of the day is responsible for managing compliance within field missions and report to the DA/CAO who in turn is responsible for monitoring. Conversely, there is no mention of legally binding doctrine from which practitioners must adhere, despite the numerous international conventions that the UN contributes to. Yet, it is an essential document for all environmental officers stationed in the field and it goes a long way in addressing environmental considerations by providing broad tools and parameters to decrease impacts from a PKO on the physical environment.

2.7.3. Additional United Nations guidelines

Under the *Medical Support Manual for United Nations Peacekeeping Operations* the Force Medical Officer is responsible for providing and overseeing the implementation of waste disposal which is considered a preventative health measure and part of field hygiene requirements (DPKO, 1999). Advisement from the Force Medical Officer is intended for the DA/CAO and/or Chief Logistics Officer on the appropriate “disposal and destruction of medical wastes and expired medical products (drugs and consumables)” (DPKO, 1999:101). The supervision/monitoring of waste disposal are recommended so that international guidelines preserved for disposal and incineration processes. However, the document neglects to prescribe any specifics as how to do so. Biohazardous material is to be a top priority, making the FMedO responsible for the compliance of standards from all medical units throughout a field mission. Finally, medical standard operating procedures for peacekeeping are meant to delineate the responsibility of medical waste disposal under Medical Logistics.

Disarmament, Demobilization and Reintegration (DDR) is a frequently utilized mandate undertaken during a PKO. The DDR *Principles and Guidelines for the Collection and Destruction of Ammunition* recognises the importance that the process can have on the environment during a field mission. The Ammunition Disposal Areas is strongly focused on safety requirements, but also addresses environmental concerns, drawing attention to the effects on the food cycle and drinking water, noise and shock (presumably from blast wave upon detonation of munitions), hazardous gases and residue (particularly on personnel and local communities), clean-up of disposal sites before site turn over to national authorities, and the recovery of scrap metals in accordance with national requirements, with the possibility of specialist assistance. It references the Technical Note for Mine Action for environmental management guidance in these areas. The disposal of depleted uranium ,

which can be toxic to plants, animals, and humans (an amount as little as g/m^2 can have negative side effects) also falls under the Technical Note for Mine Action (DPKO, 2002). The conduct of waste disposal requires force commanders to delineate prepared authorised instructions on disposal procedures for burning and disposal of waste materials arising from the operation, as well as to provide disposal activity reports and area contamination procedures to Force HQ after each disposal action is performed. (DPKO, 2002). The DDR guidelines are not doctrine, but rather a broad format to follow in the field of operations. If the document is not included in the SOFA or MoU before the mission starts, it simply becomes a reference template. Yet, because DDR is one of peacekeeping most prevalent mandates, and the solid waste produced is especially hazardous, it is increasingly important to make the environmental considerations of SWM found in the guidelines part of every mission in order to ensure impacts to the environment are minimized long after disposal of ammunitions are conducted. The progression of literature here shows the thought process and the view the UN holds when considering waste management during peacekeeping missions.

2.8. South African Nations Defence Force: Solid Waste Management policy

The SANDF has a rich background of policy and guidelines to draw on when approaching SWM systems for base camps during a peacekeeping mission. Because a TCC is obligated to use its own national SWM legislation if the country which it is operating within does not meet acceptable standards, one must look years back at South Africa's policy to see where and how it has developed. The *White Paper on Defence* (South Africa, 1996) is a good starting point to see where SANDF policy on the environment originates with principles of sustainability and environmental protection. Chapter eight states that the Minister of Defence, as well as the Chief of the SANDF, take responsibility the environmental management, protection and control of military properties, and that the preparation and implementation of military activities will not exclude ecological factors or negatively impact the long-term potential of the land and other natural resources, whose responsibility resides with Commanding Officers of military installations (South Africa, 1996).

The instruments and means put into practice by SANDF are assessed against principles within Section 2 of the South African National Environmental Management Act (NEMA) (South Africa, 1998). As South Africa's main piece of legislation for the protection of the environment, it sought to:

> "*provide for co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that*

will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state; and to provide for matters connected therewith" (South Africa, 1998:2).

From NEMA, SANDF has built its own policy and guidelines for the management and protection of the environment pertaining to SWM. Under Section 2, Principles of NEMA, SANDF has developed its current defence guidelines on SWM by seeking to advert impacts of military activities as a source of waste. Through Sections 2, no. 4(a)(iv) of NEMA "That waste is avoided, or, where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner" (NEMA Act, 1998:12). SANDF also relies on international conventions for guidance, such as one mentioned previously in this chapter, the Basel Convention on the Control of Tranboundary Movements of Hazardous Wastes and their Disposal, 1989. The convention seeks to guarantee generation of hazardous and other wastes is reduced and that the transboundry movement of waste is limited; if it has to be transported across states lines, it is done so according to environmentally sound and efficient management in order to protect human health against damaging effects.

2.8.1. Joint policy on Solid Waste Management

The SANDF has been part of the development of three Joint Environmental Security Working Group (ESWG) guidebooks on environmental management for military operations. These guidebooks were created as part of military-to-military relations between the United States and South Africa. Yet, during this time US security assistance funding to South Africa had been strained, while other military joint ventures sat idle, the environmental partnership flourished (Henk, 2006). In 2005, South Africa hosted an international conference on Military Integrated Environmental Management, which was formed by a joint US-South African Environmental Security Working Group. The conference brought over 30 countries together and produced a number of guidebooks pertaining to the 'defence' of the environment (Henk, 2006). Three guidebooks of note were developed as a joint United States and South Africa project, and were comprised of subject matter experts in both environmental management and training development from both countries.

The *Guidebook on Environmental Considerations during Military Operations* (ECOps) (South Africa, 2006) focuses on the international militaries providing tools to identify and assess the impacts "to meet its environmental responsibility and accountability in ensuring a sustainable environment" (ESWG, 2006:i). It identifies stakeholders to include Commanders, service members, and civilians as those who must carry the responsibility for "the lands and

associated environment entrusted to their care" just as the White paper does (ESWG, 2006:1). It also states that forces will not be protected or achieve sound environmental stewardship unless militaries do not reduce the impacts from their activities. The guidebook seeks to support fully as broad reference material for stating the need to establish the integration of ECOps into the decision-making process early on in the planning stages of an operation. It recommends that an Environmental Management Plan should delegate processes, roles, functions, and responsibilities, as well as monitoring, assessments and rehabilitation over the time frame of the operation for waste management. It also outlines the taking over process for rotation of forces, which must be part of the Force Rotation Plan (ESWG, 2006). It contains a useful table on how to manage different types of waste over the immediate, short term, medium term, and long term of an operation's duration. Various methods are suggested depending on the type of waste and level of hazardousness such as incineration, backload, landfill, recycling, compost, and/or primary treatment such as collection basin, oxidation pond, or wetland treatment. A variety of solutions for all stages of deployment are available for those who consider this guidebook in full.

The *Guidebook on Development and Implementation of Environmental Education and Training in the Military* seeks to "facilitate and assist the international military community in the development and implementation of environmental education and training programs within defence organizations worldwide" (US-South Africa, 2006:1). It also created to be broad in its approach and acts as a model for military organizations to more easily incorporate environmental prerequisites and ethics into military education and training programs so as to integrate the basics needed to create comprehensive environmental policies and principles into all levels of the decision-making processes. It lays out an eight step procedure to develop these environmental requirements for training and "considers the different 'target audiences' (from the corporate/ headquarters level, to commanders, supervisors/middle managers, down to the basic soldier or unit in the field)." (US-South Africa, 2006:1). Recommendations include the need for a Hazardous Waste and Hazardous Material Training Course. Various training scenarios help build knowledge on how to deal with SWM related issues as they arise.

The last of the three United States and South African environmental documents is the *Guidebook on Environmental Impact Assessment in the Military* (US-South Africa, 2004). As with the other guidebooks, it is to be general in its description and has the same intended focus for the international military community to include environmental considerations in decision-making, but with the focus on Environmental Impact Assessment (EIA). It identifies the same defence organizational stakeholders who are to be entrusted with the responsibility

for the environment in their care. Without proper EIAs, achieving suitable environmental stewardship would be unlikely – EIAs help to avoid adverse effects from military activities to the environment. Since the document is general, it is meant to develop or modify a military's own EIA policies and methods. Within its pages it includes general processes, operational areas usually encountered during military operations, identification methods for potential short- and long-term, direct and indirect, and cumulative impacts, collection methods for EIAs, and finally, measures for offsetting negative environmental impacts.

For the most part these three documents help to build the *Environmental Guidebook for Military Operations* referred to earlier on in this chapter (US-South Africa, 2008). The key concepts that link these documents together are the strong emphasis on the responsibility of trusteeship or stewardship by military organizations over the environment, and the concept of interoperability between TCCs are important to increase environmental trusteeship on a global scale.

CHAPTER 3:

ENVIRONMENTAL SYSTEMS AND SOLID WASTE MANAGEMENT

3.1. Sustainable development

When approaching the issue put forth in this research project, the importance of sustainability as the underlying principle for pursuing increased awareness on the subject of SWM during a PKO must be acknowledged. Sustainability was first put forth by the Bruntland Commission in 1987 during the World Commission on Environment and Development and was defined as humanity's ability to make development durable. The concept was defined as such in the hopes that it would ensure that "it meets the needs of the present without compromising the ability of the future generations to meet their own needs" (Brundtland, 1987:1). Thus, the Bruntland report declares that sustainable development is a critical part of the process that is change, which includes the use of resources, the way in which investments are managed, the direction of how technological development and institutional change all come together to improve present and future ingenuity so as to satisfy human requirements and ambition (Brundtland, 1987).

According to Dryzek (2007:146), Sustainable Development (SD) is a very comprehensive concept that refers to the earth's collection of closely interconnected systems. The notion of SD pursues uninterrupted growth of all combined human needs which might be satisfied "through intelligent operations of natural systems and human systems in combination" rather than by simple resource garnering. Limiting environmental degradation, while simultaneously pursuing growth of human development can be achieved if clever thinking allocates proper command and control over the operations of humanity's own advancement. For example, in September 2000, 150 heads of state and governments gathered at the UN during the Millennium Summit to create what would eventually be known as the Millennium Declaration.

As a conclusion to this summit, it was pledged by those attending that human needs and basic rights, among many other important issues, would be made a top priority and that every individual would be able to enjoy an environmentally sustainable world. As such, world leaders committed to form a global coalition on cooperation in pursuit of development in order to ensure agreed upon objectives. Since then the United Nations Millennium Development Goals (MDG) have become guiding principles for a number of its cross-cutting issues related to sustainable development and the environment. The principles used by the

United Nations Environment Programme (UNEP) to identify 'environmental projects' were those provided by Part 1 of the UN MDG no.7 which was to: "integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources" (MDG Goal 7, 2010:52). The purpose of the MDGs is to ensure that international aid is focused on its goals, no matter where aid is applied primarily to meet the needs of the world's poor and vulnerable. Projects, policy and programmes are targeted by development agencies in order to support developmental frameworks for such problems as SWM practices, which are formulated and led by the developing partner country and implemented through national and local systems and institutions (DAC, 2006). If SWM is to become a deliverable in base camps during a PKO not only in the DRC, but in other similar situations, then the MDGs' commitment to environmental management is a good building block to begin from.

3.2. Characteristics of solid waste

Because of the range and restricted changes in that of a peacekeeping missions mandate for each individual operation, it is rather difficult to simply apply a single category as far as SWM is concerned. For example, a large PKO base camp (typically the HQ for a broader mission), will maintain significantly higher amounts of logistical equipment, such as armoured vehicles and helicopters, mission personnel (both civilian and military) as well as food and supplies. This can be compared to that of the smaller temporary or mobile base camps which are more likely to create waste from ration packs and plastic water bottles (Martinsson *et al.*, 2010). Plastic bottles and packaging are a major concern when it comes to disposing of them particularly in low capacity environments where in order to reduce their volume they are typically burned. Burning produces significant air pollution and should in turn necessitate an attempt to reduce the use of plastics where possible while finding alternative solutions during a PKO by the procurement divisions of each TCC as well as the UN (Martinsson *et al.*, 2010).

For the purpose of this study 'solid waste' is a term applied to a diverse assortment of wastes produced by the UN PKO, the nature of which varies from camp to camp and from mandate to mandate. Words used to describe waste include 'garbage', 'trash', 'refuse' and 'rubbish'. One definition of 'solid waste' is that originating from the residential, commercial and institutional sectors, construction and demolition wastes, sewage sludge residues, as well as incinerator ash. In most jurisdictions, it also includes at least some non-hazardous industrial waste (Maclaren, 2004). Waste can be considered to have met its end as its useable value no longer remains to the owner or the source from which it originates.

However, when you consider the value of a recyclable waste material it becomes more difficult to determine waste and non-waste residuals. For the sake of differentiation *hazardous waste* can "be highly toxic to humans, animals and plants; it can be corrosive, highly inflammable, or explosive and react when exposed to certain things such as gases" (Singh *et al.*, 2010:60). Many industrial and military by-products are hazardous. Thus, considerable waste types generated in base camps can be considered to be hazardous waste. Base camp hazardous wastes can be considered solid waste generated by peacekeepers which display the characteristics of hazardous wastes.

The characteristics and quantity of the solid waste generated in a PKO base camp is not only a function of the living standards of the base camp's inhabitants, but also of the operational mandate set forth by UN Security Council resolutions that frame a mission's term of reference. Generally in post-conflict nations the failure to deliver adequate attention to SWM frequently occurs. For example, UNEP conducted a post-conflict environmental assessment on Sudan in 2007 that revealed the country's waste collection only occurred in affluent areas and that in most instances, waste of all kinds was found close to the point of origin and burned (UNEP, 2007). No waste separation was found at the source, such as abattoir residuals, medical wastes, sewage and chemicals were all found in the normal waste stream (UNEP, 2007). However, drawbacks at a later time are liable to take place as resource depletion occurs, while negative impacts on the physical environment and on public health and safety are likely to follow. During a peacekeeping mission, operational efficiency becomes top priority in accomplishing predetermined mandates. Frequently, however, management may fail to pay adequate attention to its own SWM practices and ensuring it meets sufficient standards. Failure to do so will in all likelihood bring about harsh consequences as a legacy of mishandled and adverse impacts to the immediate environment, health, and safety of military personnel and local populations will linger. It is important that a sound SWM program acknowledges the irrefutable fact that "the greater the degradation of the environment, the greater is the effort required to restore its good quality" (UNEP, 2005:3)

According to Sasikumar and Krishna, a waste hierarchy refers by and large to a waste management technique strategy plan where each waste material is to be managed by the best practical environmental option (Sasikumar *et al*., 2009). In the waste hierarchy, waste avoidance/prevention is the option most favourable to a waste management system. Then comes re-use, which is multiple uses for the same purpose, followed by recycling and energy production. Lastly 'waste-to-energy' conversion can become a choice, however, it can have diverse physical environmental impacts similar to disposal, which is the last

possible option. If all this is not feasible, then a waste disposal option must be chosen as a last alternative measure, for example, the use of landfill, incinerator, or some other disposal method.

The Hierarchy makes it easy for authorities to understand the basic requirements in establishing an integrated waste management strategy that addresses collection, transportation, most practical technologies, planning, and preparation of the procedure that will maximise participation and involvement (Sasikumar *et al.*, 2009). Yet Martinsson (2010) argues that low capacity environments lack the support structures to follow through with such comprehensive system requirements. The following waste hierarchy figure explains the most preferred (starting from the top) to least preferred waste management options, where complete avoidance of having a material become waste, to disposal being the least desirable method utilized at any point of the waste management process (Tammemagi, 1999). The hierarchy meets the three principles supporting sustainable development and in base camps would be more preferable than the traditional reduction, re-use, recovery and disposal hierarchy (Tammemagi, 1999).

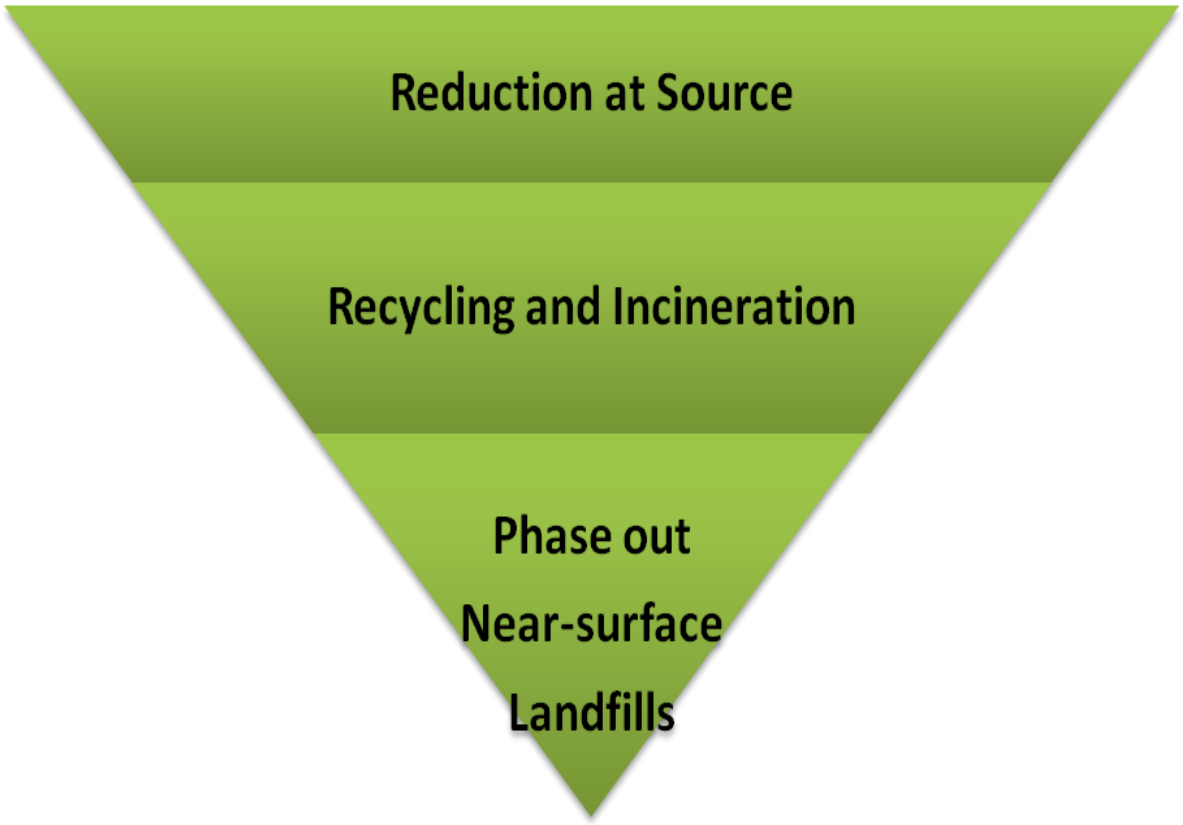

Figure 3.a: Tammemagi's Waste Hierarchy – Waste Hierarchy conveys a simpler approach to applying the hierarchy to capacity deficient environments. The top, reduction at source as the preferred first option ending with the phase out near-surface landfills as the least preferred option (Tammemagi, 1999).

The majority of the solid wastes can be separated into two major components - organic and inorganic. In general, the organic components of solid waste can be classified into three broad subcategories: putrescible, fermentable, and non-fermentable. Putrescible *wastes* tend to decompose rapidly and unless carefully controlled, decompose with the production of intolerable odours and visual unpleasantness; fermentable *wastes* tend to decompose rapidly, but without the unpleasant accompaniments of putrefaction; and non-fermentable *wastes* tend to resist decomposition and, therefore, break down very slowly (UNEP, 2005). A major source of putrescible waste is food preparation and consumption. Its nature varies with lifestyle, standard of living, and seasonality of foods. Putrescribe waste in a base camp is important to consider when bearing in mind peacekeeping's individual TCC.

For example, the South African diet is primarily characterized by the use of large amounts of cooking oil and beef, where as other TCC's including Thailand are characterized by the use of rice based products, as well as fruit and vegetables. High uses of oils can be difficult to dispose or treat during an operation. However, there are technologies that can reuse cooking oil as biodiesel for electrical generation. Such systems are part of the transportable camping systems currently in the process of procurement by the SANDF for their operations in the DRC (Potgieter, 2011). Zhang (2003:1) writes that the emissions standards of biodiesel have a much more positive "combustion profile, such as low emissions of carbon dioxide, particulate matter and unburned hydrocarbons". The process has a much lower impact as a Greenhouse Gas because the carbon dioxide produced is recycled through photosynthesis. In addition, other benefits arise from this process. The use of biodiesel would result in having to transport less petroleum, thereby lowering the carbon footprint of a PKO, or having to dispose of it in a local landfill. It also has a flash point of 150 °C making it less volatile and therefore safer to transport and it can be used as a lubricant in engines, or it can provide electricity for camps (Zhang, 2003). As stated earlier, these systems are being procured by SANDF for their UN deployment in the eastern DRC and will provide a practical means to becoming more sustainable during their operations.

Fermentable wastes can be described as crop and market debris. The primary difference between wastes generated by a peacekeeping contingent is extremely complex compared to that which is generated at the municipal level in a developing country. The later can be characterised as having a much higher organic content then that produced directly by a PKO, such as mixed plastics, electronics, machine oils, glass bottles and aluminum cans just to name a few. However, the organic portion of PKO's solid waste constitutes a large size of the waste produced and is important because of it potential adverse implications on health. Improperly managed organic waste attracts rodents as well as well vector insects

and degrades environmental quality by producing unpleasant odours and which contaminate air, water, and soil. These impacts protrude into the surrounding vicinity and cause a vast amount of health problems including amoebic and bacillary dysenteries, typhoid fever, salmonella, various parasitizes, yellow fever, plague, and others; it is difficult to track the effects of communication of these contaminates to a specific population (UNEP, 2005). Large amounts of workers who handle refuse particularly outside of a base camp, and individuals who live near or on disposal sites, can easily become infected with gastrointestinal parasites, worms, and related organisms through indigestion of polluted drinking water which is contaminated by rat droppings.

Waste generated in countries located in humid, tropical, and semitropical areas, such as the DRC, are usually characterised by a high concentration of plant debris. This is different from waste generated in areas subject to seasonal changes, or those in which coal or wood are used more frequently in daily life. These are often characterised by greater quantities of air pollution from the ash produced. The concentration of ash will thus be higher during the winter due to the need for heating in the cold months. This could be an environmental impact that PKOs located in the colder regions of the world could consider assessing. However, it was not found to be an issue with regards to SANDF operations in the DRC due to its consistently warm climate present throughout the year.

3.3. Waste volumes and streams

Based on a study done during UNMIS, it was determined that the baseline figure for a solid waste stream (the total flow of waste from beginning to final disposal), per person per day in a base camp of a PKO should be approximately 1.2 kg (UNEP/AMISOM, 2010 and Jensen, 2012). This was determined by taking the estimated percentage by weight for municipal solid waste as offered in Table 3a, and the associated footprint by proportion of waste type per person which is presented in Figure 3b. However, this would depend again on the mandate of the PKO whether it be an observational mission requiring lesser amounts of materials compared to a demilitarisation mission, which requires the dismantling of weapons and therefore, a recycling process to manage the scrap metals of destroyed rifles, hazardous waste of explosives (Douglas *et al.*, 2004). Hazardous solid waste was not factored into the study because it was beyond its scope of analysis and would require a relevant evaluation. Nonetheless, what this information reveals is that the volume of solid waste produced in a PKO base camp is substantial and that the waste stream is complex in its mixture. Materials that could be landfilled outnumber the prescribed recycling options for a PKO.

Additionally, the UNEP study determined that recycling was the least preferred option for disposal, likely because recycled materials would require the process of backloading to a TCCs country of origin. The method of backloading presents itself as a problem because of security related issues and the increase in carbon emissions from transportation measures (UNEP/AMISOM, 2010). However, as it will be discussed in the following section many of these materials could be put to good use in a SWM system that could easily generate electricity and heating, or cooling for base camps. For example, 'putrescibles', 'paper and card' and 'other combustibles' could be used for incineration and composting systems, as these three categories make up 63% of the total solid waste produced in the camps assessed in the UNEP study (UNEP/AMISOM, 2010). Furthermore, utilizing materials entering the camp would permit for a closed loop system and could help lower the volume of solid waste produced and requiring landfilling.

Material	% by weight (For MSW)	Baseline	Kilograms (per person per day)	Kilograms (per day for 200 people)	Kilograms (per year for 200 people)
Putrescibles (Food)	31%	Landfill	0.37	74.4	27156
Paper & card	21%	Recycle and landfill	0.25	50.4	18396
Other non-combustibles	11%	Landfill	0.13	26.4	9636
Plastic	7%	Landfill	0.08	16.8	6132
Glass	6%	Landfill	0.07	14.4	5256
Metals	6%	Recycle	0.07	14.4	5256
Fine material	5%	Landfill	0.06	12.0	4380
Textile	2%	Landfill	0.02	4.8	1752
Electrical equipment	2%	Recycle	0.02	4.8	1752
Other MSW	1%	Landfill	0.01	2.4	876
TOTAL	**100%**		**1.2**	**240**	**87600**

Table 3.a: Estimated composition by % weight for UNMIS personnel in base camps (UNEP/AMISOM, 2010).

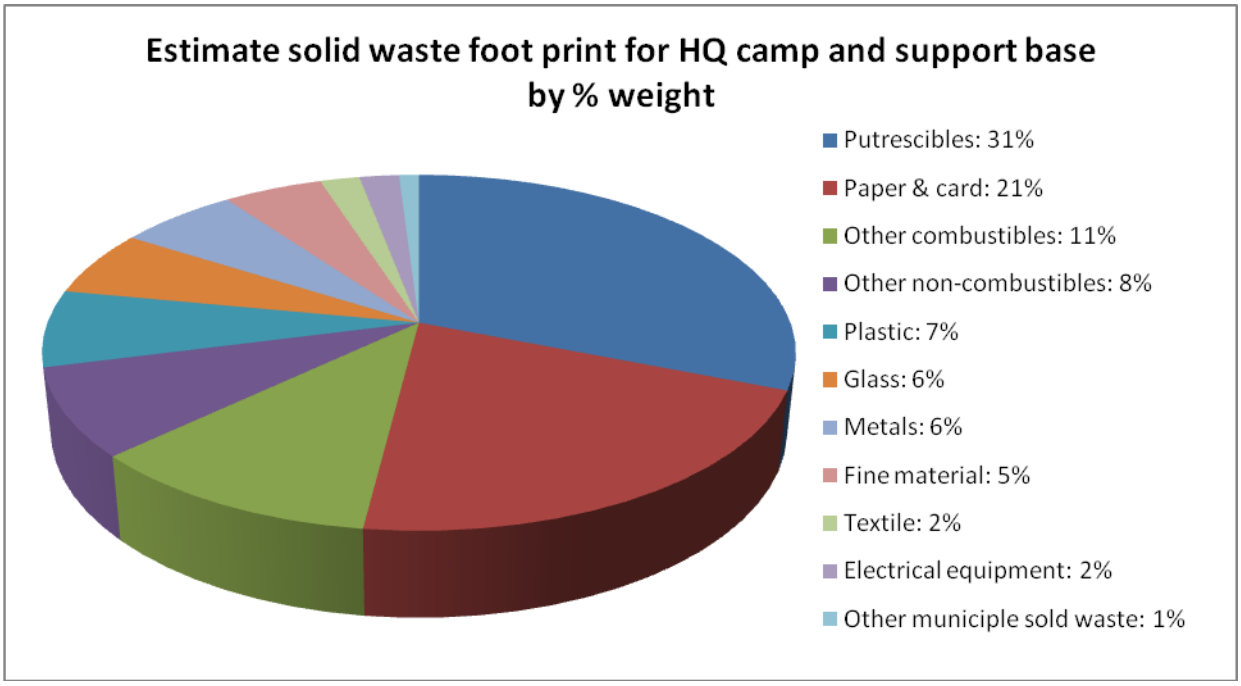

Figure 3.b: Estimated solid waste foot print for HQ camp and support bases by % weight (UNEP/AMISOM, 2010).

Many of SANDF's company base camps are in remote locations with no infrastructure, such as roads, linking them to the HQ camp in Goma, DRC. This makes it considerably difficult to backload their solid waste from the camps to HQ, and then on to South Africa. Therefore, the need to find greater environmentally sound methods of solid waste disposal, which would allow for closed loop SWM systems, should be strongly considered. Reducing the volume, or repurposing solid waste could go a long way to decreasing the space in a base camp's landfill, relieving the logistical requirements for backloading to a country of origin, or having to use private contractors who most often do not follow sound environmental guidelines. Using the formula from the UNMIS study, an estimated volume of solid waste can be calculated for the personnel stationed by SANDF in the province of North-Kivu.

Using the same blueprint of solid waste produced in the UNMIS study (shown in Table 3.a), Table 3.b illustrates the estimated volume of solid waste that the company and HQ base camps of SANDF generate per person, on a daily and yearly basis. The estimate for solid waste volumes produced by all SANDF personnel stationed in North-Kivu for one year is 471,288 kgs, which is the equivalent to one fifth the amount of an Olympic sized swimming pool. Furthermore, SANDF troops in the DRC represent only one TCC in the cog of the peacekeeping contingent worldwide, making the solid waste volumes generated by each and every individual TCC much more than this study is capable of covering. The

following figures demonstrate how the solid waste produced throughout the length of a PKO can accumulate to significantly high volumes if an operation lasts for years. Therefore, if left only to the disposal methods of a landfill site, or unregulated dumping by contractors it is easy to see how the solid waste can quickly begin to impact the environment that PKOs operate within.

Camps	Number of Personnel	Kilograms (per person per day)	Kilograms (per day for Base Camp)	Kilograms (per year for base camp)
Goma HQ	481	1.2	577.2	210,678
A Company (Munigi)	149	1.2	178.8	65,262
B Company (Mushake)	148	1.2	177.6	64,824
C Company (Kitchanga)	149	1.2	178.8	65,262
D Company (Pinga)	149	1.2	178.8	65,262
TOTAL	**1076**		**1291.2**	**471,288**

Table 3.b: Estimated Composition By % Weight for SANDF personnel in North-Kivu Base Camps.

3.4. Waste-to-Energy Technologies Options for base camps

Remote base camps are faced with the problem of reducing their solid waste volumes, particularly if backloading is required. Waste-to-Energy Technologies (WET) are considered to be an efficient and sustainable method to solve the waste management problem particularly in an area experiencing spatial restraints, while simultaneously reaping the benefits of electrical generation and creating a closed loop system. Two schools of thought emerge when viewing WTE. The first considers waste to be a renewable resource, and should therefore not be buried, but rather to be used in generating electricity. The second camp admits incineration can partially solve the waste problem, but that it does not resolve the dilemma of sustainable development (Tammemagi, 1999; Wagner, 2007). The real danger comes from the belief that consumers can continue consuming unhindered because trash is simply burned or buried and disappears. Such a belief acts in reducing the drive for aggressive waste diversion, which some peacekeeping missions are already committed to and would not wish to see further impediments. Varying advanced mechanical biological and thermo-chemical WET can be remedied to manage SWM. Some WETs can

be applied to base camps of substantial size and stability in order to recover and apply energy back into the base as well as reduce the negative environmental legacy at the operational level. Various WET exist and included in the following sub-sections.

Reclaimable inorganic materials such as metals, glass, plastic, and textiles are typically recovered by ad hoc unregulated measures and subsequently sourced out to private service providers. Recovery is therefore an important facet of SWM because the reclamation potential of waste is enormous. In developing countries, particularly warm tropical ones, organic (biodegradable) residues constitute at least 50% of the waste (by weight) (Zurbrugg, 2003). The use of biodegradables in agriculture is the most practical means of methane production. Anaerobic Digestion (AD) as a system has higher resource recovery potentials than incineration because biogas and compost are produced from the anaerobic process. Biogas; consists of methane (ranging 55% to 70%) and carbon dioxide (CO_2), and is produced from the process after 2-3 weeks (Institute for Global Environmental Strategies, 2008). As previously mentioned countries located in humid, tropical, and semitropical areas, such as the DRC, are usually characterised by a high concentration of plant debris and perfect for the AD systems requirements. Yet, according to the UN's document "Assessment of energy, water and water reduction options for the proposed AMISOM HQ Camp" it was found that AD needs further investigation into its viability for use in base camps and was excluded from recommendation due to security concerns, problems facing technical maintenance capacity, the presence of gas (methane) and the length of the overall AD process (UNEP/AMISOM, 2010).

However, the document states that "the utilization of anaerobic digestion systems to treat solid and liquid wastes derived from the camp's activities could be another "closed-loop" option with regard to the camp", meaning there is a preserved decrease in reliance on matter exchanged from outside of the base camp making it a sustainable solution to solid waste management. In the case of a UN mission in South Sudan a biogas feasibility study discovered that an AD system utilized during this particular PKO could sufficiently power cooking facilities for 1,500 staff in Juba (Jensen, *et al.*, 2012). An AD system would reduce the waste ending in landfills and incinerators. It would therefore, reduce green house emissions, produce electricity and cooling power, as well as provide the local community with benefits from the use of their organic waste, specifically, biodegradable and putrescible wastes such as sewage, plant and food leftovers to produce energy (UNEP/AMISOM, 2010).

Solid waste can be used as a feed stock in the advanced incineration process described as thermal treatment. Incineration processes have taken place in the presence of

air and at the temperatures of 1100°C and is burned for 45-70 minutes to ensure complete combustion (Tammemagi, 1999:148). Wastes are then converted to carbon dioxide, water and non-combustible materials with solid residue (bottom ash) (Department for Environment, Food and Rural Affairs, 2007). Primarily, two process stages are involved in the incineration process; (i) combustion of the waste where flue gas is produced and (ii) cleaning of the flue gas which is then emitted into the atmosphere (Ludwing *et al.*, 2003). Waste-to-energy incineration could be considered as a partial solution to peacekeeping's base camp solid waste problems by contributing to the energy needs of the base camps themselves. The electricity produced by WET can provide needed power for facilities and perhaps surrounding households in some cases. Incineration can reduce the weight of waste (up to 70%) and volume (up to 90%), which is helpful due to the need to prevent a long term foot print in an operational environment (UNEP, 1996 and Tammemagi, 1999:148). Despite the general perception of pollution risks, incineration plants can be built or modified to remove hazardous waste and particular toxic compounds such as NOx (nitrogen oxides), PCBs (polychlorinated biphenyls) and VOCs (volatile organic compounds) of up to 99.99%, which is known as the "four nines" standards (Tammemagi, 1999:155). Overall, emissions from WTE incinerators are lower than oil and coal power generation. During a PKO there is a constant supply of food waste and packaging from supply shipments that would make good fuel because of their high caloric value and consistent availability. Local biowaste could also be utilized in situations where PKO operate in tropical regions that are high in vegetative solid waste as it would provide a high caloric value for such a waste-to-energy process.

Still classified as incineration, the thermal waste-to-energy conversion of a Pyrolysis-Gasification (PG) system has the highest energy conversion potential than other previously mentioned WETs (Grieco, 2009). This system is a technology that utilizes a hybrid thermal waste treatment method where the thermal degradation process reaches temperatures of between 400-1000°C; it produces oil, char and syngas (which is composed for the most part of carbon monoxide and hydrogen (85%), carbon dioxide, nitrogen, methane, along with various other hydrocarbon gases).[5] While oxides and nitrogen, volatile organic compounds and dioxins emissions might be similar with the other thermal waste treatment technology, the process is preferred as it reduces heavy metal emissions, sulphur dioxide and various particulates (Thurgood, 2004; Malkow, 2004). Finally, this system would provide a significant payoff such as electricity generation and would minimize the size and weight of solid waste,

[5] Syngas can be used as a fuel to generate electricity or steam or as a basic chemical feedstock in the petrochemical and refining industries. The calorific value of this syngas depends upon the composition of the input waste to the gasifier

therefore making it substantially easier to backload from remote camps to HQ camps and if need be to the country of origin.

In order for these WET systems to guarantee a consistent fuel source a solid waste separation system would be required. Point source waste separation can be completed in two ways - manual and mechanical. Mixed waste processing of bulky items (electronics, furniture, appliances, etc.) and specified contaminants (e.g., hazardous waste) generated in base camps can be done through manual separation. This is typically done to the waste prior to mechanical processing. Manual separation is pertinent for the removal of the most valuable reusable materials and contaminants (i.e. components other than the materials specified for separate collection) from source-separated materials (Zerbock, 2003). Workers and equipment (sorting belt or table, hoppers or receptacles) are required in manual separation of materials. The second option for waste recovery is mechanical separation, a process which requires a number of different types of unit processes; five including size reduction, screening, air classification, magnetic separation, and non-ferrous separation (Al-Salem, *et al*, 2009). While each of these SWM systems might be difficult to implement in each type and size of base camps, it is relevant to consider them as possible solutions to waste separation and recovery. The likely alternative to waste materials that cannot be separated or turned into energy is to backload them to their country of origin to be properly treated and recovered. Backloading waste from a base camp requires some form of intermediate storage, which is the process that occurs following the collection of waste and preferably at a centralized collection point from where it is transported away for reuse or disposal.

3.5. Further disposal options discussed

Further options to the management of solid waste for PKO base camps go beyond the volume reducing and electrical generating WET systems. Well placed and managed funding can provide processes such as hydrolysis, as well as large-scale AD in a reactor. These methods rely on somewhat expensive and sophisticated equipment and are not yet in use by PKOs, however, alternatives such as composting do not require such intensive inputs. The option of employing a compost system for organic fertilizer could be used for soil improvement and can act a closed-loop system. This is facilitated by a process known as biogasification, which acts as a strong potential alternative source of energy (UNEP, 2005). Acknowledgement of quantity and composition of waste input is required if recovery of waste resources is to be successful. In addition to assuring composition and consistency of waste streams in recovery processes, a reasonable cost must be made available (UNEP, 2005).

Composting techniques can be managed by peacekeepers themselves giving them added moral incentive while deployed and have done so in last SANDF missions (Potgieter, 2011). However, because of the high caloric value that organic solid waste provides, a composting system might take away the needed fuel required for a WET system. Additionally, the limited dimensions of a base camp may not offer an appropriate amount of space for such a system as some bases are found on ridge tops.

Landfills and incineration as SWM options create higher amounts of carbon dioxide, methane and carbon monoxide emission levels than PG and AD WET systems. By-products SO_x, NO_x and heavy metals result from the incineration process and therefore can create acidification and have an impact on the repertory systems of local inhabitants in and around the vicinity of where the process occurs (Zaman, 2009). Pyrolysis-Gasification has the lowest impact on climate change due to the limited volume of air the process requires as it produces lower volumes of syngas (Zaman, 2009). Adversely, air is very much present for incineration to allow for waste materials to burn, which results in syngas being produced and then used in the WET process. Incineration and landfills are the two most environmentally harmful WET processes while PG and AD have the lowest overall impact, particularly on air pollution; carbon dioxide (incineration) and methane (landfills) emissions are mainly responsible for the effects on climate change (Zaman, 2009).

A ‘Landfill’ is the physical facility used for the final disposal of solid wastes and solid waste residuals in the surface soils of the earth (Tchobanoglous, 2002). Landfills differ from open pit dumping through a number of construction methods that decrease direct impact on the physical environment. The problematic derivative of *leachate* is created through the “removal of soluble compounds by the non-uniform and intermittent percolation of water through the refuse mass”, which if not constructed to specifications can find its way into the water table and pollute drinking water (El-Fadel *et al.*, 1997:8). Additionally, when oxygen is present throughout pockets in the landfill, it allows for aerobic decomposition. Biodegradable organic materials then react quickly with the presence of oxygen to create carbon dioxide, water, and other climate changing by-products (El-Fadel *et al.*, 1997).

Although landfills face many environmental consequences (ex: the generation of gases like methane which has approximately 23 times greater an effect on global warming than carbon dioxide), they are relatively low in cost (compared to other forms of disposal) due to their ability to accommodate a wide range of waste. (Williams, 2005; Themelis *et al.*, 2007). Unfortunately, there is no way to avert methane emissions through landfills. Vertical gas extraction is a process which allows for the collection of methane (a by-

product that a landfill typically generates) through the installation of vertical shafts. These collection systems are normally installed after the infilling is complete. In developed countries they are then routed either to a flare or to a gas utilization scheme for power generation. However, in the case of a PKO a WET landfill system is an unlikely option because of its technical feasibility. Instead landfills are best used during a PKO to dispose of the bottom-ash resulting from an incineration system. Landfills have been successfully implemented in 19 sites throughout the UNMIS mission (Jensen *et al.*, 2012). However, methane can build up in a landfill over time and reach explosive concentrations if not properly maintained (Williams, 2005). Other consequences of landfills are the potential for leachate to seep out and contaminate ground water. This problem can be solved in two ways; first, by installing control systems that abstract the leachates from the base of the landfill, and second, by flushing soluble pollutants from solid waste until they reach a non-polluting state. It is important to note that the geology of the area of landfill construction and its eventual placement should be considered before the base camp is built, Thus, fulfilling the technical aspects needed for an environmentally sound landfill. With the example of UNMIS, significant investment was generated into an area otherwise lacking the capacity to implement solid waste systems for the base camps. The engineers constructed a fenced waste disposal area including a solid waste incinerator, hazardous storage units and a landfill for incinerator ash (Jensen, *et al.*, 2012). Improvements to the system included an expansion to 19 sites, rainwater runoff management and containment barriers to prevent leachate (Jensen, *et al.*, 2012). It was found that after waste reduction, reuse and recycling, 82% of the disposal pathways could be appropriately disposed of in an on-site landfill making it the most significant disposal option that this assessment found for a PKO (UNEP/AMISOM, 2010). The AMISOM study and the example given by UNMIS demonstrates that significantly technical SWM systems, such as landfills can be constructed and carried out during a PKO, and even more importantly can be managed both within the walls of a base camp as well as off-site. (UNEP/AMISOM, 2010; Jensen *et al.*, 2012)

Landfills are a tremendously technical SWM systems requiring significant ongoing management once they have been sealed and capped. As previously mentioned in chapter one, it has been determined that during a peacekeeping mission, waste results in the most significant environmental impact (Jensen, *et al.*, 2012). Furthermore, as stated by the AMISOM (UNEP/AMISOM, 2010) study, when solid waste is disposed of in landfills (which are off-site from the camps through local means) it uncommonly meets environmental standards set by the nations they operate within. Legislation and regulations on the management of solid waste, if present in a security deprived nation such as the DRC are unlikely to be appropriately practiced due to a lack of capacity, for example, in SWM

infrastructure, follow-up processes, or a lack in available funding for collection, treatment or disposal services. As demonstrated in the UNMIS example, significant expenditures were put forth by the UN to fulfill the lack of SWM services found locally. By identifying, examining and resolving inconsistencies as well as the fundamental implications necessary for establishing and carrying out a comprehensive SWM, the creation of a cost-effective system will result. If focus is placed on treating and increasing system efficiencies in the absence of applicable solid waste regulations, significant improvements will result simply by choosing low-cost, or even sometimes no-cost, modifications to an active system. For example, in the case of an UNEP assessment on post-conflict Liberia, the waste management sector was found to have a variety of issues that kept the delivery of comprehensive SWM services from occurring. Such deficiencies included (UNEP, 2007):

- unclear and over-lapping legal mandates and responsibilities;
- inadequate institutional framework;
- poor enforcement mechanisms;
- extremely weak technical and human capacity within the government sector;
- low level of public awareness on health-waste management linkages; and
- a complete absence of cost recovery mechanisms.

Therefore, if solid waste is to leave the compound of a PKO without the elements essential to ensuring a safe and reliable SWM system, such processes will have to be handled behind the security of the base camp walls until some of the previously mentioned mechanisms and frameworks can be ensured.

3.6. The use of private contracting as a solid waste disposal option

As an additional option for the disposal of solid waste for base camps, private contracting is probably the most commonly used system over any other. The choice to use this SWM option can have a significant impact on the viability of a PKO as the number of mission components for SWM being outsourced increases. It is the mission's responsibility to act as a steward of the environment in order to lighten its operational footprint and provide the best example to its host nation. In many cases, governmental fragility, badly maintained, damaged or unavailable infrastructure, and the absence of locally professionalised contracting services, have been common issues for nations hosting a PKO. However, it has been shown in many cases to be less costly to hire local labour in operational settings than it is to employ military personnel. Yet, a lack of capacity and experience in serviceable

practices held by locals is often found to be absent in situations that peacekeeping missions find themselves (Mosher *et al.*, 2008; Martinsson, *et al.*, 2010; UNEP/PCDMB, 2007). In addition, lack of manpower and base camp security has been found to result in decisions to use local civilian waste collection (usually any civilian with a truck) (Martinsson, *et al.*, 2010). Despite the knowledge that local contracting lacks environmentally acceptable standards, finding SWM service provisions during tenuous operational conditions and allowing personnel to exit the base camp perimeter is of high importance in the decisions made over waste management strategies. Despite mission planners being aware that a base camp's solid waste will not be disposed of appropriately if local civilian contractors are hired a lack in financial and technical resources often result in their use. The shortage of available resources is a structural challenge facing many planners in the field. It is not simply a lack of consideration by mission planners over adequate environment protection. Within an operational context, waste management standards and strategies are tremendously difficult to implement and maintain without proper foresight and planning (Hull, *et al.*, 2009).

While procedures used in hiring subcontractors have been found to be insufficient, a study prepared by Swedish Defence Research Agency (FOI) found that during PKO, an increase in a dependency on the use of contractors that are substandard occurs frequently (Martinsson, *et al.*, 2010). A variety of problems arise alongside the reliance on deficient contractors. These include determining the extent of treatment and disposal methods, language problems, distrust and security issues, as well as poorly developed economic conditions. Together these reduce the range of an agreement with service providers. Follow-up of materials collected by service providers leading to off-site disposal is often limited, while local contractors' failing to provide services to agreed standards is common place (Mosher *et al.*, 2008; Martinsson *et al.*, 2010). For example, in the case the Haitian cholera outbreak, Sanco Enterprises SA (a private contracting company) won the contract by underbidding its rival. The UN officials claimed that it was the responsibility of the private contractor and the mayor of Port-au-Prince to ensure that dump sites were maintained safely, while the representatives of Sanco said complaints were made several times with UN officials, but never received a response. Neglect from the UN to follow-up was likely the cause of a lack in proper EMS as the review of sanitation systems in all military, police, and civilian installations only occurred once the cholera outbreak and media attention had reached a crisis point. The question of a lack in follow-up procedures is certainly a problem found later in this thesis. Another example of inadequate follow up procedures comes from the Rand Corporations report *Green Warrior*. It was found that in some cases contractors had "removed hazardous wastes from base camps and, without army knowledge, dumped them along the side of a road or in other inappropriate locations" leaving the cost of the

clean up to be much more than the original contract (Mosher *et al.*, 2008:7). The neglect of dumping procedures can create a strain between forces and local communities. Strain on diplomatic ties can occur from the problem of a negative legacy due to solid waste impacting the environment many years after operations have concluded.

The SANDF has contributed as a TCC to UN led missions across Africa in Burundi, the Democratic Republic of Congo, and the Sudan. Typically local small, micro, or medium enterprises, and informal service providers and contractors have been used by SANDF to manage waste during their peacekeeping missions. UN Policy demands that available local contracting services be used as a means for sustaining domestic economies, however, various problems have arisen from local contractors compromising the ability to ensure safe and compliant waste disposal. An assessment report by the UN Internal Audit Division recommended that the UN Mission in Sudan "should ensure that environmental liability clause is incorporated in all contracts executed by the Mission" (UNMIS, 2009:10). Each TCC is not often consulted on who is used to manage their waste, yet it is the TCC that incurs the liability of poor management of waste and contamination (Captain, van Blerk, 2010). Where SANDF has participated in UN sanctioned PKOs, the lack of functional government and the availability of appropriate public infrastructure resulted in improper waste disposal regulations, enforcement, and capacity (Captain, van Blerk, 2010). Again, liabilities have surfaced from the insufficient management of waste due to local contractors and therefore impeded on a TCC's duty of care principle. In some instances, establishing local service providers and their contracts were selected and negotiated with dominant rebel leaders or warlords who represented the only available local authority (Captain, van Blerk, 2010). In other cases, this procedure was conducted in accordance with UN procurement processes from a limited short list of local civilians acting as contractors. In each case where SANDF operated, security was tenuous and governance had failed or was extremely fragile. Contractors possessed elementary methods of solid waste disposal practices. Contractual agreements provided for inadequate services to dispose of waste and in most cases did not meet the best practical means for averting environmental or public health risks.

The UN is responsible for a number of waste disposal contracts for the MONUSCO peacekeeping mission in the DRC. The funding is issued by the UN Procurement Division which seeks to provide responsive, effective, and quality procurement services to peacekeeping missions worldwide. Table 2a shows that the years of 2011/12 where to have the most significant drop in spending for waste management, which peaked prior in 2010 at $7.3 million (United Nations Procurement Division, 2012). The decrease in spending could indicate that SWM infrastructure has been sufficiently established and no longer requires the

kind of financial investments of years past, but it could also indicate a growing trend of disregard for solid waste management as an important issue facing MONUSCO. Furthermore, the dramatic decrease in funding coincides with the restructuring of the UN Mission in Democratic Republic of the Congo (MONUC) and the establishment of MONUSCO to take over in its place.

This reform process included a dramatic decrease in the authorization for uniformed personnel, as well as significant changes in the mission's overall mandate. The change in mandate and reduction in the authorized troop numbers would unquestionably decrease the volume and likely change the stream's characteristics of solid waste produced throughout the overall mission. However, these figures are not conclusive in explaining why such massive cuts in funding have occurred in recent years for waste disposal contracts (Specific dollar amounts and contracting companies who were awarded funding can be found in Appendix A). Moreover, these figures do not represent the financial availability for SWM being put forth by each individual TCC, which are then billed to the UN directly. The analysis of this slump in financial support from the UN would benefit from a future study.

Year	Total amount spent on waste management contracts per annum for MONUC and MONUSCO
2012	$254,400
2011	$595,534
2010	$7,333,300
2009	$2,800,200
2008	$3,719,726
2007	$4,533,347
2006	$6,451,041

Table 3.c: Total Waste Disposal Contracts for all UN Peacekeeping Missions 2006-2012 - Table 2a is a summary of the total amounts in US dollars spent on the private provision of waste disposal services (United Nations Procurement Division, 2012).

3.7. What is Environmental Management?

While all organizations produce to some degree or another solid waste, not all independently extract resources directly from the environment. The process of extracting raw materials is conducted only by the specialized organizations at the initial phases of a supply chain. These raw materials are then processed in various ways as they move along and eventually emerge as products which are then distributed to wholesalers and retailers. Through the overexploitation of resources, and in turn, the depositing of excess waste, the

environment is converted into a degraded state. Environmental management seeks to find ways of carrying out activities which reduce or even prevent harmful degradation. A better environment can be preserved and its continuity can thus be ensured for future generations - a central tenet of environmental sustainability. Environmental management is therefore the management of the activities of an organization that identifies environmental interactions and implements then measures to best minimise its negative impacts and legacy (Starkey *ed*., 1999).

3.8. What is an Environmental Management System?

An EMS is an orderly system that an organization may utilise for the purpose of managing any environmental issues and prospects. The necessary attributes of an EMS is that its various components interrelate to provide measurable information enabling continual improvements (Starkey ed., 1999). A 'systems' approach supports processes that are stable and reiterated, yield more expected outcomes, and adapt new learning to continuous improvement. A comprehensive EMS cannot be created solely on best practices. The key systems components of an EMS should include an environmental policy statement, a planning process, an organizational structure (delineating who is to be held responsible and accountable for the process), implementation systems and operational controls, measurement and auditing systems and finally, systems for periodic top management review of the EMS or an auditing process (Starkey ed., 1999). It is rather impossible to perform an EMS without the parameter of the International Standardized Organizations (ISO) process known as ISO 14001.

3.9. Environmental Management System standards

Currently there are a variety of EMS models to make use of, such as Occupational Health and Safety Management System 18001 (OHSAS). OSHAS 18001 requires planning steps to identify hazards and risk assessment to determine controls, which then become the basis of continual improvement (Praxiom Research Group Limited, 2007). OHSAS 18001 employs the *Plan-Do-Check-Act* system. It uses this methodology to organize its standards and establish the OHSAS which can then be used to organize criterion in the following way, 1) PLAN: plan the establishment standards, 2) DO: establish and implement standards, 3) CHECK: monitor, measure, and report on the performance, 4) ACT: improve and modify standards (Jasch, 2000).

Alternatively, one of the most widely accepted and primarily used EMS is the ISO 9000 Quality Management System and the ISO 14000 series. Each focuses on the consistency of processes and can become a basis of continual improvement**.** ISO 14000 involves a broad course of action to identify environmental characteristics and significant environmental impacts, which then becomes the basis of continual improvement that any organization can adopt. The 14000 is a grouping of standards that present a consistent representation for a comprehensive EMS and proactively addresses associated environmental issues. Within the ISO 14000, ISO 14001 applies to environmental aspects which an organization can exert a degree of control and influence. ISO 14001 - Section 3.5 EMS is defined as:

> *"That part of the overall management system which includes organization structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy"*

The 14001 standard is at present the only one among the ISO 14000 family that can be endorsed by an external certification authority. Having it endorsed means increased benefits in achieving continual environmental improvement (Elefsiniotis *et al.*, 2008). The prerequisite for a comprehensive EMS is the same regardless of an organization's performance. ISO 14001 is based on the same *Plan-Do-Check-Act* technique as the OHSAS system and is the functioning standard of the ISO 14001 series. The cycle puts forward an orderly approach right from the development stage all the way through to the implementation stage of the EMS.

3.10. The costs and benefits of an Environmental Management System

Depending on the type of organization, costs and benefits will differ strongly for an EMS. Other areas of concern will include an 'eco-efficient' utilization of resources (a term coined by the World Business Council for Sustainable Development in 1992), the anticipated environmental impacts and risks (depending on the amount of different elements of the system that exist within the organization), and quality sought after by the customers and other stakeholders on a comprehensive and independently assessed EMS (World Business Council for Sustainable Development, 2000). Eco-efficiency is the primary way in which business can contribute to the concept of sustainable development. By producing more from less they use smaller amounts of energy and raw materials and in turn reduce the amount of waste and pollution cultivated (World Business Council for Sustainable Development, 2000). The choice in such practices becomes good for business because it reduces an

organization's cost. The same definition of eco-efficiency can be adapted to peacekeeping base camp operations. Both in their own activities and in their interactions with the customers they serve, municipal organizations can exert a very strong influence in promoting eco-efficiency.

In the case of base camp operations, measurable benefits will rely concretely on the extent to which management (i.e. those in charge of the mission both in the field and at HQ) are willing to commit time and required resources toward a fully deployable EMS. Additionally, the time and direct involvement of those working within the organization is an important investment in implementing an EMS. If ISO 14000 requirements are systematically implemented then substantial benefits will result - they will provide management with necessary tools to identify and control its impacts on the physical environment from its own products, services and activities (Elefsiniotis *et al.*, 2008). Setting environmental objectives and targets will produce benefits such as (Woodside, 1996):

- savings in consumption of energy and materials
- lower distribution costs
- reduced cost of waste management
- improved corporate image among stakeholders such as customers, regulators and the public
- provides a framework of continual improvement of environmental performance
- provides management with the assurance that it is in control of the organization's activities and processes which have environmental impacts
- assures employees of environmental care by their organization
- support claims and communications about the environmental policies, plans and actions of an organization

According to Starkey (*ed*., 1999), as an organization's own personnel develop an understanding of an EMS and its implementation processes, it becomes more conscious of how it affects the environment and learns how to manage environmental issues more effectively. A formalized systems approach will in turn increase the likelihood of attaining reliable gains through continual improvement, However, Starkey (*ed*., 1999), states that some of these benefits can materialize without investing wholeheartedly in a formal EMS, for example, through broadly focused ad hoc efforts. In the case of SANDF operating as a TCC in the North Kivu mission area, various types of base camps have been identified and range from mobile to permanent. Due to attempts to maximise operational effectiveness as the

mission progresses, formalized systems may be more difficult to implement in mobile bases compared to permanent ones.

3.11. How an Environmental Management System applies to Peacekeeping Operations

Peacekeeping missions are a set of complex organizations that frequently have very important interactions with the environment. For example, every mission contains various TCC's working in conjunction with one another. The ISO systems were drafted because they acknowledged that the principles they were seeking to develop applied just as much to an organization's operations as they did to the functions of a PKO. It is of importance to also recognize that a PKO can cover a wide variety of functions and that some functions are internally and externally operated. The needs of permanent bases can also be very different from those of temporary operating or mobile base camps. In general, it is useful to look at the kinds of functions that various base camps undertake in order to understand how effectively an EMS can be applied to an operational setting.

3.11.1. Operational management

Peacekeeping operations, like many other UN departments, manage large and small operations that directly affect the physical environment. These operations may produce oil, gas, paints and other chemicals, solid food scraps, cooking oil and medical waste. The UNMIS, for example, conducted an audit in 2009 and found that the base camp had "been generally disposing of hazardous and non-hazardous liquid and solid waste in accordance with established procedures and guidelines" (UNMIS, 2009:1). However, the audit recommended areas of improvement should include the improper storage of waste, the official establishment of guidelines and standard operating procedures on waste management, the need for training programmes in waste disposal and environmental protection, and finally, immediate disposal of accumulated waste at the waste disposal yard was needed (UNMIS, 2009). In such cases it is crucial to focus on the most likely direct or potential environmental impacts of the operation itself. The EMS will identify the wastes a base camp generates, the energy and materials it consumes, the environmental hazards and risks it creates, and develop management tools that continuously improve its performance with respect to those impacts. In contrast to disposing waste offsite or backloading to the country of origin, an on-site facility within the base camp must account directly for the fact that the civilians the PKO is there to protect are who will most likely to become affected by the facility.

3.11.2. Service delivery

Peacekeeping operations' frequently provide various mandated services to local populations – the protection of civilians and of UN personnel, facilities, installations and equipment; convoy transportation; to seize or collect any arms and ammunitions or related materiel namely Disarmament, Demobilization and Reintegration (DDR); medical services, for example, HIV/AIDS programmes; and provide support for security sector reforms such as law and order. In these cases it is important to look at both the direct impacts of the services being delivered and the indirect impacts of local populations benefiting from these services. For example, how exactly seized weapons, or medical waste are collected, destroyed, disposed of and treated is important, but so is how local civilians are impacted by such processes. The environmentally sound operation of mandated services depends on the effective education of the users for those services. ISO 14031 can help act as an environmental performance evaluation which is defined as "an internal process and management tool designed to provide management with reliable and verifiable information on an ongoing basis to determine whether an organization's environmental performance is meeting the criteria set by the management of the organization" (Jasch, 2000:79). Following such a procedure will assist in evaluating environmental performance against an organizations policy, objectives, and targets set out by environmental guidelines.

3.11.3. Remediation

In other cases, the PKO may take responsibility for remediating past impacts. For example, a brown-fields project could convert a former contaminated site for new use as an industrial park. Furthermore, in the case of Kenyan shepherds who were killed and maimed by bombs and ammunition left by the British army on training grounds in Samburu, northern Kenya, the subsequent payouts to those directly affected amounted to $7 million in compensation (Lesamana, 2009). In this case, EMS could apply to the cleanup operations, to the interaction with the community in planning the new use of the site and to the operation of the site for its new use. Another case involving environmental cleanup occurred after the closure of base camps by the UN Protection Force (UNPROFOR) in March 1995. The government of Bosnia and Herzegovina issued a cleanup bill for $70 million which included environmental damage allegedly caused by the operation during its mission (Sills *et al.*, 1999). Additionally, the cholera outbreak that occurred in Haiti in 2010 due to the mismanagement of sewage by a UN base camp will not only affect the country for many years and affect the legitimacy and the ongoing cost of developing Haiti, but may also result in lawsuits against the peacekeeping mission (Enserink, 2011).

3.11.4. Planning and regulation

Finally, base camp operations can have a direct effect through their planning and standardized processes. Effective planning for future growth is probably one of the most effective ways to protect local populations and surrounding communities as well as employees against direct physical environmental impacts from the side-effects of solid waste.

An EMS can provide insight on the direct and indirect environmental impacts on the future of present-day planning decisions and the patterns of growth from operations. In addition, military operations in general affect the environment by the requirements they impose on industrial and commercial activities at the procurement level. Advancing the quality of life and the environment within an organization's EMS can be greatly improved through efficient and dependable enforcement of regulations by way of means of support and regulated flexibility towards performance, and entities that display liable progress towards the environment. According to a joint project between militaries of the United States and South Africa titled "Guidebook on the Environmental Considerations during Military Operations", such enforcement can be accomplished through an Environmental Management Plan and should include:

> *"processes, roles, functions, responsibilities as well as monitoring, assessment and rehabilitation over the time frame of the operation in terms of pollution, waste, HAZMAT, use of resources, protection of environmental (natural and cultural) resources, as well as handing and taking over procedures during rotation of peacekeeping forces. This must also be integrated with a Force Rotation Plan. Plans should be reviewed and additional measures taken to address specific situations not already effectively provided for in the existing plans"* (United States - South Africa., 2006:8).

Thus, an Environmental Management Plan during a military operation can largely be considered a tactical decision. A PKO may decide to undertake a comprehensive approach to an EMS in a smaller more manageable region of its operations, while simultaneously examining all its procedures in conjunction with the mission's mandates. Such a decision would be risky for large scale operations all at once, where the initial effort would be weakened over too-wide a system. Therefore, a peacekeeping mission may choose at first to implement the system in only a few of its more permanent base camps where logistics are more freely able to operate with more resources and less constraints. Lessons learned should then be applied to an expanded application of EMS, and to areas where SWM are concerned. It is important for PKOs to demonstrate their internal compliance with policy and

guidelines. If a PKO requires industries to strictly comply with environmental regulations, it must be able to demonstrate that its own facilities - such as the landfills, incinerators, treatment systems, or civilian contracting services - are also fulfilling their guidelines.

CHAPTER 4:

METHODOLOGY

4.1. Study approach

This dissertation was conducted through the University of Pretoria with the Department of Geography and Geo-informatics and Meteorology (GGM). The study was accomplished through various research means: a desk top study and literature review, a questionnaire survey, and structured interviews conducted with the cooperation of the SANDF. The methodology chapter seeks to explain in depth the tools and means utilized in creating the written research in addition to the qualitative analysis[6] carried out during the interview and questionnaire process.

Having gained access to SANDF personnel it was possible to directly question experienced members of the organization to help answer the many questions surrounding SWM systems utilized in base camps during peacekeeping missions in Africa. The study was carried out by using an inductive approach, which allowed the analysis of specific data to form general conclusions. The data was then later applied to applicable conditions. SANDF provided itself as an ideal population of interest, where qualitative research methods could seek to generalize the SWM practices adopted by TCC taken during peacekeeping missions in base camps. All of the respondents were chosen based on their experience being deployed during a peacekeeping mission in Africa, or if they had significant knowledge in the area of environmental related issues while working with SANDF and pertaining to the military.

The work was divided into three segments:

A) Desk-top Study: data gathering included the collection of all available information on material associated with environmental management policy, guidelines and doctrine pertaining to SANDF, multinational organizations and the DPKO; geographical information on the eastern DRC; and ethical clearance from the University of Pretoria's Ethics Committee Board was also required before field research could be approved. A great deal of work was put into gaining access to the DRC through the support of SANDF. However, the field research portion of the dissertation never transpired.

[6] *"Qualitative research concentrates on the study of social life in natural settings. Its richness and complexity mean that there are different ways of analyzing social life and therefore multiple perspectives and practices in the analysis of qualitative data"* (Punch, 2005:194).

B) Structured Interviews and Questionnaire Process: Throughout this process face to face structured interviews were conducted at various SANDF military sites and questionnaires were emailed to those who could not partake in interviews.

C) Post-interview process: The findings from the interviews were catalogued in excel spread sheets and examined to arrive at useful and appropriate conclusions and recommendations. A final writing of the body of the thesis and findings resulted in the dissertation.

4.2. Research methodology

There was a notable dilemma with a limited number of subjects that have experience specifically on the research topic. Therefore, the dominant study method employed for this project was a *purposive sampling* system (Kumar, 2005). From provided conference and workshop proceedings, academic articles on relevant subjects, guidebooks and policy documents, discussions with experts in the field, and interviews with SANDF personnel, the bulk of the material examination was created.

There has been little research on the management practices used for dealing with solid waste during peacekeeping missions, but where there has been, the research strategies adopted involved qualitative surveys based on convenience samples of participants (Martinsson *et al.*, 2010; UNEP, 2010; Asiedu, 2010). Adopting a qualitative and *convenience sampling* approach to researching SWM systems deployed in base camps during peacekeeping missions will help provide accurate information in the development process, including the practicality and cost effectiveness of identifying populations of actors to partake in the study. Thus, a convenience sampling method was utilized via previously established contact lists developed by this author during an undergrad thesis project at the University of Toronto (in 2008 on a related subject) within the field of environmental considerations and peacekeeping (Kumar, 2005). To better understand the challenges and options in applying successful strategies for SWM practices during peacekeeping missions a qualitative approach using convenience sampling is best placed to deliver results. An important aspect to be considered in relation to convenience sampling of actors was the level of access to, and quality of, the sample of actors. Thus, research focused on gaining as much access to a range of high level, and exceptionally well informed experts.

Relevant research organizations included the FOI and the UN Environment Programme: Post-conflict Assessment Unit in Geneva, Switzerland. Target populations were

difficult to define as there were no readily available lists or data bases that would allow for determining the number of Environmental Officers or relevant personnel within each of the above mentioned organizations and institutions. As indicated by the FOI study "Base Camp Solid Waste Management: challenges and way forward towards sustainable management practices", PKO personnel rapidly change duty stations and more often than not are redeployed, or re-employed in other organizations and missions (Martinsson *et al.*, 2010). Therefore, it should be noted that the study's sample population is considered to be highly active, requiring a number of fluid sampling methods employed throughout the research process.

Through the desk top study, associations were made with individuals in various organizations, and a target population was therefore established. The listing of an accessible population from which the sample was drawn, called the *sampling frame***,** was determined. These contacts then shared contacts of their own and thus gave way to *snowball sampling* (Trochim, 2006). Snowball sampling was a very useful method considering the access to subjects would have been otherwise exceptionally difficult to identify and include in the study. The method was again useful due to the limited amount of expertise known personally on the subject to the author. However, it is acknowledged that the down side to this sampling system lends to a population that is of a limited in perspective and may be bias for this reason (Kumar, 2005). Yet, snowball sampling allowed easier access to those experts that would have otherwise been inaccessible through a desk top study, or literature review.

4.3. Structured interviews and questionnaire

The structured interview questions were chosen based on an extensive questionnaire that was conducted by the FOI titled "Base Camp Solid Waste Management". It was selected to emulate many of the questions found within this studies questionnaire because they had already been tested in the field and allowed for comparison of data at the conclusion of this dissertation. The selection of a structured interview process allowed for direct interaction with respondents, giving the process an opportunity to probe and ask follow-up questions. Having the ability to email questionnaires provided an inexpensive means of information gathering and allowed respondents to fill it out at their own convenience. However, there were some disadvantages. Emailed questionnaires were not the best vehicle for getting detailed written responses and not all questionnaires were returned for analysis. Some participants expressed their dislike and inexperience with email. Due to the readiness of today's technologies, this method was utilized to perform the questionnaire part of the research project.

4.3.1. Sample representation chart

A total of eight SANDF personnel participated in the interviewing process. All of the respondents had experience being deployed during a peacekeeping mission in Africa, or had significant knowledge in the area of EMS pertaining to military operations. Figure 4.a illustrates the portion of those interviewed, and rank, which were involved in the questionnaire process of this MA dissertation.

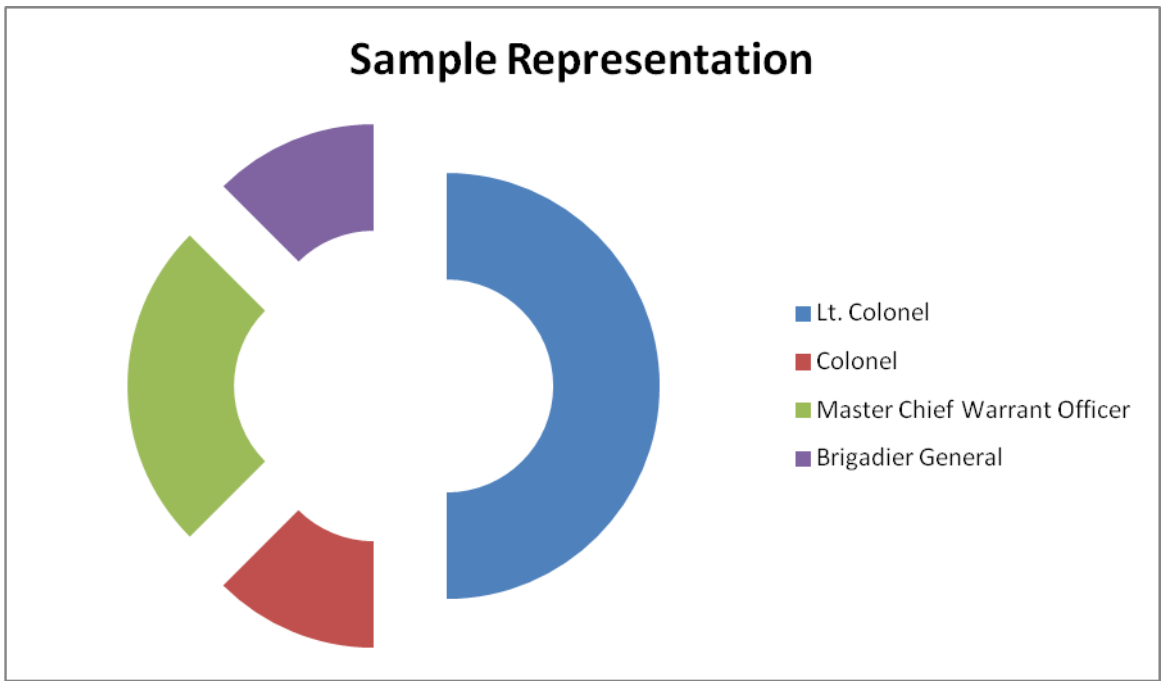

Figure 4.a: Participants interviewed represented by rank – The chart shows a break down in the groups of ranking SANDF officials questioned during the interview process.

4.3.2. Global Information Systems

Geographical Information Systems were used to generate location maps displaying fairly accurate site positions. A Geographical Information System is once that handles and processes geographical data, which is then processed to produce maps, tables, graphs, and statistics (Mason, 2003). It is a system that does data analyses, modelling and forecasting of different areas and situations. It also provides opportunities to experiment with the scale of the maps along with different techniques to display the final maps used in this project. The potential to use Geographical Information Systems in marking locations of waste movement, or long term disposal sites for future PKO, or any number of environmentally sound practices, is a plausible one.

CHAPTER 5:

INTERVIEW FINDINGS

5.1. Background

Structured interviews were a significant element of this research dissertation. The questionnaire was also used to verify the literature review and academic focuses whereby triangulating the data for the findings section. Interview participants were predominantly provided through contacts made at the SANDF Joint Support Operations department Pretoria, South Africa, and then chosen based on their accessibility. Participants had to fulfill the interview requirements; SANDF members who are experts pertaining to environmental issues, and/or, have been deployed with SANDF during a peacekeeping mission in Africa, with special focus placed on the DRC peacekeeping mission MONUSCO, and knowledge regarding waste management practices. Both commission and non-commission officers were interviewed in order to gain the varying perspectives and experiences from both the command and control aspects of SANDF's involvement in PKO. Together, each position of authority would have the experience needed to convey all the stages of the peacekeeping operational life-cycle covering the specific issues of private contracting, environmental impact, operational management, communication, and planning and development.

The structured Interviews were conducted among two locations; the Armaments Corporation of South Africa in Pretoria, which is the officially appointed acquisition organisation headquarters for the South African Department of Defence, and at the SANDF 43 Brigade HQ in the Wallmannsthal region, just north of Pretoria. 43 Brigade currently provides commanding officers for UN peacekeeping missions in the DRC and Sudan. A total of eight SANDF personnel participated in the interviewing process - two Master Warrant Officers, four Lt. Colonels, one full Colonel, and one Brigadier General. All of the respondents had experience with being deployed during a peacekeeping mission in Africa, or had significant knowledge in the area of environmental-related issues pertaining to the military. Peacekeeping deployments included the DRC, Darfur, Burundi, and the Sudan. Special consideration and focus of questions was placed on the DRC as the majority of interviewees had been on mission with the UN there. The following tables illustrate each participant as a designated letter, which are then referenced throughout the rest of the chapters.

Name and Rank	Place of interview	Date of interview	Date of interview
Lt. Colonel Potgieter	Pretoria, South Africa. Armaments Corporation of South Africa (ARMSCOR)	September 01, 2011	Participant A
Master Warrant Officer F. Lores	Wallmannsthal AH, South Africa, 43 Brigade Head Quarters	September 26, 2011	Participant B
Colonel Plessis	Pretoria, South Africa. Armaments Corporation of South Africa (ARMSCOR)	September 06, 2011	Participant C
Lt Colonel Swartz.	Wallmannsthal AH, South Africa, 43 Brigade Head Quarters	September 26, 2011	Participant D
Lt. Colonel Litnnar	Wallmannsthal AH, South Africa, 43 Brigade Head Quarters	September 26, 2011	Participant E
Anonymity Requested: SANDF Interviewee no.1	Wallmannsthal AH, South Africa, 43 Brigade Head Quarters	September 27, 2011	Participant H
Anonymity Requested: SANDF Interviewee no.2	Wallmannsthal AH, South Africa, 43 Brigade Head Quarters	September 23, 2011	Participant G
Anonymity Requested: SANDF Interviewee no.3	Wallmannsthal AH, South Africa, 43 Brigade Head Quarters	October 10, 2011	Participant F

Table 5.a: Interview participants referencing information – Each member of SANDF that was interviewed has been given a designated letter for referencing in the following chapters 5 and 6.

5.2. Summary of interview findings

The chapter that follows is divided into a number of sub-sections that correspond with the title themes laid out in the questionnaire. The figures display the question that was asked during the interview and is highlighted in bold. There is a certain level of bias having interviewed the personnel from any one TCC, however, having interviews of varying ranks and being of commissioned and non-commissioned officers helped alleviate this problem, assuredly to a reasonable measure. Those who were asked to describe their category of involvement with SWM while deployed during contingency operations had varied responsibilities and participation as is seen in the following Figure 5.a. There was overlap in experience because of the number of deployments respondents participated in over their careers, and also overlap of responsibilities during their deployments. Because the sample group was predominantly from the officer corps, most had experience in the area of operations and management of solid waste during at least one or more of their deployments.

Planning of SWM strategies was the second largest knowledge group, while monitoring and policy/doctrine/control had the third most experienced involvement. In the case of answering 'Other', one respondent had been predominantly involved with the design and maintenance of contracts with local waste management service providers.

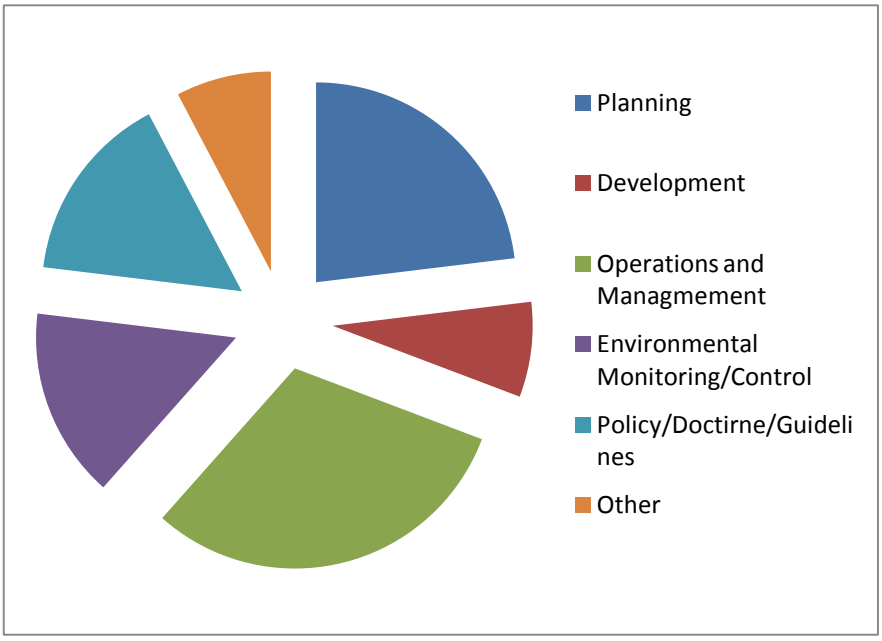

Figure 5.a: Participants involvement with SWM issues related to contingency operations – The interview participants involvement with SWM issues vary due to reassignments and assignments and operation rotations taking place over the span of their careers, which is shown here in this chart.

There was a clear response as to whose chief responsibility it was to oversee the control and management of solid waste on base camps; the responsibility belonged to the Occupational Health and Safety (OHS) officers. These officers were supposed to be embedded with the mission at all times. However, it was revealed that in the Darfur PKO, no OHS officer was assigned to the mission. During one officers time in the DRC (2008) the OHS officer was only present there for 6 out of 12 months. It was unanimously conveyed that the UN was supposed to be responsible for the collection of waste off-site of the base camps.

5.2.1. Management and personnel

When asked to briefly specify/describe who is generally responsible for the planning and development of the SWM systems used in contingency operations in the field, no one answer was the same. This is probably due to the fact that management of solid waste is done on a case by case (ad hoc) basis as a mission evolves and develops to strenuous situations. The level of communication between those responsible for the planning and

development of the infrastructure and those responsible for its operations and management in the field were also found to be diverse and varying. Two respondents believed that a lack of communications impacted SWM negatively, while another officer claimed that it depended largely on each mission. It was to be positive if everyone is concentrated on waste. Each mission again is different; therefore, as one participant indicated, SANDF is not alone on the matter as other TCCs were indicated to face similar problems. It was generally viewed that while some countries have a positive impact, others do not. Some are partaking in the mission for "the money, not to make a difference and are not interested in the improvement of the locals" or such issues as waste management" (Participant E, 2011).

The knowledge and experience level in SWM practices by those generally responsible for waste management practices during SDNAF's deployment in the DRC varies, but there are some consistencies. As Figure 5.b indicates, *planning* of SWM strategies was generally regarded as moderate to good, meaning that the life cycle of a SWM was considered by those responsible for the planning an operation; however, one issue was raised with regards to the process. There are gaps in the planning because most of the planners are civilians with no military experience, which for a TCC is viewed as being good for UN, but bad for SANDF because there is a lack of input into development needed by TCCs. For example, big cargo air planes must land in Kigali, Rawanda because the UN had not improved the airport in Goma since the eruption of Mount Nyiragongo in 2007. This makes things harder for SANDF as the civilian planners do not see the benefits to developing the airport to its original standards. Those responsible for the development of SWM strategies were seen to vary slightly from poor to good. However, one SANDF member indicated that every mission developed as poor in the beginning was because the societal capacity to deliver services in the area was seriously limited due to decades of war and infrastructure neglect (Participant H, 2011). Furthermore, the use of locals in the SWM processes helped to bridge and develop this divide by building capacity in the areas immediately surrounding base camps. Installations were for the most part considered to be well constructed and maintained to acceptable standards. It was expressed by many that SANDF built the base camps only to have them turned over to another TCC and fall into disrepute. Participant C (2011) indicated that while on mission in Burundi there was no specific logistics representatives' responsibility allocated for SWM, however, an OHS officer was present at the base camp in eastern DRC for the most part and only partially with the Sudan mission. Participant E (2011) claimed that Operations and Maintenance was reported to be all over the place. Participant B (2011) stated that they Operations and Maintenance were good in that they had improved during his last deployment to the DRC, with septic

gases, likely a kind of anaerobic digestion system, generating power for elements of the base camps.

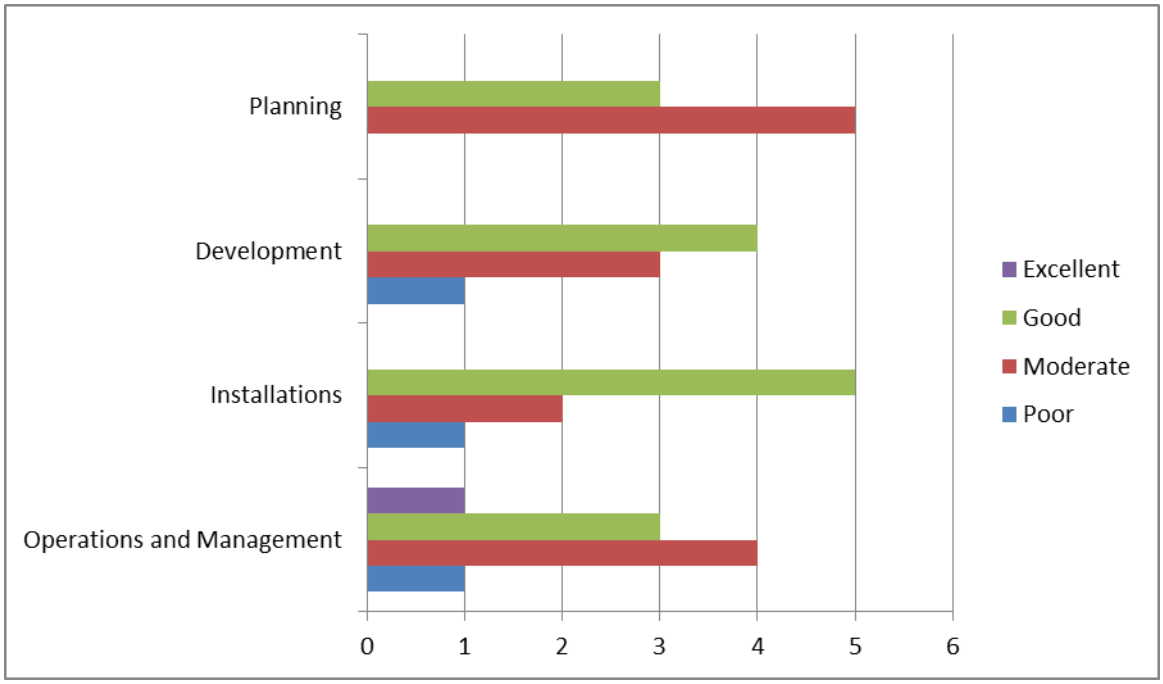

Figure 5.b: Knowledge and experience levels in SWM practices by those generally responsible – The opinion of respondents vary over the knowledge of those responsible for the oversight of SWM practices during SANDF participation in a peacekeeping mission

Organizational structures do not seem to be having a negative impact on the effectiveness of the waste management systems in base camps. It was found unanimous by all participants not to be the case as a commander will respond to OHS reports with the means available. Those in charge, management or otherwise, were seen to be very supportive in the efficiency of waste management systems. It was believed that some TCCs generally have a positive impact while others do not. Some are there for the money through serviceable equipment payments from the UN, and not there to make a difference as their first priority. It was suggested that including SWM equipment for serviceable payments would help increase TCC involvement. Some TCCs do not seem to be interested in the upliftment of the locals, or the building of capacity through the hiring of locals for projects related to solid waste.

Personnel turnover during long-term missions can sometimes leave gaps in programmes and management. Impact from typical turnover levels of personnel (individuals leaving/joining the mission) responsible for the operation and management of the SWM systems vary. Personnel are seen as qualified in their posts during monthly inspections resulting in positive turnover for the continuance of SWM systems. However, others see the

issue changing from mission to mission. Continuity of SWM systems is positive if everyone is concentrated on waste as an important issue; it should be the sole responsibility of everyone to manage waste Participant E, 2011).

General attitudes of SANDF personnel in the camp towards SWM practices such as recycling of waste materials varied in opinion and can be seen in Figure 5.c as divided into their respective categories. While one respondent found it to be negative, he also stated that it can be "positive with the reprisal if the necessary means are there and if the opportunity is given to engage in waste management practices" (Participant A, 2011). However, according to one member, no recycling takes place and there has in the past been a problem with the management of medical waste; that problem was having to backload the waste from base camps in operation to South Africa, as well as appropriate separation. In 2010, the DRC base camp in Goma was provided with a medical burner. Yet, in company base camps, it is very difficult to handle because of the remoteness of these camps and difficult terrain, which results in backloading to South Africa.

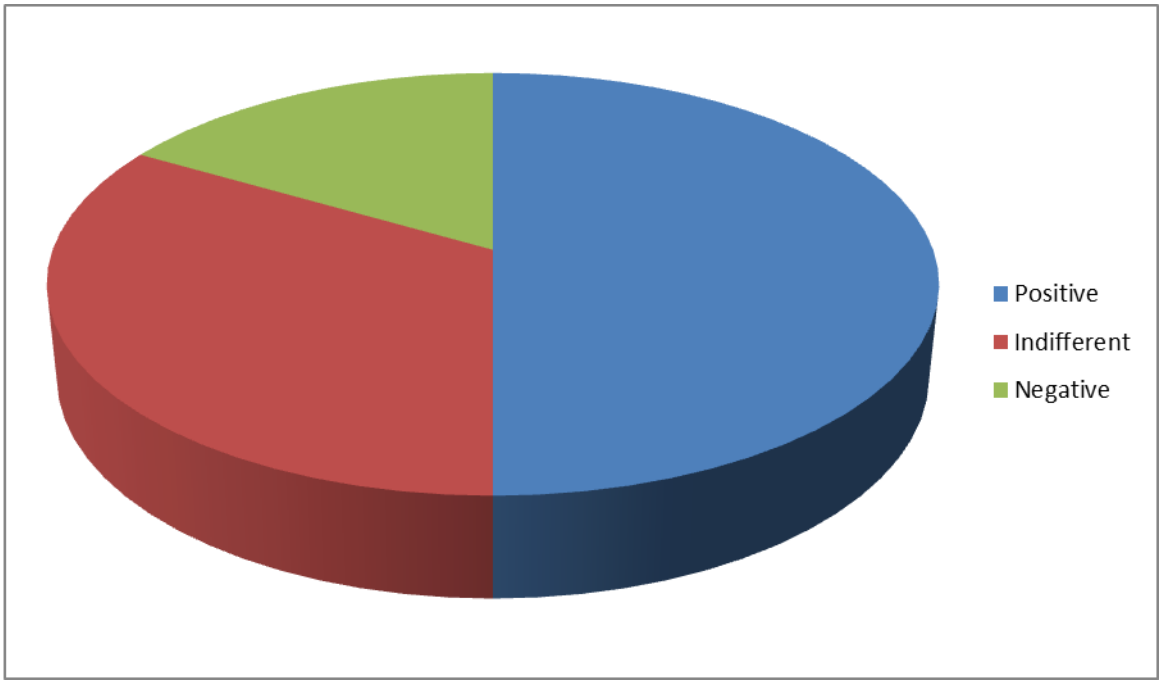

Figure 5.c: General attitudes of SANDF personnel in the camp towards solid waste management issues – The general attitude for the management of waste by personnel in base camps shows to be positive in most respondent's experiences.

There was found to be resources and opportunities available to increase the amount of training provided on the systems for the management of solid waste in PKO base camp settings. Contingency training is always necessary for those deployed in operations, yet much is learnt in the field, while on mission. The training provided to those responsible for

the operation and maintenance of the SWM systems used in the field was generally considered limited for the general SANDF staff. However, OHS officers were reported to be tasked to the current mission in the DRC. These members were considered to be well trained, but there was no way of telling the extent of training for other TCCs - only the OHS officer reported on changes needed to base camps that effected the health and safety from within (Participant E, 2011). The general attitude among the personnel in the camp concerning SWM issues affecting their daily routines was rated rather inconclusive. While half of those interviewed claimed they were positive, the other half rated the general attitudes of those working in base camps to be indifferent and negative. It seems that the large waste management issues such as medical waste and other major operational material were properly handled and backloaded, flown back to South Africa in a SANDF aircraft. It is unlikely that the small day-to-day solid waste such as bottles or wrappers, were recycled and disposed of off camp by private contractors.

5.2.2. Physical environmental issues

The layout of a base camp is of vital importance to the physical environment and the impact from solid waste on it. When asked to what extent environmental issues related to the appropriate disposal of solid waste would affect/dictate the layout of the base camp, there was a mixed response. For reasons that are limited, the UN works with a formula for demarcating base camps, always using the same size and shape for forces layout (Participant B, 2011). Layout is forced on TCCs without choice, therefore they cannot choose the base camp location. The UN determines a specific spot and a TCC must make do with it. Land is tenuous with locals often trying to claims ownership, making it best left to the UN to manage and negotiate with landlords who are often chiefs from tribes who own the area. Additionally, the known negative effects on the physical environment from base camp layout are limited because doctrine from SANDF or the UN does not specifically provide demarcation practices and procedures for SWM facilities within a base camp. Adversely, when entering a base a commander seeing a clean base will motivate his officers to keep it as such. Camps are already chosen by the UN before TCCs arrive and set up with their own equipment, and use of environmental experts can help determine the design within the camp limits therefore limiting impacts to the environment. Environmental Baseline Surveys conducted prior to the installation of the camp in order to establish an appropriate location for the treatment/disposal facilities, are not done by SANDF, but during mission surveys they are carried out frequently. OHS and Environmental officers and the engineering section manage surveys, but there is only so much one can do with a certain piece of land. Going beyond what is allotted would leave a TCC out of pocket with no remuneration. The physical

geography acts as a big constraint in preventing physical environmental impact. Those camps which reside on ridges, tops of mountains, or on lava rocks, make building above the rock difficult as effluents can get into the rock pit toilets or drinking water. In one instance there was only one truck to dispose of kitchen or normal waste and sewage. For this reason, environmental consideration should be included in the initial reconnaissance and survey for a suitable deployment of military base camp. Monitoring of the physical environment is done regularly as part of the environmental health function, there is definitely concurrence between health and environment. Usually health issues are said to be picked up by OHS officers. OHS officers check and inspect, and recommends where improvements are needed.

Consideration for minimizing potential negative physical environmental impacts from SWM systems used in base camps was has previously taken place as far back as the Angola war. Waste pits were dug which attracted pests, such as rats, hyenas and lions, while also negatively affected the water table (Participant A, 2011). Waste contracting was uncontrolled once taken away by contractors. Waste once leaving the base camp is not monitored. Today, with regards to company bases, there still does not seem to be adequate waste management in the kitchen (Participant E, 2011). Company bases do not have running water and must use pit latrines. Therefore, there is significant room for improvement when considering the physical environmental impacts from solid waste systems in base camps.

Finally, those who personally experienced effects directly resulting from poor SWM on the physical environment during their deployment were only a minority. One member of SANDF, Participant A (2011), recalled open pit dumps used by SANDF during the Angola war in the 1970's, which "affected water, and attracted pests such as lions and hyenas" (Participant A, 2011). Another example was given by Participant B (2011) while during his deployment in the DRC, 2004. Problems arose with the delivery of fresh produce arriving late to the base camp. The solution was to bury it inside the base camp so that the locals would not attempt to eat the spoiled produce. Afterwards, produce was mostly procured locally so as to prevent the same occurrence.

5.2.3. Policy, doctrine and guidelines

Generally there seems to be sufficient applicable reference material or other forms of guidance available to those responsible for the operation and maintenance of the SWM systems in a PKO base camp. A number of tools being employed include Orientation

Programme for Project Managers modules on environment, handbooks and policies, and available literature from other militaries. All future commanders will train on military integrated environmental planning. Another important source of information comes from militaries that have a lot of open sourced information on the internet and are willing to share. Officers are encouraged and given the resources to find information. Literature can be obtained from OHS officers who can provide information. Some members of SANDF deployed during a peacekeeping mission found that doctrine on SWM did not differ from the start to the end of the operation and was sufficient throughout their deployments. But for others it changed from the beginning to end in policy and practice. According to Participant a (2011), waste management considerations are driven naturally by a change in international views on waste, and greater social responsibility to reduce risk and enhance sustainability options, which helps reduce risk to mission personnel and local populations. SANDF operates according to the regulations from its own country and in turn tries to control the situation inside its own base. There has been continuous improvement since 1994, but not much focus on waste management issues *per* se. 2011 had a particularly strong focus to limit the impact on the environment by SANDF, particularly with environmental policy and utilization of the improved policy.

While the issue of SWM is one that is generally known by the officer corps of SANDF, when it comes to the capturing and documenting lessons learned for future reference, there are mixed opinions. This is indicated in Figure 5.d where interview participants choices of ‘frequently’ and ‘always’ dominated half the responses as paper trails for the handover process is continuous, meaning that there is perceived to be a consistent level of documentation from operations. The rotation of troops happens roughly every six months (this is not a constant, it was indicated that OHS and Env Officers could stay on for a year at a time), while everything within that time frame is kept in a war diary used for documenting issues. These rotations of troops or Env Officers do not change the volumes, or stream characterises of the solid waste, because as it is discussed earlier in this document it is the authorisation of mandates and number of troops allotted per mission which causes these changes. Joint Support Operations then takes those records from the contingency commander (usually a full Colonel). The records might indicate that there is testimony of experiences and lessons learned, but that they are not necessarily transferred into something that can help better prepare for future operations.

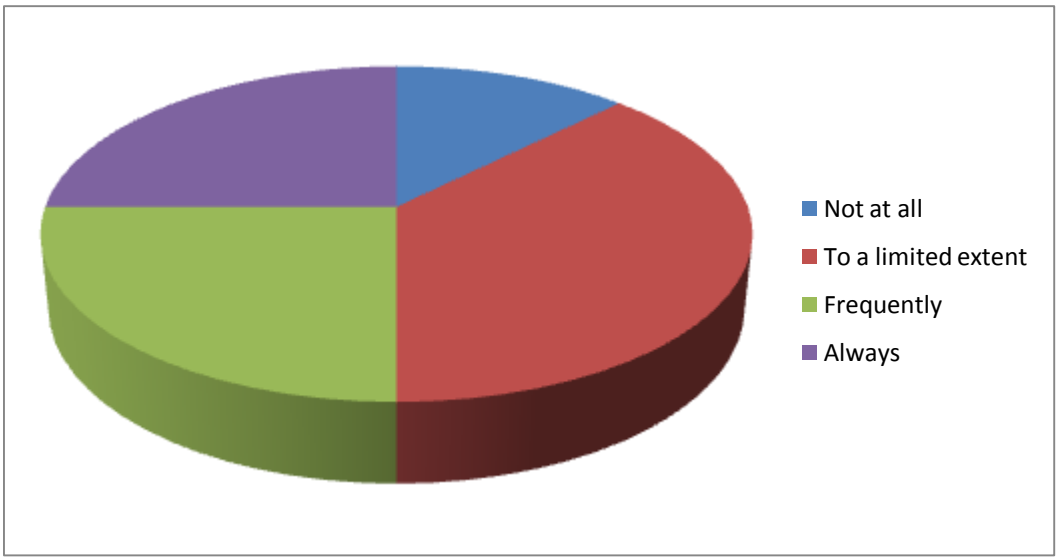

Figure 5.d: To what extent would you say previous experiences and lessons learned are captured and documented for future reference? – A mixed response from respondents as to the level of incorporation of lessons learned from PKOs for future planning of peacekeeping missions by SANDF.

Once more, there seems to be a mixed response as to whether there are currently enough resources available to absorb and utilize identified lessons for further systems development and future planning. Those who believe that there is say this is the case because there are post-operational reviews by environmental officers, examples from operations all over the world, and there are opportunities to convey these lessons to planners. Also, before a mission, those responsible for planning can go back to look at lessons learned from older missions (such as Burundi) and apply them to present day missions in the DRC and Sudan. The majority believed that there is sufficient effort on the part of SANDF, but none from the UN. There are some who were in opposition claiming that SANDF struggles with their lessons learned systems and is developing currently a programme/data base on the intranet, while another view is that it is not done perhaps because it is not a priority for SANDF.

With the participation of each TCC for a peacekeeping mission, UN support in the form of policy and doctrine should be present due to the coordination efforts between organizations during a deployment. However, from the members of SANDF interviewed for this thesis, only a few had seen UN policy and doctrine on the matter of SWM firsthand, while most had only heard of its existence. In addition, only one officer was aware of any other environmentally friendly and sustainable procurement policies being promoted by the UN. However, this officer could not name any (Participant A, 2011), only to say he had seen it and know it exists. Furthermore, the general attitude towards the incorporation of UN policy and doctrine in providing an effective incentive to the development of more efficient SWM

systems most seemed of the opinion that the current organizational means was adequate. It was believed that it would be difficult for the UN to teach each TCC individually how to develop more efficient SWM systems. Utilizing practices from their own country was determined to be the best choice. The development of more efficient SWM systems could be restricted to the MoU between the UN and the South African government to more clearly determine whose responsibility it is to manage solid waste originating from within base camps. Again according to Participant A (2011), when deploying in a multination deployment, one has an opportunity to develop an overarching document. Before the deployment, countries could convene to create documents including waste management in different situations that are focused and not broad. The SOFA or MoU must clearly define waste management and services. Life cycle of waste must be clearly defined within that system.

5.2.4. Private contracting

The dichotomy of on-site versus off-site SWM dominates the core of this MA dissertation. What happens to waste when it leaves a base camp is of serious concern if there is no follow-up on its final destination. As each base camp produces significant amounts of solid waste, determining what extent, or the frequency off-site treatment/disposal of solid waste by local contractors is utilized, which is captured in Figure 5.e, is the first step in resolving the impact to the physical environment. As it stands, all SANDF respondents claim that private contracting of local service providers is utilized regularly. Most interviewees were quick to point out that a shortfall in societal capacity to cope with service delivery was often present when a PKO is first deployed. A lack of capacity is prone to lead to improper dumping by contractors and therefore, inflict significant physical environmental damage. The likelihood of environmental impact is probable because there is not typically follow up to where the waste is being treated (very unlikely) or disposed of according to many of the interviewees. The UN's Department of Field Support organizes contracts with specific local services providers, not the TCCs, whose standards are not up to par due to years of conflict resulting in low capacity in local infrastructure and lack of regulations/legislation on appropriate SWM procedures. Each individual peacekeeping unit that is provided with contractors does not have control over the methods the contractor employs, such as going to dump wherever they want. This is a big risk as SANDF personnel have not spent time or money on establishing a compliant waste site or management system (Participant H, 2011). Rehabilitation of a dumpsite after the deployment is unlikely to occur (Participant A, 2011). Additionally, the equipment that contractors use is usually in poor condition, and even before reaching a dump site, much of the waste is gone, having fallen

off or taken out by others. In one instance, Participant E (2011) explained that a ten ton trailer used by a contractor was empty before reaching the dump site. The contractors were collecting for themselves before even taking it out of camps. Secondary markets are common in areas around peacekeeping base camps. The solid waste from base camps becomes a resource for the local population, not just the jobs contracts it creates (Participant C, 2011).

Figure 5.e: To what extent is off-camp treatment/disposal of solid waste by local contractor utilized? - This figure shows the opinions of SANDF members on whether disposal and treatment occurs outside the base camps once solid waste has been collected by contracting service providers.

There are a number of reasons and concerns that were given for requiring the use of private service contractors for the SWM outside of base camps. The management of solid waste was felt to be too much for the military to handle. Each soldier creates 2.5 kgs of waste per day (Participant A, 2011). Utilizing civilian contractors and locals to help with solid waste management is necessary and can assist in building the capacity of the local population to deliver enhanced services. The concern is that at first, those contractors may not be trained to international standards (Participant B, 2011). Many of the SANDF members interviewed felt that making use of locals can help to rebuild capacity by creating jobs as a nation building endeavour (Participant E, 2011). In towns there is usually no waste removal causing each household to burn their own waste. Everything must be rebuilt from scratch following a conflict like that experienced in the DRC, such as rail, electrical grids, water systems - this leaves waste management systems as one of the least likely to be rebuilt if there was one existing in the first place (Participant H, 2011). The use of locals inside the

base camps can and have been used as cleaners and gardeners. However, they have presented a whole set of security concerns. For example, those working inside one base camp in the DRC were found to be working with contractors to remove military equipment through the waste process, and in turn comprising the security of the base camp (Participant B, 2011). SANDF personnel must then go through waste to find out if anything is missing before leaving the camps, creating unnecessary work and possible health concerns. Once more, to have local workers as service providers can help channel money back to contractors in order to help inflate the economy.

Besides local contractors benefiting from the money earned through contractual agreements and hiring locals, other benefits can permeate into local societies from the solid waste produced in base camps. Interestingly, it was mentioned by Participant E (2011) that laws in DRC prevent the dumping by SANDF themselves; therefore, they must use local contractors as a TCC is often left with no other choice. Further concerns include the lack of appropriate waste sites, the lack of knowledge on requiring the use of private service contractors for SWM services outside of base camps, lack of knowledge on collection, transport, treatment and disposal, and therefore, environmental and health risks associated with uncontrolled and incompliant waste sites. There is also the strong potential for the establishment of a secondary market leaving people to pick through the waste dumped by contractors. Understandably, as local measures and legislation for handling hazardous waste are not present in a place such as Goma, medical waste is incinerated, burned or backloaded in SANDF cargo air craft to South Africa therefore not using local contractors in this instance (Participant E, 2011).

It was found that procedures used for hiring local contractors for off-site collection of SWM were lacking by the standards that SANDF typically utilized, and in fact were generally not handled by SANDF or other TCCs. It was determined that the responsibility lay with the UN's Department of Field Support to contract and follow-up with monitoring of disposal by contractors, leaving, most to feel that their responsibility stopped at the gates of the base camps once waste had left the sites. One reason to leave the responsibility of follow-up to the UN to control was because it is too much effort for TCCs to monitor and supervise. Another reason given by the interviewees was because there was a lack of infrastructure no matter how good a contract might be, if the infrastructure does not exist, or does not have the means for compliant disposal, then it is just a contract, meaning the biggest problem/hindrance then to the contractual agreement is the lack of capacity from the society TCC's operate within. Additionally, the level of knowledge in appropriate SWM procedures generally held by local contractors hired to provide these services was felt to be poor.

However, Participant C (2011) who worked contracting private companies during his deployment in Burundi, claimed that the knowledge of service providers he encountered while deployed in Burundi was good regardless of the fact that they cared about money first and foremost. Participant C (2011), said that his contracts gave the right to inspect dumping sites, while Lt. Colonel Swartz claimed that while in the DRC as the 2IC (an operation's second in command), "there were follow ups [and that] sometimes SANDF members drove out to check sites" (Participant D, 2011). Yet, many who said monitoring did not take place stated reasons such as SANDF having restricted involvement with UN negotiated contracts, and therefore local contractors, as well as having no general knowledge of monitoring measures outside the base camps. In countries such as the Comoros Islands, SANDF was told before their first deployment that everything they brought with them, they would have to bring back to South Africa (Participant A, 2011). There might be situations where you do not take waste out of the base period, resulting in the option of reduce, reuse or destroy it on the base; backloading solid waste could also be an option. It all must be well planned out prior to the deployment.

Given that contracts act as a strong economic incentive in post-conflict environments, they draw attention and competition from everyone with a truck in proximity to base camps. Contracts would typically last three months to spread opportunity around as per UN policy (Participant H, 2011). Word of mouth was typically used to find contractors, which usually left few to choose from with these countries in such a low level of functionality. There is, therefore, often competition for contracts by local service providers to obtain SWM service contracts. Participant E (2011) explained that "in Africa, it's not about [getting] work, it's about the money and local chiefs, employing locals, will tell [those in charge of contracting] who to hire for contracting positions… must listen to local chiefs in the hiring process. You pay a contractor, the chief gets a cut" (Participant E, 2011). Furthermore, there was reported competition for SWM jobs within base camps (Participant B, 2011). Again, Participant B (2011) affirmed that during his deployment, he was aware of "lots of competition for those who wanted to work in the base… CV (curriculum vitae, or resume**)** are there before you arrive" (Participant B, 2011). Participant E (2011) also stated that "once you arrive the whole town will be outside the front gate and now must employ them" (Participant E, 2011). Therefore, there is knowledge of conflict created over competition for contracts. While most had not heard of such incidences, Participant A (2011) pointed out that in Burundi the waste contractor established a side business on site, where he disposed and sold waste to locals preventing equal access and creating possible conflict, while Participant E (2011) also mentioned that he heard from locals about conflict, while outside the camp over the waste itself, not just the work contracting and positions.

The relationship between on-site and off-site base camps cannot become indistinguishable from one another - creating a strong dependency on external contractors can become inevitable, as most respondents agreed. In one instance, SANDF was responsible for its SWM early on in a deployment in Kindu as the area only boasted three trucks and its train had not run in three years (Participant H, 2011). Only later on did contractors become increasingly employed and as a peacekeeping mission can last for years as it has in the DRC, connections increase and therefore their dependency from base camps for the need of service providers',

5.2.5. Challenges and limitations to base camps

Each component of SWM carries a different kind of challenge during a peacekeeping mission. Primary collection is that which is gathered on-site, within the walls of a base camp; secondary-collection is the coordination from on-site to off-site or outside the base camp. There are three further components that occur off-site: the transfer of solid waste by contractors, the treatment process, and disposal. These three components could also be managed by SANDF and backloaded to South Africa, but for the sake of this survey, focus was placed on the process between base camps and contractors. It was identified that the SWM components which present the largest of challenges to base camp waste is the lack of capacity to deliver comprehensive treatment, and disposal off-site. Secondary-collection was deemed difficult, as finding competent waste management contractors was challenging. Transfer of solid waste once outside the base was much less of a problem than treatment of disposal because transfer was seen to be non-existent, and again impossible, due to the lack of capacity in region such as the eastern DRC. These various challenges and limitations to each of the previously mentioned SWM components are measured in Figure 5.f.

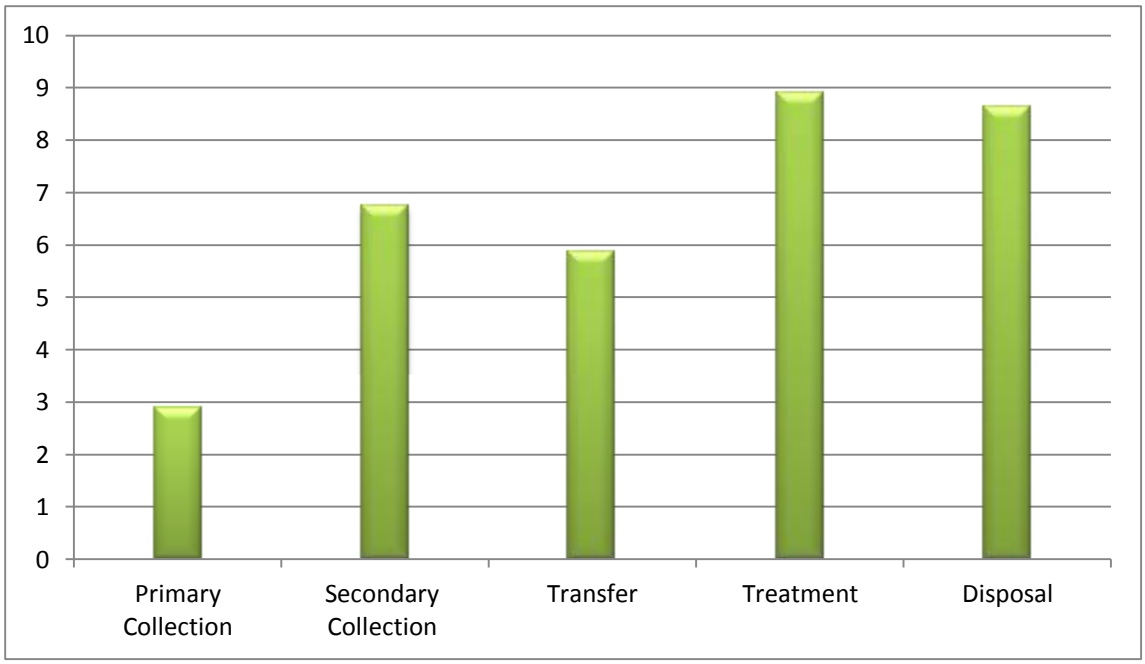

Figure 5.f: The challenges associated with components of SWM system – As the process from the first stages of collection occur to the final stages of disposal, the challenges associated with ensure environmental compliances lessen outside the camp walls.

All respondents agreed that the time frame of a peacekeeping mission was considered during the planning and designing of SWM systems for base camps. Therefore, such considerations include planning for the decommissioning phase of the waste management infrastructure after a mission is over, or a base camp is moved and no is longer needed. For the most part, “camps are broken down and relocated - semi-permanent/temporary structures” (Participant F, 2011). However, there seem to be a number of possibilities for the transfer of SWM systems. Base camps are usually handed over to the country’s defence, police, locals or a mix of the three who then take over ownership. Returning to the issue of base camp demarcation by the UN, local chiefs and landlords might sometimes get ownership depending on how the contracts were initially agreed too. Another possibility is having other TCCs, or have other UN contingents simply take over the base camps if the mission is to continue for longer periods than anticipated. Non-combat type of equipment and infrastructure can also be easily handed over. Most structures remain for years afterwards and therefore become a negative legacy, particularly the off-site dumps or burn pits. According to Participant A (2011), as “one looks at the camp, rehabilitation will focus on the special boundaries of the base… Will not go look at where waste was disposed of by contractors” (Participant A, 2011). An absence of monitoring and follow-up procedures with waste disposal again presents itself as an issue of becoming a negative legacy to the physical environmental and, therefore, requires serious consideration in the timeframe of a SWM system for a PKO and further support the thesis statement. Consequently, considering

the handing over of base camp infrastructure to the local community as part of the rebuilding process of an area having experienced conflict, could help to mitigate the legacy left by protracted PKOs and their concurrent unmonitored off-site SWM originating from within base camps. All respondents concurred that doing so would provide positive solutions for continuing with sound SWM practices by local communities, allowing "the community to carry on with the [development] process" (Participant G, 2011). It would also be cheaper to leave it behind because the "Community can get good use of it for many years, but this must be negotiated before the deployment occurs… Good infrastructure [should be] negotiated before missions starts" (Participant A, 2011). In some cases the fate of camp infrastructure is decided between the UN and landlords and depends on the original negotiation for base camp contracts. Many times the "UN tells TCCs either to leave infrastructure behind or to clean out, this depends on what was originally negotiated" (Participant E, 2011). Again, this conveys the need for forward thinking in the pre-deployment planning stages; more focused consideration for SWM systems end use could be included in the design of the MoU and SFOA. The inclusion of such systems can create utility for the locals after a mission is complete, or a base camp is no longer required.

5.2.6. Waste characteristics

The composition of waste will likely differ for a number of reasons. While some interviewees said waste characteristics did not differ from one mission to the next, this is undoubtedly not the case. Participant A (2011) was quick to point out a variety of reasons for why and how solid waste characteristics will differ according to the "posture of an operation, for example, aggressive (explosive ammunition waste) and mobile (ration packs, cans and boxes.) Each member generates their own (roughly 2.5 kgs each day) waste which has to go into a container… Stability (controlled environment to manage waste such as a concentration of kitchen waste).... the origin of the waste will differ" (Participant A, 2011). Additional reasons for the difference in solid waste characteristics include: mission/base camps location and geography; mandate/posture, which would include the need for different types of military equipment and materials such as explosives; diets of personal and cultural lifestyles from one TCC to the next; the length, and most importantly the size and therefore, the number of personnel deployed for a mission. The average percentage of solid waste produced in base camps is therefore very difficult to determine. Interviewees were asked to try and determine what percentage of the waste generated in a typical base camp is readily biodegradable and combustible. While estimates were given, it is inconclusive without proper field site investigation to base camps. It was decided by interviewees that kitchens created the greatest amounts of biodegradable waste, and delivery days increased the quantity of

solid waste for those days. Interestingly, party waste from weekends was indicated to increase waste variations in the form of cans, bottles and wrappers. As SANDF was the only known TCC in Goma allowed to drink on weekends, it speaks to cultural and lifestyle choices that affect solid waste characteristics. As for the collection and storage of explosive and flammable materials, there are sufficient regulations and guidelines that are carried out and followed by the munitions corps of engineers. Unlike common forms of solid waste, local contractors do not handle spent ammunition or explosives. Within bases, quarterly inspections occur and these spent devices are disposed in specially designed cantonment camps separate from peacekeeping personnel bases (Participant B, 2011). These hazardous materials are stockpiled in specially prepared stores and ammunition bunkers, then backloaded in prepared six by three meter shipping containers to South Africa and handled according to the regulation and legislation found there (Participant B, 2011). Ammunitions inspectors examine stores before backloading takes place. Flammable materials, such as oil, have in the past been managed through strictly regulated agreements with local oil companies who provide and dispose of such hazardous materials (Participant C, 2011).

In view of these previous points regarding solid waste characteristics and the variety of reasons and ways in which the waste stream of a PKO can be affected, future waste generation should factor in the procurement of goods/equipment/materials for base camps. As a responsibility of the logistics branch of SANDF, items are mostly bought in South Africa and flown to the DRC or other ongoing peacekeeping deployments. Systems such as a transportable camping system, waste management vehicles (grey waste transport) tin shredders, glass and florescent tube crushers, compost makers, and high capacity incinerators for general and medical waste, are all examples of equipment of procurement options for improving SWM systems in base camps. The option for the local procurement of materials such as produce, meat, or items such as plastic bags, can sometimes be an alternative for lessening the amount of waste from packaging, as well as lowering costs from having to fly items in from TCCs country of origin (Participant D, 2011). However, doing so runs the risk of procuring poor quality items - proper procedures must be followed consistently (Participant E, 2011). There is also the problem of split economies in post-conflict societies where there are two different prices; one for locals, and another, usually much higher, for TCCs such as SANDF (Participant H, 2011). With all of these concerns considered, it elevates the issue of creating standardized procedures for SWM systems in order to benefit the overall mission. To standardize would mean that the overall capability is foreseen, including guidelines and proven technologies for a peacekeeping mission's SWM systems. Participant D (2011) stated that "if there was to be [a standardized SWM process] it

must be flexible" (Participant E, 2011). The disregard for appropriate SWM measures can "distract focus and may cause morale problems" for an operation and its troops, thus, a clean base camp can help in the building of morale of subordinates and should be considered important to the success of any mission (Participant D, 2011). Furthermore, command "must respect where you are in order to gain the respect of locals" as peacekeepers are there to make peace (Participant D, 2011). Additionally, the problem of the 'legacy' from solid waste, such as "the build up around a camp if not managed properly… Health wise, [solid waste] can affect camps so it is proper to handle it as the mission continues" (Participant H, 2011). Participant E (2011) made a valid point that it "does not matter if the policy is solid, the locals do not have capacity and do not follow procedure… Once waste leaves the camps all planning and policy go out the window". As such, this is a good point in terms of creating a flexible standardization for off-site SWM. Adversely, it does not rule out the possibility of finding some solutions to lessening the environmental impact from contractors that dump sold waste unmonitored.

CHAPTER 6:

DISCUSSION AND RECOMMENDATIONS

6.1. Discussion preamble

The preceding chapters have overviewed the theory pertaining to environmental and SWM systems, the literature on the ethics of peacekeepers taking up the responsibility of stewardship over the environment, and finally policy and doctrine originating from the UN and the SANDF on how best to manage solid waste in base camps during PKOs. Interviews were conducted with various members of SANDF who had experience with being deployed during a peacekeeping mission in Africa, or had significant knowledge in the area of EMS related to military operations. SWM systems used in base camps during PKOs were found to be rife with problems, particularly in the off-site processes, reaffirming the UMNIS Audit Report's recommendations that "environmental liability clause [should be] incorporated in all contracts executed by the [peacekeeping] Mission" (UNMIS, 2009:10). Additionally, Martinsson (*et al.*, 2010) and Mosher (*et al.*, 2008) also both affirm that follow-up processes with private contracting services were lacking where peacekeeping base camps utilized them. The handling of waste contractors require more forward thinking solutions particularly in the planning and pre-deployment process, as well as further research on a much broader scale in order to capture a more comprehensive perspective of the impact from peacekeeping to the environment.

The purpose of this study was to determine the practical applications of SWM systems for peacekeeping base camps by examining the complexities of managing on-site versus off-site SWM systems through an interview process with various members of SADNF. The objectives included the **evaluation of solid waste collection, treatment and disposal methods utilized in base camps and their specific limitations** and to **determine the problems and benefits that arise from the use of private contracting services off-site of base camps**. After an extensive literature review, the interviews assisted in supporting and comparing the results of the research with the objectives.

6.2. Summary of results

While interviews were conducted with a total of eight personnel from various ranks within SANDF, the purpose of the procedure was to meet the objectives put forward at the commencement on this dissertation. Within the interview questions there were six thematic sections consisting of:

- Management and Personnel
- Physical environmental Issues
- Policy, Doctrine and Guidelines
- Private Contracting
- Challenges and Limitations to Base Camps
- Waste Characteristics

These sections provided primary information that will be utilised to compare relative literature and create the recommendations for the improvement of SWM systems used in base camps during PKOs. It is this chapter that captures the findings from each themed section and discusses their current implications in relation to the objectives and aim of the dissertation.

6.2.1. Management and personnel

Although broad based manuals exist within SANDF for training, conducting environmental assessments and other issues related to environmental considerations, problems facing collection, and disposal methods in base camps were found to be limited due to a lack of training for those in SANDF to manage solid waste to appropriate standards. Responsibility to manage solid waste in base camps typically falls to “any available officer” despite the absence of appropriate training (Mosher *et al*., 2008). Waleij (*et al.*, 2009) recommended that training and awareness should be tailored to meet an individual’s rank and responsibilities. Furthermore, as the interviews revealed, there does not seem to be an awareness of the techniques needed to deal with solid waste in base camps. There are three reasons for lack of awareness that match Mosher’s findings (Mosher, *et al.*, 2008): first, there was found to be a lack of appreciation for the environment during PKO; second, training provided during peacetime or prior to deployment does not necessarily reflect problems found in base camps (particularly if lessons learned are not properly documented); and third, the same conditions utilized for training in South Africa do not match those found in African peacekeeping missions investigated (Mosher *et al*., 2008). According to the interviewees the general attitude of personnel in the SANDF base camps concerning SWM issues in affecting their daily routines was found to be split, leaving an ominous result over whether appreciation for the environment and peace time training are congruent with what is found during an actual operation. The *Environmental Guidebook for Military Operations* (Waleij *et al.*, 2008) states that prior to a pre-deployment phase, risk assessments should be

conducted as an essential part of environmental protection so as to verify environmental awareness training.

6.2.2. Physical environmental issues

Geography can present a host of problems, i.e. negative impacts for the physical environment when positioning base camps. The accessibility to drinking water or space to store waste, for example, differs depending on characteristics of the physical environment (SERDP, 2010). During planning, locations may need to be strategically positioned on a hill top, resulting in runoff of effluents into drinking water, or in an area where not even private contracting services can reach with their trucks. Because the UN works with a formula when demarcating base camp positions for TCC, designs come predetermined and leave little consideration for SWM systems (Participant B, 2011).

To prevent issues arising from improper disposal of solid waste in constrained settings, considerations for the geography must be taken into account at the early stages. The planning phase becomes critical for protection of the physical environment; environmental surveys, and any essential follow-up assessments are needed in the camp planning process (Waleij *et al.*, 2008). The pre-deployment phase must perform preliminary surveys, and Environmental Baseline Surveys must be produced for the purpose of Environmental Consideration in Base Camp Planning which in turn directs the environmental analysis for a mission's Operational Plan (Waleij et al., 2008).

6.2.3. Policy, doctrine and guidelines

Much of the policy and guidelines available to personnel in the field for the management of solid waste was found to be generally broad in its applications. However, as the joint United States and South African guidebooks for environmental considerations during military operations points out, the MoUs and SOFA act as the formal decision to participate in an operation, and environmental consideration must be included in these documents (US-South Africa, 2008). When deploying a multinational peacekeeping force, these documents allow for a cohesive document that each and every TCC must adhere to, creating an opportunity to bring all involved in line with the same principles and objectives. The UMNIS Audit also affirms that waste disposal and environmental protection clauses should be included in the MoU and SOFA between each TCC, the UN, and the governments of host nations (UNMIS, 2009). It is likely to conclude that the lack of oversight and delegated responsibility for SWM in peacekeeping missions will lead TCCs to manage their

waste at sub-par standards. The inclusion of waste management principles in agreements (SOFA and MoU) would help focus solutions, but more importantly, would determine the responsibilities for the management of solid waste stemming from base camps. Doing so would help to guarantee that environmental assurances, like those needed for SWM systems, would be included in the planning process. A further benefit might allow TCCs to more accurately estimate the cost of SWM for base camps given the exact definition of responsibilities. The MoU and SOFA documents must clearly identify SWM systems and services, such as guidelines for contractors, as well as define the life cycle of waste (Participant A, 2011).

The interview process found that those members of SANDF who had served during peacekeeping missions were provided with sufficient literature to manage solid waste. Yet, availability does not go far enough to ensure acceptable practices. Training must also be included with the available literature and in the use of equipment. Officers must be encouraged to look elsewhere for relevant literature when need be (Participant A, 2011).

It is recommended that UN policy adjust in terms of providing incentives for waste management by each TCC when they arrive with much of their own military equipment (Participant A and E, 2011). Equipment in good standing order such as armoured personal vehicles or airplanes are rewarded by the UN financially. Giving a TCC compensation for SWM equipment could help ensure greater involvement in dealing with solid waste from within base camps (Participant E, 2011). Serviceable equipment could be funded by the UN to include waste management apparatus such as crushers, sorters, waste-to-energy technologies (including incinerators and anaerobic digestion) and garbage trucks. None of the literature researched in this report has suggested this recommendation making it truly unique in its approach to bettering SWM systems found in base camps during PKOs.

6.2.4. Private contracting

Private civilian contracting proved to be one of the largest challenges facing PKO's in limiting the physical environmental impacts from SWM originating from base camps. Because of the remoteness of base camp locations, security related issues during the transfer of waste from inside to outside a camp, the availability of cheap labour, the need to build the capacity of local populations during a peacekeeping mission, and finally, the lack of monitoring and follow up processes, civilian contractors employed by the UN for TCC SWM purposes often do not operate with appropriate treatment of disposal practices required by EMS standards (i.e. the ISO 14000 series) (Martinsson, 2010). The use of the Plan-Do-

Check-Act would help place priorities in the right path from the start, allowing for a comprehensive SWM system (Jasch, 2000). Such standardizing processes should again be included in the MoU and SOFA agreements explained previously (UNMIS, 2009). Capacity of private civilian contractors is often completely insufficient in meeting standards that would otherwise ensure that open pit dumps meet the prerequisites suitable to limit physical environmental impacts (Mosher *et al.*, 2008; Martinsson, 2010; UNEP/PCDMB, 2007). However, the process of hiring contractors was found to have flaws. The politics in post-conflict settings are difficult to balance, often resulting in service contracts being given to local chiefs, while at the same time, TCCs are told who to hire rather than allowing for a competitive bidding or thorough hiring processes that would permit for sufficient screening (Participant E, 2011). Yet, as Participant E, (2011) pointed out in the previous findings chapter, where there is the shortage of capacity to manage solid waste, whether it is an absence of legislation or the financial capital for civilian contractors to treat potential recyclable materials, “once waste leaves the camps all planning and policy go out the window” (Participant E, 2011). It is therefore recommended that an environmental liability clause is included in all contracts drafted by PKOs (UNMIS, 2009:10). Insufficient control over the monitoring of transport, disposal or treatment too often results in a lack of compliant waste dump sites which do not undergo rehabilitation once a mission has completed (Participant A, 2011). The problem of solid waste as a negative legacy can go on continuing to damage the physical environment for many years following a PKO. Monitoring of waste (disposed and treated) is necessary while a mission is ongoing and can follow some of the DPKO policy to ensure limited impact from solid waste does occur:

- Annual reports to be conducted by subcontractor. For example, 1) a polychlorinated biphenyl (PCB), 2) Hazardous Waste Report, made available to the EO where mission heads, including Director of Administration/Chief Administrative Officer, Force Commander, Police Commissioner, can easily access it if necessary. (DPKO, 2009; Responsibilities 23.3, 23.4)

- Quarterly reports on recycling activities including chemicals recycled and quantity of each chemical recycled. (DPKO, 2009; Responsibilities 23.10)

- Documentation required to be made readily available to contractor for review: characterization, designation, inspection, and disposal records for subcontractor waste generated. (DPKO, 2009; Responsibilities 23.9)

While there are benefits that do occur from civilian solid waste contracting for locals, such as job skills, financial gains from labour, and even the selling of recycled materials, as operations grow in length and in size (personnel increases), connections increase with the surrounding communities of camps, and so too does the dependence for waste removal, making the use of such services a slippery slope (Martinsson *et al.*, 2010). The ability to develop a reasonable monitoring system decrease as language barriers, security problems and distrust increase in probability, therefore decreasing the ability to meet agreed upon standards. Where functioning local authority (available legislation) is present, it is strongly recommended that contractors include a Waste Management Programme for review, and SWM considerations must be included in the SOFA and MoU, between the UN, TCC and the host nation. These agreements will allow each TCC to coordinate under one arrangement, rather than having to each negotiate with the host nation. Including waste management in these agreements will allocate the issue as a command function and therefore an essential component of the mission's overall success. The Environmental or OHS officer must work alongside contractors in order to ensure Waste Management Programme requirements are maintained throughout the entire mission. International standards such as ISO 9000 and 14001 and OHSAS 18001 can be used if TCCs implement these standards as part of their pre-deployment planning, therefore internalizing or diverting the impact of deployed commodities. The Waste Management Programme must be in compliance with a host nation's pre-existing National Legislation first and foremost, but a TCC can always look to its own national legislation to support SWM practices. International legislation such as The Basel Convention on the Control of Transboundry Movements of Hazardous Wastes and their Disposal, and the Treaty of London on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter must be incorporated to strengthen standards of compliance with contractors so as to keep solid waste from crossing borders, or if need be, managed with strict standards.

6.2.5. Challenges and limitations to base camps

The legacy from a peacekeeping base camp can leave a long term impression on a host country and its fragile physical surroundings. One significant challenge for base camps is to limit its negative legacy from solid waste. Structures such as landfills and buildings can increase a footprint that remains for years after a mission is complete. It is therefore recommended that the geology for the construction of a landfill, on-site and/or off should be determined before the base camp is built. Doing so will help to fulfill the technical aspects required for an environmentally compliant solid waste disposal option.The UN and TCCs must "liaison with host nation(s) on possible long term rehabilitation" as part of the

demobilization process (US-South Africa, 2008; Mosher *et al.*, 2008; Martinsson *et al.*, 2010). It was found that as the process moved from solid waste collection within a base camp to its transfer off-site, the likelihood in the treatment and disposal of environmentally sound methods becomes increasingly more difficult to ensure, particularly at the off-site dumps, or burn pits used by private contractors. Nearing the end of a mission "rehabilitation will focus on the special boundaries of the base… Will not go look at where waste was disposed of by contractors", an indication that follow up procedures with waste are not the status quo (Participant A, 2011). The absence of monitoring procedures must be addressed and considered as part of the whole time frame for a peacekeeping mission. Again, considerations for the end use of SWM systems must be included in the design of the MoU and SFOA so as to create utility for the locals after a mission is complete and a base camp is no longer required.

6.2.6. Waste characteristics

The change in solid waste types varies from one TCC to the next because of dietary differences, mission mandates, and varying logistical requirements in terms of military equipment or base camp size. Small remote or mobile camps will require managing food scraps, ration packs and water bottles, and the need to bury or burn, which creates health problems from the resulting air pollution (Martinsson *et al.*, 2010). Further issues result from the purchase of materials from outside of a peacekeeping mission, meaning they must be flown in creating a significant footprint in, terms of waste from packaging and costs from transportation (Participant D, 2011). One option was to procure materials locally when close to a town. However, doing so does two things: it is likely to lower the quality of substances needing proper quality assurances, and it also creates a host of security problems which go hand in hand with the employment of locals; these can be reconciled if measures are taken (Participant E, 2011). Varying mandates require shifting responses to the management of solid waste.

6.3. Study limitations encountered

There were a few limitations that should be highlighted during the process of this dissertation. Low reliability of measures might have included poor question wording, and questions exacerbated by a language barrier; all respondents spoke English as a second language. However, there was consistency to the interview process as it was a standardized set of questions making the results more reliable to conclude relationships. A further limitation to the study came from the range of people interviewed, or the sample group.

According to Trochim (2006), there is a perceived threat due to the random heterogeneity of respondents, in other words, a limited diversity of a sample group (i.e. respondents were all from SANDF, and the majority were from 43 Brigade). Their experiences may not speak for an entire United Nations peacekeeping force spread across the world. Furthermore, there is also the assumption that respondents were 100% able to speak freely. There might be a culture of limitation in the military to speak openly, but because most respondents were high ranking they were probably less likely to be under pressure from supervisors to have to respond in a certain way. Lastly, the intended original aims and goals were changed as the study progressed. The proposed field research component to this dissertation, earmarked for the eastern province of North-Kivu, DRC, did not take place. The purpose was to connect the findings from the interviews with first hand observations of the SWM systems in SANDF base camps. The Vetting Authority (i.e. security clearance) and Logistics Authority (transportation support) was approved by SANDF. Once obtained, a letter of motivation was submitted to the Joint Support Operations branch of SANDF. Consequently, due to the time frame allowed to complete this MA dissertation, the field research component intended for the eastern DRC was regrettably abandoned in its entirety limiting the ability to draw connections first intended. This process would have had to have been repeated with other Troop Contributing Countries, which would have been far too time consuming for this research project. The travel restriction and vetting process therefore limited the expected sample size as it was smaller than anticipated.

6.4. Recommendations and opportunities

Waste management studies related to peacekeeping are likely to increase, furthering the growth of knowledge on how to better handle SWM in low capacity environments, such as those experienced during PKOs. Greater attention needs to be focused on further research into the inclusion of SWM responsibilities and objectives in MoUs and SOFA, using accurate clauses to ensure environmental protection needs can be met. In doing so, it is recommended that a standardization process for SWM systems be used in all peacekeeping base camps and clearer delineation of care of duty standards. A UN Audit, similar to the UNMIS audit referenced throughout this report, should examine in-depth how to include the payment by the UN for a TCCs own SWM equipment. It is recommended that more research be done on suitable types of SWM equipment TCCs can use and employ in difficult terrain which their base camps operate, as could be seen in the B Company (Ngungu) base camp photograph in Chapter three, which sat a top an isolate ridge. Future research could also focus on the steady decline in UN spending for waste disposal services for the MONUSCO mission. The amount of financial awards granted by the UN's Procurement Division towards

waste management have in the case of MONUSCO decreased significantly since its mission's authorisation was changed in 2010. A future analysis of this decrease in financial support from the UN would be beneficial in discovering the current status of SWM in the DRC. Furthermore, a global data base should be considered for officers in all UN contributing militaries and peacekeeping missions to allow for easily accessible environmental and waste management literature tailored to base camps in low-capacity environments. Doing so will help ensure greater solutions for environmental considerations in future missions. Lastly, the potential to use Geographical Information Systems in marking locations of waste movement, or long term disposal sites for future peacekeeping missions, or any number of environmentally sound practices, is a plausible one and should be researched.

6.5. Final comments

Being the initial UN organization to establish itself in a conflict situation provides the DPKO with the opportunity to be the first to assess the state of the environment. Additionally, the UN has the opportunity to influence the internal policy of troop contributing nations to better protect the environment. Peacekeeping missions have a responsibility to the host nation to make sure contracting is accountable in order to reduce risk, both to the natural environment and to the health of the public and operational personnel. These assurances will become more concrete by having command and command cadre focus on the waste management as a function of the operation, utilizing the SOFA and MOA to create coherent waste strategies between all TCCs and a host nation thereby preventing transboundary transfers and dumping of waste, and long term monitoring of disposed and treated waste. A well-designed Waste Management Programme will reduce mission costs, guarantee sustained military activities in the field, limit legal liability from environmental or health related mishaps, and demonstrate the mission's commitment to sustainable operations. However, serious limitations are ever present, as can be seen in the SANDF example - where the use of local contracting made such services often unreliable and incapable of meeting adequate environmental protection. Solid waste management should be of the utmost importance to a PKO, creating a greener agency and improving the viability of forces wherever they might find themselves.

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APPENDIX A: UN Listings for Purchase Order Awards for the Field Missions of MONUC and MONUSCO

This table shows the contracts awarded to private service providers for waste disposal services for MONUC between April 2006 – February 2010 and for MONUSCO between September 2010 – February 2011 (United Nations Procurement Division, 2012).

	Vendor	Country	Description	Value	Ref no.
2012					
May	ETS IRENE BYAMUNGU	Zaire/DRC	Waste Disposal	$72,000	MONUSCO
	Ntagahwa Mirenge Panda	Zaire/DRC	Waste Disposal	$62,400	MONUSCO
April	SANI-BEAUTÉ	Zaire/DRC	Waste Disposal	$72,000	MONUSCO
February	KIS-Services "C>G>I>C"	Zaire/DRC	Waste Disposal	$48,000	MONUSCO
2011					
May	ITA _ WORKPOWER SPRL	Zaire/DRC	Waste Disposal	$69,000	MONUSCO
April	ETS LIMIF TRADING	Zaire/DRC	Waste Disposal	$48,750	MONUSCO
	Ntagahwa Mirenge Panda	Zaire/DRC	Waste Disposal	$72,000	MONUSCO
February	DYNASTY AFI	Zaire/DRC	Waste Disposal	$75,000	MONUSCO
2010		Zaire/DRC			
***September** -change in mission designation occurred on June, 2010	SANI-BEAUTÉ	Zaire/DRC		$195,000	MONUSCO
February	ETS LA GONAIVE	Zaire/DRC	Waste Disposal	$35,000	MONUC
January	SANI-BEAUTÉ	Zaire/DRC	Waste Disposal	$143,416	MONUC
2009		Zaire/DRC			
November	KIS-SERVICES	Zaire/DRC	Waste Disposal	$38,400	MONUC
	SOCIETE D' EXPLOITATION AGRICOLE ET COMMERCIALE (SEAC)	Zaire/DRC	Waste Disposal	$34,560	MONUC
September	DYNASTY AFI	Zaire/DRC	Waste Disposal	$46,020	MONUC
	Ntagahwa Mirenge Panda	Zaire/DRC	Waste Disposal	$41,875	MONUC
	WABRICE PEST SERVICES LIMITED	Zaire/DRC	Waste Disposal	$30,180	MONUC
August	ACTION SOLIDAIRE	Zaire/DRC	Waste	$40,684	MONUC

	DES TRANSPORTEURS DU NORD-KIVU "A.S.T.N."		Disposal		
May	BPC CHEMICALS LIMITED	Zaire/DRC	Waste Disposal	$40,000	MONUC
	WABRICE PEST SERVICES LIMITED	Zaire/DRC	Waste Disposal	$30,180	MONUC
2008		Zaire/DRC			
November	ACTION SOLIDAIRE DES TRANSPORTEURS DU NORD-KIVU "A.S.T.N."	Zaire/DRC	Waste Disposal	$33,000	MONUC
October	ITA _ WORKPOWER SPRL	Zaire/DRC	Waste Disposal	$109,200	MONUC
September	WABRICE PEST SERVICES LTD	Zaire/DRC	Waste Disposal	$44,820	MONUC
2007		Zaire/DRC	Waste Disposal		MONUC
November	AROME SPRL	Zaire/DRC	Waste Disposal	$47,250	MONUC
	ITA _ WORKPOWER SPRL	Zaire/DRC	Waste Disposal	$109,200	MONUC
September	ACTION SOLIDAIRE DES TRANSPORTEURS DU NORD-KIVU "A.S.T.N."	Zaire/DRC	Waste Disposal	$42,000	MONUC
	SANI-BEAUTÉ	Zaire/DRC	Waste Disposal	$132,571	MONUC
May	ISINDA ABETSHA JOHN	Zaire/DRC	Waste Disposal	$36,400	MONUC
2006		Zaire/DRC	Waste Disposal		MONUC
July	IMMONET	Zaire/DRC	Waste Disposal	$56,000	MONUC
April	AROME SPRL	Zaire/DRC	Waste Disposal	$37,500	MONUC
	IMMONET	Zaire/DRC	Waste Disposal	$32,500	MONUC
	ISINDA ABETSHA JOHN	Zaire/DRC	Waste Disposal	$31,000	MONUC

APPENDIX B - Structured interview/questionnaire

Personal Information

1. What is the name of your organization, what part of it do you represent and what rank or title do you hold? Please specify...

2. In what African peacekeeping missions have been involved?

3. In what way are you or have you been involved with solid waste management issues related to contingency operations in base camps? (choose one or several categories)

    A. Planning
    B. Development
    C. Operation and management
    D. Environmental monitoring/control
    E. Policy/doctrine/guidelines
    F. Other and/or if necessary elaborate any option chosen

Management and Personnel

4. Briefly specify/describe who is generally responsible for the planning and development of the solid waste management systems used in contingency operations in the field?

5. How would you rate the level of communication between those responsible for the planning and development of the infrastructure and those responsible for its operation and management in the field?

    A. Poor
    B. Limited
    C. Good
    D. Very good

6. How would you rate the knowledge and experience level in solid waste management practices by those generally responsible for each listed task?

	Poor	Moderate	Good	Excellent
Planning				
Development				
Installations				
Operations and Maintenance				

7. Do you consider the current organizational structures to negatively impact on the effectiveness of the waste management systems?

    A. No
    B. Yes, please elaborate...

1. How would you rate the impact from typical turnover levels of personnel (individuals leaving/joining the mission) responsible for the operation and management of the solid waste management system?

    A. No negative impact
    B. Limited negative impact
    C. Significant negative impact
    D. Positive impact
    E. Other, please specify

2. How would you rate the general attitude among the personnel in the camp concerning solid waste management issues in affecting their daily routines? For example, recycling of material requiring them to put the right material in the right collection bin.

    A. Indifferent
    B. Negative
    C. Positive
    D. Other please specify...

3. Do you consider there being resources and opportunities available to increase the amount of training provided on the systems for the management of solid waste in deployed base camp settings?

    A. YES
    B. NO, please elaborate

4. How would you rate the training provided to those responsible for the operation and maintenance of the solid waste management systems used in the field?

    A. No training provided
    B. Poor
    C. Limited
    D. Good
    E. Very good

Physical Environmental Issues

5. To what extent would environmental issues related to the appropriate disposal of solid waste affect/dictate the layout of the base camp?

    A. Not at all
    B. Limited
    C. Significant
    D. Other, please specify

6. To what extent are environmental baseline surveys conducted prior to the installation of the camp to establish an appropriate location for the treatment/disposal facilities?

    A. Not at all
    B. To a limited extent
    C. Frequently
    D. Always
    E. Other, please specify...

7. To what extent is monitoring of the physical environmental conducted to establish the effect of the waste management system during the mission?

    A. Not at all
    B. To a limited extent
    C. Regularly
    D. Other, please specify....

8. In your opinion is enough consideration put into the solid waste management system used in base camps to minimize potential negative physical environmental impact?

    A. Yes
    B. No, please elaborate...

9. Have you personally experienced any effects directly resulting from poor solid waste management on the physical environment during your deployment? Please elaborate...

Policy, Doctrine and Guidelines

10. Based on your own experience, is there generally sufficient applicable reference material or other forms of guidance available to those responsible for the operation and maintenance of the SWM system in the base camp?

    A. No
    B. Yes, please elaborate...

11. How did the doctrine on solid waste management differ from the start to the end of the operation?

12. To what extent would you say previous experiences and lessons learned are captured and documented for future reference?

    A. Not at all
    B. To a limited extent
    C. Frequently
    D. Always

13. Do you think there are currently enough resources available to absorb and utilize identified lessons in further system development and future planning?

    A. No
    B. Yes, please elaborate...

14. Are you aware of UN policy and doctrine on the matter of solid waste management, for example the UN's Environmental Guidelines and Policy for UN field missions?

    A. NO
    B. YES, please elaborate...

15. Are there any other environmentally friendly and sustainable procurement policies being promoted by the UN that you are aware of?

16. Do you think that UN policy and doctrine can provide an effective incentive to the development of more efficient solid waste management systems, or is your current organizations means enough?

    A. YES
    B. NO, please elaborate...

Private Contracting

17. To what extent is off-camp treatment/disposal of solid waste by local contractor is utilized?
    A. Never
    B. Not common
    C. Common
    D. Very Common
    E. Always

18. List some reasons/concerns for the use of contractors for solid waste management services from outside the base camps?

19. In your opinion, are the procedures used when hiring local contractors for off-camp solid waste management sufficient to ensure that appropriate measures are taken to ensure safe disposal, such as, providing a formulized Waste Management Programme/Plan?

    A. YES
    B. NO, please elaborate...

20. How would you rate the level of knowledge in appropriate SWM procedures generally held by local contractors hired to provide these services?

    A. Don't know
    B. Poor
    C. Limited
    D. Good
    E. Very good

21. Did you have knowledge of where disposal of waste occurred outside the camp(s), and is/was there follow-up with these processes?

    A. YES
    B. NO, please elaborate

22. Have you ever noticed competition for contracts by local service providers to obtain a position in obtaining contract(s)?

    A. YES
    B. NO, please elaborate...

23. During an operation, do you think there is a possibility of creating a dependency on external contractors?

A. NO
B. YES, please elaborate...

24. Have there, to your knowledge, been any conflict with the local community regarding base camp generated solid waste and its collection, treatment or disposal?

A. NO
B. YES, please elaborate...

25. Has competition with the local population for recycled resources, or land outside the base camp for waste management related activates effected the physical environment?

A. NO
B. YES, please elaborate...

26. To the best of your knowledge, have local populations ever benefited from base camps waste, and what types would these have been?

Challenges and Limitations to Base Camps

27. Please rate the challenge associated with each listed component of the solid waste management system? Please rank then on a scale from 1-10 with 10 being the most challenging.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Primary collection - primary collection system is waste is collected regularly										
Secondary-collection - storage										
Transfer										
Treatment										
Disposal										

28. Is the timeframe of an operation/mission considered during the planning and designing of the solid waste management system?

A. YES
B. NO, please elaborate...

29. What happens to the waste management infrastructure after the decommissioning of the camp(s)?

30. Do you consider the handing over of base camp infrastructure to the local community, as part of the rebuilding process of the conflict area, to be a valid option?

A. NO
B. YES, please elaborate

Waste Characteristics

31. Do waste characteristics vary between missions and operational objectives/mandates; how/why?

    A. NO
    B. YES, please elaborate

32. Please try and estimate/specify what percentage of the waste generated in a typical base camp is readily biodegradable?

33. Please try and estimate/specify what percentage of the waste generated in a typical base camp is readily combustible (can be burnt)?

34. How and where are explosive and flammable solid wastes stored?

35. In your opinion, how might an efficient and standardized solid waste management system benefit operations and the success of the mission overall?

36. Has future waste generation been factored in when goods/equipment/materials are procured/brought into the base camp?

    A. YES
    B. NO, please elaborate

Final Considerations

37. Are there any issues left out of this survey which you think is of crucial importance, if so please describe them briefly.