

**MUNICIPAL SOLID WASTE MANAGEMENT IN OSHAKATI
TOWN, NAMIBIA: AN EMPIRICAL ANALYSIS**

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF DOCTOR OF
PHILOSOPHY**

DAVID TSIKILA HANGO

MZU REGISTRATION NO.: 2200251

Ph.D. REGISTRATION NO.: MZU/Ph.D./2034 of 03.06.2022



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NAMIBIA: AN EMPIRICAL ANALYSIS**

BY

DAVID TSIKILA HANGO

Department of Public Administration

Supervisor

Prof. A. MUTHULAKSHMI

Submitted

**In partial fulfillment of the requirement of the Degree of Doctor of Philosophy
in Public Administration of Mizoram University, Aizawl**



MIZORAM UNIVERSITY
(A Central University)
Department of Public Administration
Tanhril, Aizawl – 796004, Mizoram

Ph. No. +91 70850 99930

email: muthumzu@gmail.com

Prof. A. Muthulakshmi

Department of Public Administration

CERTIFICATE

This is to certify that the Thesis titled '**Municipal Solid Waste Management in Oshakati Town, Namibia: An Empirical Analysis**' is submitted by **Mr. David Tsikila Hango** in partial fulfilment for the award of Degree of Doctor of Philosophy (Ph.D.) in the Department of Public Administration, Mizoram University, Aizawl.

This Thesis is an original work of his research which has not been used previously and which has not been submitted to any other university for any purpose.

(Prof. A. MUTHULAKSHMI)

Supervisor

Aizawl, Mizoram

DECLARATION
MIZORAM UNIVERSITY
NOVEMBER, 2025

I **DAVID TSIKILA HANGO**, hereby declare that the subject matter of this thesis is the record of work done by me, that the contents of this thesis did not form basis of the award of any previous degree to me or to do the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other University/Institute.

This is being submitted to the Mizoram University for the **Degree of Doctor of Philosophy in Public Administration.**

Date: 21 November, 2025

(DAVID TSIKILA HANGO)

Place: Aizawl

RESEARCH SCHOLAR

(Prof. LALNEIHZOVI)

(Prof. A. MUTHULAKSHMI)

Sr. Professor & Head

Supervisor

Department of Public Administration

Department of Public Administration

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Date : 21.11.2025

Place : Aizawl

(DAVID TSIKILA HANGO)

MZU/Ph.D./2034 of 03.06.2022

Research Scholar

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ABBREVIATIONS

3R	-	Reduce Reuse and Recycle
AI	-	Artificial Intelligence
AMC	-	Aizawl Municipal Council
APP	-	Annual Procurement Plan
AU	-	African Union
CAT	-	Collective Action Theory
CBO	-	Community Based Organisation
CEO	-	Chief Executive Officer
DEA	-	Directorate of Environmental Affairs
EC	-	Environmental Commissioner
EIA	-	Environmental Impact Assessment
EMA	-	Environmental Management Act
EPA	-	Environmental Protection Agency
GDP	-	Gross Domestic Product
HYSACAM	-	Hygiene et Solubrite de Cameroon
ISWMT	-	Integrated Solid Waste Management Theory
ISOP	-	Internal Standard Operating Procedures
IWMP	-	Integrated Waste Management Policy
MCDM	-	Multi Criteria Decision Making
MEFT	-	Ministry of Environment Forestry and Tourism
MHSS	-	Ministry of Health and Social Services
MSW	-	Municipal Solid Waste
MSWEI	-	Municipal Solid Waste Efficiency Index
MSWM	-	Municipal Solid Waste Management
NDRMP	-	National Disaster and Risk Management Plan
NEMA	-	National Environment Management Authority
NPA	-	New Public Administration
NPHC	-	National Population and Housing Census
NPCCN	-	National Policy on Climate Change for Namibia
NPM	-	New Public Management
NSA	-	Namibia Statistics Agencies

NSISERN	- National Second Integrated State of the Environment Report for Namibia
NSWMSN	- National Solid Waste Management Strategy for Namibia
ODP	- Oshana Development Plans
ORC	- Oshana Regional Council
OTC	- Oshakati Town Council
OTCWMP	- Oshakati Town Council Waste Management Policy
PMU	- Procurement Management Unit
PPP	- Public Private Partnership
SDG	- Sustainable Development Goal
SW	- Solid Waste
SWM	- Solid Waste Management
SWMC	- Solid Waste Management Committee
UNDP	- United Nations Development Programme
USA	- United States of America
WHO	- World Health Organisations
WMT	- Waste Management Theory

Fig 1 Political Map of the Republic of Namibia



Source: https://www.nationsonline.org/oneworld/information_sources.html.

Accessed on 22.03.2025.

CHAPTER-I

INTRODUCTION

Waste is defined as any discarded materials that the owner has no longer of use to one individual or for a specific purpose, opening for the idea that it might become useful again, for someone else, or for a different purpose.¹

Waste shall mean any object or substance which the holder discards or is required to discard. Wastes are materials other than radioactive materials intended for disposal, for specific reasons. Wastes are substances or objects, which are disposed of by the provisions of a law. Waste is either an output with no economic value from an industrial system, object, or any substance that has been used for its intended purpose by the consumer and will not be used anymore. Waste is a substance that needs to be expelled in order that the system continues to function. Waste is a man-made substance that has no purpose or is not able to perform its purpose anymore.²

Solid waste is a non-liquid waste. In other words, solid waste is defined as any garbage, refuse, or sludge from a waste water treatment plant, water supply treatment plant. This can be defined as superfluous refuse, no longer serving a purpose, left over after use by physiological process or product of manufacturing.³

Municipal Solid Waste definition varies by country to country, depending on the type of waste, its origin, and collection; whether it is only solid waste collected by the municipality or any waste inside the boundaries of a city. In other words, MSW is the waste generated from the residential, commercial and other places within the boundaries of a city or town. It is also classified, based on

¹Oshakati Town Council. (2015). *Waste Management Policy 2015*, Oshakati, Namibia. Print

²Kadhila, T. (2019). *Implementation of a municipal solid waste management system in Swakopmund, Namibia* (Doctoral dissertation, Stellenbosch: Stellenbosch University). <https://scholar.sun.ac.za/items/52388b03-2033-4c28-bfee-fa32a88b8f0a>

³Sasikumar, K., & Krisha, S. G. (2021). *Solid waste management*. PHI Learning.

composition, season, income, and economic growth. This is defined to include waste from households, non-hazardous solid waste from industrial, commercial and institutional establishments such as hospitals, market waste, yard waste and street sweepings.⁴

Municipal Solid Waste Management is defined as the collection, handling, and disposal of solid wastes that are no more in use, thrown away after the lapse of its purpose, and become unusable.⁵ MSWM is a crucial process that involves controlling the generation, storage, collection, transfer, processing, and disposal of solid wastes in urban area. It encompasses a range of technologies aimed at harnessing energy from waste materials. The six functional components of solid waste management include waste identification, on-site handling and storage, waste collection from various sources, waste transfer, waste processing to sort reusable and recyclable materials, and final disposal, often at landfill sites. The generation of solid wastes stems from various factors, such as population growth, economic affluence, modern use-and-throw lifestyles, and waste-generating technologies. Improper management of accumulated waste can lead to detrimental effects on the environment, human health, and other organisms. To address these challenges, solid waste management utilizes various methods for treatment such as landfilling, incineration, recycling and composting. In most cases, waste recovery and recycling play vital roles in eco-friendly and cost-effective solid waste management. By following the three rule of reduce, reuse, and recycle, valuable resources are conserved, energy is saved, and environmental pollution is significantly reduced.⁶

MSWM includes, the generation, storage, collection, transportation, treatment, recycling, and recovery of resources. Waste generation: Waste generated

⁴Aliu, I. R., Adeyemi, O. E., & Adebayo, A. (2014). Municipal household solid waste collection strategies in an African megacity: Analysis of public private partnership performance in Lagos. *Waste Management & Research*, 32(9), 67-78.

⁵Rajaram, V., Siddiqui, F. Z., Agrawal, S., & Khan, M. E. (2016). *Solid and Waste Management - Waste to Wealth* (1st Edition). PHI Learning Private Limited, Delhi

⁶Singh, R., Vidyarthi, A. K., & Majumder, C. B. (2024). Recent developments in municipal solid waste management in India. *Igi Global*, 407-440 <https://doi.org/10.4018/979-8-3693-4054-7.ch016>

from any source, including residences, businesses, and industries. Waste storage: Apart from the collection by the responsible agencies, solid waste is stored in dust bin, refuse bags, or skip containers, and sometimes is disposed of in the open in the absence of the storage facilities described earlier. Waste collection: These include both household solid waste collection, and waste collection at roadside or dumpsites by municipalities. Waste transportation: Upon waste is collected, it delivered to its final disposal location, such as a landfill, utilising collection trucks or other forms of transportation. Waste disposal: Organic waste is composted, hazardous waste is recycled or burnt, and the remaining solid waste is landfilled or used to generate energy.⁷

Fundamental Principles of Solid Waste Management

Various waste management strategies that afford the protection of human health and the environment are implemented in order to avoid the impacts of solid waste to the environment. Such strategies present the waste managers with challenges and opportunities of handling waste, as each strategy is applied based on the nature and amount of waste being handled. Waste management strategies are prioritized by individual choices, and this contributes to achieving other priorities such as issues related to health, urban governance, employment, tourism development and resource recovery. Moreover, responsible waste management requires a development of legal frameworks that set out laws and regulations specifically geared towards responsible implementation of the waste management strategies. The following waste management strategies are implemented in efforts to manage waste and for reducing the environmental impacts of waste: prevention of waste generation, waste recovery (recycling, re-use and treatment), and disposal of waste in an environmentally safe manner. In fact, this is the waste management hierarchy. In essence, the principles of waste management aim to promote sound environmental management. Consequently, if applied appropriately, important issues

⁷Khan, A. H., López-Maldonado, E. A., Khan, N. A., Villarreal-Gómez, L. J., Munshi, F. M., Alsabhan, A. H., & Perveen, K. (2022). Current solid waste management strategies and energy recovery in developing countries: State of art review. *Chemosphere*, 291, 133088.

of concern such as protection of human health, protection of the environment at large, protection of resources for future generations as well as reduction of burdens for future generations will be addressed.⁸

Origin of Municipal Solid Waste Management

MSWN started during the 500 Before Christ (BC) in Athens city of Greece in Europe, whereby it was the responsibility of each household to dispose their garbage to the dumping site, that was located over 1.5 kilometres away from the city wall. During Roman Empire, the beginning of waste collection was introduced. Households started threw their garbage in the streets whereby collected and transported to an open pit that was located within the community by carts pulled by horses. During 1700s, waste has become a major issue when burning was linked to diseases experienced by scientist and this takes almost 150 years. In the United States of America (USA), the modern concept of SWM started in 1890s. In 1930, most USA cities level of solid waste collection and disposal was moderately as all cities offered garbage collection services. During 1950s, the typically engineered sanitary landfill has started whereby solid wastes disposed on land by spreading the waste in thin layers and covering it with soil by using earth moving equipment every day. Between 1970s and 1980s, scientists recognised that landfills were causing groundwater contamination. As a result, a number of factors were put into consideration by placing caps and plastics over the landfill in order to decrease the infiltration of precipitation.⁹

Municipal Solid Waste Management in Namibia

Municipal Solid Waste Management in Namibia is the responsibility of local authorities. As stipulated by Section 94 of the Local Authorities Act No. 23 of 1992, a local authority council may, after consultation with the Minister responsible for

⁸Hasheela, R. (2009). *Municipal waste management in Namibia: The Windhoek case study* [Doctoral thesis, Universidad Azteca]. Chalcode de Diaz Covarrubias, Mexico. <http://the-eis.com>

⁹Harzen. (2020, October 10). A short history of solid waste management. <http://taras.org>

Regional and Local Government and Housing make regulations by notice in the Gazette in relation to various areas relevant to pollution control and waste management, including the supply, distribution and use of water in its local authority area. Local authorities do thus play an important role in waste management and pollution control. In the bigger cities, this mandate has resulted in an improvement of the waste situation in the country. SWM falls under the responsibility of the Department of Environmental Affairs, part of the Ministry of Environment, Forestry, and Tourism (MEFT). Among different institutions involved in solid waste management include, the Ministry of Urban and Rural Development, the Ministry of Health and Social Services, and the Ministry of Works and Transport. The informal sector, on the other hand, is involved in collecting and recycling recyclable materials, and there is a policy for supporting this sector.¹⁰

In the Namibian context, SWM, treatment, handling, and disposal activities are listed in terms of the Environmental Management Act, 2007 which promotes the sustainable use of resources as an approach to waste management. Namibia has enacted SWM legislation and has a national SWM budget. Since the regulations of the Environmental Management Act were gazetted in 2012, the ministry of environment and tourism has been engaging local authorities, regional councils, and local industry to improve standards of waste management and waste disposal sites as well as to ensure that all waste disposal sites apply for environmental clearance-certificates. A strategy on national SWM was implemented and approved by the cabinet. It is believed that this strategy will deliver significant socio-economic benefits in terms of job creation especially to the youth. The NSWMSN aims to make Namibia the leading country in Africa in terms of standards of solid waste management by the year 2028. To address waste management challenges, the Government of Namibia is to spearhead the implementation of the NSWMSN on both the rural and urban levels.¹¹

¹⁰Ruppel, O. C., & Ruppel-Schlichting, K. (2016). *Environmental law and policy in Namibia: Towards making Africa the tree of life*. https://www.hss.de/fileadmin/media/downloads/Publikationen/160602_Namibia_Edition.pdf.

The Second National Integrated State of the Environment Report for Namibia (SNISERN) of 2021 states that due to the lack of integrated waste data management system, the estimated volumes of waste being generated in Namibia per year cover a wide range. It was estimated that, between 75 and 550 kilotons of solid waste are being generated in Namibia per year. Even though this range might seem low on a country level, the vast distances between main centres in Namibia implies high transport costs and contributes to increasing the cost of waste management on a per tonne or per person basis.¹²

The common means of disposing garbage in Namibia is through burning 38 per cent, followed by regular collection 37 per cent. Rubbish pits and roadside dumping accounts for a combined 20 per cent of waste disposal. 70 per cent of urban households benefit from regular waste collection while two of three rural households burn their waste. Regular waste collection in rural areas is only available to about 5 per cent of all households. Regular waste collection is most common in the Erongo and Khomas Region 80 and 74 per cent, respectively, but almost unknown in the Omusati and Ohangwena regions both 6 per cent.¹³

Solid Waste Management Status in Namibia

Same as many countries in the world, Namibia faces many environmental threats resulting from the dichotomy between development and environment, which require holistic management to attain the goal of sustainable development. The

¹¹Ministry of Environment and Tourism. (2017). *National solid waste management strategy for Namibia*. <https://www.oneplanetnetwork.org/sites/default/files/from-crm/94-626967351dc24cb26894c1ecd0363fce>

¹²Ministry of Environment, Forestry and Tourism. (2021). *Second national integrated state of environment report for Namibia*. <https://sdacnamibia.org/wp-content/uploads/2024/09/Second-National-ISOER-Namibia-2021.pdf>.

¹³Namibia Statistics Agency. (2011). *Namibia population and housing census, main report: Republic of Namibia*. <https://cms.my.na/assets/documents/p19dmn58guram30ttun89rdrp1.pdf>.

Department of Environmental Affairs (DEA) under the MEFT is the leading agency for the safekeeping of the environment.¹⁴

When waste is not well managed, environmental threats negatively impact to the environment, resulting in disasters such as species decline and extinction, health problems and diseases, climate change, and land degradation.¹⁵

Although there are many stakeholders in waste management in Namibia, waste management is a priority for the government. The management of solid waste in Namibia is the local authority's responsibility, including municipalities and town councils. These authorities work closely with the private sector and businesses. Generally, the current waste management systems leave much to be looked for, meaning wastes generated from all the sectors of the economy are currently not well managed. Waste disposal sites in most areas of jurisdiction are either not there or poorly managed. Improvements are needed in waste management, covering from waste generation minimisation, segregation, storage, collection, transportation, disposal, re-use, recycling, and treatment. The Government of the Republic of Namibia enacted legislation such as the Environmental Management Act No. 7 of 2007 to control activities related to environmental protection. Most municipalities and town councils in the country have not been able to adequately deliver services to their residents.¹⁶

Urbanisation in Namibia

Urbanisation is the growing number in the proportion of the population residing in towns and cities, brought about by migration from rural areas. It is also the higher urban levels of natural increase resulting from the greater proportion of

¹⁴Amwele, L. N. (2022), *Solid waste management systems in three urban areas of Namibia* [Master's Thesis, Cape Peninsula University of Technology], <https://etd.cput.ac.za/handle/20.500.11838/3731>

¹⁵Miller, G.T. (2007). *Living in the Environment* (15th edition). Thomson Learning Inc., Belmont, USA.

¹⁶Amwele, L. N. (2022), *Solid waste management systems in three urban areas of Namibia* [Master's Thesis, Cape Peninsula University of Technology], <https://etd.cput.ac.za/handle/20.500.11838/3731>

people of childbearing age in cities. Additionally, urbanisation results from social change and is most notable in the development of capitalism and industrialisation. Urbanisation is the inevitable result of economic growth, with the rise of specialised craftsmen, merchants, and administrators and further views the stresses of the importance of agglomeration economies where cities offer employment markets and well developed infrastructure which in all increase their comparative advantage. Africa has the highest level of poverty in the world especially Sub-Saharan Africa where half the population lives below the poverty line. Namibia has been faced with an increase in urbanisation leading to sprawling informal settlements and an increase in poverty as more people migrate and face being unemployed. With the continuous growth of these areas more solid waste is being generated and has become an overwhelming issue for the Local Authority as well as for the inhabitants as it has led them to live in distress. Developing countries' rapid urbanisation which is synonymous to elimination of poverty is uncontrollable, and it is an unprecedented shift without economic and technological support. This can only be dealt by local authorities since they have strong supporting systems that can instruct the involvement of communities to manage their own solid waste.¹⁷ There is relative number of inhabitants in towns compared to rural area. Oshakati is one of the top five populous towns in Namibia with 58 656 residents. The capital city of Namibia Windhoek is topping with the population of 486,301, followed by Rundu with 118 632, Walvis Bay 102 592, then Swakopmund with 75 921.¹⁸

Urbanisation in Oshakati Town, Namibia

By the time of Namibia's independence in 1990, the population of Oshakati was about 21 600 residents with the growth rate of 0.9 percent. In the year 2011, the

¹⁷Ndhlovu, L. N. (2018). *Investigating the effectiveness of a community based approach towards solid waste management in Windhoek's Okahandja Park* [Master's thesis, University of Namibia], Windhoek, Namibia. <http://www.repository.unam.edu.na>

¹⁸Namibia Statistics Agency. (2023). *Namibia population and housing census, preliminary report: Republic of Namibia*. https://nsa.org.na/wp-content/uploads/2024/07/Preliminary-Report-2023-Population-and-Housing-Census_compressed.pdf.

population recorded was 36, 541 while a 58, 656 was recorded in 2023 with the annual growth rate of 3.9 percent respectively. Due to the escalation of the population, the town is expanding mostly in informal structures. Due to the high number of residents, the amount of wastes generated on a daily basis is rapidly increasing. The high number of unemployment lead to poverty and some residents cannot afford to prevent wastes by purchasing dust bins which cost equivalent to 4, 370 Indian Rupees.¹⁹

Profile of Oshakati Town, Namibia

Oshakati town is the capital city of Oshana Region, located to the northern part of the country founded in 1966. According to the NPHC of 2023, there are 58, 696 inhabitants in Oshakati town.²⁰

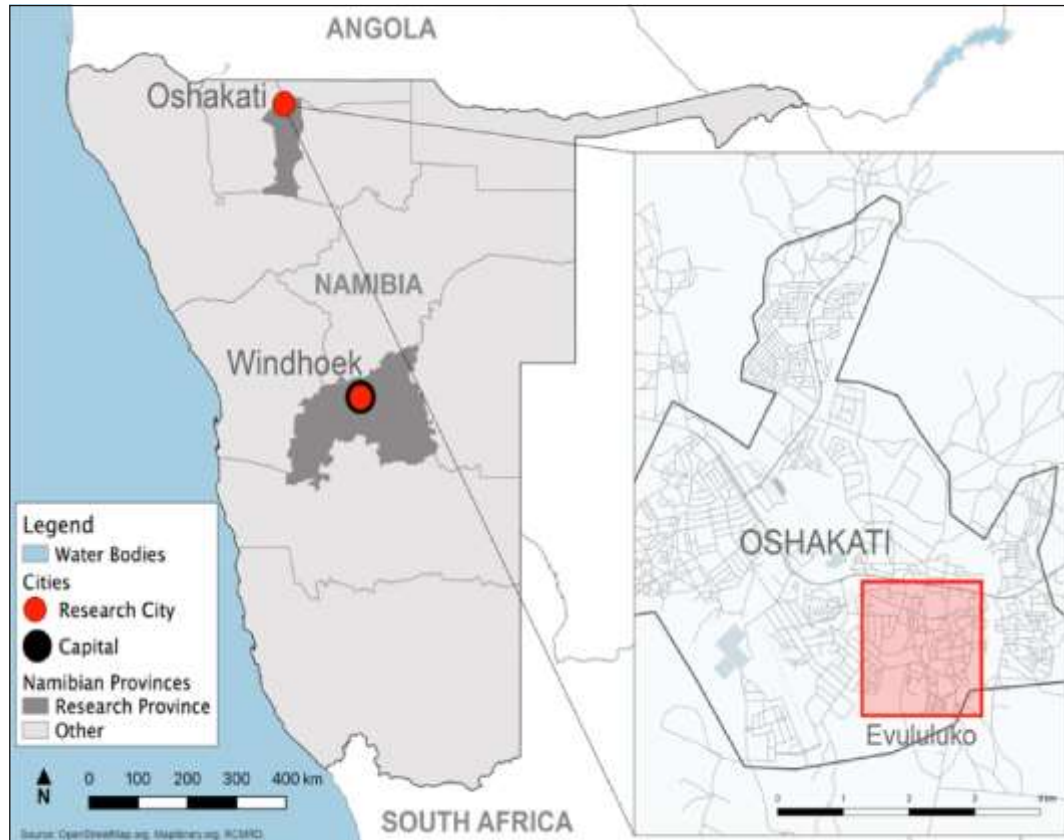
The Oshakati town falls under two constituencies namely: The Oshakati-East and the Oshakati-West constituency respectively. Oshakati-East Constituency is one of the eleven (11) Constituencies of Oshana Region and its office is in Ompundja growth point. The constituency is situated southern side of Oshakati town. Oshakati-East shares boarders with Ongwediva on the northern side, Ondangwa-Rural on the eastern side, Ompundja on the western side and Oshakati-West on the western side. Oshakati West Constituency is situated western part of Oshana Region and it borders with Ompundja constituency to the South-East, Okatana constituency to the North-West, Uuvudhiya constituency to the South and Oshakati-East constituency to the East. The north-eastern part of the constituency falls within Oshakati town's boundary.²¹

¹⁹Namibia Statistics Agency (2024). *Namibia population and housing census, main report*. <https://nsa.org.na/document/2023-population-and-housing-census-main-report/>

²⁰Namibia Statistics Agency. (2023). *Namibia population and housing census, preliminary report: Republic of Namibia*. https://nsa.org.na/wp-content/uploads/2024/07/Preliminary-Report-2023-Population-and-Housing-Census_compressed.pdf.

²¹Oshana Regional Council. (2023). *Oshana development profile 2023*. <https://oshanarc.gov.na/regionalprofiles>

Fig 2 Map of Oshakati Town



Source: <https://www.researchgate.net/publication/349686365> Accessed on 22.03.2025

Waste Hierarchy

The waste hierarchy is a framework for managing waste that prioritizes methods with the least environmental impact, placing prevention as the most preferred option and disposal as the least preferable. It includes stages like prevention, reduction, reuse, recycling, and recovery, often depicted as an inverted pyramid where top priorities are at the apex and least preferred options at the base. This framework guides decision-making to maximize resource value and minimise waste generation and its environmental effects. In Namibia, SWM is planned and improved in line with the principles of the waste hierarchy whereby waste minimisation and recycling is preferred to waste treatment and disposal.

Fig 3 Waste Hierarchy



Source: <https://axil-is.com/blogs-articles/waste-management-hierarchy/>

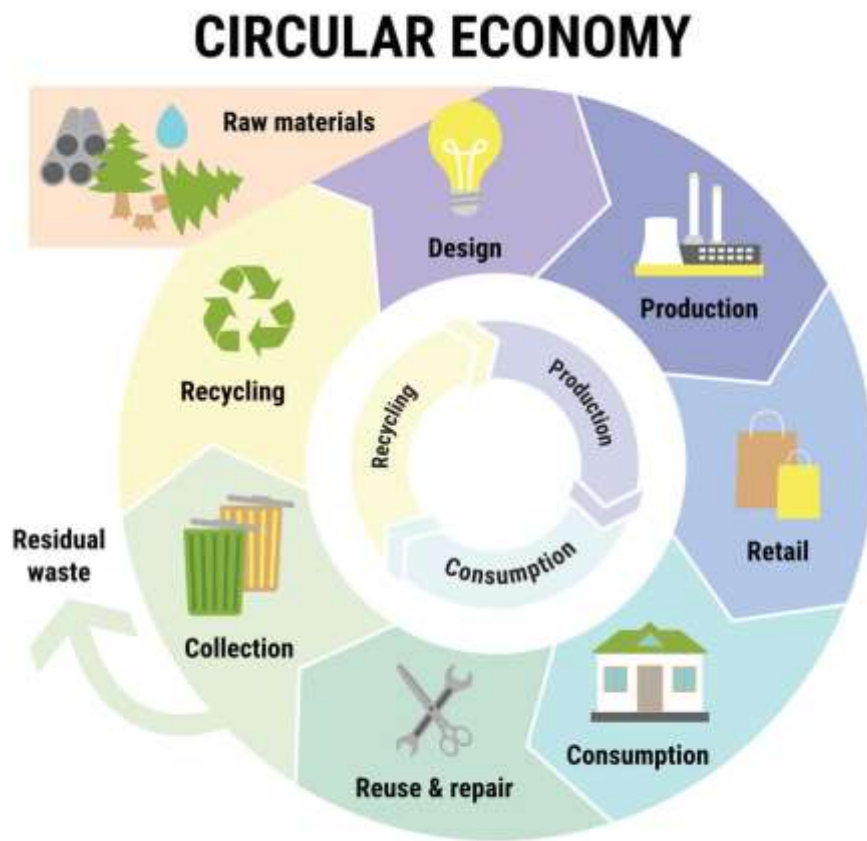
Waste Circular Economy

The circular economy is an alternative to a traditional linear economy in which resources are kept in use for as long as possible, extracting the maximum value from them whilst in use, then the products and materials are recovered and regenerated at the end of each service life.²² It is a business model based economic system which replace the ‘end-of-life’ concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes. It implies creating environmental quality, economic prosperity and social equality, to the benefit of current and future generations.²³

²²Ministry of Environment and Tourism. (2017). *National solid waste management strategy for Namibia - 2017*. <http://www.oneplanetnetwork.org>

²³Kirchherr, J., Reike, D., & Hekkert, M. (2017). *Conceptualizing the Circular Economy: An Analysis of 114 Definitions*. *Resources, Conservation and Recycling*, 127, 221-232.

Fig 4 Circular Economy



Source:https://www.google.com/search?q=circular+economy&oq=circular+economy&gs_lcrp

Municipal Solid Waste Management and Sustainable Development Goals

Sustainable development refers to the development that preferably for the current generation but not compromising future generation needs. In 2015, the head of states from 193 countries worldwide came together to discuss the sustainability of the future. There were pushing factors such as urbanisation, poor sanitation, water scarcity, and poor waste management in the cities, towns and villages. Leaders among these countries came up with a plan called the Sustainable Development Goals (SDGs). It comprises of 17 goals predicting how the planet should be in 15 years to come on what should be done in order to overcome environmental challenges. The United Nations Development Programme (UNDP) is to spearhead

the plan and to ensure that SDGs will be achieved by the year 2030. Among 17 goals, there are three goals related to waste management.

These are:

Goal: 3 Good Health and Well-being, ensure healthy lives and promoting well-being for all at all ages.

Goal 11: Sustainable Cities and Communities focusing on efforts to reduce the adverse per capita of cities, paying special attention to air quality and waste management.

Goal 12: Responsible Consumption and Production focusing on efforts to achieve the environmentally sound management of all wastes through their life cycle, to significantly reduce their release to air, water and soil, and to substantially reduce waste generation through prevention, reduction, recycling and reuse.²⁴

Constitutional Mandate Relation to Solid Waste Management in Namibia

The Namibian Constitution establishes three levels of government: (1) central government (2) regional government and (3) local government. The President and the members of the National Assembly represent all the people of Namibia. They deal with issues which affect everyone in the nation. But communities also need other government bodies which are closer to them, to focus on the issues and problems of the community. For example, there are many things that affect different regions in Namibia differently. Some regions are very well developed, with many schools and clinics and a good supply of water and electricity, but other regions do not have enough services. A regional government can focus on the needs of a single region instead of having to think of the entire nation all at once. Similarly, local government focuses on the needs of the people who live in that local authority. Regional and local councillors are important contacts for lobbying on regional and local issues.

²⁴<https://sdgs.un.org/goals>. *The 17 Sustainable Development Goals (SDGs)*, Accessed on 13/04/2024

Constitutional Provisions of Municipal Solid Waste Management Related to Health in Namibia

The Namibia Constitution through Local Authorities Act, 1992 (Act No. 23 of 1992) provides for local authorities under Articles 102 and 111 of the Constitution, which empowers the parliament to enact legislation relating to local authorities.²⁵ Article 102 (3) of the Namibian Constitution defines local authorities to be as follows: Every organ of regional and local government shall have a Council as the principal governing body, freely elected in accordance with this the Constitution and the Act of Parliament referred to in 13 Sub-Article (91) hereof, with an executive and an administration which shall carry out all lawful resolutions and policies of such council, subject to this Constitution and any other relevant laws.²⁶

Legal Aspects Governing Municipal Solid Waste Management in Namibia

MSWM is part of environmental management that fall under the authority of government ministries, municipalities, private companies and individuals. Prior to independence, Namibia's legal frameworks with regard to the environment were the same as those that have been used in South Africa. Immediately after independence many out-dated legislations, policies and regulations were amended and clarified to suit the practicality of current environmental activities taking place in Namibia. Among others, some of the main environmental related laws, policies and legislations existing in Oshakati and the entire Namibia falls under the MEFT, Ministry of Health and Social Services (MHSS), and the Ministry Urban and Rural Development (MURD).²⁷

²⁵*Local Authorities Act 1992.* (1992, August 31). <https://www.npc.gov.na/wp-content/uploads/2022/06/Regional-Councils-Act-No.-22-of-1992-.pdf>

²⁶*The Constitution of the Republic of Namibia.* (1990). <https://www.lac.org.na/namlex/Constitution.pdf>

²⁷Kadhila, T. (2019). *Implementation of a municipal solid waste management system in Swakopmund, Namibia* (Doctoral dissertation, Stellenbosch: Stellenbosch University). <https://scholar.sun.ac.za/items/52388b03-2033-4c28-bfee-fa32a88b8f0a>

Marketing Recycling in Municipal Solid Waste Management

Waste materials can be recovered through recycling and re-use processes. Recycling is a strategy used to recover value from waste for consumption. Re-use refers to making use of discarded waste material products. These are waste minimization strategies that are implemented in order to reduce the amount of waste being generated. They are essential, particularly for the fact that they reduce the impact of waste in the environment. Even so, they are not 100 per cent efficient. Recycling for example causes negative impacts on the environment through emissions as a result of waste material processing. As a strategy to reduce the life-cycle impacts of products, the use of materials that can easily be recycled is practiced. Practically, recycling benefits the environment by reducing the use of virgin materials as well as toxicity in some instances. In addition, recycling recovers a lot of waste while causing less waste to be disposed. In the view of re-using waste materials, discarding of materials to the waste stream is avoided, as this strategy does not require processing. As a result, re-use of waste materials can be of environmental benefit.

Theoretical Framework

Theoretical framework is the foundational review of existing theories that serves as a roadmap for developing the arguments that a researcher uses in the study. The study explores the following theories linked to the waste management namely: Waste Management Theory; Institutional Theory; Integrated Sustainable Waste Management Theory; Community Engagement Theory; Collective Action Theory; Social Capital Theory; New Public Management Theory; and New Public Administration Theory.

Waste Management Theory (WMT)

This study based on WMT as the main guiding theory supported by some related theories as well. WMT represents a more in-depth account of the domain and contains conceptual analyses of waste, the activity upon waste, and a holistic view of the goals of waste management. WMT is founded on the expectation that waste management is to prevent waste causing harm to human health and the environment.

WMT is based on the hypothesis that the way the study describe a target prescribes action upon it, which implicates that sustainable waste management depends greatly upon how waste is defined. Every term used in a scientific theory or in a given branch of science ought to be precisely defined. Definition is the most obvious, and adequate method of characterising a scientific concept. Definitions are offered to state or describe the accepted meaning, or meanings, of a term already in use are called descriptive definitions. There are practical values of WMT namely: Predicting the waste management actions outcomes; Provides guidelines for choosing waste management options; Supporting legislation on how to prescribe activities upon waste; Providing answers to conceptual questions by explaining waste concepts; Laying a foundation for how and when to select and integrate waste management options. Waste management theory, as differentiated from waste management practice, represents a more in-depth account of the domain and contains conceptual analyses of waste, the activity upon waste, and a holistic view of the functions, and goals of waste management. This is the best theory as it will give an account of an in-depth analysis in the goals of successful waste management.²⁸

Institutional Theory

Institutional theory has a well-developed conceptualisation of the environment, including the field, the societal level, and world polity. The field is especially relevant to the study of organisational culture. Furthermore, institutional fields are inhabited by various subpopulations, each holding various institutions. Institutional theory also has a well-developed conceptualisation of the kinds of pressures from the institutional environment working on organisations, which may help us not only appreciate the way the environment affects organisational culture but also the mechanisms involved. There are three types of institutional environment namely coercive, normative, and mimetic pressures. Coercive institutional pressures involve explicit regulatory processes rule-setting, monitoring, and sanctioning

²⁸Pongracz, E., Phillips, P. S., Keiski, R. L. (2004). *Evolving the theory of waste management: Defining key concepts*. Mass and Heat Transfer Process Laboratory, University of Oulu, Finland. <https://www.witpress.com/Secure/elibrary/papers/WM04/WM04046FU>

activities. Normative pressures involve values and norms that may introduce a prescriptive, evaluative, and obligatory dimension into social life.²⁹

Institutional theory has been frequently used to describe the adoption of the practices of organisation. Practices of other influential organisations, consulting firms, industry trade associations and voluntary reporting guidelines act as mimetic pressures while the changes in stakeholder expectations, hiring of individuals from the same industry, recruitment of staff from a narrow range of training institutions and common promotion practices are some normative pressures that will put pressure on the organisations in adopting management practices of waste.³⁰

Institutional Setup for Solid Waste Management in Namibia

The MEFT is in charge of SWM in Namibia and Environmental Management Act (EMA). Under the MEFT through the Directorate of Environmental Affairs (DEA) there is Environmental Commissioner (EC) mandated to issue licences and to promote environmental sustainability across all other ministries, private sector and non-governmental organisations. There is also Environmental Protection Authority (EPA) that deals with waste management and pollution control, and inspections. The court is mandated to hear and determine disputes issues on planning of environment and protection includes the issues on SWM. The Namibian Police mandate is to secure the internal security, and to maintain law and order in the country. Members of the community involved in many aspects of waste as consumers of goods, waste generators and users of waste minimisation initiatives.³¹

²⁹Zilber, T. B. (2012). The relevance of institutional theory for the study of organizational culture. *Journal of Management Inquiry*, 21(1), 88-93.

³⁰https://www.researchgate.net/publication/282335028_Conceptualising_the_adoption_of_sustainable_waste_management_practices:_An_institutional_theory_perspective. Accessed on 29 October 2025.

³¹Ministry of Environment and Tourism. (2017). *National solid waste management strategy for Namibia*. <https://www.oneplanetnetwork.org/sites/default/files/from-crm/94-626967351dc24cb26894c1ecd0363fce>

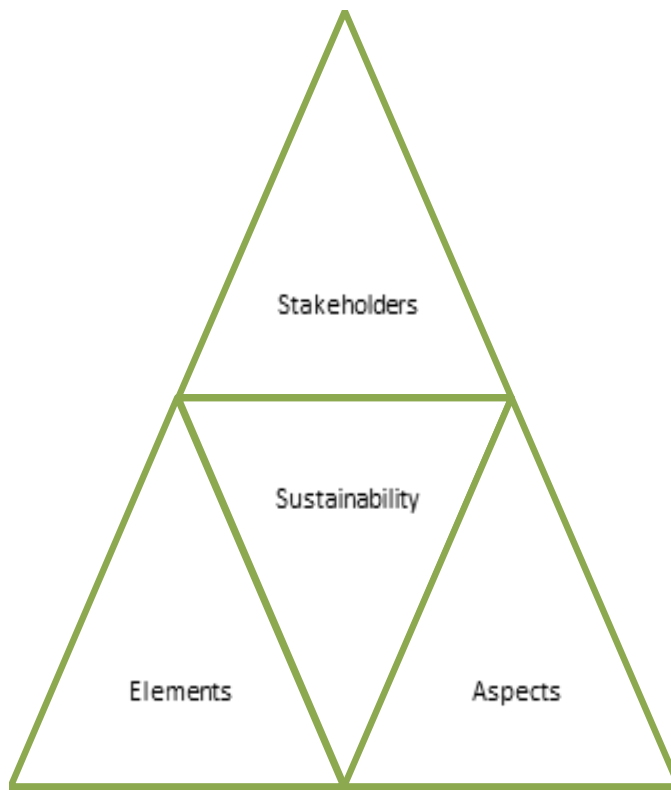
Integrated Sustainable Waste Management Theory (ISWMT)

The concept of ISWM was initiated in 1995 by the Dutch Non-Governmental Organisation (NGO). The organisation works to transform waste into opportunity through advising on urban environment and development.³² ISWM allows studies of complex and multi-dimensional systems in an integral way. The model was developed by waste advisers on urban environment development and partners or organisations working in developing countries during the mid-1980s and further developed by the Collaborative Working Group (CWG) on solid waste management in the mid-1990's. It acknowledges the importance of three dimensions when analysing, developing or changing a waste management system. The dimensions are: the stakeholders that have an interest in solid waste management, the elements or stages of the movement or flow of materials from the generation points towards treatment and final disposal and the aspects through which the system is analysed.³³

³²Schioldborg, A. A. (2014). *Livelihood impacts of solid waste management in informal settlements of Windhoek, Namibia*. (Unpublished master's thesis). Universitetet i Agder. <https://core.ac.uk/download/pdf/154669814.pdf>

³³Wilson, D. C., Velis, C. A., & Rodic, L. (2013). Integrated sustainable waste management in developing countries. *Proceedings of the Institution of Civil Engineers-Waste and Resource Management* (Vol. 166, No. 2, pp. 52-68). ICE Publishing.

Fig 5 Integrated Sustainable Waste Management (ISWM)



Source: <https://core.ac.uk/download/pdf/154669814.pdf>

Stakeholders in ISWM

The main focus within the ISWM model is the participation and cooperation between the stakeholders. Stakeholder involvement is one of the pillars in a SWM system, securing social, economic and environmental sustainability of waste management systems, where the participants feel responsible for the long-term success of the system. Achieving a satisfactory level of participation is important for a holistic SWM, and it requires legal, economic, governmental, political, administrative and environmental support. There are two categories of stakeholders namely: formal and informal. Central, regional and local government, private businesses and service users are all regarded as formal stakeholders. The informal stakeholders are people who gain a livelihood through waste related activities such as

picking, recycling, trading and collecting. However, the study only focus on the formal stakeholders.³⁴

The main stakeholders in this research are the OTC and its SWM Division; Contractors in formal PPP with the OTC; and Community members of Oshakati town.

Community Engagement: consists of people living together in some form of social organization and cohesion. It is member share in varying degrees of political, economic, social and cultural characteristic and interest. It is the process by which individuals and families assume responsibility for their own health and welfare and for those of community and develop the capacity to contribute to theirs and the community development. They come to know their own situation better and are motivated to solve their common problems. This enables them to become agents of their own development instead of positive beneficiaries of development aid. Community participation is taken as a crucial aspect of solid waste management because is a continuous maintenance system, for example to store the garbage in a specific bag or bin, to bring it to an agreed point, to separate it in wet and dry waste. Community-based solid waste management projects are activities carried out by members of the community. However, these communities are concerned with the collection and transport of solid waste from the neighbourhood to a dumping site outside it. Secondary collection, that is transport of the waste to the final disposal site and operation of this site, is usually carried out by the municipality.³⁵

³⁴Schioldborg, A. A. (2014). *Livelihood impacts of solid waste management in informal settlements of Windhoek, Namibia*. (Unpublished master's thesis). Universitetet i Agder. <https://core.ac.uk/download/pdf/154669814.pdf>

³⁵Ahmed, S. J. (2022). *Evaluation of waste-to-energy in Bauchi Metropolis: A key component to a comprehensive municipal solid waste management* (Doctoral dissertation, University of Surrey).

This is the way of constituting power. The commitment of democracy claims that experience with, and access to power is crucial to the development of the capacities of ordinary person because power is important to human dignity and realisation. Community engagement in MSWM falls under the two theories namely: Collective Action Theory (CAT) and Social Capital Theory (SCT) as explained below.³⁶

Collective Action Theory: Assumes that human beings are important to the environment and creatures. It states that people can voluntarily participate in social development and processes to achieve goals if their common interests are matched and justified from the economic point of view. It also acknowledges the value of individuals forming groups to make rational choices and self-interest, which can lead to decision-making. Depending on their choices, the outcome can vary, and the group achieves the best results when the members choose to cooperate. This, however, is based on the trust and rational choice of the members paying it off together. Collective Action Theory forms a part of this study to analyse collective action of community involvement in solid waste management in Oshakati town.³⁷

Social Capital Theory: Has the potential to enhance community engagement through various means. Firstly, it can enhance the dissemination of information and expertise among members of a community, thereby enabling individuals to stay informed about critical matters and act. Moreover, it has the potential to facilitate the development of solidarity within a community and a shared sense of identity, thereby incentivising collaborative efforts toward shared goals.³⁸

³⁶Raymond. W. C. (2020). *Public Administration in Theory and Practice*. Routledge. New York.

³⁷Oh, J., & Hettiarachchi, H. (2020). Collective action in waste management: A comparative study of recycling and recovery initiatives from Brazil, Indonesia, and Nigeria using the institutional analysis and development framework. *Recycling*, 5(1), 4.

³⁸Kafula, N. (2024). *Exploring the role of community participation in sustainable solid waste management: A case study of Moses//Garoeb and Samora Machel informal settlements in Windhoek, Namibia* (Doctoral dissertation, Stellenbosch University). <https://core.ac.uk/download/pdf/642874827.pdf>

New Public Administration Theory: Focus in administration towards political or policy making process specifically in public programmes. Public administration was influenced and shaken by the social turbulence and crisis-ridden period during 1960s. as from 1968, the public administration evolving discipline has come to be enriched by emerging to NPA.³⁹

New Public Administration: is a new and qualitatively different phase in the growth of public administration infused with political values such as social justice, equity, and commitment. NPA approaches to waste management emphasize a shift from traditional methods to strategies like source generation, segregation, storage, collection, transportation, disposal, and processing. Responsibility of extended producer, community participation, and the integration of technology, aiming for greater efficiency and effectively in waste handling. The involvement of government policies, public awareness campaigns, private sector involvement, and citizen responsibility to transform waste into a resource reduce negative impact to the environment.⁴⁰

New Public Management Theory: is a body of managerial thought or as an ideological thought system based on ideas generated in the private sector and imported into the public sector. In general, public services are carried out by private sectors with structural, organizational and managerial changes. NPM focuses on the management of public services carried out by the private sector with management changes. In this point of view, it is easy to link this to governance and PPP. PPPs is the transfer and control of a good or a service currently provided by the public sector, either in whole or in part, to the private sector. NPM basically discussed fundamental changes to the power relationships between the main players in the system of government and requires significant attitudinal changes on the part of bureaucrats. NPM tries to ensure better governance with less cost. To deliver services in low cost,

³⁹Basu, R. (2022). *Public administration: Concepts and theories* (5th ed.). Sterling Publishers (P) Ltd.

⁴⁰Chakrabarty. B., & Kandpal. P. C. (2020). *Public Administration in a globalizing world: Theories and practices*. Vivek Mehra for SAGE Publications India Pvt Ltd.

NPM emphasizes public manager's roles in providing high quality services, identifies the importance of providing the human and technological resources which they need to achieve their goals. However, without good governance it is very difficult to achieve goals. NPM theory states that, even if public services are delivered by the private sector, still government has a responsibility to guide them in addressing public issues. Normally public sectors have more responsibility to deliver public services to the citizens. Accordingly, the goal of the public sector, it is to deliver their services to the people. NPM theory says agencies can share their resources when they need.⁴¹

The application of NPM in local government has given a new orientation to public administration. NPM applies private-sector management principles to the public sector, focusing on efficiency, performance, and customer service in local government by restructuring operations, using market mechanisms like competition and contracting out, decentralising decision-making, and adopting a results-oriented approach to service delivery. Key applications include shifting from input-focused to outcome-based evaluations, viewing citizens as customers empowered with rights, incentivizing performance through clear targets, and leveraging technology for better public services. This approach aims to enhance productivity, accountability, and value for money in local governance.⁴²

New Public Service elaborates a set of norms and practices that focus on democracy and citizenship as basis for the practices of public administration theory. New Public Service addressed questions about the nature of public service, the role of administration in governance, and the value tensions surrounding bureaucracy, efficiency, equity, responsiveness, and accountability. It was organized around core arguments related to the role of the public service in facilitating citizenship and

⁴¹ Muneera, M. N. F. (2012). *Public-Private Partnership (PPP) in solid waste management: Literature review of experiences from developing countries with special attention to Sri Lanka*. [Master Thesis, Norwegian University]. <http://hdl.handle.net/11250/265466>.

⁴² Prasad. R. N., Lalkima. C., Pathi. S., Lalrintluanga., Lalneihzovi., & Lakshmi. M. (2008). *New public management in India: Problems and perspectives*. Shipra Publication

promoting democratic governance.⁴³ New Public Service has been identified recognised as an important undertaking that contributes to the betterment of society, supported by politicians and citizens.⁴⁴

Review of Literature

These are the reviews of what other researchers and authors had explored already related to this study. Literature review is crucial as it justifies a research and identifies the aim of the study. Published literature sources such as journal articles, newspapers and books are to be used as literature reviews. Various researches and articles in the similar study conducted elsewhere will also be a part of a literature review.

Naik & Tiwari, (2005), in their book, *Society and Environment* clarified municipal waste as generated from households and commercial. Urban wastes constitute are similar worldwide but the density per capita proportion is differing from country to country, town to town, level of economy, social condition, geographic location and weather. It is believed that 22 human diseases are associated with wastes therefore it is crucial to prevent them. Flies and rats make use of wastes for breeding. In many developing countries including India, with a warm climate, diarrhoea can easily transmit by flies. Most industrial wastes are toxic and hazardous and pose threat to the living things if not well managed. Collection of wastes need efficient collection and transportation. In India, the basic mode of refuse collection is picking from various community storage points. On a daily basis, the household refuse is delivered to fixed storage bins made from concrete blocks. The refuse finally collected by vehicle for disposal. Daily collection is essential because in hot climate the organic matter in the refuse tends to decompose. It was realised that handcart collection is the best mode of refuse transport due to narrow and congested

⁴³Denhardt, R. B., & Denhardt, J. V. (2000). The new public service: Serving rather than steering. *Public Administration Review*, 60(6), 549-559.

⁴⁴Denhardt, J. V., & Denhardt, R. B. (2010). *Public administration*. Cengage Learning India Private Limited.

streets in residential, which are not well-planned. However, in well-planned cities, large vehicles with some mechanical compression are being used.⁴⁵

Hasheela, (2009), in his study, *Municipal Waste Management in Namibia: The Windhoek Case Study* based to answer the question of “How can Namibia maintain a well-managed system for municipal waste management in future?”. The study investigated the current status of municipal waste management in Namibia, specifically in the city of Windhoek. Urbanisation is the most challenge that the city is facing as the huge amount of wastes generated every day, which puts a pressure on disposal facilities. Literature survey, questionnaires, personal interviews, on site data gathering and data analysis were used as a methodology by the researcher. Windhoek was acknowledged as the cleanest city in Africa, due to its proper SWM. The municipality of Windhoek make sure that all wastes generated are collected, transported and disposed at the right disposal site. Household wastes are collected by its own division, while business generated wastes are collected by both the SWM division and private companies. In Windhoek, the waste disposal is very exciting as there are six (6) general landfill sites for rubbles and garden refuse. These sites are located in Khomasdal, Eros, Havana, Pioneerspark, Ludwisdorf and Olympia. There is special engineered landfill site known as Kupferberg located about 11 Kilometres away from the city centre for general and hazardous wastes. Two separate cells are to be found on this site whereby hazardous wastes are being disposed in the hazardous cells while general wastes generated from households, commercials and industrial activities are disposed in general cells. The findings of this study suggest that the MSWM of the city of Windhoek is the best in Namibia and all towns in the country are encouraged to adopt it.⁴⁶

Abul, (2010), conducted the study, *Environmental and Health Impact of Solid Waste Disposal at Mangwaneni Dumpsite in Manzini: Swaziland*. The study was

⁴⁵Naik, S. C., & Tiwari, T. N. (2005). *Society and environment*. Mohan Primlani.

⁴⁶Hasheela, R. (2009). *Municipal waste management in Namibia: The Windhoek case study* [Doctoral thesis, Universidad Azteca]. Chalcode de Diaz Covarrubias, Mexico. <http://the-eis.com>

design to determine the effects of the dumping site on the surrounding of human settlement in the Mangwaneni area of the Golf Course dumping site in Manzini city. The effects that were assessed were the possible impacts of the dumping site on the health and the environment. It also assesses the views of the residents regarding the location of the dumpsite. Data were collected from 78 household owners, through the use of self-administered questionnaires. Households owners were divided into strata, with 39 nearby less than 200 metres and 39 far away more than 200 metres of the Mangwaneni area. A comparison between the nearby and far away residents were done in order to achieve the objectives. The study revealed that, both residents were affected by the location of the dumping site closer to their settlements. It was also noted that the residents whose houses are within 200 meters from the dumpsite are victims of malaria, chest pains, cholera, and diarrhoea. However, residents whose houses are in the distance of over 200 meters are also affected with the chest pain and bad smell from the dumpsite, but mainly when wind is blowing in their direction. The study concludes that dumping sites should be located at least 200 meters away from human settlements. Therefore, the study recommends that dumping sites should be properly located and managed to minimise its effects on the environment. The study recommended that, central government and municipalities should revise laws regarding the locations of the dumping sites to be at reasonable distance.⁴⁷

Ai, (2011), conducted the study, *Challenges of Sustainable Urban Planning: The Case of Municipal Solid Waste Management*. The study objectives were to investigate the impacts of urban growth on activities of waste management and potential strategies to promote sustainable waste management. The study further discussed the study need of reactive nature of current waste management transformation. The importance of the contribution of town planners and their factors to put into consideration towards sustainable waste management was also assessed. To the question of urban growth impact, the study conducted both empirical and theoretical analyses. The results from correlation analyses found that population

⁴⁷Abul, S. (2010). Environmental and health impact of solid waste disposal at Mangwaneni Dumpsite in Manzini: Swaziland. *Journal of Sustainable Development in Africa*, 12(7), 64-78.

growth was not always associated with increases in waste generation. The empirical study revealed that pro-landfilling activities presented cost advantage temporary, but experienced cost jumps after facility closure for long-term maintenance and pollution control. This study suggested that pro-landfilling activities can only create revenues for distressed areas but cannot sustain growth in future.⁴⁸

Iqbal & Naved, (2012), in their book, *Textbook of Solid Waste Management* identifies three types of landfills. Depending upon the availability of land and disposal methods, landfills are classified as: slope landfills, area landfills, and trench landfills. Slope landfills are erected in hilly areas. Solid wastes are disposed by local foothills after providing a suitable liner and a leachate collection system. Slopes of 30 to 35 degrees is recommended to be safe, depending on the solid waste characteristics. Area landfills is on-ground landfills. It is provided where natural or man-made depressions are not available and excavation difficult. Waste are to be covered with a suitable materials and in most cases with soil that is to be brought from other area. Trench landfills is one of the most widely used method in the world. It is suitable for the areas where natural or man-made depressions are available and a very deep water table.⁴⁹

Muneera, (2012), in his thesis, *Public-Private Partnership (PPP) in Solid Waste Management: Literature Review of Experiences from Developing Countries with Special Attention to Sri Lanka* revealed some findings. In many developing countries, partnership is taking more significant role in infrastructure development and providing services regarding SWM while government ownership has declined. At present PPP is considered as an important model for urban development. It has been found that privatisation or partnership can be used as a good policy to improve economic growth. PPPs is also said to enhance social infrastructure in a

⁴⁸Ai, N. (2011). *Challenges of sustainable urban planning: The case of municipal solid waste management* [Doctoral dissertation, Georgia Institute of Technology, Atlanta, Georgia]. <https://hdl.handle.net/1853/44926>

⁴⁹Iqbal, H. K., & Naved, A. (2012). *Textbook of solid waste management* (5th ed.) CBS Publishers & Distributors PVT. LTD.

sustainable way. Therefore, the purpose of the study was to find out practically how PPP works in SWM in developing countries and specifically in the Sri Lankan context. An actor-oriented theory has been used, in order to explain the actors and their behaviour. New Public Management theory has been used to describe management of public services carried out by the private sector with management changes. Mainly, secondary data were used to get understanding of the PPP in SWM and to find out the developing nation's experiences in PPP. The study reveals that due to weaknesses in the public sector such as inefficiencies, wastefulness, carelessness, weakness in service delivery and provision of low quality goods for high rates, developing nations face problems to manage the waste properly. So, governments in developing nations have increased the involvement of the private sector to provide SWM services. Thus developing countries have introduced PPP as an alternative solution to manage waste. Also the study found that the governments alone could not deliver effective and valuable services. With the introduction of PPP, the partner could supply SWM services more effectively and cheaply. However, it has been found that, if there is no good supportive environment, then the partner has difficulty to manage the waste leading to failure in the project.⁵⁰

Mwendamseke, (2013), in his project report, *Contribution of Public Private Partnership (PPP) Towards Sustainable Municipal Solid Wastes Management (MSWM): Case of Majengo Ward in Dodoma Municipality* found that PPP is recommendable. The study was conducted in the municipality of Dodoma at very populated Majengo ward in Dodoma region, Tanzania. The objective of the study was to assess the contribution of PPP towards sustainable MSWM. The study aim was to find out if, how and why the involvement of the private sector has led to better municipal solid waste management in the municipality of Dodoma especially at Majengo ward. Purposive sampling method was used for the study and data

⁵⁰Muneera, M. N. F. (2012). *Public-Private Partnership (PPP) in solid waste management: Literature review of experiences from developing countries with special attention to Sri Lanka*. [Master Thesis, Norwegian University]. <http://hdl.handle.net/11250/265466>.

collection tool was key informant interview, direct observation and questionnaire where by data from 18 respondents were gathered. 16 municipal experts in solid wastes management were interviewed face to face and two questionnaires were sent to some officials. The results reveals that the government capability in monitoring the solid wastes is not good enough. For the overall data obtained from response of solid wastes expertise from private and public sectors. 61 per cent of them blamed government to be incapable in monitoring activities while 39 per cent showed that government is capable in monitoring and management of the solid wastes activities in the locality. This shows that the capability of government in monitoring solid wastes activities is very low. PPP was recommended as the best alternative way for sustainable solid wastes management for 100 per cent of all respondents.⁵¹

Vanlalthinpui, (2013), in her study, *Public-Private Partnership in Municipal Solid Waste Management in Aizawl* elaborated Public Private Partnership (PPP) as the agreement between the government and the private sector in a certain project or rendering services to the public. After the establishment of the first Aizawl Municipal Council (AMC) and the election of local council in all nineteen wards under AMC, the SWM fell under the AMC as per powers and functions stipulated in Aizawl Municipal Act of 2007 (amended in 2009). It is a mandatory for every locality to establish its own SWMC. The SWMC is a combination of different councils from local council members of Young Mizo Association, Mizo Hmeichhe, Insuihkhawm Pawl and Mizo Upa Pawl. The AMC guideline stipulates that MSW are to be collected and transported in every locality by SWMC. SWMC is to arrange the collection of MSW from all areas including for deep areas where vehicles may not enter easily. In non-accessible areas, the SWMC provides information in advance

⁵¹Mwendamseke, E. (2013) *Contribution of Public Private Partnership (PPP) Towards Sustainable Municipal Solid Wastes Management (MSWM): Case of Majengo Ward in Dodoma Municipality* [Bachelor's Thesis, University of Dodoma], Dodoma, Tanzania. <https://www.academia.edu>

as where, when, and time residents have to drop their waste for pick up.⁵²

Mughal, (2014), in his study, *Waste Management in Northern Towns of Namibia* conducted the study in three towns of northern Namibia namely: Ondangwa, Ongwediva and Oshakati. Results from Ondangwa town revealed that, there are five contracts in PPP responsible for recycling, collecting, and transportation of wastes. Each company have more than one truck that collect waste from door-to-door in its area of responsibility. In most cases, the contractor hires community members to segregate recyclable waste manually. Furthermore, it was found that the big portion of waste management budget goes to the private contractors. Private contractors also make their own money by selling their recyclables that they collected throughout. There is a contract agreement signed between the private contractors and the town council of Ondangwa. It stipulates that if a private contractor fail to fulfil its task, an initial warning have to be made, followed by a fine in second offence. This agreement aims to assure that PPP contractors are fully accomplish their duties.⁵³

Jain & Singhal, (2014), in their article, *An Analysis of Treatment Options for Solid Waste by Characterization and Composition Study* point out that solid waste generation is increasing rapidly due to rapid urbanization, industrialization and population growth. The present system of the Jaipur city has studied in the thesis and it was found that the storage and collection of waste are insufficient and infrequent, open dumping is followed. The results revealed that high moisture content of waste amount of biodegradable waste are present in studied sample of solid waste which meets all the criteria required for anaerobic digestion. The study found that Jaipur city generates 1383 tons of waste per day which possibly produce 4.48 Mega Watts of electricity on anaerobic digestion. From the review of literature and field survey it is found that unscientific dumping in Mathuradasura and Sewapura landfill site of

⁵²Vanlalhlmpuii, J. (2013). *Public-private partnership in municipal solid waste management in Aizawl* [Master's thesis, Mizoram University], Aizawl, India

⁵³Mughal, M. I. (2014). *Waste management in northern towns of Namibia* [Bachelor's thesis, Tampere University of Applied Sciences], Tampere, Finland. <http://core.ac.uk>

Jaipur city is polluting soil and ground water quality. Based on the risk index score it is suggested that both the sites need to be converted into engineered landfill sites.⁵⁴

Rajagopalan, (2014), in his book, *Environmental Studies: From Crises to Cure* describes waste as any material that is not needed by the owner, producer or processor. In developed countries, household waste is separation into different categories starts in home using different bins. The most and simple method used in the cities is collection and dumping the waste in a landfill outside the city. The amount of municipal waste produced in Indian cities daily per capita ranges between 100 to 500 grams. The use of plastics causes many environmental problems though some amount of recycle is used. The only way to get rid of waste is to prevent or to generate waste at minimum level.⁵⁵

Nawa, (2014), in his project report, *Solid Waste Management in Northern Namibia (Oshakati Case Study)* pronounces that waste can be a health hazard if not well managed and can cause serious harm to the environment. In Namibia, little knowledge of the current state of municipal solid waste management is existing. The study aimed to establishing the current state of solid waste management in Oshakati town by focusing on the applied methods of waste management. All types of solid waste in Oshakati ends up at the dumpsite where recyclables are sorted by scavengers and collected by recycling companies that transport them to Windhoek, Walvis Bay or to the Republic of South Africa. Multiple challenges are currently hindering the Oshakati town council's efforts to conduct proper solid waste management including; lack of funding, trained stuff and poor public participation in waste management programs. A lot should be done in order to target particular aspects of waste management in Oshakati town, and the entire country.⁵⁶

⁵⁴Jain, A., & Singhal, M. K. (2014). An analysis of treatment options for solid waste by characterization and composition study: A Case of Jaipur City. *International Journal of Emerging Trends in Science and Technology*, 1(03).

⁵⁵Rajagopalan, R. (2014). *Environmental studies: From crises to cure*. Oxford University Press.

⁵⁶ Nawa, W., (2014). *Solid waste management in northern Namibia (Oshakati case study)* [Bachelor of Science Research Project, University of Namibia]. <https://www.scribd.com/document/469763612/>

Croset, (2014), in her thesis, *Opportunities and Challenges of a Sustainable Solid Waste Management in Tsumeb, Namibia* found out some of the challenges facing Tsumeb town in Namibia. Tsumeb is the medium town in Namibia, located to the northern part of the country. The aim of the study was to get the clear understanding on MSW flow and the level of waste management in the town of Tsumeb. The study found out that, vehicles used in waste collection are outdated, resulted to multiple breakdown and cause delays of waste collection. The road to the dumpsite that is located three kilometres away from the town is very bad and causing damages to the truck. Community members participate by collecting cans and sell them for living to the metals scrapyards.⁵⁷

Amegashie-Viglo, (2014), in his book, *Waste Management and Environmental Sustainability in Ghana: Challenges and Strategies of the Ketu North Assembly in Managing Waste* examined sustainable waste management practices and sustainability of the methods that are employed in the management of waste in Dzodze. The study examines the challenges confronting Ketu District Assembly in managing waste and assesses the strategies applied in so doing. The major objective of the study was to analyse the degree of sustainability of waste management practices in Ketu north district of Ghana. Information was gathered from the field through face-to-face interviews and the administering of questionnaire among waste management practitioners and waste producers. The study found out that the inability of acquiring land for final disposal sites, environmental pollution and its attendant health hazards are the limitations to waste management. Furthermore, inadequate public waste containers in the communities, inadequate litter bins for commuters at some points and poor waste management attitudes are also factors contributing to the poor waste management. The study recommends the provision of more communal waste containers and litter bins to promote waste separation and harnessing it as a resource for development and periodic education community members to help

⁵⁷Croset, E., (2014). *Opportunities and challenges of a sustainable solid waste management in Tsumeb, Namibia* [Master's Thesis, Royal Institute of Technology]. <https://diva-portal.org/smash/get/diva2:760986>

address poor attitude to waste management.⁵⁸

Turan et al., (2016), in their paper, *Municipal Solid Waste Characteristics and Management in Sinop, Turkey* presents municipal solid MSW responsibility and management structure in Sinop, Turkey together with the current situation of collection, recycling, transport and disposal of MSW. Based on the survey results, an integrated MSW management plan is proposed and presented. In Sinop, a mean of 175 tons of MSW are generated each day or 1.71 kg/day/capita. Approximately 50 percent of the MSW generated were collected, and the mean density of these is 162 kg/m³. Composting can help to divert more than 60 percent of the total waste and will lead to enormous savings in cost of waste collection, transport and disposal. The rest of the waste can be disposed in a landfill.⁵⁹

Rajaram et al., (2016), in their book, *Solid and Liquid Waste Management - Waste to Wealth* elaborated how a small town of Namakkal in Tamil Nadu State of India with a population of 60 000 to 70 000 manage solid waste effectively. It is the first municipality in India to privatise MSWM from door to door collection of waste to segregation at source, vermicomposting production, and inorganic waste recycling. It became a success by following these measures: By 100 percent segregation in the entire town and door to door collection of waste makes the roads and streets waste free area; Burial grounds and parks beautification through voluntary organisations and Non-Governmental Organisations (NGO). Furthermore, the town introduced main roads and public places sweeping at nights by using three wheelers at narrow places and getting rid of all stray animals from the town such as: pigs and dogs. The municipality also impose service charge on restaurants, hotels, waste generating industries, commercial complexes and more trees plantation. Due to the teamwork and integrated approach of various bodies such as municipal

⁵⁸Amegashie-Viglo, S. (2014). Waste management and environmental sustainability in Ghana: Challenges and strategies of the Ketu North assembly in Managing Waste. *Public Policy and Administration Research*, 4(8). <http://www.iiste.org>

⁵⁹Turan, N. G., Baki, O. G., & Ergun, O. N. (2016). Municipal solid waste characteristics and management in Sinop, Turkey. *Environmental Engineering and Management Journal*, 15(1), 13–18. <https://doi.org/10.30638/eemj.2016.002>

corporation, district administration, self-help groups, NGO, market industrial associations, schools, rag pickers and resident welfare associations. Every resident is responsible for keeping the town clean and all waste have to be thrown in the bins. Right now, Namakkal has become a zero waste town in India.⁶⁰

Dangi et al., (2017), conducted the study, *Assessment of Environmental Policy Implementation in Solid Waste Management in Kathmandu, Nepal*. Before the democratic constitution of 1990 in Nepal, full-fledged environmental legislation was rare. Environmental Protection Act of 1997 was the first law covering the environment and sustainability. Though the Solid Waste Act was introduced in 1987, the problem of solid waste management still surfaces in Kathmandu. In order to understand the bedrock of this unrelenting failure in solid waste management, the study assessed the policy implementation by dissecting solid waste rules, environmental legislations, relevant local laws, and solid waste management practices in Kathmandu, Nepal. A study includes surveys, interviews, site visits, and literature review provided the basis for the article. The study shows that the volumes of new Nepalese rules are crafted without effective enforcement of their predecessors and there is a frequent power struggle between local government bodies and central authority in implementing the codes and allocating resources in solid waste management. Finally, the study concludes that Kathmandu does not require any new instrument to address solid waste problems; instead, it needs creation of local resources, execution of local codes, and commitment from central government to allow policies to exercise freely.⁶¹

Douti et al., (2017), In their article, *Solid Waste Management Challenges in Urban Areas of Ghana: A Case Study of Bawku Municipality* found out that there is a lack of access to information on solid waste management in Bawku Municipality of

⁶⁰Rajaram, V., Siddiqui, F. Z., Agrawal, S., & Khan, M. E. (2016). *Solid and liquid waste management - Waste to wealth* (1st Edition). PHI Learning Private Limited.

⁶¹Dangi, M. B., Schoenberger, E., & Boland, J. J. (2017). Assessment of environmental policy implementation in solid waste management in Kathmandu, Nepal. *Waste Management & Research: The Journal for a Sustainable Circular Economy*, 35(6), 618-626.

Ghana. This is attributed to the unavailability of waste management institutions to create awareness through workshops whereby community members may participate in guiding the planning of SWM. Apart from that, unavailability of skips in some areas make it difficult for the collection of wastes. This situation forces some community members to walk long distances in order to dispose their wastes to the nearby skips. According to the Zoomlion Company Limited, the acceptable ratio standards of skips is 1:700 while the current ratio to the population is 1:3136. Some residents illegally decide to dispose their wastes at the roadside and on backyards of their houses. The transportation of wastes to the disposal area is conducted by mechanical and manual methods of skip loader trucks and tricycles respectively. The study revealed that the skip loader, personnel and tricycles are not enough and resources are limited. Poor planning of the town, narrow and poor quality roads makes it difficult for waste collection and transportation. In order to address all the above mentioned constraint, community participation is crucial as they know the area better than top decision makers. The volume of waste generated in the town should be recorded so that it helps in budgeting and planning.⁶²

Sichiweza, (2017), in his study, *Participation of Households in Solid Waste Management Circular Economy Towards Sustainability: A Case Study of Kabwe Town, Central Province of Zambia* found out that in most parts of the world, community members are regarded as beneficiaries of government services and are excluded in decision making process. By this understanding, household communities fail to know their role in the communities. A clean and conducive environment begins at home therefore, community participation in municipal solid waste management could lead to a healthy living surroundings. Due to the large volumes of solid waste generated, the central government of Zambia in collaboration with the Kabwe Municipal Council implemented top-bottom approach in order to manage solid wastes. However, top-bottom approach failed and bottom-up was introduced

⁶²Douti, N. B., Abanyie, S. K. & Ampofo, S. (2017). Solid waste management challenges in urban areas of Ghana: A case study of Bawku Municipality. *International Journal of Geo Sciences*, 8, 494-513. <https://doi.org/10.4236/ijg.2017.84026>

whereby household community members plays vital role in inclusive solid waste management. The involvement of household participation starts from waste prevention, segregation, collection, transportation and finally disposal.⁶³

Maskey, (2018), in his book, *Municipal Solid Waste Management in Nepal: A Case Study of Gorkha Municipality* conducted a study aimed to analyse the household solid waste situation in the municipality of Gorkha, Nepal. Waste management in urban areas is the major problem especially in municipalities of developing countries. Nepal is one of the least developed countries in South Asia and municipal solid waste management is the biggest challenge for the local and national government. Logit regression model was adopted, in order to identify the factors that influence households' waste segregation behaviours. The study found that environmental awareness, waste collection service, willingness-to-pay, make compost, and segregated waste for a week variable are statistically significant at one per cent level of significance. In some limited areas of Gorkha municipality, the waste collection services are provided for free. The factors that significantly influence households' willingness-to-pay are monthly household income, education of household head, environmental awareness and waste collection service. The significant factors that influence the maximum amount of money that households are willing to pay for improved waste collection service are monthly household income, environmental awareness and waste collection service. Household composting is known to be an effective approach to manage organic waste, which reduces significant burden for the municipality to collect and manage household waste, thus minimising the amount of waste going for final disposal. The study found that 56 percent of the surveyed households are continuing to use compost bin. The reasons for those households who are not using the bin are insect invasion, foul smell, leachate production, damaged bins and natural calamity. Kitchen and garden waste are the most common types of waste that were used as an input for household

⁶³Sichiweza, E. (2017). *Participation of households in solid waste management circular economy towards sustainability: A Case study of Kabwe town, central province of Zambia* [Master's thesis, University of Twente], Enschede, Netherlands. <http://essay.utuwent.nl/73871/>

composting.⁶⁴

Sandhu, (2018), in his study, *Private Sector Participation in Municipal Solid Waste Management in Indian Cities and its Implications* realised the increase in municipal solid waste generation across the urban centres in the developing countries. As the challenge of providing this service becomes more and more pressing, municipalities are turning to the private sector to fill the gap and become the prime service providers. Privatisation of solid waste management services has thus emerged as the alternative and as such several municipalities have taken hasty steps to introduce private sector participation in solid waste management services, treating it as a panacea for the municipal solid waste management woes of the cities. The logic of private sector participation in municipal solid waste management services hinges on the assertion of it performing more efficiently on all fronts.⁶⁵

Ndhlovu, (2018), in her dissertation, *Investigating the Effectiveness of a Community Based Approach Towards Solid Waste Management in Windhoek's Okahandja Park* discovered some SWM challenges. The increasing diversity of waste characteristics and lack of effective implementation of consistent waste policies in urban areas resulted to solid waste management to become a big challenge. Like many other African countries, Namibia is also facing rapid urbanisation as well. This has overwhelmed the local authorities' resources for provision of municipal solid waste management henceforth leaving the City of Windhoek struggling to find possible solutions to solid waste management problems, which is health pollution degradation. The researcher applied mixed method approach for gathering the data where questionnaires and interviews were conducted. Despite the application of the open space street cleaning project, solid waste management in informal settlements where many of the urban poor live is still a

⁶⁴Maskey, B. (2018). *Municipal solid waste management in Nepal: A case study of Gorkha municipality* [Doctoral thesis, Hiroshima University], Graduate School for International Development and Cooperation, Hiroshima, Japan. <https://core.ac.uk/download/pdf/222962421.pdf>

⁶⁵Sandhu, K. (2018). Private sector participation in municipal solid waste management in Indian cities and its implications. <https://doi.org/10.25904/1912/1803>

critical problem. It has negatively affected them both socially and economically. The study found that a large portion of the population perceive the five R's of zero waste (refuse, reduce, recycle, reuse and rot) negatively. This perception is more rooted in existing programmes provided by the City of Windhoek. Community members have played a minor role in solid waste management as a catalytic instrument in improving their environments. Poor communication and lack of skills influenced informative programmes and negative attitudes have been a problem. The solution to have strict laws on solid waste mismanagement and involve people of different social, ethnic, gender and religious groups in the reconstruction of SWM systems to create typical win-win situations will improve their perceptions towards solid waste management.⁶⁶

Elago, (2019), in his article, *Factors Associated with Self-Reported Health Outcomes by Residents Residing Near Oshakati Municipal Disposal Site in Oshana Region, Namibia*. The study sought to assess association between the number self-reported health outcomes cases by residents and living near Oshakati Municipal Disposal site. Open waste disposal sites are among the main causes of environmental pollution and public health hazards. In Namibia, majority of the towns, including Oshakati town, use waste disposal sites for waste disposal, a method that is known to cause environmental and public health hazards. Residents near Oshakati Municipal Disposal site raised health concerns which they link to the presence of the disposal site in their neighbourhood. In addition, medical records from Oshakati State Hospital revealed that diarrhoea diseases, respiratory and eye diseases were among the top ten morbidities reported at the hospital from 2014 to 2017. The study used cluster sampling method and utilized a closed-ended researcher administered questionnaire in all 103 households within the study area. Collectively, this study revealed that nearly all households contracted at least one case of acute respiratory symptom. It is therefore recommended that the council strictly enforce waste

⁶⁶Ndlovu, L. N. (2018). *Investigating the effectiveness of a community based approach towards solid waste management in Windhoek's Okahandja Park* [Master's thesis, University of Namibia], Windhoek, Namibia. <http://www.repository.unam.edu.na>

management laws and regulations, encourage community participation in waste management. In the long run, the council should consider relocating the disposal site far away from the residential area and finding a suitable site to construct an engineered landfill.⁶⁷

Kalra, (2019), in his article, *Community Participation and Waste Management* emphasised that one of the current important factors is the role of community in waste management. Several success stories of community participation across developed and developing countries have strengthened the view of government and local bodies that they cannot work in isolation and require active participation of all the stakeholders to manage waste. People attitude toward waste and the understanding toward the consequences if it is left unattended play a significant role in encouraging their participation in waste management. This study is a brief overview of the significance of community participation in waste management. The study derives its theoretical framework from two theories: social capital and integrated waste management model. Both theories discuss the significance of community participation and cohesion to deliver effective and efficient public service. The study finding revealed that the cooperation and cohesion between government and the community plays a crucial role in the success of waste management.⁶⁸

Njoku et al., (2019), conducted the study, *Health and Environmental Risks of Residents Living Close to a Landfill: A Case Study of Thohoyandou Landfill, Limpopo Province, South Africa*. The aim of the study was to test the hypothesis that the deposition of waste on landfill has an impact on the surrounding environment and residents living closer to it. This was achieved by evaluating the perception of the respondents drawn from people living within 100 metres and those living over 100

⁶⁷Elago, M. M. (2019). *Factors associated with self-reported health outcomes by residents residing near Oshakati municipal disposal site in Oshana region, Namibia* (Doctoral dissertation, The University of Zambia). <https://dspace.unza.zm/items/52ca2146-cc92-4551-a035-acb22629f74d>

⁶⁸Kalra, N. (2019). Community participation and waste management. *Springer Singapore*, 115-123. https://doi.org/10.1007/978-981-13-7071-7_10

metres away from the landfill site, concerning environmental issues, health problems, and life satisfaction. The study found that, 78 per cent of the respondents living closer to the landfill site indicated serious contamination of air quality evident from bad odours linked to the landfill site. participants living closer to the landfill than those living far from the landfill. The study recommends a proper covering of waste on daily basis in order to reduce the problems of the residents living closer to the landfill site.⁶⁹

Spoann et al., (2019), in their study, *Assessment of Public–Private Partnership in Municipal Solid Waste Management in Phnom Penh, Cambodia* reviewed the details of the processes and examined the performance of the private sector and local government authorities. Multiple sustainability domains were evaluated: institutional, legislative, technical, environmental and health aspects as well as social, economic, financial and critical aspects. The results indicate that the long-term contract design attempts for partnership may actually result in a worsening of the situation by facilitating new ways of concentration, inefficiency and political interest. The limited institutional capacity of the public sectors is also a consequence of the inefficient decentralisation of MSWM policies. Revising the legal framework, establishing a facilitating agency that will assist in the design and the nurturing of partnerships, competitive tendering, and transparency and financial accountability are essential elements for PPP on the provision of waste services.⁷⁰

Rahman, (2019), in his study, *Solid Waste Management in Sindh* indicated that solid waste is one of the problem in metro cities internationally. The modern solid waste management consultants consider solid waste as solid gold since it could be converted to energy and at the same time making solid waste management environment-friendly so that it may not pollute the environment and food resources.

⁶⁹Njoku, P. O., Edokpayi, J. N., & Odiyo, J. O. (2019). Health and environmental risks of residents living close to a landfill: A case study of Thohoyandou landfill, Limpopo Province, South Africa. *International Journal of Environmental Research and Public Health*, 16(12), 2125.

⁷⁰Spoann, V., Lay, C., Yim, M., Fujiwara, T., & Seng, B. (2019). Assessment of Public–Private Partnership in Municipal Solid Waste Management in Phnom Penh, Cambodia. *Sustainability*, 11(5), 1228. <https://doi.org/10.3390/su11051228>

Sustainable solid waste should strive to achieve its goals and targets through innovative and research-based approach.⁷¹

Goyal, (2019), in his study, *Mainstreaming Informal Sector in Municipal Solid Waste Management in Ludhiana, Punjab* narrated that MSWM has become a critical challenge in most cities of India. Increasing per-capita income and disproportionate population increase has strained the carrying capacity of land and infrastructure. Due to administrative, financial and human resource constraints, municipal corporations continue to be incapacitated. Mainstreaming informal waste rag pickers into the formal chain of collection, transportation, treatment, recovery and disposal of the MSW can help to institutionalise a sustainable model of MSW and inclusive urban growth. Such policy will also be constructive in environmental conservation through effective implementation of the solid waste management rules, with respect to at source waste segregation and decentralised waste disposal.⁷²

Zhanget et al., (2019), in their paper, *Physical Components and Influence Factors of Municipal Solid Waste (MSW) in the Residential Area of Beijing* elaborated that treatment, disposal and management of municipal solid waste strongly depend on the composition and characteristics of municipal solid waste. After the investigation and elaboration of the physical composition of MSW in residential of Beijing city, the result showed that the composition of MSW in four seasons was similar, and the kitchen was the main composition of MSW, accounting for 69-74 percent of the total amount of MSW. The average age of families, educational backgrounds, family income and building area have a great influence on the physical proportion of MSW. As the average age of the family increases, the proportion of other wastes was gradually reduced, the proportion of the harmful waste was increased. With the increase of educational backgrounds and family income, the content of kitchen waste decreased, while the content of recyclable waste

⁷¹Rahman, A. (2019). Solid Waste Management in Sindh. *glasstree*. <https://doi.org/10.20850/9781534299283>

⁷²Goyal, N. (2019). Mainstreaming informal sector in municipal solid waste management in Ludhiana, Punjab. *Think India*, 22(2), 2436–2451. <https://doi.org/10.26643/think-india.v22i2.9230>

increased obviously. The 50 square meters was used as a dividing point for the residential area of the family, the kitchen waste decreased at first and then increased, while the proportion of disposable packaging and other waste increases at first and then decreases with the increase of building area.⁷³

Owiti, (2019), Conducted the study, *Evaluating the Effectiveness of the Waste Management Regulation, Legal Notice 121, 2006, In Relation to Solid Waste Management in Kiambu Town, Kenya*. The aim of the study was to evaluate how effective is the Waste Management Regulation (Legal Notice No. 121, 2006) within Kiambu town. The Legal Notice No. 121, 2006 was enacted to regulate waste disposal activities within the country, Kenya, under the Authorities of Ministry of Environment and Natural Resources (MENR) and National Environment Management Authority (NEMA). To assess how effective this regulation was, the study hypothesised that this regulation was effective in Kiambu town. Through the compliance theoretical framework, the study adopted various indicators, which also formed the research objectives used to assess the overall effectiveness of this public law. These include; capacity to solve disputes, stability, public awareness, consistency, participation of the national government through NEMA. The study revealed that the community had little awareness of the law and of the role of the county government and national governments towards enforcing the law, while the involvement of NEMA was not enough. However, the law was stable and was not influenced by other legislations from some other sectors.⁷⁴

Lalchhuanawma, (2020), conducted the study, *Good Governance in Urban India: A Case Study of Aizawl*. The aim of the study was to find out how SW is managed in Aizawl city. It was found out that, there is no scientific SWM system segregation of waste during collection and disposal. The practice of open dumping is

⁷³Zhang, H., Wang, G., Bai, Y., Chen, R., & Zhang, L. (2019). Physical components and influence factors of municipal solid waste in the residential area of Beijing. In *E3S Web of Conferences* (Vol. 118, p. 04012). EDP Sciences. <https://doi.org/10.1051/e3sconf/201911804012>

⁷⁴Owiti, J. (2019). *Evaluating the effectiveness of the waste management regulation, legal notice 121, 2006, in relation to solid waste management in Kiambu town, Kenya* (Doctoral dissertation, University of Nairobi). <https://erepository.uonbi.ac.ke/handle/11295/106891>

still existing on the roadside between Tuirial and Zemabawk though the main dumping centre is near Tuirial which has been in operation since 1997. Burning of waste is still a practise and it is highly increasing to the environment pollution. Some people continues to dump wastes in the neighbouring areas, such as drainage and streams. During October to March when the temperature is dry, wastes are piled up in these locations and monsoon storm water washed away wastes into the rivers and mostly, it witnesses that many time wastes are dumped on the roads and remains there. It was recommended that technical support and infrastructural development is the first requirement in order to manage solid waste properly. Community members are encouraged to participate in cleaning their area and surroundings actively. Proper training of the personnel involved in the SWM in the city should be a mandatory. Fine to those who disobeying to the city by-laws should be imposed strictly by city authority.⁷⁵

Inglezakis et al., (2020), in their paper, *Municipal Solid Waste Management in Kazakhstan: Astana and Almaty Case Studies* provides an overview of the MSW management in Kazakhstan and focuses in more detail on two major cities, Astana, the new capital and Almaty, the former capital of the country. The study focused on legislations, current management policies, facilities and infrastructure, as well as typical solid waste quantity and composition were aligned to the waste management long-term plan. The analysis was supported by the implementation of a Decision Support Tool, which provides insights in waste management needs and supports comparison and ranking of Integrated Waste Management (IWMP) alternatives. The study recommended the IWMP to be used as a basis of detailed feasibility studies in future.⁷⁶

⁷⁵Lalchhuanawma, H. C. (2020). *Good governance in urban india: A case study of Aizawl* [Doctoral thesis, Mizoram University], Aizawl, India.
<http://mzuir.inflibnet.ac.in:8080/jspui/handle/123456789/987>

⁷⁶Inglezakis, V., Rakhmatulina, R., Khamitova, G., Movotakag, K., Abikak, Y., Cepnk, B., Tokmurzin, D., & Pouloupoulos, S. (2020). Municipal solid waste management in Kazakhstan: Astana and Almaty case studies. *Chemical Engineering Transactions*, 5(6), 565–570.
<https://doi.org/10.3303/cet1756095>

Sharma & Jain, (2020), in their study, *Municipal Solid Waste Generation, Composition, and Management: The Global Scenario* scrutinised the increasing population and prosperity and the generation rate of municipal solid waste. It is believed that every person living in urban area in the world is affected by the MSWM issue. MSWM is reaching a critical level in almost all areas of the world and seeking the development of MSW strategies for a sustainable environment. It was found that most developed countries have effectively implemented the solid waste management SWM hierarchy and are now focusing heavily on reducing, reusing and recycling of MSW. On the other hand, SWM has become very serious in low-income and low-middle-income countries because most of the MSW openly dumps and most countries are dependent on inadequate waste infrastructure and the informal sector. Furthermore, ineffective waste policies, insufficient funds, inappropriate technology selection and lack of trained personnel are the challenges facing municipalities in execution of wastes.⁷⁷

Yadav & Choudhary, (2020), in their paper, *Municipal Solid Waste Management Practices in Alwar, Rajasthan, India* describes solid waste management as the process of collecting, treating and disposing off the material after segregating the reusable and recyclable material. After the observation of mismanagement of municipal solid waste in Alwar city, it was decided to carry out a study, in order to find out the status of the solid waste management practices. During study, the residential areas of the city were visited and sample were collected from households on daily basis, which helped to analyse the waste generation as well as the seasonal variation of the waste. The study found that all wastes are mixed together by the residents due to unawareness about the biodegradable and non-biodegradable wastes. It was also found that it is very difficult for the concerned authorities in municipal corporation of Alwar to estimate the actual quantity of biodegradable and non-biodegradable wastes. In absence of segregation of wastes, the authorities

⁷⁷Sharma, K. D., & Jain, S. (2020). Municipal solid waste generation, composition, and management: the global scenario. *Social Responsibility Journal*, 16(6), 917–948. <https://doi.org/10.1108/srj-06-2019-0210>

occasionally use thumb rules for the dry and wet wastes estimation. During the study, the main thrust was given to find out the variation in seasonal waste in different areas of the city, so as to help in assessing the deployment of available resources for their full utilisation. It was found that segregation is not done at the level of individual households and therefore, awareness among community members need to be brought as well as to deploy additional manpower for segregation at the collection points. There is a need for engaging enough official by the municipal corporation of Alwar for collection and transportation of solid waste in the city. At the moment, diesel vehicles are used for transportation, and suggestions was made to make use of electric vehicles like rickshaws and loaders for environmental protection and sustainable development.⁷⁸

Muliawaty, (2020), conducted the study, *Implementation of Municipal Solid Waste Management in Indonesia*. The aim of the study was to find out how Regional Cleaning Company in Bandung city of Indonesia improves the SWM. This study finds that from three types of waste management namely: centralization, decentralization, and decentralization-centralization, the most appropriate waste management in Bandung is decentralization-centralization because most people in Bandung do not have a place for processing waste. MSWM implemented in Bandung still has not optimal yet because the infrastructure and human resources are limited. Therefore, the Indonesian government needs to be aware and optimize MSWM to improve the lives of its people in terms of cleanliness, beauty, and health.⁷⁹

Fisher et al., (2020), in their study, *A Baseline Scenario of Municipal Solid Waste Management* established a baseline scenario of MSWM in Ghana, through material flow analysis and understanding of MSW handling practices, using the Wa Municipality as a case study. The study revealed that sustainable waste management

⁷⁸Yadav, A. K., & Choudhary, M. P. (2020). Municipal solid waste management practices in Alwar, Rajasthan, India. *International Journal of Engineering and Advanced Technology*, 9(3), 3244–3249. <https://doi.org/10.35940/ijeat.c6210.029320>

⁷⁹Muliawaty, L. (2020). Implementation of municipal solid waste management in Indonesia. *Humanities & Social Sciences Reviews*, 8(2), 854–861. <https://doi.org/10.18510/hssr.2020.8294>

has remained elusive because MSWM in the case study area and Ghana in general, consist of some waste collection, transportation and open dumping, where the entire amount of waste is open dumped without pre-treatment. The sorting of waste at the generation sources, and the provision of adequate MSWM infrastructure, through an integrated solid waste management system can ensure sustainable waste management in the country.⁸⁰

Rajendiran et al, (2020), in their paper, *Challenges in Municipal Solid Waste Management: A Key*, evaluates composition of MSW and also identifies the source of waste generation, with extensive use of waste collection technique, treatment method and handling of all the districts of Tamil Nadu state, India. The evaluation includes public-private partnership harnessing benefits, challenges and unrecognised role of rag-pickers. The study concludes that creating decentralised solid waste treatment units in all districts makes it easier to manage waste effectively.⁸¹

Tsyarkin et al., (2020), in their study, *Improving the Control of Municipal Solid Waste Management Processes in the Region* elaborated measures to improve the control of municipal solid waste management processes in the region. The authors have proved the expediency of creation and modernization of the municipal solid waste recycling system. There is a need to form a differentiated pricing policy for the removal of refuse and to grant tax benefits for the activity of a municipal solid waste management company. Furthermore, there are strategies that must be taken into account for the development of motivators for the application of new technologies and mechanisms at all stages. There should be application of public and private partnership mechanisms, fostering environmental culture of society, raising public awareness, development of new principles of producers' liability for compliance with environmental requirements for safe disposal of products and

⁸⁰Fisher, J., Kayaga, S., & Bowan, P. A. (2020). A baseline scenario of municipal solid waste management. *International Journal of Environment and Waste Management*, 1(1), 1. <https://doi.org/10.1504/ijewm.2020.10025834>

⁸¹Rajendiran, B., Arumugam, A., & Subramaniam, S. (2020). Challenges in municipal solid waste management: A key. *International Journal of Ambient Energy*, 43(1), 2889–2899. <https://doi.org/10.1080/01430750.2020.1784275>

packaging. Creation of a complex system for the collection, transportation, recycling and disposal of municipal solid waste within the territory will make it possible to: reduce environmental impact of waste, change the quality of life of population, introduce separate waste collection, increase the percentage of recovery of recoverable resources, set up new advanced waste recycling companies, build landfills that would meet the current technological horizon, increase the level of environmental culture of society, attract investment in the field of municipal solid waste management.⁸²

Llanquileo-Melgarejo et al., (2021), in their study, *Evaluation of the Impact of Separative Collection and Recycling of Municipal Solid Waste on Performance: An Empirical Application for Chile* confirmed that the collection of MSW is a public service with notable effects on the environment and public health. The study revealed that the selective collection and recycling of MSW had a significant impact on the performance of the municipalities in providing these services. The efficient and eco-efficient municipalities were heterogeneously distributed throughout the country, revealing the lack of collaboration between municipalities at the regional level. Lastly, exogenous variables to the management of MSW carried out by the municipalities, including the population served, population density, tourism and waste generated per capita, all had an impact on the efficiency and eco-efficiency scores. The study suggested that policy makers at the regional and local levels should improve the management of MSW in the context of a circular economy.⁸³

Mmereki et al., (2021), in their study, *Status of Municipal Solid Waste Management Policy Implementation in Developing Countries: Insights from Botswana* revealed that Botswana has promulgated environmental policies and

⁸²Tsyppin, Y. A., Bliznukova, T. V., Pakulin, S. L., Kamaev, R. A., & Feklistova, I. S. (2020). Improving the control of municipal solid waste management processes in the region. *Springer*, 747–759. https://doi.org/10.1007/978-3-030-39797-5_73

⁸³Llanquileo-Melgarejo, P., Carosi, L., Romano, G., & Molinos-Senante, M. (2021). Evaluation of the impact of separative collection and recycling of municipal solid waste on performance: An empirical application for Chile. *Sustainability*, 13(4), 2022. <https://doi.org/10.3390/su13042022>

legislation to protect the environment and reduce public health impacts. While the Botswana Waste Management Strategy and Waste Management Act were introduced in 1998. The study suggests numerous inadequacies in the implementation of policy related to municipal solid waste management such as: lack of approaches to policy support; weak institutional influences; and lack financial support.⁸⁴

Phu et al., (2021), in their study, *Analysing The Characterization of Municipal Solid Waste in Da Nang City, Vietnam* revealed that the MSW was taken directly from trucks at the landfill site with the sample size by 500 kilograms per waste sources. The study proves that the simultaneous development of production, trade and service activities in the last decade has led to the speedy growth of waste by 9 percent annually, and reached 1,073 tonnes per day in 2018. In which, waste generated from industry and the hospitals account inconsiderable proportions by 3.9 percent and 1.4 percent. This study also indicated that the MSW generation rate from the urban areas is more than that of the coastal and industrial areas. For the composition of MSW, biodegradable waste and recyclables are the main components with the proportion of 54 percent and 27 percent of the total waste.⁸⁵

Nanje, (2021), in his study, *Municipal Solid Waste Management in Cameroon: Case Study of Beau Municipality*, conducted a study to find how this city keeps its environment clean. Cameroon is one of the developing country in Africa where there is a rapid economic and industrial growth. This growth has led to a huge problem in terms of SWM. According to the findings, the Buea municipality joint PPP with Hygiene et Salubrite de Cameroon (HYSACAM) for help to fight the poor condition of waste disposal. Later on, the Buea Municipality experienced another problem attributed to lack of manpower, ineffective legislations, inadequate equipments, and lack of community participation. The researcher recommended that,

⁸⁴Mmereki, D., Mosime-Serero, L., & Velempini, K. (2021). Status of municipal solid waste management policy implementation in developing countries: Insights from Botswana. *The Journal of Solid Waste Technology and Management*, 47(1), 46–55.<https://doi.org/10.5276/jswtm/2021.46>

⁸⁵Phu, S., Akasaki, N., Fujiwara, T., Le, C., Giang, H., & Pham, D. (2021). Analysing the characterization of municipal solid waste in Da Nang City, Vietnam. *Chemical Engineering Transactions*, 83, 241–246.<https://doi.org/10.3303/cet2183041>

community participation should be enhanced. Laws related to MSWM should be amended and HYSACAM to increase number of employees and buy effective equipment.⁸⁶

Jotaworn et al., (2021), in their study, *Partnership Towards Synergistic Municipal Solid Waste Management Services in a Coastal Tourism Sub-Region*, aimed to explore public and private sectors as the key players. The study aims to identify challenges, opportunities, and need for further analysis of the synergistic MSWM services in the Eastern Economic Corridor, Thailand. The study revealed that the public sector has different MSWM strategies with PPP. The synergistic opportunities from both sectors can therefore be considered for possible integration into four aspects namely: challenging synergies within the public sector; potential synergies via the private sector; synergies with a cross-sectoral partnership; and synergies through other types of partnership. The synergic partnership was recommended as the best approach for enhancing MSWM.⁸⁷

Nambuli et al., (2021), in their article, *Waste Scavenging a Problem or an Opportunity for Integrated Waste Management in Namibia: A Case of Keetmanshoop Municipality, Namibia* investigated how waste scavenging can be transformed into an opportunity for Integrated Waste Management in Namibia. The study revealed that poverty and unemployment leads to waste scavenging for living. Although the waste scavenging is neglected, the study concluded that waste it contributes significantly to the living life of waste pickers of Keetmanshoop. Finally, the study recommends that waste scavenging should be regulated and integrated into the formal waste management system of the municipality through avenues such as the formation of the waste picker's cooperatives that will be registered with the

⁸⁶Nanje, F. (2021). *Municipal solid waste management in Cameroon: Case study of Beau Municipality* [Bachelor's thesis, The University of Ykreshogskolan Vovia], Raseborg, Finland. <https://www.theseus.fi/bitstream/handle/10024/512834>

⁸⁷Jotaworn, S., Kusakabe, K., Xue, W., & Nitivattananon, V. (2021). Partnership towards synergistic municipal solid waste management services in a coastal tourism sub-region. *Sustainability*, 13(1), 397. <https://doi.org/10.3390/su13010397>

municipality and recognised through formal structures.⁸⁸

Rasmeet, (2021), in his study, *Municipal Solid Waste Management in the City of Indore- A Case Study* stated that MSWM is one of the mandate of Municipal Corporation and urban local bodies to minimize solid waste and process it efficiently. the study aimed to analyse the present situation of waste generation, collection, transportation, and disposal of the Indore city in India. The study found that municipal solid waste collection, disposal, and management plan of the city of Indore in India is well managed. Furthermore, the study suggested a closer monitoring of the parameters like population density, road connectivity, waste generation and disposal capacity, and waste transportation from collection sites to disposal sites. The transfer stations can be improved in strength for more efficient management. The model also represents minimum cost to distance ratio for transportation.⁸⁹

Mishra et al., (2021), in their study, *Solid Waste Management Models* identifies solid waste management approaches through conventional methods create many environmental problems and realise the needed for critical analysis of various sustainable waste management models. Various approaches and models have been developed to mitigate the organic waste; a sophisticated mixed-integer linear programming model used in the long-term planning of solid waste management activities and a decision support system designed to promote integrated programs for recycling, treatment, incinerations and disposal. Life cycle assessment models used various criteria to evaluate the functional unit, system boundaries, waste composition and energy modelling. A waste management model is sustainable when it addresses environmental, economic and social facets. Mathematical modelling plays crucial

⁸⁸Nambuli, F., Shikongo, A., & Togarepi, C. (2021). Waste scavenging a problem or an opportunity for integrated waste management in Namibia: A case of Keetmanshoop Municipality, Namibia. *Environment and Pollution*, 10(2), 2-47. <https://doi.org/10.5539/ep.v10n2p47>

⁸⁹Rasmeet, S. (2021). Municipal solid waste management in the city of Indore - A case study. *Journal of Civil Engineering and Environmental Sciences*, 7(1), 008-017.<https://doi.org/10.17352/2455-488x.000039>

role in waste management, primarily in solid waste management systems.⁹⁰

Cristovao et al., (2021), in their study, *Index for the Assessment of Municipal Solid Waste Management in Angola: A Case Study in Kuito, Bie Province* evaluate the efficiency of the municipal solid waste by using the Municipal Solid Waste Efficiency Index (MSWEI) management system adapted to African conditions in Kuito, Angola. Four dimensions constitute MSWEI: governance; gravimeter and logistics; sorting, valuation, and composting; and final disposal. The MSWEI reached 37.6 percent, corresponding to an inadequate MSW management system. The main MSW management guidelines include the development of environmental education; selective collection, sorting of dry recyclable materials and shipping to the capital city of Angola, Luanda. Composting of the organic waste; creation of an inter-municipality consortium to share the costs of a landfill were found as suitable methods.⁹¹

Camarillo & Bellotindos, (2021), in their study, *A Study of Policy Implementation and Community Participation in the Municipal Solid Waste Management in the Philippines* elaborated that MSW has become one of the most pressing environmental concerns in Philippines. Ecological Solid Waste Management Act Of 2001 was implemented to overcome the issue. The study revealed that there is less extent of compliance in almost all of the SWM policies such as segregation, composting, recycling, incentives, and public information. There is a moderate extent of compliance in terms of collection and transport of solid waste and enforcement of penalties and fines. However, there is non-compliance in terms of facilities for final disposal. Furthermore, the results suggested that effective measures for recycling and composting should be undertaken to encourage higher

⁹⁰Mishra, R., Panda, A. K., & Bisht, S. S. (2021). Solid waste management models: Past, present and future. *Multidimensional Approaches to Impacts of Changing Environment on Human Health*, 277-292. <https://doi.org/10.1201/9781003095422-15>

⁹¹Cristovao, G. S. F., De Medeiros, G. A., Mancini, S. D., & Pessela, J. D. (2021). Index for the assessment of municipal solid waste management in Angola: A case study in Kuito, Bie Province, *African Geographical Review*, Ahead-of-Print, 545–557. <https://doi.org/10.1080/19376812.2021.1974902>

participation among residents of the barangay. The presence of effective, functional, and marketable materials resource facilities and convenient drop-off locations for recyclable materials ensure final sorting according to its type for composting and recycling.⁹²

Addo-Fordwuor and Seah, (2022), in their article, *Factors Influencing Household's Willingness to Comply with Municipal Solid Waste Management Regulations in The Kumasi Metropolis, Ghana* conducted the study on investigating the factors that influence household's willingness to comply MSWM regulations in the Kumasi Metropolis of Ghana. A total number of 400 households in Kumasi were surveyed and analysed by applying descriptive statistics and a binomial logistic regression model. The results found out that education, employment, income, monthly expenditure on MSWM, familiarity with MSWM regulations and regulation benefit expectations has influence on household's willingness to comply with MSWM regulations. It was further recommended that the city authorities should educate households on the benefits they stand to gain from their strict compliance with MSWM regulations.⁹³

Randhi, (2022), in his book, *Municipal Solid-Waste Management* identified the municipal solid waste compositions and characterization, their collection, transportation and treatment procedures to achieve sustainable waste management. The management of solid waste remains a challenge in a great number of countries around the world. Thus, these practices include open dumps that are improperly controlled and unlawful roadside dumping, have the potential to degrade scenic qualities, damage soil and water resources, and create possible health problems for

⁹²Camarillo, M. E. C., & Bellotindos, L. M. (2021). A study of policy implementation and community participation in the municipal solid waste management in the Philippines. *Applied Environmental Research*, 30–45. <https://doi.org/10.35762/aer.2021.43.2.3>

⁹³Addo-Fordwuor, D., & Seah, S. (2024). Factors influencing households' willingness to comply with municipal solid waste management regulations in the Kumasi Metropolis, Ghana. *African Geographical Review*, 43(2), 408–426. <https://scholar.google.com/scholar?hl>

those who are exposed to them.⁹⁴

Asiedu-Ayeh et al., (2022), in their study, *Assessing Social Responsibility Initiatives for Public-Private Partnership Success Based on Multi-Criteria Decision Making: Evidence from Municipal Solid Waste Management in Ghana* highlighted that through PPP, social responsibility is important for developing sustainable public infrastructure for MSWM. The study identifies social responsibility initiatives from the literature and groups them into three dimensions: Environmental-based, Community-based, and Employee-based social responsibility. Concerning the Employee-based social responsibility, workers' health and safety is the most important initiative. The study recommends scholars, companies, investors, and policymakers of the initiatives that need attention to promote sustainable development in solid waste management.⁹⁵

Khanna & Chauhan, (2022), conducted the study, *Urban Solid Waste Management in Municipal Corporation Gurugram, Haryana: An Analytical Study*. The growing rate of migration from rural areas in search of employment and a higher quality of life lead to urbanisation and cause solid waste management problems in cities. About 1100 tons are being produced in Gurugram Municipal Corporation per day. Inadequate facilities for collection and disposal of waste resulting in a high proportion of waste remaining uncollected. It has been observed that waste is collected and dumped in the low-lying areas ignoring the consequences of the dumping on the environment and soil. Solid wastes are disposed by using landfill and already crossed 32 lakh tons of legacy waste and there are total of 514 bulk waste generators in Gurugram. In order to manage solid waste in Gurugram, the principle of integrated solid waste management was adopted which entails the use of appropriate technologies. It coverer different types of solid waste from different

⁹⁴Randhi, D. U. D. (2022). Municipal solid-waste management. *School of science, GITAM Deemed (To Be) University, Hyderabad* – 502329. <https://doi.org/10.9734/bpi/mono/978-93-5547-927-3>

⁹⁵Asiedu-Ayeh, E., Guangyu, C., Obiora, S. C., & Asiedu-Ayeh, L. O. (2022). Assessing social responsibility initiatives for public-private partnership success based on multi-criteria decision making: Evidence from municipal solid waste management in Ghana. *Journal of Environmental Planning and Management*, 66(13), 2713–2738. <https://doi.org/10.1080/09640568.2022.2082929>

sources to attain the dual targets of waste reduction and effective waste management.⁹⁶

Mutobe et al. (2022), in their study, *Residents' Participation in Solid Waste Management in Solwezi District, Zambia. Journal of Environment* highlighted that community participation in solid waste management is currently seen as a determinant of successful solid waste management. Cases of failed solid waste management are common in areas where the waste management is regarded as a responsibility of local authorities while the community remains indifferent. Research has shown that public participation in solid waste management is marginal in most African countries. The study revealed that the low community participation in solid waste management in Solwezi was attributed to failure to adequately sensitize residents by the municipal council. Residents' attitudes towards sustainable management of solid waste and community engagement in decisions related to solid waste management by the local authority was token at best. The study recommended sensitization in community participation as well as incentivising champions of community waste management as a way of improving community participation in solid waste management.⁹⁷

Md Raihan Gafur et al. (2022), in their study, *An Assessment to Solid Waste Management System in the Rajshahi City Vodra Railway Slum Through Community Participation* stated that better life is the first requirement of every person and for this a healthier environment is needed. Municipal solid waste is a serious environmental hazard and social problem in Bangladesh. It was found that about 170 tons of different types of solid wastes are being generated daily in Rajshahi. The study found that the municipality which is the sole provider of the solid waste management services neither performed this service efficiently nor fully involved the

⁹⁶Khanna, S., and Chauhan, S., (2022). *Urban solid waste management in municipal corporation Gurugram (MCG), Haryana: An analytical study.*
<https://www.researchgate.net/publication/364387219>

⁹⁷Mutobe, B., Nchito, W. S., & Mubanga, K. H. (2022). Residents' participation in solid waste management in Solwezi District, Zambia. *Journal of Environment*, 2(1), 19–38.
<https://doi.org/10.47941/je.778>

community members to support it.⁹⁸

Assuah, (2023), in his article, *A Lot of People Ignore our Culture When it Comes to Waste Management: Examining the Impacts of Culture on Solid Waste Management in two Canadian First Nations Municipal*, revealed that, SWM approaches in Canadian First Nations have ignored the culture of communities. The study was to examine whether the culture of First Nations have a relationship with MSWN. A qualitative study was based on case study of Peguis First Nation, Manitoba, and Heiltsuk Nation, British Columbia, was conducted, with additional 52 semi-structured interviews. Findings revealed that avoiding waste, taking care of one another, protecting the land, respecting the land, and connection to the land were cultural factors that influenced participants' municipal solid waste management efforts. Rather than that, respondents indicated that applying these cultural factors to municipal solid waste is not widespread because of culture loss; hence, programs that improve the understanding of culture and highlight the importance of cultural beliefs, values, and education in managing waste should be developed. The study concludes that cultural solutions need to be pursued to complement other solutions that aim to improve MSWM.⁹⁹

Mohamed et al., (2023), in their study, *Environmental and Health Effects of Solid Waste Dumpsites in Wadajir District, Mogadishu, Somalia*. The aim of the study was to study the environmental and health effects of a solid waste dumpsite in Wadajir District, Mogadishu, Somalia. The study utilized a prospective case-control analytic approach as well as a cross-sectional study to assess the impact of these dumpsites on the environment. The study revealed that in Wadajir district, the majority of people believed that improper solid waste management leads to water

⁹⁸Md Raihan Gafur, A., S M Mahmudul Hasan Rifat, A., Mahzabin, F., Nazneen Labonno, H., & Nazneen Sultana, M. (2022). *An assessment to solid waste management system in the Rajshahi city Vodra railway slum through community participation*. *International Journal of Environmental Protection and Policy*, 10(2), 22. <https://doi.org/10.11648/j.ijep.20221002.12>

⁹⁹Assuah, A. (2023). "A lot of people ignore our culture when it comes to waste management": Examining the impacts of culture on solid waste management in two Canadian First Nations: *An International Journal of Indigenous Peoples*, 19(2), 466-474. <https://journals.sagepub.com/doi/abs/10.1177/11771801231163635>

and air pollution; similarly, in Dharkeynley district, the majority of respondents believed that improper solid waste management leads to water and air pollution. The study has also revealed in Wadajir district that the majority of the population was affected by malaria during the last six weeks, while in Dharkeynley district, the majority of the population was also affected by this disease, showing that there is a significant association between improper waste disposal and the transmission of malaria. These findings demonstrate that solid waste management is a crucial issue that affects both the environment and human health in the district. The study paper recommends protecting public and environmental health by reducing risks caused by improper solid waste management. It suggests opening landfills in remote areas without habitation and proper monitoring to minimize the impact on nearby residents.¹⁰⁰

Afful et al., (2023), in their study, *Public-Private Partnership in Municipal Solid Waste Management in the Sunyani Municipality of Ghana* assessed the roles, effectiveness and challenges of PPPs in urban waste management in the Sunyani municipality of Ghana. The study revealed that some policies and actions of the local government do not positively facilitate the effective functioning of PPPs in municipal solid waste management. It was also found that lack of effective stakeholder consultation, collaboration and grassroots inclusion in the PPPs which affect the effective management of the increasing volumes of solid waste being generated within the municipality. The study suggested that local authorities should initiate steps to effectively coordinate all the involved private companies and all beneficiaries.¹⁰¹

¹⁰⁰Mohamed, D. A., Yousif, M. E. A., & Abdalla, A. I. (2023). Environmental and health effects of solid waste dumpsites in Wadajir District, Mogadishu, Somalia. *World Journal of Advanced Research and Reviews*, 19(3), 621-631.

¹⁰¹Afful, B. E. B., Addaney, M., Anafo, D., Akudugu, J. A., Borkor, F. K., Yeboah, E. O., & Sampana, J. (2024). Public-private partnership in municipal solid waste management in the Sunyani municipality of Ghana. *Journal of Property, Planning and Environmental Law*, 16(3), 201-217. <https://doi.org/10.1108/jppel-04-2023-0012>

Toro et al., (2023), conducted the study, *Sequential Methodology for the Selection of Municipal Waste Treatment Alternatives Applied to a Case Study in Chile*. The study found out that most municipalities especially in developing countries does not have technical and economic resources to improve their MSWM system. There, tools are needed to be identified in order to put waste into better use. The study presents sequential methodology for the analysis of MSWM alternatives. The method consists of two stages namely: (1) screening available technologies based on a small set of key variables; (2) ordering the selected alternatives by a combination of multi criteria methods that integrate local priorities. For this second stage, a basic series of technical, environmental, economic and social indicators is proposed. The methodology is applied to a case study where current management is limited to mixed MSW disposal in a landfill without gas recovery. Possible seven options for implementing energy recovery in landfill were identified like; using mechanical plants to recover part of recyclable material, treating the organic fraction, and employing refuse-derived fuel and waste to energy incineration, were evaluated together with the current situation and considering four scenarios. The study suggested various alternatives that allow the sustainability of MSWM in the case study to improve. Finally, the best method is to introduce economic instruments that discourage final disposal rather than making municipal waste recovery viable.¹⁰²

Korobka, (2023), in his study, *Legal Problems of Environmental Information in the Management of Solid Municipal Waste* reveals some problems of legal regulation of the MSWM system. The study found accumulated environmental effect in terms of the elimination of unauthorized locations of solid municipal waste and landfills of solid waste. The study realised the importance of the measures and rules that needs to be adopted in order to ensure the implementation of environmental protection projects successfully. These are the minimisation of negative impact on the environment and human health, the importance of improving legislation in terms

¹⁰²Toro, E. R., Martinez, A. L., & Cortazar, A. L. G. (2023). Sequential Methodology for the Selection of Municipal Waste Treatment Alternatives Applied to a Case Study in Chile. *Sustainability*, 2023(15), 7734. <https://doi.org/10.3390/su15097734>

of ensuring access to environmental information in the field of education, processing, disposal and disposal of municipal solid waste is noted. Particular attention is paid to the need to establish transparency of the state environmental management aimed at implementing an Environmental Safety Strategy, one of the main issues of which is the creation of an integrated system for the management of solid municipal waste and the elimination of accumulated environmental damage.¹⁰³

Kumari et al., (2023), in their study, *Role of Artificial Intelligence (AI) in Municipal Solid Waste Management* found out that Waste management incorporates technological, climatic, environmental, and demographic concerns plays a vital role in waste management. Traditional methodologies struggle to analyse, predict, and enhance such complex linear processes but AI tools can help tackle MSWM concerns. AI solves obscure problems, learns from mistakes, and manages uncertainty and incomplete facts. Although much research has been done in this field, few review studies have evaluated AI's potential in MSWM. It has been revealed that AI technologies can be applied in municipal trash management.¹⁰⁴

Olodu & Efameh, (2023), in their study, *Waste to Energy: Review on the Development of Land Fill Gas for Power Generation in Sub-Saharan Africa* realised the development of land fill gas for power generation in Sub-Saharan Africa. In rapidly expanding cities in developing and emerging nations, it has been observed that MSW has increased dramatically, raising public concern about the effects on the environment and public health. In Sub-Saharan Africa today, the garbage of roughly 3.5 billion people is disposed of carelessly. Environmental pollution and its effects on people's quality of life have become more sensitive topics among residents and decision-makers in Sub-Saharan Africa. Additionally, MSWM is becoming a more important topic on the local political agenda. Local decision-makers routinely debate

¹⁰³Korobka, L. E. (2023). Legal problems of environmental information in the management of solid municipal waste. *Courier of Kutafin Moscow State Law University (MSAL)*. 2(3) 183-192. <https://doi.org/10.17803/2311-5998.2023.103.3.183-192>

¹⁰⁴Kumari, N., Pandey, S., Pandey., A. K., & Banerjee, M. (2023). Role of Artificial Intelligence (AI) in municipal solid waste management. *British Journal of Multidisciplinary and Advanced Studies: Engineering and Technology*. 4(3). 5-13. <https://bjmas.org/index.php/bjmas/index>

whether to invest in waste-to-energy technologies as part of their effort to modernize waste management systems.¹⁰⁵

Hector et al., (2023), in their study, *Sustainable Selection of Waste Collection Trucks Considering Feasible Future Scenarios by Applying the Stratified Best and Worst Method*, examined the use of decision support methods such as Multi-Criteria Decision-Making (MCDM) is widespread in MSW management. However, their application mainly focuses on selecting plant locations and the best technologies for waste treatment. Despite the critical role played by transport in promoting sustainability, MCDM has seldom been applied for the selection of sustainable transport alternatives in the field of MSW management. There are a few MCDM studies about choosing waste collection vehicles, but none that include the most recent green vehicles among the options or consider feasible future scenarios. In this article, different engine technologies for collection trucks were evaluated under sustainability criteria in a Spanish city by applying the stratified best and worst method. This method enables considering the uncertainty associated with future events to establish various feasible scenarios. The results show that the best-valued options are electric trucks, diesel trucks, and hydrogen-powered trucks.¹⁰⁶

Moreno-Solaz et al., (2023), conducted the study, *Smart Technological Options in Collection and Transportation of Municipal Solid Waste in Urban Areas: A Mini Review*. The study focused on examining numerous issues such as lack of technological resources, strategical management, social awareness and public participation on waste management. The study revealed that the technological methods in most developed countries are designed based on their geographical stretch, climatic factors, waste characteristics and compatible

¹⁰⁵Olodu, D. D, & Efameh, A. (2023). Waste to energy: Review on the development of land fill gas for power generation in Sub-Saharan Africa. *Black Sea Journal of Engineering and Science*. <https://www.researchgate.net>

¹⁰⁶Moreno-Solaz, H., Artacho-Ramírez, M. Á., Aragonés-Beltrán, P., & Cloquell-Ballester, V. A. (2023). Sustainable selection of waste collection trucks considering feasible future scenarios by applying the stratified best and worst method. *Heliyon*, 9(4). <https://scholar.google.com/scholar?hl>

technology, resulting in sustainable MSW management. However, developing countries have followed the same monotonous approach in managing their MSW, which fails in technological process. The case study provides a valuable resource for researchers and policymakers to frame a better technological process based on the recent technological interventions, infrastructure development, and social and economic status.¹⁰⁷

Hussain et al., (2023), in their study, *Municipal Solid Waste Management in Skardu: Current Status, and Corrective Measures* has stated that solid waste management is a marginalized sector in Gilgit Baltistan. The situation posed health hazard especially Skardu district of 112997 residents. The study was devised to calculate, characterize, and analyse the past status, and current position of municipal solid waste production, so that necessary management practices and corrective measures can be carried out more efficiently in the study area. It was found that the method used to collect waste was: door-to-door collection, placement of waste bins, and collection from the arterial roads. Waste was collected manually in polythene bags, handcarts, and baskets. The findings revealed that approximately 45-50 tonnes of waste was generated per day in the winter and in the summer it increases to 50-55 tonnes. The average waste generation was 0.43 kg per capita per day and is increasing at a rate of 2.28 percent annually. The main sources of waste were commercial and household waste contributing approximately 60 percent and 40 percent of the total waste production respectively. There was no scientific disposal system for the collected waste which is dumped on the dumping sites by utilizing available resources considering environmental protection agency regulations along the Indus River bank. Thus specific steps should be taken to develop a proper scientific disposal system of collected wastes by incorporating the experts' expertise and modern

¹⁰⁷Singh, D., Dikshit, A. K., & Kumar, S. (2024). Smart technological options in collection and transportation of municipal solid waste in urban areas: A mini review. *Waste Management & Research*, 42(1), 3-15. <https://scholar.google.com/scholar?hl>

technologies.¹⁰⁸

Karimi et al., (2023), in their article, *A Systematic Review of the Latest Research Trends on the Use of Satellite Imagery in Solid Waste Disposal Applications from 2012 to 2021* investigate research trends and to identify knowledge gaps on the use of satellite-based applications. The total of 170 studies published over the last decade from 2012 to 2021 were examined and classified using a bibliometric approach. The study revealed that out of 72 short-listed studies, 44.4 per cent were carried out in Asia, followed by Europe with 18.0 per cent. Asia is also a leading region in the use of multiple satellite products. Only two satellite products were utilized in African studies. The absence of local satellites could potentially be the reason behind the sole use of global satellite imagery. Globally, landsat contributed 70.8 per cent of the total studies. The majority of studies 56 per cent applied image classification methods to study changes in land use and land cover. The temporal trend reveals a general increase in the total number of studies, particularly for suitable site detection and disposal-site-induced anomaly detection. This review directly addresses the knowledge management aspect of data-driven solid waste management.¹⁰⁹

Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection of Germany, (2023), in the study, *The Development of Waste Policy in German*, describes how Germany evolves to be on top globally in MSWM. During the 1980s, waste disposal sites and incineration plants were scarce in Germany. Such situation forces the government to put more efforts on recycling of wastes in order to overcome the problem. In 1990, the producer's responsibility law was introduced, so that any producer of something that may cause waste must be

¹⁰⁸Hussain, I., Khan, K. M. I., Ali, S., Ayub, M., Fehmi, A., & Hussain, Z. (2023). Municipal solid waste management in Skardu: Current status, and corrective measures. *Proceedings of the Pakistan Academy of Sciences: B. Life and Environmental Sciences*, 60(3), 455-562. <https://ppaspk.org/index.php/PPAS-B/article/view/1176>

¹⁰⁹Karimi, N., Ng, K. T. W., Mahmud, T. S., Adusei, K. K., & Kerr, S. (2023). A systematic review of the latest research trends on the use of satellite imagery in solid waste disposal applications from 2012 to 2021. *Environments*, 10(7), 128. <https://www.researchgate.net/publication/372571251>

responsible of waste prevention. In 1996, the Closed Substance Cycle and Waste Management Act and the 2020 Circular Economy Act extended this policy. In 2005, landfilling of biodegradable and other organic waste phased out and Germany became a zero landfill country in the world. Today, waste management has become a large economic sector with about 280 000 employees in 15 000 waste treatment plants and contributing a revenue of 80 billion Euros annually.¹¹⁰

Di Foggia & Beccarello, (2023), in their study, *Efficient Scale and Scope of Business Models Used in Municipal Solid Waste Management* compares the efficiency of alternative municipal solid waste management business models: a single provider against multiple providers. The study revealed that a single-provider waste management business model is efficient compared to multiple provider.¹¹¹

Nambahu, (2023), in her dissertation, *Evaluation of Municipal Solid Waste Management Practices in Karibib, Namibia* revealed that the collection of MSW in Karibib town was not in line with the NSWMS requirements as it failed to cover all the populated areas in the town. The urban poor living in informal residential areas were found to be suffering most from the lack of collection services, which in turn exacerbated illegal dumping and littering. Transportation for MSW was found to be sufficient in the town; however, challenges were the lack of garages in the town and problems accessing parts that had to be acquired from elsewhere, hampering the collection process. The disposal of MSW was also found to not be in line with the requirements set out in the NSWMS, which jeopardised public health and the environment. No processing of MSW was found to be taking place in the town. Waste reclaiming that was taking place at the dumpsite was done by the private formal and informal sectors. The informal sector was found not to have been incorporated in any way into the formal waste management system of the town and

¹¹⁰Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection of Germany. (2023). *The development of waste policy in Germany*. <https://www.bmuv.de/WS585-1>

¹¹¹Di Foggia, G., & Beccarello, M. (2023). Efficient scale and scope of business models used in municipal solid waste management. *Center for Open Science*. <https://doi.org/10.31235/osf.io/8ybyqw>

its contribution not acknowledged. The outsourcing of the collection and disposal functions, the creation of community-based waste management initiatives, the passing of by-laws and the formalisation of the informal sector were found to be some of the most effective methods that could be used by Karibib Town Council to alleviate some of the problems that the town is facing.¹¹²

Kiguli et al., (2023), in their study, *Compliance and Implementation of Municipal Solid Waste Management Laws and Regulations in Mukono District, Uganda* assessed the compliance and implementation of municipal solid waste management laws and regulations in Mukono district, Uganda. The aim was to characterize the solid wastes generated in Mukono municipality; determine the mechanisms of implementation of solid waste management laws and regulations in Mukono municipality; and to assess the effectiveness of the solid waste management laws and regulations in Mukono municipality. A case study design complimented with both quantitative and qualitative approaches were employed to obtain the required data to answer the stated objectives. A questionnaire and documentary review were used to collect the required data for the study. There are solid waste management laws and regulations used in the management of wastes in Mukono municipality. The study found out that there has been an ineffective implementation of municipal solid waste management laws in Mukono municipality which were most likely brought about by poor leadership, inappropriate allocation of funds and low levels of awareness among members of the local community. It is recommended that Institutions like the Environment Police and the National Environment Authority should work hand in hand to strengthen the implementation of solid waste management laws and regulations in the country. The government should enhance sensitization campaigns about what the solid waste management laws and regulations

¹¹²Nambahu, T. M. N. (2023). *Evaluation of municipal solid waste management practices in Karibib, Namibia* (Doctoral dissertation, Stellenbosch: Stellenbosch University). <https://scholar.google.com/scholar?hl>

entail. In addition, funds required for implementation of the laws and regulations should be appropriated and be used for the intended purposes.¹¹³

Ivanova & Lisina, (2023), conducted the study, *Municipal and Industrial Urban Waste: Legal Aspects of Safe Management*. The aim of the study was to analyse the current condition of solid waste management systems in developed and developing countries and identifies the features and prospects of waste management, including the one in Russia. It is established that the existing set of organisational, sanitary, and legal measures, and legal regulation of relations and law enforcement practices in the field of solid municipal waste management in many developing countries is still in the forming stage. It was found that there is there is positive experiences of countries in implementing sustainable systems of safe waste management and the positions of judicial bodies on controversial issues of waste management in the cities. Environmental policy plays vital role in safe waste management at all levels of public authority, as well as improving legislation in the field of waste management.¹¹⁴

Amos et al., (2024), in their study, *An Assessment of Municipal Solid Waste Management System in Oshogbo, Osun State Nigeria: Challenges and Prospects* assessed the challenges and prospects of municipal solid waste management system in Oshogbo, Osun State, Nigeria. The study specifically looked into the current - status, the performance of municipal solid waste social control system of the city, and the households solid waste social control practice. The results showed that Osun state waste management agency is not leaving up to its responsibility and delay in collection of wastes, the activity of municipal solid waste social control of the town is majorly executed by micro and macro scale enterprises with very limited contribution of the agency saddled with such responsibilities. Furthermore, the study

¹¹³Kiguli, D. K., Nabukonde, A., & Barakagira, A. (2023). Compliance and implementation of municipal solid waste management laws and regulations in Mukono District, Uganda. *Archives of Current Research International*, 23(7), 194-204. <https://www.researchgate.net/publication/374192389>

¹¹⁴Ivanova, S., & Lisina, N. (2023). Municipal and industrial urban waste: Legal aspects of safe management. *Laws*, 12(3), 48.

revealed that there is no involvement of non-governmental organization and private sectors as the government of the day portrayed it. Likewise, they are uncovering in the rain, light and heat, they do not take cognizance of sustainable solid social control actions for instance, reprocessing, reclaim and composting. Except, for the prohibited solid waste disposal. In addition, they are less motivated to clean their immediate environment. Thus, the study recommends that government waste management agency in conjunction with non-governmental organization should commence training on waste social control practices, with focus on women as agent of change in a community, while the institutions should leave up to their responsibilities.¹¹⁵

Kadam, (2024), in his study, *Community Participation in Solid Waste Management in Rural Maharashtra* elaborated that community participation in solid waste management in rural Maharashtra is crucial for sustainable development and public health. The study explores how local communities can be mobilized to engage in solid waste management, highlighting the importance of active involvement in planning, implementing, and monitoring waste management practices. The study revealed barriers and opportunities, emphasizing that community engagement can lead to better resource allocation, increased awareness, and more sustainable practices.¹¹⁶

Maskun et al., (2024), in their study, *Strengthening Indonesia's Waste Management Laws: Compliance with Public Health and Marine Conservation Norms* examines the legal accountability of household waste management in Makassar City within the framework of Indonesian environmental law and its alignment with Sustainable Development Goals (SDG) 3 (Good Health and Well-being) and SDG 14 (Life Below Water). The findings highlight that ineffective

¹¹⁵Amos, O., Ademola, O. A., Abiodun, O. A., Olalekan, O. E., Opeodu, O. T., & Bode, A. M. (2024). An assessment of municipal solid waste management system in Oshogbo, Osun State Nigeria: Challenges and prospects. *International Journal of Multidisciplinary Research and Growth Evaluation*, 5(1), 687-696.

¹¹⁶Kadam, D. D. (2024). Community participation in solid waste management in rural Maharashtra. *Igi Global*, 69–100. <https://doi.org/10.4018/979-8-3693-8527-2.ch005>.

enforcement of criminal sanctions has contributed to the persistence of poor waste management practices. Instead, administrative sanctions, such as fines and corrective measures, have demonstrated greater effectiveness in ensuring compliance. The study concludes that an effective regulatory framework, coupled with community engagement and structured law enforcement, is essential for achieving intergenerational sustainability and environmental protection in Indonesia.¹¹⁷

Mashiane & Odeku, (2024), in their study, *Sustainable Solid Waste Management Practices in South Africa: A Comparative Legal Analysis* analyses sustainable solid waste management practices in South Africa and draws lessons from England and Kenya focusing on solid waste management, collection and disposal. England is a developed country with advanced waste management systems, while Kenya is a developing country facing similar solid waste management challenges to South Africa's. While South Africa has its legal framework on solid waste management, the lessons from both England and Kenya are to improve and strengthen waste management practices and enforcement in South Africa. The findings of the study are important for policy development. The study concludes that South Africa's legal and policy framework needs to be inclusive and enhanced for effective enforcement of sustainable solid waste management.¹¹⁸

Usha, (2024), in their study, *Solid Waste Management* elaborated that solid waste management is a critical aspect of urban sustainability, encompassing the collection, transportation, treatment, and disposal of solid waste materials. Effective solid waste management practices are essential to minimize environmental pollution, conserve natural resources, and promote public health. The study revealed that public education and awareness campaigns are crucial to promote waste reduction and

¹¹⁷Maskun, M., Mohamad Khalid, R., Ratnawati, R., Mutawalli, M., Anggara, W., & Ramli, R. N. R. (2024). Strengthening Indonesia's waste management laws: Compliance with public health and marine conservation norms. *Substantive Justice International Journal of Law*, 7(2). <https://doi.org/10.56087/substantivejustice.v7i2.298>

¹¹⁸Mashiane, K., & Odeku, K. (2024). Sustainable solid waste management practices in South Africa: A comparative legal analysis. *Journal of Comparative Law in Africa*, 11(2), 1–42. <https://doi.org/10.47348/jcla/v11/i2a1>

recycling practices. The study underscores the importance of sustainable solid waste management practices in creating cleaner, healthier, and more resilient communities.¹¹⁹

Paterylo & Aliksieienko, (2024), in their article, *Public Administration of Domestic Solid Waste Management as a Direction for the Protection of Consumer Rights* identified the public administration of solid household waste management as a direction of consumer rights protection. Attention was drawn to the positive aspects of public administration regarding the management of solid household waste as a means of protecting consumer rights in the Dnipropetrovsk region. The study found that the existence of the National Waste Management Strategy in Ukraine until 2030; the presence of a solid household waste collection and disposal system; availability of municipal solid waste landfills; and gradual formation of awareness among the population regarding the need to segregate resource-valuable components from the general flow of solid household waste. It was concluded that lack of a systematic approach to creating effective management and handling of solid household waste; insufficient funding of solid waste management and management; lack of waste transfer stations and waste processing enterprises are the problems and challenges facing solid waste management to succeed.¹²⁰

Aleisa et al., (2024), in their study, *Characterization of Municipal Solid Waste in Kuwait: Sector-Specific Composition Analysis and Implications* elaborated that MSW characterization plays a pivotal role in devising effective waste management strategies conducive to fostering a circular economy. It was found that there is a significant variation across most waste categories. The plastic waste proportion has increased by 48.5 percent compared to 2013 data, despite awareness campaigns. Paper waste has also increased in proportion from 6.8 percent to 16.2

¹¹⁹Usha, B. R. M. (2024). Solid waste management. *International Journal of Scientific Research in Engineering and Management*, 08(03), 1–11. <https://doi.org/10.55041/ijrem29308>

¹²⁰Paterylo, I., & Aliksieienko, I. (2024). Public administration of domestic solid waste management as a direction for the protection of consumer rights. *Analytical and Comparative Jurisprudence*, 1, 428–432. <https://doi.org/10.24144/2788-6018.2024.01.75>

percent; this increase is associated with the mixed paper subcategory, which is mostly used for packaging. The composition data provided in this study are necessary for long-term monitoring, strategy assessment, and legislation associated with waste reduction and remediation.¹²¹

Balabenko et al., (2024), in their article, *Urban Aspects of Selecting Lands for Municipal Solid Waste Disposal Facilities* identified the main approaches to the selection of a land plot for municipal solid waste disposal facilities, taking into account urban planning features. According to the analysis and theoretical studies, the selection of a land plot for municipal solid waste disposal facilities implies an interdisciplinary study and design of the territory, planned for development. The main objectives of the study include environmental protection requirements, building codes and regulations, sanitary and hygienic, engineering-environmental and urban planning rules. The paper analyses the main aspects of organising a land plot for municipal waste disposal facilities. The greatest attention is paid to the study of the regulatory framework in the field of urban planning in terms of determining the legal status of territories for the location of municipal solid waste disposal facilities. The necessary industrial regulations, defining the composition of requirements for the selection of a land plot for municipal solid waste disposal facilities, which should be improved taking into account urban development, are highlighted.¹²²

Tandiwe & William, (2024), in their study, *Value Addition of Recyclable Solid Waste Materials: The Case of Namibia* elaborated the importance of recycling of solid waste in Namibia. Study findings revealed that in Namibia, recycling industry processes a wide range of recyclable products such as plastic, paper and glass bottles. Except for plastic, the value addition of recovered materials was limited to the pre-processing stage. The full growth of the industry is still to be realised.

¹²¹ Aleisa, E., & Al-Jarallah, R. (2024). Characterization of municipal solid waste in Kuwait: Sector-specific composition analysis and implications. *Journal of the Air & Waste Management Association*, 74(9), 623–638. <https://doi.org/10.1080/10962247.2024.2378102>

¹²² Balabenko, E. V., Chernysh, M. A., Oberemok, E. N., & Bogak, L. N. (2024). Urban aspects of selecting lands for municipal solid waste disposal facilities. *Journal of Izvestiya Vuzov. Investitsii. Stroitelstvo. Nedvizhimost*, 13(4), 726–738. <https://doi.org/10.21285/2227-2917-2023-4-726-738>

Policy and intervention programs should promote more value addition in raw materials in the country as a whole considering the benefits to sustainable economic growth.¹²³

Singh et al., (2024), in their article, *Recent Developments in Municipal Solid Waste Management in India* identified urbanization, industrial expansion, and fast adoption of fashion-oriented lifestyle choices have all contributed to the substantial increase in waste generation and, consequently, the rise in various types of problems associated with MSWM in India. Citizens unawareness and attitude toward waste disposal, the unorganized nature of the informal waste sector, financial constraints, and ineffective implementation of laws and policies are the major challenges most states and cities face. Furthermore, the study proposed that there is an urgent need for strategic implementation of integrated solid waste management regulation and replicating existing models for best practices with effective transfer of knowledge and technology.¹²⁴

Bredun et al., (2024), conducted the study, *Regional Specifics of Using Community Bins in Waste Management: A Case Study of Rural Communities in Poltava Region (Ukraine)*. The study aimed to examine the waste collection system through the use of specialized community bins. The study outcomes revealed that the vast majority of rural settlements in the Poltava region were deprived of such an organizational structure as community waste systems; there was an irrational placement of special sites for community urns, which prevented the full collection of household waste from the population. The study found that the priority direction for optimizing the use of public household bins is the use of the entire range of bin capacities from 0.12 to 1.1 m³, which will reduce capital costs. Conclusion: The study filled a gap in organizational approaches to the development of solid waste

¹²³Tandiwe, M., &William., C. (2024). Value addition of recyclable solid waste materials: The case of Namibia. *African Journal of Social Sciences and Humanities Research*, 7(2), 1–19. <https://doi.org/10.52589/ajsshr-mnkk2swm>

¹²⁴Singh, R., Vidyarthi, A. K., & Majumder, C. B. (2024). Recent developments in municipal solid waste management in India, *Igi Global*, 407–440. <https://doi.org/10.4018/979-8-3693-4054-7.ch016>

management systems in rural areas and communities of the Poltava region, which increases the efficiency of waste collection from the population and reduces capital costs for organizing the process.¹²⁵

Mishra, (2024), in the study, *Unravelling the Environmental Challenges: A State-of-the-Art Review of the Legal Framework of Solid Waste Management in Metropolitan Cities of India* emphasizes the importance of legal regulations in ensuring effective waste management to address environmental concerns. The research highlighted the need for coordinated efforts among public authorities, adopting technologically advanced best practices globally, and incorporating Waste Hierarchy and Circular Economy concepts for efficient waste management. The study found that by addressing challenges like poor community engagement, understaffing, and political interference, the study underscores the importance of robust legal frameworks and strategic policies to mitigate environmental impacts and improve waste management practices in metropolitan cities. The study recommends enhancing transparency in environmental information, establishing sustainable waste management systems, improving legislation, and promoting stakeholder engagement.¹²⁶

Atem, (2025), in his article, *Effective Waste Management in Urban Centres in South Sudan* assess effective solid waste management in urban centres in South Sudan with special reference to Juba City Council. The study revealed that paper and carton, yard trimmings, food, scraps, wood, glass, plastics, metal and clothes were the types of solid waste generated within the urban centres in South Sudan. The study further found that urban population growth significantly affects solid waste management in Juba city and poses the challenges of solid waste segregation since

¹²⁵Bredun, V., Choudhary, R., & Kumar, A. (2024). Regional specifics of using community bins in waste management: A case study of rural communities in Poltava Region (Ukraine). *Trends in Ecological and Indoor Environmental Engineering*, 2(4), 10–17. <https://doi.org/10.62622/teiee.024.2.4.10-17>

¹²⁶Mishra, P. (2024). Unravelling the environmental challenges: A state-of-the-art review of the legal framework of solid waste management in Metropolitan Cities of India. *Chinese Journal of Environmental Law*, 9(1), 29-47.

the waste is indiscriminately disposed of. In addition, insufficient funding led to inadequate provision of facilities and equipment for solid waste management coupled with inadequate enforcement of public health legislations and solid waste management by-laws. Finally, the study recommended the use of integrated solid waste management, adequate resourcing, law enforcement and strengthening of the capacity of the Juba City councils' policies and regulations.¹²⁷

Al-Rashed, (2025), conducted a study, *Assessing Public Perception and Parametric Analysis of Municipal Solid Waste Management Solutions in Tabuk City, Saudi Arabia* emphasised that accelerated urbanization, population growth, and industrial revolution have resulted in significant environmental degradation and health issues for residents due to municipal solid waste. The study revealed that an absence of recycling systems since the majority of respondents were uninformed of existing practices and expressed a readiness to engage in recycling programs if established. It was found that lack of awareness along with authority responsibility is the most influential factor impacting poor waste management practice. Finally, it was concluded that enhanced community education, organized municipal solid waste recycling system and governmental restrictions to mitigate environmental damage and foster sustainable waste management is strongly encouraged in Tabuk city.¹²⁸

Ejike-Alieji et al., (2025), in their study, *Household Knowledge and Vulnerability Assessment of Sustainable Solid Waste Management in Ebonyi State, Nigeria* revealed that vulnerability was high in 73 percent of studied households while 13 percent had high vulnerability to climate change impact. The results further show that 14 percent, 54 percent and 47 percent of the households in Ikwo, Abakaliki and Afikpo, respectively had an unsatisfactory knowledge of sustainable solid waste management practices and awareness on policy or law. The study concluded that variations in knowledge within specific geographical region play a role in their

¹²⁷Atem, P. G. (2025). Effective waste management in urban centres in South Sudan. *Journal of Environment*, 5(1), 1–16. <https://doi.org/10.47941/je.2488>

¹²⁸Al-Rashed, W. S. (2025). *Assessing public perception and parametric analysis of municipal solid waste management solutions in Tabuk City, Saudi Arabia*. *Scientific Reports*, 15(1), 11304.

adoption of sustainable solid waste practices and recommends improving knowledge of the identified vulnerable households in order to hasten achievement of the sustainable development goal 12, target 3.¹²⁹

Singh, (2025), conducted the study, *Identifying and Analysing the Key Drivers and Challenges of Environmental and Socio-Economic Externalities Caused by Municipal Solid Waste Management in Delhi*. The study aimed to determine and examine the major drivers and challenges pertaining to the environmental and socio-economic externalities arising from poor MSW management in Delhi. The study revealed that the imperative necessity for integrated policy reforms, improved community engagement, and scalable infrastructure solutions to avert the cascading impacts of suboptimal MSW practices. Furthermore, the study recommended that policymakers, waste management agencies, and civil society organizations should put more efforts on MSWM.¹³⁰

Research Gap

Little work has been done on MSWM in Oshakati town of Namibia. As a result, no clear and enough findings had been made to combine all aspects of the functions of MSWM starting from waste generation, segregation, storage, collection, transportation, disposal and processing. A study conducted by Mughal on waste management in northern towns of Namibia included Oshakati town but did not cover the functions, legal aspects, public private partnership, and community involvement in MSWM of Oshakati town, Namibia. Furthermore, his study did not fully examine laws, policies and legislations that are governing the municipal waste management in

¹²⁹Ejike-Alieji, A. U. P., Nzeadibe, T. C., & Ezeah, C. (2025). Household knowledge and vulnerability assessment of sustainable solid waste management in Ebonyi State, Nigeria. *The Journal of Solid Waste Technology and Management*, 51(1), 59–71. <https://doi.org/10.5276/jswtm/iswmaw/51si1/2025.059>

¹³⁰Singh, D. (2025). Identifying and analysing the key drivers and challenges of environmental and socio-economic externalities caused by municipal solid waste management in Delhi. *International Journal for Research in Applied Science and Engineering Technology*, 13(4), 3909–3917. <https://doi.org/10.22214/ijraset.2025.69165>.

Oshakati town, Namibia.¹³¹

Due to the unfilled gaps in their studies, a researcher would like to conduct an empirical study based on sources, types and MSWM functions; legal framework, Public Private Partnership, and community participation and perception in solid waste management in Oshakati town, Namibia.

Statement of the Problem

The Ministry of Environment and Tourism (MET) is the custodian body spearheading the management of SW in Namibia. As a result of rapid waste threat in Namibia, the National Solid Waste Management Strategy (NSWMS) was drafted in 2017. The aim was to ensure that the future regulations, directions, funding and action plans for SWM improvements are properly co-ordinated and consistent with national policy, and to facilitate co-operation with all stakeholders. The strategy directed that all municipalities with a population of more than 20, 000 residents at National Population and Housing Census of 2011 are required to have no open burning of waste but to cover the waste on a weekly basis. Furthermore, the dumping waste must be at least 500 metres away from residential or planned housing area. There are some key strategies of NSWMS that a researcher aligning to this study:

1. The waste collection system at most municipalities is generally operating to an adequate standard compared to waste disposal. However, there is scope for improvement at all municipalities and there are particular shortfalls with waste collection from informal areas of housing;
2. The legal framework for solid waste management is weak, and an approach for the step-by-step tightening of standards is needed. In particular, minimum standards for waste disposal need to be adopted and implemented;
3. There is significant interest from the private sector in solid waste management services, but more support is needed from the central government to facilitate private sector participation;

¹³¹Mughal, M. I. (2014). *Waste Management in Northern Towns of Namibia* [Bachelor's thesis, Tampere University of Applied Sciences], Tampere, Finland. <http://core.ac.uk>

4. Participation of households through more awareness raising activities is needed.¹³²

The Oshakati town council's Waste Management Policy statement of 2015 outlines the system of work that will enable the OTC and its staff members to ensure that all wastes are disposed off correctly, without endangered human health and the environment.¹³³

Residents who are living in informal settlements of the Oshakati town are more suffering compared to those staying in formal residential area. Residents living in informal settlements of Oshakati east such as Kandjengedi and Oneshila are longing for better hygiene services. The town council does not have enough skip containers where residents who does not have dumping bins drop wastes for collection. This situation forces some residents to dump wastes in open area and as a result it attracts dogs and flies. Some residents unlawfully burn those rubbish possibly on dry grasses surrounding that may cause uncontrolled fire and smoke. This situation pose threat especially to their kids when playing around. They expressed that, wastes are being dumped in streets and on uncovered ditches and during rainy season, they become full of water and mosquitoes breeds in.¹³⁴

The researcher would like to fill the gap between directives from NSWMS of 2017 by empirically find how the Oshakati town is complying to it.

Scope of the Study

The scope of the study is narrowed to analyse the types, sources and functional element of municipal solid waste management; solid waste management related laws, legislations, policies, and institutional set up; role of public private partnership in municipal solid waste management; and community participation,

¹³²Ministry of Environment and Tourism. (2017). *National solid waste management strategy for Namibia – 2017*. <http://www.oneplanetnetwork.org>

¹³³Oshakati Town Council. (2015). *Waste management policy 2015*, Oshakati, Namibia. Print

¹³⁴Ashipala, N. (2019, August 29). Municipal services elude Oshakati east. *New Era*. <https://neweralive.na/posts/municipal-services-elude-oshakati-east>

opinions and perceptions in municipal solid waste management in Oshakati town. Though hospital wastes are solid by nature, it was not the part of the study. The study only focused on municipal solid waste management.

Objectives of the Study

1. To study the various types and sources, of solid waste in Oshakati town, Namibia,
2. To examine the environmental related laws, legislations, policies and institutional setup existing in solid waste management in the Oshakati town, Namibia,
3. To study the role of Public Private Partnership in solid waste management in Oshakati town, Namibia,
4. To assess the opinions and perceptions of the community members and their participation in solid waste management and environmental impact in Oshakati town, Namibia and
5. To find out the problems and challenges being facing the Oshakati town in rendering solid waste management services.

Research Questions

In light of the problem statement above, the research questions were as follows:

1. What are the various types and sources of solid waste in Oshakati town, Namibia?
2. What are the environmental related laws, legislations, policies, and institutional set up existing in solid waste management in Oshakati town, Namibia?
3. What is the role of Public Private Partnership in solid waste management in Oshakati town, Namibia?
4. What are the opinions and perceptions of community members and their participation in solid waste management and environmental impact in Oshakati town, Namibia?
5. What are the problems and challenges being facing the Oshakati town in rendering solid waste management services

Significance of the Study

The study oversees the achievement of NSWMS on improving the SWM in Oshakati town. It will promote awareness on waste prevention and find the effective and efficient way of waste management. Furthermore, it drives the Oshakati town council to find a sustainable way of waste management and make improvements. This will benefit the entire Oshakati town and Othingo village residents where the landfill site is located to live in a healthy environment.

Methodology

In study design, an attempt has been made to figure out the statement of the problem, objectives, research questions, methodology, and the respondents personal background.

Design of the Study

In the methodology of the research, scope of the study, data source, design of the study, sampling design, respondent's selection, interview schedule, data collection method, data processing, data analysis and presentation of the report is explained.

Sources of Data

Both primary and secondary data sources were used for the study. Primary sources of data were gathered from the interviews with officials belonging of the OTC waste management department and the public relations officer; selected household heads from Othingo village; contractors; and the community members of Oshakati town. Secondary sources of data from previous studies such as journals, documentary analysis and books were explored as well and used for the study.

Study Design

As this is an empirical study, no hypothesis test was done. Hence, the study is based on descriptive design on solid waste management practices in Oshakati town, Namibia. The present study is based on descriptive design. Mixed method approach combining both qualitative and quantitative method was adopted to collect primary

data for the study.

Sampling Design

The Oshakati town residents, solid waste management officials, contractors in PPP with Oshakati town, and the Residents of Othingo village where the dumping site is located form a part of the study. For selecting study sample, purposive non-probability sampling method was adopted to select samples.

According to the NPHC of 2023, there are about 58, 696 inhabitants in the Oshakati town.¹³⁵ The researcher's aim was to find out how the Oshakati town is complying to the National Solid Waste Management Strategies of 2017 by looking to the: Various types and sources of solid waste and how they are managed; examine the environmental related laws, policies, legislations and existing institutional set up; the PPP role; and opinions and perceptions of the community members and their participation in solid waste management including environmental impact.

The Oshakati town is demarcated into 13 waste collection zones. They are: Oshakati East Residential, Extension 16; Oshakati East Red Zone; Ompumbu, Industrial Area, Game; Oshakati West North; Uupindi South; Okandjengedi, Onawa; Oshoopala, Bank Windhoek, Sky Location; Oshakati West, South, Eemwandi, UNAM; Uupindi North; Oneshila; Evululuko West; Evululuko East; Ekuku and Ehenye.

Disproportionate Stratified Probability Sampling method was adopted to select the sample from 13 waste collection zones. The researcher conducted personal interviews with 10 household heads from each zone totalling to 130. The researcher walked around in the Oshakati town and observe the conditions of solid waste. Furthermore, the researcher purposively selected ten households in the surrounding of the Othingo dumpsite. The researcher wanted to contact all officials of OTC but only contacted five. The five officials of OTC are as follows: Corporate

¹³⁵Namibia Statistics Agency. (2024). *Namibia population and housing census - 2023, main report*. <https://nsa.org.na/document/2023-population-and-housing-census-main-report/>

Communication Officer (Town Spokesperson); Manager of Public Health and Environmental Management; Waste Management Officer; Waste Collection and Disposal Officer (Cleansing Officer); and Transport (Operator/Driver). There are 13 operating refuse removal contractors in PPP with the Oshakati town. Each driver from waste remover contractor was given questionnaires for primary data purpose. The population of the study in the general town for the larger group from which the sample was selected for the present study was 158 respondents.¹³⁶

Data was presented and interpreted in tables and narrative form. The researcher classified similar responses and put them into themes and categories. This helps the researcher to examine the interview transcript and documentary notes before identifying the pattern and organizing the data into categories. Document Analysis also helps the researcher to evaluate the solid waste management in Oshakati by analysing documents.

Selection of the Respondents

As the study is on municipal solid waste management in Oshakati town, hence the targeted respondents are from Oshakati town.

The researcher collected data from five (5) officials from OTC as follows: Corporate Communication Officer (Town Spokesperson), Manager of Public Health and Environmental Management, Waste Management Officer, Waste Collection and Disposal Officer (Cleansing Officer), and a (Operator/Driver). Furthermore, the study also includes one hundred and thirty (130) community members of Oshakati town; thirteen (13) contractors in PPP with the OTC; and ten (10) residents from the Othingo village where the dumping site is located, totalling to one hundred and fifty-eight (158) respondents.

¹³⁶Oshakati Town Council. (2015). *Waste management policy 2015*, Oshakati, Namibia. Print

Table 1.1 Respondents and Their Represented Groups

Serial Number	Sampling	Sample Size (%)
1	Oshakati Town Council Officials	05 (3)
2	Community Members of Oshakati Town	130 (82)
3	Public Private Partnership Contractors	13 (8)
4	Othingo Village Residents	10 (7)
	Total	158 (100)

Source: *Field study conducted during November 2023 to February 2024*

Table 1.1 shows the respondents involved in the study as follow: 3 percent of OTC Officials; 82 percent of community members of Oshakati; 8 percent of PPP contractors in PPP with OTC; and 7 percent represented the Othingo village residents.

Methods of Data Collection

The following data collection tools and techniques were used: A desk study, field data collection, semi-structured administered interviews, questionnaires and observation method. The researcher found these tools and techniques suitable as it collects data in different forms. The desk study comprises of a review of existing documents published by previous researchers on the same topic worldwide while the field data collection involved primary data. Participants, observation and interviews forms a part of primary data while hard copy documents that were not accessible online provided by the town council officials form a part of secondary data. The interviews were conducted with the help of semi-structured interview schedule and contained open-ended questions conducted on a face to face basis with Senior Environmental Health Officer of Oshakati Town Council. Participant observations were done by capturing photographs by using phone camera and taking notes. All the three data collecting tools were self-designed.

Data Processing

Data processing was done using descriptive statistics and inferences in the form of simple percentages and averages.

Data Analysis

Analysis of data is an explicit step in theoretically interpreting data collected by using specific strategies to transform the raw data into a process form of data. Analysis of data involves working with data, organising it, breaking it down, synthesizing it, searching for patterns, discovering what is important, what is to be learnt and deciding what a researcher will tell others. This made it easier for a researcher to examine the interview transcript and documentary notes before identifying the pattern and organising the data into categories. Descriptive statistics data analysis was used for presentation of the findings.¹³⁷

Report Presentation

When raw data was processed and analysed, report writing followed. Enough care was considered to present the report as required by the study designed earlier.

Chapterisation

The study is divided into six chapters as follows:

The first chapter is an introductory to the study which briefly overviews about Municipal Solid Waste Management in Oshakati town, Namibia. It briefly elaborates how Municipal Solid Waste is managed in Namibia towns in general and in Oshakati town specifically. The chapter comprises of introduction, literature review, problem statement, scope and objectives of the study, research questions, and the methodology applied for the study and chapterisation.

The second chapter is “Types and Sources of Solid Waste in Oshakati town, Namibia”. The chapter attempts to study the different types of solid waste, the

¹³⁷Kumar, R. (2014). Research methodology (4th ed.). Los Angeles: Sage Publications Ltd

sources where solid wastes are being generated. Furthermore, the study examines the solid waste prevention, segregation, storage, collection, transportation, disposal, recycling, and incineration.

The third chapter is “The Environmental Related Laws, Legislations, Policies, and Institutional set up Existing Governing the Solid Waste Management in Oshakati town, Namibia”. The chapter identify the legal and institutional framework guiding the management of municipal solid waste in Oshakati Town, Namibia.

The fourth chapter is “The Role of Public Private Partnership in Solid Waste Management in the Oshakati town, Namibia”. The chapter starts with an overview of Public-Private Partnership concept and the meaning in general and its application in Namibia in general and by the Oshakati town in specific.

The fifth chapter is “Results and Discussions” of the study. The chapter presents the results and findings from the interview schedule and interprets the study findings and explains their importance. The fourth study objective “The Opinions and Perceptions of Community Members and their Participation in Solid Waste Management and Environmental Impact in Oshakati town, Namibia”, and the fifth study objective “Problems and Challenges Facing the Oshakati town in Rendering Solid Waste Management Services” are joint together and form this chapter.

The sixth chapter is “Summary, major findings, conclusions, and suggestions” comprises of all chapters starting from Chapter I to Chapter V. The chapter gave suggestions and recommendations for improvements.

CHAPTER-II

TYPES AND SOURCES OF SOLID WASTE IN THE OSHAKATI TOWN, NAMIBIA

The second chapter identify the types, sources and functional elements of solid waste management in the Oshakati town. The practices of SWM in Oshakati town are being presented and analysed based on qualitative data collected from secondary data sources. Based on the NSWMS, these practices were then analysed in order to find out if they are matching as per guidelines provided in Namibia on how SWM should be improved.

Waste prevention is the reduction in the amount of waste generated will reduce the efforts and resource required to manage the waste. This also eases the pressure that waste puts into the environment. It is based on a simple concept: If you create less waste, you consume fewer resources and you don't have to spend as much money to recycle or dispose of your waste. Segregation is the process of separation of municipal solid waste into four groups namely: organic, inorganic, recyclables and hazardous wastes. This is a critical requirement as it enables recycling, reuse, treatment and disposal of various components of waste.¹³⁸

Profile of Namibia

Namibia is a country situated on the south-western part of Africa and share borders with Angola to the north, Zambia and Zimbabwe to the north-east, Botswana to the East, South Africa to the south and the Atlantic Ocean to the west. The country's largest city is Windhoek, situated in the central part of the country and is also the capital city. Namibia is divided into 14 political regions and 57 unitary local authorities categorised in 13 municipal councils, 26 towns and 18 village councils. The country covers 8,24,292 square kilometres of land with a sea surface area

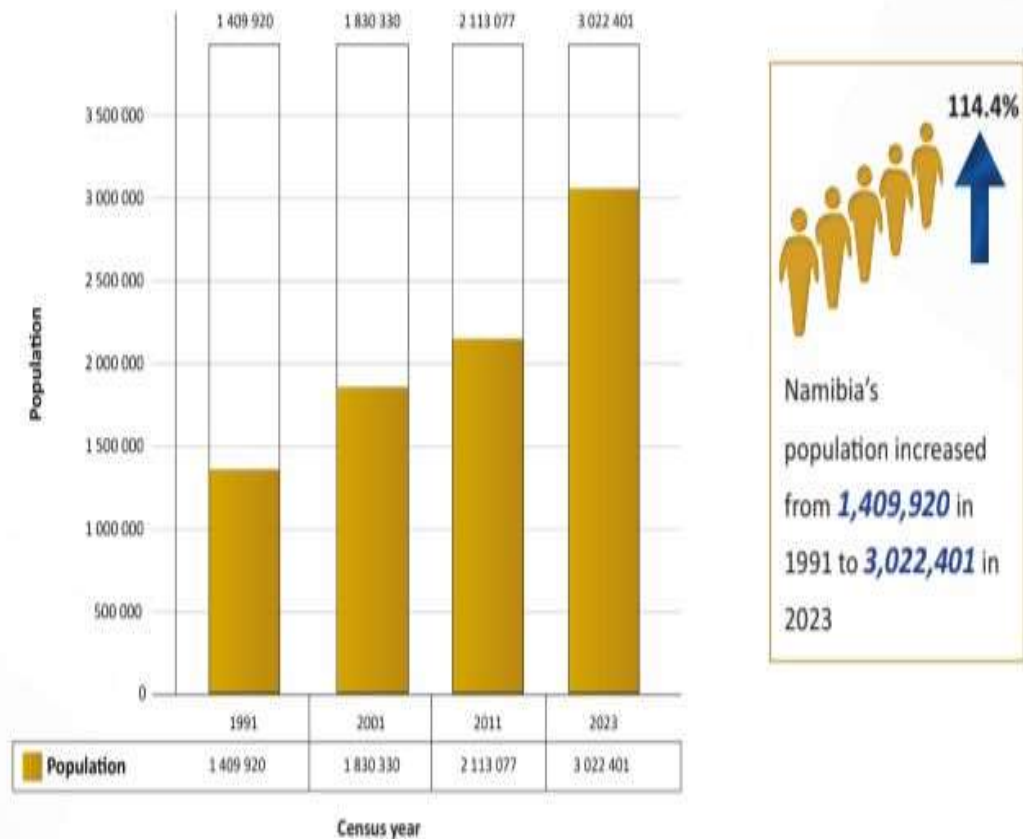
¹³⁸Nawa, W., (2014). *Solid waste management in northern Namibia (Oshakati Case Study)* [Bachelor of Science Research Project, University of Namibia]. <https://www.scribd.com/document/469763612/solid-waste-management-in-northern-namibia-oshakati-case-study>

estimated to be 513,015 km². Namibia is a multi-ethnic nation, previously called South West Africa before attained independence on the 21 March 1990 from apartheid South Africa that time. Namibia is a high middle-income country with a per capita Gross Domestic Products (GDP) of N\$74 489 in 2017 and measures among the highest inequalities in the world of 0.59 Gini coefficient. The GDP in 2017 stood at N\$176.5 Billion and records an average economic growth of 3.7 percent during 2008 to 2017. This economic performance is driven by the tertiary industries, followed by primary industries and secondary industries. Administratively Namibia is divided into fourteen political Regions namely: Karas, Erongo, Hardap, Kavango East, Kavango West, Khomas, Kunene, Ohangwena, Omaheke, Omusati, Oshana, Oshikoto, Otjozondjupa and Zambezi regions.

The Namibia Statistics Agency (NSA) is mandated to conduct population and housing censuses every ten (10) years. The first census was conducted in 1991 immediately after independence, followed by the second and third censuses, conducted in 2001 and 2011 respectively. In the year 2021 the fourth population and housing census did not take place due to the break out of the world pandemic Covid-19, therefore the fourth census took place in 2023. According to the 2023 population and housing census, there are 3,022,401 people in Namibia as of 24 September 2023.¹³⁹

¹³⁹Namibia Statistics Agency. (2024). *Namibia population and housing census - 2023, main report*. <https://nsa.org.na/document/2023-population-and-housing-census-main-report/>

Figure 6 Namibia Population by Census Years (1991, 2001, 2011, and 2023)



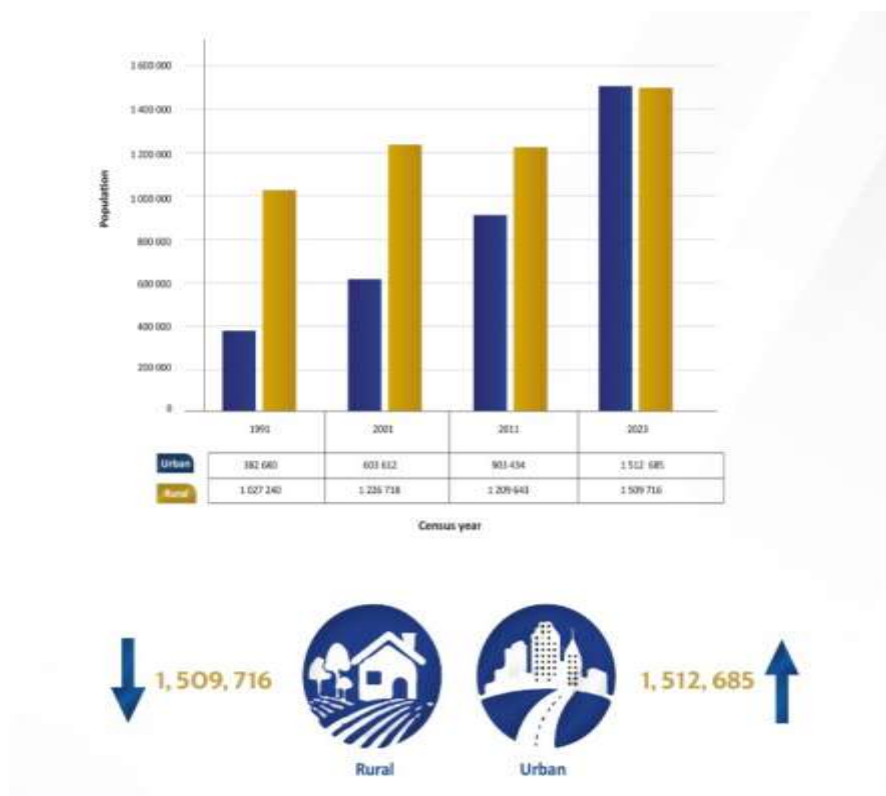
Source: <https://nsa.org.na/census/wp-content/uploads/2024/10/2023-Population-and-Housing-Census-Main-Report-28-Oct-2024.pdf> Accessed on 12/12/2024

Figure 2.1 shows the Namibia's population increased from 1,409,920 in 1991 to 3,022,401 in 2023, representing a population increase of 1,612,481 (114.4%) over the period of 32 years.

The Urban Population in Namibia

The urban population has caught up and slightly exceeded the rural population for the 2023 census year. The urban population was 1,512,685 compared to the rural population which recorded 1,509,716 people. The result indicates an increase of 67.4 percent in the urban population between the 2011 and 2023 census, while the rural population increased by 24.8 percent between the two census years.¹⁴⁰

Fig 7 Namibia's Urban and Rural Population Size by Census Year (1991, 2001, 2011, and 2023)



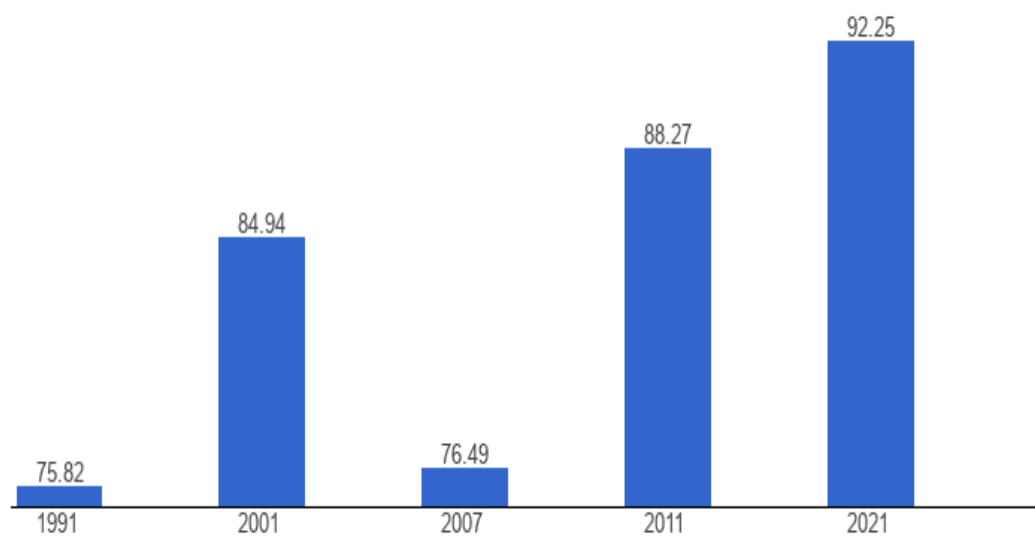
Source: <https://nsa.org.na/census/wp-content/uploads/2024/10/2023-Population-and-Housing-Census-Main-Report-28-Oct-2024.pdf> Accessed on 12/12/2024

¹⁴⁰Namibia Statistics Agency. (2024). *Namibia population and housing census - 2023, main report*. <https://nsa.org.na/document/2023-population-and-housing-census-main-report/>

Literacy Rate in Namibia

Literacy rate is the percentage of a population that can read and write with understanding in a given language. It is a statistical measure of a population's literacy skills and is calculated by dividing the number of literate people in a specific age range by the total population in that same age range, then multiplying by 100.¹⁴¹

Figure 8 Literacy Rate in Namibia between 1991 - 2021



Source: https://www.theglobaleconomy.com/Namibia/Literacy_rate/ Accessed on 12/12/2024

Fig 2.3 shows the average for Namibia from 1991 to 2021 is 83.55 percent. The minimum value, 75.82 percent, was reached in 1991 while the maximum of 92.25 percent was recorded in 2021.

¹⁴¹Namibia Statistics Agency. (2024). *Namibia population and housing census - 2023, main report*. <https://nsa.org.na/document/2023-population-and-housing-census-main-report/>

Types and Sources of Solid Wastes

The following types of solid waste are being generated in Oshakati town:

Residential (Domestic) Waste

This category of waste comprises the solid wastes that originate from single and multi-family household units. These wastes are generated as a consequence of household activities such as: cooking, cleaning, repairs, hobbies, redecoration, empty containers packaging, clothing, old books, paper and old furnishings.

Commercial Waste

Included in this category are solid wastes that mainly originate in offices, wholesale and retail stores, restaurants, hotels, markets, warehouses, and other commercial establishments. Some of these wastes are further classified as garbage and others as rubbish.

Institutional Waste

Institutional wastes are the wastes generating from institutions such as schools, universities, hospitals and research institutes. It includes wastes which are classified as garbage and rubbish, as well as wastes, which are considered to be hazardous to public health and to the environment as well.

Construction and Demolition Wastes

Construction and demolition wastes are the waste generated by the construction, refurbishment, repair and demolition of houses, commercial buildings and other structures. It mainly consists of earth, stones, concrete, bricks, lumber, roofing materials, plumbing materials, heating systems and electrical wires and parts of general municipal waste stream, but when generated in large amounts at building and demolition sites, it is generally removed by contractors for filling low lying areas and by urban local bodies for disposal at landfills.

Municipal Services

Municipal waste includes waste generating from municipal activities and services such as street sweeping, dead animals, market wastes and abandoned vehicles. However, the term is commonly applied in a wider sense to incorporate domestic wastes and commercial wastes.

Agricultural Wastes

These are the wastes includes both natural and non-natural wastes generated through farming activities. These activities include seed growing, livestock breeding, gardens, nursery plots. In some cases, agricultural wastes include spoiled food grains, vegetables, animal and plant wastes, litter, pesticides and fertilizers. Agricultural wastes are mostly biodegradable but few wastes like pesticide and fertilizers are toxic. When discharged to the environment, it can be both beneficial and detrimental to living matter.

Bulk waste

These are household wastes comprises of household furniture; appliances such as stoves, washing machines and refrigerators; mattresses and springs, rugs, television sets, water heaters, tires, lawn mowers, auto parts, tree and brush.

Hospital and Clinical Waste

Though hospital wastes are solid by nature, they are categorised as hazardous waste, therefore it is not a part of this study.

Table 2.1 Various Sources and Types of Solid Waste Generated in Namibia Towns

Source	Typical Waste Generator	Types of Solid Waste
Residential	Single and multi-family dwellings	Food wastes, cardboard, paper, plastics, textiles, leather, yard wastes, glass, wood, metals, ashes, special wastes (e.g. bulky items, consumer electronics, white goods, oil, batteries, tires), and household hazardous wastes
Industrial	Light and heavy manufacturing, fabrication, construction sites, chemical and power plants	Housekeeping wastes, packaging, food wastes, ashes, construction and demolition materials, hazardous wastes, special wastes
Commercial	Stores, hotels, restaurants, markets, office buildings, etc.	Paper, cardboard, plastics, glass, wood, food wastes, special wastes, metals, hazardous wastes
Institutional	Schools, hospitals, prisons, government centres	Same as commercial
Construction and Demolition	Road repair, New construction sites, renovation sites, demolition of buildings	Wood, steel, concrete, dirt, etc.
Municipal Services	Street cleaning, landscaping, parks, beaches, other recreational areas, water and wastewater treatment plants	Street sweepings, landscape and tree trimmings, beaches, general wastes from parks, and other recreational area, sludge
Process	Heavy and light manufacturing, refineries, chemical plants, power plants, mineral extraction and processing	Industrial process wastes, scrap materials, off-specification products, slag, tailings
Agriculture	Orchards, crops, vineyards, dairies, feedlots, farms	Spoiled food wastes, hazardous wastes (e.g. pesticides), agricultural wastes

Source: Ministry of Environment, Forestry and Tourism. (2021). *Second National Integrated State of Environment Report for Namibia*.

Generation of Solid Waste in Oshakati Town

The Oshakati town council carries responsibility of solid waste management services to domestic, commercial and industrial premise, street sweeping, grass cutting, public toilet cleaning and conduct public health education campaigns. Some of these services are carried out by the town council workers from waste management department, while other services are outsourced to external contractors. Mostly, the main types of wastes generated are: bottles, plastics, cans, cardboards, and scrap metals. The waste generated on a daily basis amounts to roughly 92.5 tons per day and a per capita generation of about 2.5 kg per person per day.¹⁴²

Segregation and Storage of Solid Waste in Oshakati Town

Waste segregation is the process of separating solid waste into the groups of inorganic, organic, hazardous and recyclable wastes.¹⁴³ The Department of Public Health and Environmental Management is to ensure that the waste generated is stored at right place, time and in right storage facility. Through this department, the Oshakati town provides businesses and households with 240 litres containers called wheel bins to serve the waste management needs. Such bins are only meant for some types of waste such as food waste, domestic refuse, commercial waste and all light materials that may not cause any damage to the containers. Other types of waste such as stones, wood, bricks, iron sheet, sand, heavy metals, tree branches and grass are not to be stored in the wheelie bins. These can be stored in big containers called known as skip containers, that are distributed in some residential areas, including informal residential areas where illegal dumping of waste has been experienced. The informal residential areas are those areas where the basic municipal services such as formal housing, clean water, sewerage and electricity are not available. In some occasions, black garbage bags are provided by OTC to store waste generated in

¹⁴²Nawa, W., (2014). *Solid waste management in northern Namibia (Oshakati Case Study)* [Bachelor of Science Research Project, University of Namibia]. <https://www.scribd.com/document/469763612/solid-waste-management-in-northern-namibia-oshakati-case-study>

¹⁴³Sasikumar, K., & Krisha, S. G. (2021). *Solid waste management*. PHI Learning.

informal settlements and in open spaces, based on the need. The OTC also provide garbage bins and skip containers at some businesses and institutions. It is the responsibility of the OTC to make sure that wastes are stored correctly and safely.¹⁴⁴

Waste storage is one of the critical step in solid was management. All the activities which correspond to the solid waste before being placed in to the containers which are used to carry it to the material recovery facilities or recycling centres are called waste storage. However, it is crucial to note that choosing the right type and volume of the container is quite important for the waste storage. In Namibia, the availability of waste storage depots is most in poor hygiene, inefficient and unscientific posing causing health hazard to the public health and environment. In most towns, solid wastes are being stored in various ways as follows: In open area, skip containers, plastic waste bins, empty oil metal drums, black plastic bags.¹⁴⁵

Collection of Municipal Solid Waste in Oshakati Town

Collection of MSW is an essential public service as it has implications for public health and to the entire environment. The Oshakati town council has collection service coverage of over 90 percent of the urban premises and 40 percent of the rural premises while 95 percent of commercial premises are serviced.

The Oshakati town adopted six common methods used for MSW collection.

These are:

- **House-to-House:** Municipal waste collectors visit each house with an open or compactor truck to collect waste once a week. Compactor assistants accompany the truck to hook bins on and pick up waste that is dropping on the ground. Residents normally pay a municipal fee for this service.

¹⁴⁴Oshakati Town Council. (2015). *Waste management policy 2015*, Oshakati, Namibia. Print

¹⁴⁵Nawa, W., (2014). *Solid waste management in northern Namibia (Oshakati Case Study)* [Bachelor of Science Research Project, University of Namibia]. <https://www.scribd.com/document/469763612/solid-waste-management-in-northern-namibia-oshakati-case-study>

- **Skip containers:** these bins are shared with the rest public members. Usually placed busy places, and at construction sites. Municipality and contracted collectors use trucks to pick up the bin randomly or when they reach the full capacity. Skip containers are usually used to dispose of heavy refuse, garden refuse and building rubble, however some residents deposit general waste.
- **Kerb side Pick-Up:** Normally residents leave black garbage plastics directly outside their homes or alongside the roads, based on the garbage pick-up schedule for the municipality.
- **Self-Delivered:** Sometimes solid waste generators and general public deliver waste to the skip containers or directly to the disposal site.
- **Contracted or delegated services:** Municipality and business hire waste collecting firms on a contract basis. A private contractor in partnership to carry out the task on their behalf.
- **Street cleaning:** The municipal workers by sweeping the streets to remove sand and other solid waste.¹⁴⁶

The collection services done directly by the municipality amounts to only 10 percent while companies contracted by the municipality collect the municipal council does not service about 80 percent of the solid waste and the remaining 10 percent. For more efficient collection of various types of waste, modern solid waste management employs a technique of distributing multiple bin which are designated for storage of different types of waste separately e.g. plastic, glass, paper, tins and organic waste. These bins are usually marked or colour coded to distinguish one from another. This system does not only make it easier to sort various types of waste for disposal but also makes it easy for recycling companies to collect the type of waste they intend to use. However, this practice does not exist in Oshakati town due to lack of financial resources. While this system is costly, the Oshakati town council collect these items and store them safely for recycling companies to buy. This can be

¹⁴⁶Yadav, V., & Karmakar, S. (2020). Sustainable collection and transportation of municipal solid waste in urban centres. *Sustainable cities and society*, 53, 101937.

a source of much needed income for the town council while at the same time promoting recycling and better environmental protection.

Transportation of Solid Waste in Oshakati Town

Waste transportation is the transfer the wastes from collection point to the dumping site. In many cases, wastes are transported by facilities such as loaders, truck, small collection vehicles, and conveyors. One of the reasons to use these facilities is the high distance between collection point and the dumping site. To avoid the illegal dumping due to large haul distance. The Oshakati town council does not have a proper solid waste collection policy but has set some guides for its contractors. In most cases vehicles used for solid waste transportation are caged light trucks with high guard rails covered by canvas. companies and individuals that are not serviced by the town council waste management unit or those that for one reason or another have need dispose of waste on their own use various forms of transport to move waste to the dumpsite.

Disposal of Solid Waste in Oshakati Town

This is the process of getting rid of wastes that are produced throughout by disposing them. At a selected place. The correct disposal of waste is not only important for environmental preservation and reducing the negative impacts upon it, but also in the prevention of risks to the health and safety of people who may come into contact with any waste which has not been correctly disposed. There is only one dumpsite in Oshakati town whereby all types of wastes are disposed. It is about 10 hectors, located about five kilometres west side of the town in Othingo village. The site was initiated in the year 2006. Various types of waste in disposed of in this dumpsite except for hazardous waste such as medical waste which is incinerated. The Oshakati town council currently does not have information on the exact composition of the waste that is disposed of at their landfill but only a bulk amount record.¹⁴⁷

¹⁴⁷Nawa, W., (2014). *Solid waste management in northern Namibia (Oshakati Case Study)* [Bachelor of Science Research Project, University of Namibia].

Solid Waste Treatment

Waste treatment is the process of managing waste materials in order to minimise their quantity and negative impact to the human health and environment. There are five common ways of solid waste treatment applied in the world namely: Gasification, Composting, Incineration, Recycling, and Landfilling. Gasification of solid waste is thermal waste treatment involves the breakdown of organic materials by placing them within a high-temperature environment. Composting involves placing organic materials into designated pits or bins, where, with the help of microorganisms such as bacteria, these materials eventually break down into a soil-like substance that is rich in nutrients and environmentally friendly.¹⁴⁸

Incineration is the process, workers place garbage inside of a very hot furnace then extreme heat turns the waste into ash residue or other substances, such as carbon dioxide and water vapour.¹⁴⁹

The OTC disposal site applies only two methods of solid waste treatment namely recycling and landfill.

Recycling of Solid Waste

Recycling is the process of separating disposed materials for reprocessing, remanufacturing and reuse. It plays several roles in a solid waste management plan. Recycling may be the only major consideration, one among other major considerations, a minor consideration, or a consideration in the design of a municipal solid waste management plan. The facility may be a part of the disposal facility or it may be an independent entity. The importance of availability overemphasised, particularly in waste processing facilities which are both maintenance intensive and

<https://www.scribd.com/document/469763612/solid-waste-management-in-northern-namibia-oshakati-case-study>

¹⁴⁸Sasikumar, K., & Krisha, S. G. (2021). *Solid waste management*. PHI Learning, Delhi.

¹⁴⁹Frolov, S. M. (2021). Organic Waste Gasification: A Selective Review. *Fuels*, 2(4), 556-650.

cannot be easily shut down without upsetting the solid waste management system. The best and easy method is to do recycling during waste storage.¹⁵⁰

Landfilling of Solid Waste

There are two methods of landfilling practice namely open dumps and sanitary landfills. Landfilling has three methods which are: controlled sanitary landfill, controlled open dumpsite, and uncontrolled open dumpsite. The landfilling method is most commonly used in MSWM, whereby waste is collected and disposed at landfills. However, among the three methods, controlled open dump and uncontrolled open dump are most common in developing countries, while controlled sanitary landfills are common in developed countries. In Namibia, the most frequently observed methods are controlled open dumpsites and uncontrolled dumpsites. The Oshakati town SWM practice a controlled sanitary landfill whereby waste is being filled under the ground.¹⁵¹

Overview

Chapter II highlighted the types, sources and functional elements of solid waste management in Oshakati town. Results was presented and analysed based on qualitative data collected from secondary data sources. Based on the NSWMS, these practices were then analysed in order to find out if they are matching as per guidelines provided in Namibia enhancing SWM. The result presented focused on MSW segregation, storage, collection, transportation, disposal, and treatment.

¹⁵⁰Diaz, L. F., Golueke, C. G., Savage, G. M., & Eggerth, L. L. (2020). *Composting and recycling municipal solid waste*. CRC Press.

¹⁵¹Kadhila, T. (2019). *Implementation of a municipal solid waste management system in Swakopmund, Namibia* (Doctoral dissertation, Stellenbosch: Stellenbosch University). <https://scholar.sun.ac.za/items/52388b03-2033-4c28-bfee-fa32a88b8f0a>

CHAPTER-III

ENVIRONMENTAL RELATED LAWS, LEGISLATIONS, POLICIES AND INSTITUTIONAL SETUP EXISTING GOVERNING THE SOLID WASTE MANAGEMENT IN OSHAKATI TOWN, NAMIBIA

Introduction

Chapter three presents the applicable laws, legislations and policies, and institutional setup existing related to solid waste management. Upon Namibia's independence in 1990, the government adopted some previous laws that existed before the independence and some new laws were made. This chapter covers central, regional and local government laws governing MSWM in Namibia and of Oshakati town in specific. The results and discussions of this chapter are to be analysed in chapter V, while suggestions are on chapter VI.

Applicable Environmental Related Laws, Legislations, Policies in Solid Waste Management in Oshakati Town

The Constitution of Namibia has legal framework that protects the environment and maintain safe and healthier environment. The legal framework is at national and local level that are categorised in groups includes: Acts, Regulations, Policies, and Strategies. The Environmental Management Act (EMA) of 2007 and The Public and Environmental Health Act of 2015 are mandated with the role to regulate MSWM.

Table 3.1 Applicable Legal Framework Guiding the Operations of Solid Waste Management in Oshakati Town

Legal Framework	Description
The Constitution of Republic of Namibia	Actively Promote and maintain the welfare of all Namibians by adopting and promoting ecosystems and processes for present and future generations.
Environmental Management Act No. 7 of 2007	Promote sustainable management of the environment and its natural resources and assessments.
Environmental Impact Assessment Regulations	Provide environmental management plan and listed activities, its implementation and continuous progress reporting.
Water Act 54 of 1956	Provide sustainable water use of national water resources.
Atmospheric Pollution Prevention Ordinance No. 11 of 1976	Provision for prevention and minimising atmospheric pollution.
Hazardous Substance Ordinance No. 14 of 1974	Hazardous waste disposal and management
Public Health Act 36 of 1919	Prevention of public health nuisances
Oshakati Town Council Waste Management Policy	Provide guidance for waste management strategy in Oshakati town.
Oshakati Town Waste Management Regulations: Local Authority Act No. 250 of 1992	Provision for management of waste in Oshakati town

Source: <https://www.meft.gov.na/service/environmental-impact-assesment-/233/>

Environmental Management Act of 2007

In the year 2007, the parliament of the Republic of Namibia passed the Environmental and Management Act 7 of 2007. The object of the Act is to promote the sustainable management of the environment and the use of natural resources by establishing principles for decision making on matters affecting the environment. To establish the sustainable development advisory council. To provide for the appointment of the environmental commissioner and environmental officers. To

provide for a process of assessment and control of activities which may have significant effects on the environment; and to provide for incidental matters.¹⁵²

The Public and Environmental Health Act of 2015

In 2014, the Minister of Health and Social Services introduced the Public and Environmental Health Bill¹ in order to promote public health and wellbeing; prevent injuries, diseases and disabilities; protect individuals and communities from public health risks; encourage community participation in order to create a healthy environment; and to provide for early detection of diseases and public health risks. In 2015, the Public and Environmental Health Act of 2015 has been passed by Parliament and came into force in 2020. Part 9 of the Act addresses integrated waste management and stipulates among others that in order to prevent environmental pollution and public health risks, local authorities must ensure that all waste generated is collected, disposed of and recycled in accordance with the requirements of all laws governing the management of the different waste streams. Health nuisances are addressed in Part 10 of the Act, in which specific health nuisances are identified, including among others polluted sources of water supply, the accumulation or deposit of refuse, which is injurious or dangerous to health and other conditions which are offensive, injurious or dangerous to health. According to Section 68, the Minister may require the preparation of public and environmental health plans.

The Water Act No. 54 of 1956

This rather out-dated legislation remains in force until the new Water Resources Management Act comes into force upon signing by the Minister. Although two new Water Resources Management Acts have been approved by Parliament, the first in 2004 followed by the approval of the recent Water Resources Management Act in 2013, neither of them has been signed into law. The 2004 Act has in fact never been signed into law and has been repealed as a whole by the 2013

¹⁵²Ministry of Environment and Tourism. (2007). *Environmental management Act 7 of 2007*. <https://www.lac.org.na>

Act, which is yet to be signed by the Minister to become operational. Thus, the 1956 Act remains applicable for the time being. The main purpose for passing the Water Act, as its preamble states, was to consolidate and amend the laws relating to the control, conservation and use of water for domestic, agricultural, urban and industrial purposes.

Soil Conservation Act of 1969

The purpose of this Act is to consolidate and amend the law concerning the combating and prevention of soil erosion, the conservation, improvement, and manner of use of the soil and vegetation, and the protection of the water sources in the territory of Namibia.

Namibia's Pollution Control and Waste Management Policy of 2003

In 2003, Namibia's Pollution Control and Waste Management Policy was drafted with aims to create a legal framework to empower an inter-ministerial body and the competent authority which would oversee implementation of national pollution control and waste management strategy in Namibia. Furthermore, is to monitor and to comply with international agreements relating to waste management. It provides legislative, regulatory and economic incentive for proper management of waste including waste minimisation and recycling.¹⁵³

The National Law on Solid Waste Planning

Namibia's Vision 2030

Namibia's Vision 2030 is a long term development plan that was the initiative of the first and the founding President of the Republic of Namibia His Excellency Doctor Sam Shafiishuna Nujoma and was launched in 2004. The aim is to make Namibians quality of life better. Vision 2030 addresses the sustainability of

¹⁵³Ruppel, O. C., & Ruppel-Schlichting, K. (2016). *Environmental law and policy in Namibia: Towards making Africa the tree of life*. Faculty of Law, University of Stellenbosch, South Africa. Third Edition 2016.
https://www.hss.de/fileadmin/media/downloads/Publikationen/160602_Namibia_Edition.pdf.

natural resources and considering the environment in attaining sustainable development.¹⁵⁴

The Atmospheric Pollution Prevention Ordinance No. 11 of 1976

The Atmospheric Pollution Ordinance of 1976 pertinent to the prevention of air pollution with particular focus on public health contains detailed provisions on air pollution. The Ordinance deals with administrative appointments and their functions; the control of noxious or offensive gases; atmospheric pollution by smoke; dust control; motor vehicle emissions; and general provisions. As per the Ordinance, control areas can be established in order to control noxious or offensive gases or atmospheric pollution by smoke. So far, the Ordinance has been of minor practical relevance.¹⁵⁵

Hazardous Substances Ordinance No. 14 of 1974

This Act provide the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances; to provide for the division of such substances into groups in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances; and to provide for matters connected therewith.¹⁵⁶

¹⁵⁴National Planning Commission. (2004). *Namibia vision 2030, policy framework for long-term national development*. <http://www.npc.gov.na/national-plans/vision-2030/>

¹⁵⁵Ruppel, O. C., & Ruppel-Schlichting, K. (2016). *Environmental law and policy in Namibia: Towards making Africa the tree of life*. Faculty of Law, University of Stellenbosch, South Africa. Third Edition 2016. https://www.hss.de/fileadmin/media/downloads/Publikationen/160602_Namibia_Edition.pdf

¹⁵⁶Legal Assistance Centre: Republic of Namibia. (1974). *Hazardous substances ordinance Act 14 of 1974*. <https://www.lac.org.na>

National Disaster Risk Management Plan (NDRMP) 2011

The NDRMP aims to provide overview on how Namibia addresses the risks and impacts of hazards by preventing, readiness and responds to natural disasters. It contributes to the achievement of sustainable development goals in line with Namibia's Vision 2030 by strengthening of national capacities to minimize risks and build community resilience to natural disasters.¹⁵⁷

National Policy on Climate Change for Namibia (NPCCN) of 2011

Natural resources are the Namibia's backbone for economic growth therefore the impacts of climate change will negatively affect the economy and sustainable development. The NPCCN came into effect in 2011 as a legal framework on climate risk management. The aim is to lead Namibia in attaining sustainable development as per Vision 2030 plans by building resilience against climate change shocks and reducing the risks associated with climate change.¹⁵⁸

Harambee Prosperity Plan

The Harambee Prosperity Plan was enacted in 2016 and developed to complement the National Development Plans and Vision 2030. The plan is targeting to build better houses for the Namibian people with good solid waste management and to reduce the high unemployment rate. It is working towards building an economical stable structure for the people of Namibia where in cases of solid waste and environment sustainability, the communities will be educated and trained, to create jobs and hatch out entrepreneurial skills among the people to implement green based projects which will boost Namibia's economy. With most Namibians having

¹⁵⁷Office of the Prime Minister. (2011). *National disaster risk management plan of 2011*. <https://www.preventionweb.net/media/60728/download>.

¹⁵⁸Ministry of Environment and Tourism. (2011). *National policy on climate change for Namibia of 2011*. <https://www.meft.gov.na>

access to a clean environment that means the current high rates of infant and maternal mortality will be reduced by 2030.¹⁵⁹

National Solid Waste Management Strategy (2018-2028)

The MEFT has recognised the urgent need to improve solid waste management in Namibia. In 2017, the National Solid Waste Management Strategy was drafted to ensure that the future directions, regulations, funding and action plans to improve solid waste management are properly co-ordinated and consistent with national policy, and to facilitate co-operation between stakeholders. The final draft Strategy was distributed to key stakeholders for their feedback, and they were invited to the national consultation workshop that was held on 19 July 2017. Following a baseline assessment and a stakeholder consultation process in 2017, the National Solid Waste Management Strategy (2018-2028) was finalised with the vision “to become the leading country in Africa in terms of standards of solid waste management by 2028”. In very general terms, the strategy aims to improve the management of waste and hazardous substances in Namibia. The baseline assessment identified various priorities, which have in the following been addressed in the Strategy. These priorities include waste disposal, which, under the current solid waste management is one of the major environmental problems in the country. It has been captured among others, that Namibia, at the time of the baseline assessment, only had two hazardous waste disposal sites at Windhoek and Walvis Bay. Illegal dumping and litter, especially in areas where no formal waste collection system is in place; there is a lack of awareness with regard to solid waste; and, most importantly in the context of this chapter, it has been stated that “the legal framework for solid waste management is weak, and an approach for the step-by-step tightening of standards is needed. In particular, minimum standards for waste disposal need to be adopted and implemented.” Based on these priorities, an objective to strengthen the institutional, organisational and legal framework for solid waste management,

¹⁵⁹http://www.nied.edu.na/assets/documents/08Governments/13HPP_page_70-71.pdf,
Prosperity Plan II (2021-2025). Accessed on 22/03/2023

Harambee

including capacity development have been formulated. The aim is to strengthen the institutional, organisational and legal framework for solid waste management, including capacity development.¹⁶⁰

Hazardous Substances Ordinance of 1974

This Act regulates substances that may cause ill health or death of human beings because of their corrosive, toxic, irritant, flammable nature or strongly sensitising or generation of pressure, thereby in certain circumstances. It also plays a role in dividing such substances into groups about the degree of danger. Finally, the Act regulates and controls the dumping of such substances. This ordinance provides for the control of toxic substances and thus also relevant for pollution control. It covers the control of hazardous substances, as well as their manufacture, sale, use, disposal, dumping, import and export.¹⁶¹

National Climate Change Strategy and Action Plan of Namibia of 2013- 2020

Climate change impacts directly on the entire chain of national development, and is likely to have negative impacts on efforts to achieve development objectives, including the long-term objectives and targets of Namibia's Vision 2030. Climate change is a complex and cross-cutting concern, thus there is a need for a holistic and integrated approach to developing a multi-sectoral (cross-practice based) National Climate Change Strategy and Action Plan (NCCSAP) in order to implement the National Policy on Climate Change (NPCC), which was promulgated in Namibia in 2011. The NCCSAP has been developed as a result of the growing concern and discourse focusing on climate variability, and climate change risks and impacts affecting Namibia's social, environmental and economic developmental potential. The Strategy and Action Plan is a key instrument to operationalise the NPCC over a period of 8 years from 2013 – 2020 as a first comprehensive and practical tool which offers guidance on the mechanisms, means and manner in which implementation can

¹⁶⁰Ministry of Environment and Forestry. (2017). *National solid waste management strategy for Namibia – 2017*. <http://www.oneplanetnetwork.org>

¹⁶¹Ruppel, O. C. (2022). *Environmental Law and Policy in Namibia*, 75-108.

happen. It is clear that climate change awareness, knowledge and understanding, both in terms of the risks, impacts and responses is rapidly developing, and therefore a mid-term review process of the implementation and impact of the NCCSAP is foreseen. The development of the NCCSAP started in 2011 and intensive interactive consultations took place over a period of two years with a great variety, diverse and multiple numbers of stakeholders in the country. These included government ministries, agencies, Members of Parliament, Non-Governmental Organisations (NGOs), IGOs, private sector representatives, regional councils, local authorities, Community based Organisations (CBOs) and other civil/civic society organisations.¹⁶²

Namibia's Pollution Control and Waste Management Policy, 2003

This policy ensures the management of non-hazardous waste, hazardous and special waste in the country. It also provides legislative, regulatory, and economic incentives for correctly managing waste reduction, reclamation, and recycling. Moreover, primarily necessary, it encourages implementing comprehensive pollution control and waste management education and capacity building programmes by the government and the private sector.¹⁶³

Plans and Policies of the Oshakati Town

The laws, legislations, and policies related to Solid Waste in Oshakati town are briefly stipulated in Section 94 (c) of the Local Authorities Act No. 23 of 1992, a local authority council may, after consultation with the Minister responsible for Regional and Local Government and Housing make regulations by notice in the

¹⁶²Ministry of Environment and Tourism. (2011). *National policy on climate change for Namibia of 2011*. <https://www.meft.gov.na>

¹⁶³Ministry of Environment and Tourism. (2003). *Namibia's pollution control and waste management policy*. <https://theeis.com/elibrary/sites/default/files/downloads/literature/Namibias%20pollution%20control%20and%20waste%20management%20policy.pdf>

Gazette in relation to various areas relevant to pollution control and waste management.¹⁶⁴

Environmental Management Plan: Oshakati Designated Disposal Site of 2023

During the year 2023, the Environmental management plan was drafted to provide the description of the recommended processes for OTC and associates to maximum compliance and minimising threats on both the environment and human which may result from current waste disposal operations. The OTC has prioritised for environmental management plan compliance and considerations within its periodic ended strategic plans and the recent for 2020-2025 years for improved waste management services and development.¹⁶⁵

The Regulatory Function of the Local Authority in relation to MSWM in Oshakati Town

The OTC manage the waste under the Act of “Town of Oshakati: Regulations relating to Waste Management: Local Authority Act 1992”. The OTC, after consultation with the Minister of Regional and Local Government and Housing, under section 94 (1) of the Local Authorities Act, 1992 (Act No. 23 of 1992), makes the regulations that govern the operations of waste in the town.¹⁶⁶

Oshakati Town Council Strategic Plan for The Year 2015-2020

The OTC strategic plan for the period of 2015/16-2019/20 was a very important long term strategic plan to understand the environment in which the town is operating. It was planned in the line with sustainable development by ensuring that the town is prosperous, habitable, and sustainably industrialised. Environmental strategic issues include, water and electricity supply, provision of land for business

¹⁶⁴https://www.npc.gov.na/wp-content/uploads/2022/06/Local_Authorities_Act-No.-23-of-1992.pdf, Accessed on 07/10/2023

¹⁶⁵Ministry of Environment and Tourism. (2023). *Environmental management plan: Oshakati designated disposal site*. <https://www.meft.gov.na/service/environmental-impact-assesment-/233/>

¹⁶⁶Oshakati Town Council. (2004). *Regulations relating to waste management: Local authorities Act, 1992*. <https://www.lac.org.na/laws/2004/3310.pdf>

and housing, waste collection and sewage system. The OTC five-year strategic plan document expired in July 2015 and it was deemed fit to review the old plan and formulate a new one for the period 2015/16-2019/20. Prior to such expected outcomes it is always essential to understand the environment in which OTC operates before the development of the long-term strategies. To this end the scoping study through the survey was structured in a manner which would unearth views and opinions of councillors; staff and management as well as customers.¹⁶⁷

Municipal By-Laws

In Namibia, local authorities are given powers to pass their own by-laws in order to secure municipalities effective administration. Municipal by-laws have been defined as a public regulatory laws which only applicable in a specific municipal area. Municipal by-laws are always in line with the Constitution of the Republic of Namibia and can be enforced with penalties. By-laws are crucial to municipalities as they allow them to give effect to policies which are otherwise not legally binding on the communities.¹⁶⁸

While the OTC align its operation and efforts on environmental protection, there are those who neglecting, litter or ignoring the policy and other regulations of the council of assuring that the communities lives in a conducive environment that does not compromise with public health. Council in its annual tariff has set penalties for contravening the waste management Policy as follows:

Fine for illegal dumping of refuse and related waste

- First offence N\$ 550.00 (2530 Indian Rupees)
- Second offence N\$ 700.00 (3220 Indian Rupees)
- Third offence – Legal action

¹⁶⁷Oshakati Town Council. (2015). *Strategic plan 2015-2022*. <https://www.oshtc.na>

¹⁶⁸Nambahu, T. M. N. (2023). *Evaluation of municipal solid waste management practices in Karibib, Namibia* (Doctoral dissertation, Stellenbosch: Stellenbosch University). <https://scholar.google.com/scholar?hl>

The fine escalates with the council's tariff as per financial year.

The Oshakati Town Waste Management Policy 2015

The town council of Oshakati is mandated by the Local Authority Act, (Act 23 of 1992) as amended and the General Health Regulations (GN 121 of 1969) as amended to ensure the provision of waste management services to the community of Oshakati regardless of their status, political affiliations, and religious or cultural background. The Policy is directed to all aspects of waste management that occur as OTC has to fulfil its obligation to:

- Maintain regulatory compliance within residents
- Provide and maintain environmental hygiene that promote public hygiene
- Maintain cooperation with partners, stakeholders and contractors
- Provide acute, primary and community healthcare

The Policy supports other obligations with respect to aspects of waste management that are inherent within the operation of the town council. The policy statement outlines the system of work that will enable the OTC and its staff members to ensure that all wastes are disposed correctly, without endangering human health and without using processes or methods which could harm the environment.

The Objectives of the Policy are:

The OTC must manage waste in accordance with all existing and future regulations requirements. It is the mandates of the OTC to develop the waste management strategy to meet with other applicable mandatory, codes of practice and best practice in the area of waste management.¹⁶⁹

¹⁶⁹Oshakati Town Council. (2015). *Waste management policy - 2015*, Oshakati, Namibia. Print

Institutions Mandated Enforcing Municipal Solid Waste Management Laws, Legislations, and Policies

There are institutions that are in charge for enforcing solid waste management regulations. These includes: The central government represented by the MEFT through the Directorate of Environmental Affairs (DEA) lead by Environmental Commissioner (EC), Environmental Protection Authority (EPA), the Courts, the Namibian Police, Community Members, and Community Members.

The Role of the Central Government

In relation to MSWM in Namibia, the MEFT through the DEA. The mandate of DEA is licensing and to promote environmental sustainability across all other ministries, private sector and non-governmental organisations.

Functions and Objectives of the DEA are to:

- Promote sustainable development;
- Protect biological diversity;
- Improve environmental awareness;
- Promote natural capital accounting as a decision-making support tool;
- Encourage participatory environmental planning and management;
- Actively involve Namibia in regional and global environmental issues, programmes and treaties.

The activities of the DEA contribute towards the achievement of Strategic Objective 3 of the MET Strategic Plan 2012/13-2016/17, which is to make sure that Namibia's environment, biodiversity and ecological processes are conserved, managed and sustainably utilized.¹⁷⁰

¹⁷⁰ <https://www.meft.gov.na/about-meft/department-of-environmental-affairs-and-forestry/327/>. Accessed on 12/06/2024

Environmental Commissioner (EC)

The (EC) serves as head of DEA, and perform the following functions in terms of Section 5 of the Environmental Management Act No.7 of 2007:

- Advise organs of state on the preparation of environmental plans;
- Receive and record applications for environmental clearance certificates;
- Determine whether a listed activity requires an assessment;
- Determine the scope, procedure and methods of an assessment;
- Review the assessment report in accordance with this Act;
- Issue environmental clearance certificates in terms of this Act;
- Maintain a register of environmental assessments undertaken in terms of this Act;
- Maintain a register of environmental clearance certificates issued and environmental plans approved in terms of this Act;
- Conduct inspections for monitoring compliance with this Act; and
- Perform any other duty or function, which the Minister may assign or prescribe.¹⁷¹

Environmental Protection Authority

The Division of Environmental Assessment, Waste Management and Pollution Control, and Inspections (EAWMPCI) comprises of three subdivisions namely: Waste Management and Pollution Control, Environmental Assessments, and Environmental Inspections.

The core functions of this division are to:

- Receive and review Environmental Assessments and provide recommendations on the issuing of environmental clearance certificates;

¹⁷¹<https://www.meft.gov.na/about-meft/department-of-environmental-affairs-and-forestry/327/>. Accessed on 12/06/2024

- Promote the management of waste, hazardous substances and pollution in an environmentally sound manner;
- Monitor and enforce Environmental Management Plans and general measures for environmental protection; and
- Serve as national focal point and coordinate national level implementation of relevant international conventions.

The Courts

The court has is mandated basically to hear and determine disputes issues on planning of environment and protection includes the issues on solid waste management. The magistrates court has power to hear and determine criminal matters that relates to waste management for example offences like not adhered to the Public Health Act of 1919 and offences under EMA for example transporting of waste without valid documents and operating a dumpsite without environmental clearance certificate.¹⁷²

The Namibian Police

The Namibian Police mandate is to secure the internal security, and to maintain law and order in the country. Furthermore, the Police prevent and investigate crimes, protect life and property. The environmental issues concern has prompted a great deal of reflection about the problem of enforcing anti-pollution legislation. Since environmental degradation is such a pervasive problem, a wide-reaching and comprehensive enforcement apparatus is required to cope with it. The Namibian Police constitute an established law enforcement apparatus with both the personnel and potential to carry out an enforcement mandate; this is true despite the fact that their role regarding environmental matters is currently obscured. The

¹⁷²<https://www.meft.gov.na/about-meft/department-of-environmental-affairs-and-forestry/327/>. Accessed on 12/06/2024

Namibian Police involvement in monitoring the quality of the environment is crucial.¹⁷³

Community Members

Members of the community are involved in many aspects of waste as consumers of goods, waste generators and users of waste minimization initiatives. Their participation determines the success of waste initiatives. The community culture plays a significant role in determining the responses of citizens to government initiated actions. Often the first reactions of citizens are to oppose change that involves them taking more effort. Then comes acceptance when the citizens realize that they can engage in doing environmental good with very little effort and finally they become champions expressing dismay that others are not prepared to engage to the same extent.¹⁷⁴

The Private Sector

The public sectors are the Non-Governmental Organisations (NGO,s). They play crucial role in the shaping and implementation of participatory democracy. Their credibility lies in the responsible and constructive role they play in society. Formal and informal organisations, as well as grass-roots movements, should be recognized as partners in the implementation. The nature of the independent role played by non-governmental organisations within a society calls for real participation.¹⁷⁵

¹⁷³<http://www.lac.org.na/laws/summaries/Police.pdf>. Accessed on 02/07/2025

¹⁷⁴<https://www.meft.gov.na/about-meft/department-of-environmental-affairs-and-forestry/327/>. Accessed on 12/06/2024

¹⁷⁵ <https://sdgs.un.org/goals>. The 17 Sustainable Development Goals (SDGs), Accessed on 13/04/2024

Municipal Solid Waste Management at Regional and Local Government Levels in Namibia

In Namibia, MSWM falls under two ministries namely: The MEFT, and the Ministry of Urban and Rural Development (MURD). MEFT have the mandate to promote biodiversity conservation in Namibia, through utilisation of natural resources and tourism development for the maximum social and economic benefits of its citizens. Under this ministry there is a directorate of Environmental Management which controls environmental waste management. The MURD mandate is to create fairness to its communities through economic assistance, rural development, housing provision and facilitating effective local government. Directorate of Regional and Local Government, Traditional Authority mandated to support the decentralisation activities of the central government authorities at regional, local and traditional levels.¹⁷⁶

The Regional (State) Level

In Namibia the regional government is referred to as a second tier of government authority and the Oshana Regional Council represents this level as a regional authority. Namibia is divided into 14 regions by a Boundaries Delimitation and Demarcation Commission appointed by the President with the approval of the National Assembly. Each region has been divided into constituencies by the Commission. According to the Namibia Constitution, there can be 6 to 12 constituencies in each region. The voters in each constituency elect one person to represent them on their regional council. A person who is elected to represent a constituency on the council must go to live in that constituency if he or she is not already resident there. This requirement is necessary to help regional government fulfil its purpose of bringing government closer to the people. Each regional council must select three of its members to represent the region in the National Council. Each representative to the National Council will serve on the National Council for five

¹⁷⁶ Ministry of Environment and Forestry. (2017). *National solid waste management strategy for Namibia – 2017*. <http://www.oneplanetnetwork.org>

years. Regional councils work together with the National Planning Commission to make a development plan which will guide growth and development in each region. Regional councils also help local governments in the region. The President or Parliament can assign other duties to regional councils as necessary. Each region has a Governor appointed by the President. The President may also appoint special advisers to assist the Governor. The Governor's functions are to act as a link between central and regional government and to investigate and report on any matter relating to the region at the request of the President or the Minister responsible for regional or local government. The Governor can attend council meetings. The Governor may require the Regional Council to convene urgent special sessions or to address a particular issue identified by the Governor. The Governor reports to the President. Each Regional Council elects a management committee from amongst its members to hold office for half of the Council's term (2,5 years). The committee will have 3 members if the Regional Council is small (less than 9 members) and 4 members if the Council is larger (9 or more members). Each Regional Council must also appoint a chief regional officer who is responsible for carrying out the Council's decisions and directing the administration of the Council's affairs.¹⁷⁷

Each region is governed by a Governor appointed by the President. The President may also appoint special advisers to assist the Governor. The Governor's functions are to act as a link between central and regional government and to investigate and report on any matter relating to the region at the request of the President or the Minister responsible for regional or local government. The Governor can attend council meetings. The Governor may require the Regional Council to convene urgent special sessions or to address a particular issue identified by the Governor. The Governor reports to the President. Each Regional Council elects a management committee from amongst its members to hold office for half of the Council's term (2,5 years). The committee will have 3 members if the Regional Council is small (less than 9 members) and 4 members if the Council is larger (9 or

¹⁷⁷Legal Assistance Centre (n.d.). <http://www.lac.org.na>

more members). Each Regional Council must also appoint a chief regional officer who is responsible for carrying out the Council's decisions and directing the administration of the Council's affairs.¹⁷⁸

The Oshana Region (State), Namibia

The Oshana Region (State) is a diverse region located in northern Namibia with a population of 230 801. There are three municipalities governed by town councils namely: Oshakati, Ongwediva and Ondangwa. There are two Settlement areas namely: Uukwangula and Eheke Settlement Areas.¹⁷⁹

Chapter 12 of the Namibian Constitution, under article 102 (1) and the Regional Council Act of 1992 mandates Regional Councils to plan, coordinate and spearhead the course of regional development.¹⁸⁰ Oshana Region in particular spearheads regional developments in eleven (11) constituencies. The Region is headed by the Governor representing the office of the President and all government institutions. The region consists of eleven (11) political constituencies represented by Regional Councillors who amongst themselves elect the Chairperson of the Regional Council. At the local level, there are three (3) Local Authorities namely, Ondangwa, Ongwediva and Oshakati. Each local authority is represented by Local Authority Councillors, who amongst themselves elect a mayor of the town. In addition, there are three (3) traditional authorities namely; Uukwambi, Ondonga and Oukwanyama that serve as advisors on communal land and customary matters. For effective regional planning the above stakeholders play a pivotal role both politically and administratively with the main aim of ensuring service delivery to the people. As part of governance structures, the region has eleven constituencies, three local authorities and two settlement areas, created with a purpose of taking the government

¹⁷⁸Regional Councils Act 1992. (1992, August 31). <https://www.npc.gov.na/wp-content/uploads/2022/06/Regional-Councils-Act-No.-22-of-1992-.pdf>

¹⁷⁹Oshana Regional Council. (2023). *Oshana development profile 2023*. <https://oshanarc.gov.na/regionalprofiles>

¹⁸⁰Regional Councils Act 1992. (1992, August 31). <https://www.npc.gov.na/wp-content/uploads/2022/06/Regional-Councils-Act-No.-22-of-1992-.pdf>

services closer to the people.¹⁸¹

Oshana region is among fourteen regions of Namibia, adjacent to Omusati in the west, Ohangwena in the north, Oshikoto in the east and Kunene in the south. It is the smallest region in Namibia in terms of geographical area, located in the central northern part of Namibia with 11 constituencies and an area size of 8,656 square kilometres. There are three towns in the region namely; Ongwediva, Ondangwa and Oshakati. The Oshakati town is the administrative city of the Oshana Region.¹⁸²

The Oshana Region (State)

Diagram 3.1 Governing Structure of Oshana Region (State)



Source: *Field study conducted during November 2023 to February 2024*

Diagram 3.1 shows the governing structure of Oshana Region comprises of the Governor, Chairperson of the Management Committee, and three members of the

¹⁸¹Oshana Regional Council. (2023). *Oshana development profile 2023*. <https://oshanarc.gov.na/regionalprofiles>

¹⁸²Namibia Statistics Agency. (2024). *Namibia population and housing census - 2023, main report*. <https://nsa.org.na/document/2023-population-and-housing-census-main-report/>

Management Committee.

Table 3.2 Oshana Region (State) Population Size in all Eleven (11) Constituencies

Serial No.	Name of Constituency	Population Per Constituency
1	Okaku	31 466
2	Okatana	19 974
3	Okatyali	44 166
4	Ompundja	21 892
5	Ondangwa Rural	4 582
6	Ondangwa Urban	4 502
7	Ongwediva	1 4959
8	Oshakati East	30 665
9	Oshakati West	39 915
10	Uukwiyu	13 033
11	Uuvudhiya	5 647
	Total Population	230 801

Source: <https://nsa.org.na/census/wp-content/uploads/2024/10/2023-Population-and-Housing-Census-Main-Report-28-Oct-2024.pdf> Accessed on 12/12/2024

Fig 9 Map of Oshana Region (State)



Source: <https://oshanarc.gov.na/regionalprofiles>. Accessed on 22.03.2025

Fig 9 shows the map of Oshana Region with all Okaku, Okatana, Okatyali, Ompundja, Ondangwa Rural, Ondangwa Urban, Ongwediva, Oshakati East, Oshakati West, Uukwiyu, and Uuvudhiya constituencies.

Establishment of Local Authorities (Municipalities) by the Namibia Constitution

Article 111 Local Authorities of the Namibia Constitution states that Local Authorities in Namibia shall include all municipalities, town councils and village councils.

(1) Local Authorities shall be established in accordance with the provisions of Article 102 hereof.

(2) The boundaries of Local Authorities, the election of Councils to administer the affairs of Local Authorities, the method of electing persons to Local Authority Councils, the methods of raising revenue for Local Authorities, the remuneration of Local Authority Councillors and all other matters dealing with or incidental to the administration and functioning of Local Authorities, shall be determined by Act of Parliament.

(3) Persons shall be qualified to vote in elections for Local Authority Councils if such persons have been resident within the jurisdiction of a Local Authority for not less than one (1) year immediately prior to such election and if such persons are qualified to vote in elections for the National Assembly.

(4) Different provisions may be made by the Act of Parliament referred to in Sub-Article (2) hereof in regard to different types of Local Authorities.

(5) All by-laws or regulations made by Local Authorities pursuant to powers vested in them by Act of Parliament shall be tabled in the National Assembly and shall cease to be of force if a resolution to that effect is passed by the National Assembly.¹⁸³

¹⁸³*The Constitution of the Republic of Namibia.* (1990).
<https://www.lac.org.na/namlex/Constitution.pdf>

Classification of Local Authorities in Namibia

There are three tiers of local authorities in Namibia Namely: villages, towns and municipalities. The President decides how to classify each local authority by looking at its financial resources and its capacity to provide services. A local authority can be re-classified as it changes and develops. The classification of a local authority affects its duties and powers – towns have responsibility for more services than villages, and municipalities have responsibility for more services than towns. Village councils have 5 members. Town councils have 7-12 members and municipal councils 7-15 members – depending on their size. Elections for local authority councils are held every five years. Local authority elections are held on the basis of party lists, where voters elect a political party rather than an individual. Voters and persons on the party list must have been living in the local authority for at least one year. The powers of the local authorities are divided into three tiers:

- (1) All local authorities are given certain powers automatically.
- (2) Other powers are given to towns and municipalities automatically, whereas villages are given these powers only when the Ministry responsible for local government thinks they are ready.
- (3) Still other powers are given to municipalities automatically, but are given to towns and villages only when the Ministry thinks they are ready.

This system is designed to help local authorities develop, by giving them increased responsibilities only as they are ready to handle them. For example, a village can be given additional powers until it is doing almost all of the things that a town can do automatically - then the village will be ready to be re-classified as a town.

Local authorities have the power to make local regulations on a wide variety of matters. All local authorities must supply water, sewerage and refuse disposal services to communities which have been formally established as residential areas – which includes neighbourhoods where the local authority has laid out streets and divided the land up into plots available for purchase. When any local authority is unable to carry out its responsibilities, central government may take steps to deal

with the problem. Each municipal council and town council elects a mayor and a deputy mayor from amongst its members. The mayor and deputy mayor serve as the chairperson and vice-chairperson of the council. They are responsible for formulating policies, promoting employment, and monitoring the implementation of the council's policies. The mayor and deputy mayor are accountable to the people who live in the local authority. They have a duty to investigate and resolve issues relating to the local authority. A village council elects a chairperson and a vice-chairperson. These officials have powers and duties similar to those of the mayors and deputy mayors in larger local authorities.

Municipal and town councils elect management committees from amongst their members each year. Management committees has 3-5 elected members, depending on the size of the council. It also includes the mayor and deputy mayor. The management committee is responsible for seeing that the council's decisions are carried out. It controls the council's budget. It also has the power to ask the council to reconsider a decision in light of factors pointed out by the committee. Municipal and town councils appoint clerks. Village councils appoint village secretaries. These clerks and secretaries act as the chief executive officers of the local authority. They are responsible for carrying out the council's decisions and administering the local authority's affairs. The chief executive officer is a good point of contact if you have questions about the local authority. Regional and local authority council meetings are generally open to the public. Councils can also convene public meetings to give community members a chance to share their views on a particular subject. Public meetings are supposed to be announced in local newspapers and through other channels, so that interested persons will know the date, time, place and topic. You can request a public meeting on any matter of public interest. If you or your organisation collects the signatures of 10 per cent of the registered voters in your region or local authority, then the council must hold a public meeting. Regional and local councillors may not take part in any decision that could affect a financial interest of the councillor or the councillor's spouse, relative, household member or

business partner. This prevents conflicts of interest.¹⁸⁴

Functions of Town Councils (Municipalities) in relation to Solid Waste Management

There are twenty-six functions to be performed by the town council under the Local Authorities Act, 1992 as follow: To supply water to the residents in its area for household, business or industrial purposes. To provide, maintain and carry on a system of sewerage and drainage for the benefit of the residents in its area. To provide, maintain and carry on services to such residents for the removal, destruction or disposal of rubbish, slop water, garden and stable litter, derelict vehicles, carcasses of dead animals and all other kinds of refuse or otherwise offensive or unhealthy matter. To establish and maintain cemeteries, or to take over any cemetery situated within its area. To construct and maintain streets and public places; to supply electricity or gas to the residents in its area; to establish, carry on and maintain sand, clay, stone or gravel quarries and works for the manufacture of bricks and tiles, and to dispose of sand, clay, stones, gravel, bricks and tiles exploited or manufactured from such quarries. To establish, carry on and maintain a public transport service.

Organisation Structure of the OTC

The organisation structure of the OTC is comprises of elected officials (Councillors) and appointed officials (Executives).

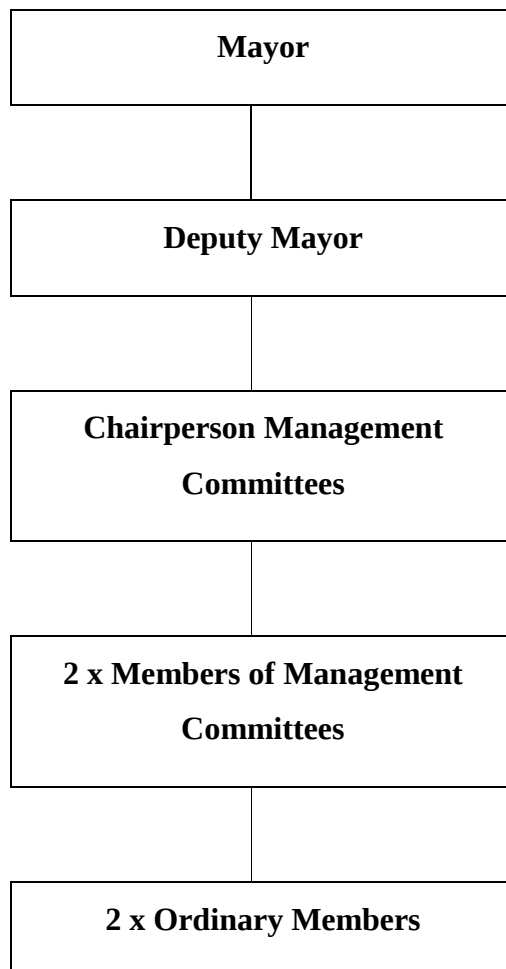
The Elected Officials (Councillors)

There are seven (7) elected councillors through local government elections whereby different political parties contest in every after five (5) years. The last elections took place in November 2020 and the following elections will take place by November 2025. The seven (7) elected officials have to elect among themselves the following councillors. These are: The Mayor; Deputy Mayor; Chairperson of the Management Committee; Two members of Management Committee; and Two

¹⁸⁴ Local Authorities Act 1992. (1992, August 31). <https://www.npc.gov.na/wp-content/uploads/2022/06/Regional-Councils-Act-No.-22-of-1992-.pdf>

Ordinary Members.¹⁸⁵

**Diagram 3.2 Organisation Structure of OTC Elected Officials (Councillors)
Elected on November 2020**



Source: Field study conducted during November 2023 to February 2024

Diagram 3.2 above shows the elected officials (Councillors). These are: The Mayor; Deputy Mayor; Chairperson of the Management Committee; Two members of Management Committee; and Two Ordinary Members.

Powers and Functions of Mayor

The mayor of a town council shall perform the following functions: Be the

¹⁸⁵ Local Authorities Act 1992. (1992, August 31). <https://www.npc.gov.na/wp-content/uploads/2022/06/Regional-Councils-Act-No.-22-of-1992-.pdf>

principal head and, in consultation with the town council concerned. Initiate and formulate planning and development policies. Initiate promotion for the creation of employment in its local authority area. Closely monitor the implementation of the policies. Supervise, planning and execution of all development programmes and projects. To be accountable to the inhabitants of the local authority area regarding any matter. In consultation with the municipal council or town council concerned, investigate and endeavour to solve, any issue pertaining to the local authority area concerned; and be responsible for the promotion and creation of the social well-being of the inhabitants of the local authority area concerned.

Powers and Functions of Deputy Mayor

The deputy mayor assists and advise the mayor in execution of his or her duties.

Management Committee

As per Local Authority Act of 1992, 21. (1), the Oshakati town also have a management committee.

Composition of the Management Committee

Amongst the members of the council, the mayor, deputy mayor, and three members of the council form up a management committee.

Powers and Functions of Management Committee

A management committee make sure that the decisions of the local authority council are carried out. It also prepares and compile for the approval of the local authority council the estimates and supplementary estimates of revenue and expenditure of the local authority council. The management committee control the expenditure of moneys voted by the local authority council in its approved estimates and additional estimates and all other moneys or funds made available to the local authority council. Report at meetings of the local authority council on the exercise of the powers and the performance of the duties and functions of the management committee. Furthermore, a management committee may at any time in writing request a local authority council to reconsider any decision referred to with due

regard to such facts or other considerations as may be set out in such request.

Functions of the Chairperson of Management Committee

The chairperson of the OTC management committee is the presiding officer of the meetings of the council and ensures that the council's decisions are implemented. The chairperson is the advisor to the council on matters entrusted to it by law. To prepare and compile the council's budget for approval, controls the expenditure and reports to the council on its performance and the exercise of its powers.

Ordinary Members

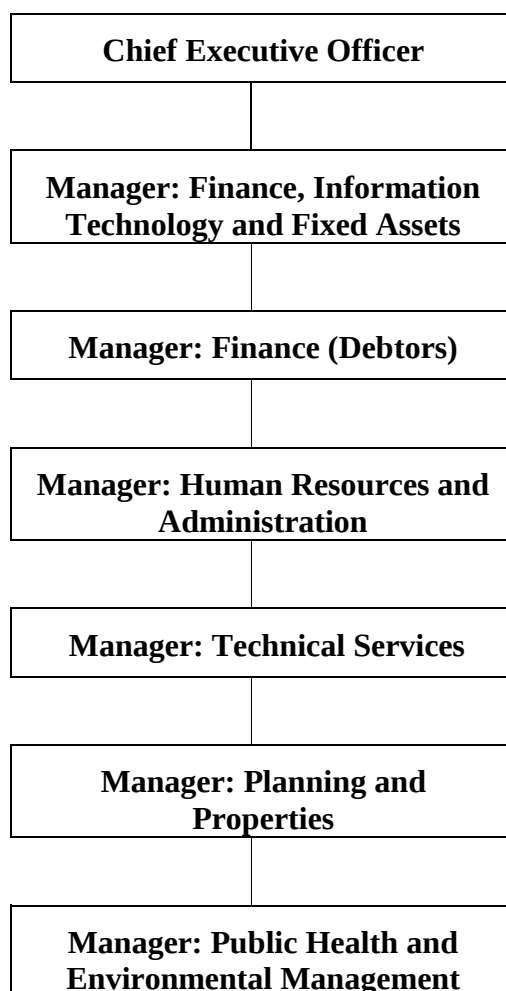
There are ordinary members of the management committee mandated for voting and elect a mayor and deputy mayor to lead the council; formulate policies, monitoring and implementation.

Appointed Officials (Executives)

The OTC executives comprises of eight (8) appointed officials who perform day-to-day activities of the town. The executive jobs normally advertised in local media upon available. Candidates who met the minimum requirements apply to fill the vacant. The human resources select the potential candidates for interview. The panel comprises of different panellist from different ministries and private sectors to prove transparency. The CEO only serve for five (5) years contract. The current CEO was appointed in March 2021 and will serve until February 2026. The rest of the position such as: Manager - Finance, Information Technology & Fixed Assets; Manager - Finance (Debtors); Manager - Finance (Creditors); Manager - Human Resources and Administration; Manager - Technical Services; Manager - Planning and Properties; and Manager - Public Health & Environmental Management are not contractors but permanent positions.¹⁸⁶

¹⁸⁶Local Authorities Act 1992. (1992, August 31). <https://www.npc.gov.na/wp-content/uploads/2022/06/Regional-Councils-Act-No.-22-of-1992-.pdf>

Diagram 3.3 Organisation Structure of the Oshakati Town Council Appointed Officials (Executives) as on 30 March 2021



Source: *Field study conducted during November 2023 to February 2024*

Functions of the CEO

The functions of CEO of the OTC is stipulated in the Local Authorities Act, 1992, 27 (1) (a) as follows: Serve as the accounting officer for the town council and principal advisor to the council; formulates and reviews policies, and develops strategic directions for the town. Administers the affairs of the town council and coordinates the activities of the municipality. Management of budget; accountable for the council's operations and activities; serves as a communication link between

the council, its management committee, and the departments of the municipality; monitors the implementation of policies; ensures compliance with laws and regulations; addresses the needs of the community.¹⁸⁷

OTC Departments

The Oshakati Town Council is comprising of seven departments in order to run its day to day activities and to accomplish its mandates. These are: Finance, Information Technology & Fixed Assets; Finance (Debtors); Finance (Creditors); Human Resources and Administration; Technical Services; Planning and Properties; and Public Health & Environmental Management. Below are the details relating to the departments mentioned above.

Department of Finance, Information Technology & Fixed Assets

The functions of a finance, information technology, and fixed assets manager in OTC include: Planning and managing the financial and accounting functions; Coordinating the financial and accounting functions; Controlling the financial and accounting functions; Adhering to financial policies, regulations, credit control policy, and legislative requirements.

Department of Finance (Debtors)

A finance manager at OTC is responsible for managing the financial operations of the council, including: Locating and contacting debtors to inquire about their payment status, updating receivables, and keeping track of assigned accounts; planning a course of action to recover outstanding payments, negotiating payment plans, and alerting superiors of debtors who are unable or unwilling to pay; implementing a credit control policy to ensure sufficient cash flow; ensuring the effective management of all council revenue, with an emphasis on controlling debtor accounts; attending to consumer queries and handling complaints; investigating and

¹⁸⁷Local Authorities Act 1992. (1992, August 31). <https://www.npc.gov.na/wp-content/uploads/2022/06/Regional-Councils-Act-No.-22-of-1992-.pdf>

resolving discrepancies; creating trust relationships with debtors to avoid future issues; updating account status and database regularly.

Department of Finance (Creditor)

The functions of a finance-creditor manager of the OTC are: Identifying beneficiaries, signing contracts, collecting outstanding and due amounts, improving efficiency and quality of service delivery, establishing that bidders have the financial, technical, and capacity to fulfil their obligations, establishing that bidders have the necessary infrastructure and equipment, Requesting additional information from bidders.

Department of Human Resources and Administration

The human resources manager of OTC has many functions, including: Planning, training, recruitment, employee's relations, budgeting and communication.

Department of Technical Services

The Technical Services Manager of the OTC is responsible for a variety of functions, including: Infrastructure designing, project management, procurement, construction supervision and contract administration.

Department of Planning and Properties

The Manager of Planning and Properties of the OTC is responsible for a variety of functions, including: Implementing and maintaining the town council's strategic plan; developing and implementing policies; managing budget; reporting; human resource development; customer care and corporate communication; and risk management.

Department of Public Health & Environmental Management

There is a Public Health & Environmental Management Department headed by the Manager. The functions of a Public Health and Environmental Management manager in Oshakati town are to promote and maintain health; environmental and waste management. The main objective of the department is to provide community

services such as recreational facilities, healthcare, environmental management and sustainability initiatives. There are three divisions fall under this department namely: business registrations, shops inspections, and waste management division.

Wastes Management Division

Waste management division are to keep the town clean in order to avoid damage to environment and maintain health. The Senior Environmental Health Officer is the overall responsible official of all waste management including solid waste in the Oshakati town. Other officials of waste management division are: Waste Management Officer, Cleansing Officer, Operators/Drivers, Waste Disposal Guard, and General Assistants assisting the Public Health and Environmental Management Manager.¹⁸⁸

Conclusion

This chapter presented the applicable laws, legislations and policies, and institutional setup existing related to solid waste management in Namibia and of Oshakati town. Various environmental related laws, policies, legislations and institutional setup governing solid waste management at central, regional and local government were identified.

¹⁸⁸<https://www.oshtc.na/public-health-and-environmental-management/> Accessed on 11/05/2025

CHAPTER-IV

THE ROLE OF PUBLIC PRIVATE PARTNERSHIP IN MUNICIPAL SOLID WASTE MANAGEMENT IN OSHAKATI TOWN, NAMIBIA

Introduction

This chapter discusses the role of PPP in SWM in Oshakati town. The primary research objective of this chapter is to analyse the role of PPP in Oshakati town. The secondary research objectives of this chapter is: to study the principles of PPP; to analyse how PPP was implemented in MSWM by the OTC; and to study the problems and challenges faced in implementing PPP in SWM in Oshakati town. Problems and challenges hindering the implementation of PPP are to be discussed in chapter V.

Public Private Partnership

PPP can be defined as arrangement between government and private sectors for the purpose of providing public infrastructure, community facilities and related services and allocates responsibilities and risks among the various partners. Through the agreement, the private sector agrees to provide services which were hitherto provided by the government. The main characteristics of PPP is the sharing of investment, risk, responsibility and reward between the two partners. There may be many reasons as to why governments and private sectors enter into such ventures, however, the understanding in these types of partnership is that the strength of both the public and the private sector are drawn to complement the relationships.¹⁸⁹

Composition of Public Private Partnership

PPP is also a conceptually collaboration between public and private entities in public service delivery. Though it involves the public and private sectors, it does not exclude the involvement of civil society. It is believed that four sectors involved namely: the government, non-governmental organisations (NGOs), Community

¹⁸⁹Vanlalhlmpuii, J. (2013). *Public-Private Partnership in municipal solid waste management in Aizawl* [Master's thesis, Mizoram University], Aizawl, India. <https://scholar.google.com/scholar?hl>

Based Organisations (CBOs), and the private sector PPP is comprising of two main categories: Public Sector and Private Sector. Public sector is a public own enterprises or institutions. In SWM context, the public sector actors include local governments. Public actors are directly controlled by the laws enacted by the central government. The Private Sector comprises of formal private sector, informal private sector and non-governmental organisations. The formal private sector includes registered enterprises carrying out SWM services such as collection, transport, and disposal and recycling. The formal private sector can be defined as private sector corporations, institutions, firms and individuals, operating registered or incorporated businesses with official business licenses, an organised labour force governed by labour laws, some degree of capital investment, and generally modern technology. Informal Private sector includes unregistered, unregulated activities undertaken by individuals, families, groups or small scale business waste pickers, itinerant buyers, traders in waste materials and non-registered small-scale enterprises. Informal waste collectors are not regulated or controlled by government agencies. This chapter focused on formal private sector involvement in SWM with the OTC.¹⁹⁰

Motive of Public Private Partnership and New Public Management

The strategic motive to implement a PPP is to reduce costs for non-core activities or to gain access to expertise. It also aims to reduce the burden of tasks and responsibilities. PPP is selected when a certain organisation wants to improve service levels and reduce costs at the same time. PPPs are focused on introducing and developing new and innovative services and seem to accomplish most intents at the expense of higher risks. The intents have relatively subtle differences, compared to how significantly the arrangements differ.¹⁹¹

¹⁹⁰Keyter, C. (2010). Perceptions of stakeholders involved in a Public-Private Partnership arrangement: A case study of solid waste management in the City of Windhoek, Namibia. *Journal of Public Administration*. 45 (1): 1-19. <https://scholar.google.com/scholar>.

¹⁹¹Joha, A., & Janssen, M. (2010). Public-private partnerships, outsourcing or shared service centres: Motives and intents for selecting sourcing configurations. *Transforming Government: People, Process and Policy*, 4(3), 232-248.

In NPM, contracting involves outsourcing public services to private companies to improve efficiency, cost-effectiveness, and service delivery by introducing private sector management practices. This approach, also known as contracting out, aims to increase productivity and foster competition among providers to ultimately enhance public services. However, the success of contracting hinges on careful contract design, suitable context, and effective contract management to ensure desired outcomes rather than perfunctory or predatory behaviour by contractors.¹⁹²

Fundamentals of Public Private Partnership

Different theories including the NPM theory suggest some basic fundamentals that need to be right if the expected results of PPP are not to be elusive. It is believed that various issues are necessary when addressing the involvement of the private sector in rendering solid waste services. These includes: accountability, efficiency, legislation, management, finance, and costs. Cost effective and adequate service standards can only be reached by creating effective competition amongst several private sector contractors. This may be achieved through transparent bidding procedures, accountability for both contract parties and the comprehensive monitoring of contracted services. Competition is the key condition for successful private sector participation. The adoption of competitive tendering involves four steps: specification of the service to be provided; request for tenders; evaluation and selection of the contractor; and managing the contract after it has been let. Highly specific contract terms that establish duties; performance monitoring; rules for changing prices and sanctions hold the key to contractual exchange.¹⁹³

Privatisation of Solid Waste in Public-Private Partnership

Privatisation involves outright disinvestments in, or sale of, utility or public service to private sector. The government remains accountable and ensure that the

¹⁹²Fortin, Y., & Hassel, H. V. (2003). *Contracting in the new public management: From economic to law and citizenship*. IOS Press.

¹⁹³Oduor, J. (2015). *Public private partnership in solid waste management: Case study of Nairobi* (Doctoral dissertation, University of Nairobi). <http://erepository.uonbi.ac.ke>

standard of service quality, price certainty and cost effectiveness. The major role of the government is monitoring and evaluation while private sector is to finance, build and rendering of service. Under PPP approach, the expertise, skills, and experience of both public and private sector linked together to deliver higher standard of service to the consumers. The public sector contributes assurances in terms of citizen support, stable governance, financing, and also assumes social, environmental and political risks. The private sector also brings along operational efficiencies, innovative technologies, access to additional finances, managerial effectiveness and bears construction, commercial, and operational risks of the entire project.¹⁹⁴

Differences between Privatisation and Public-Private Partnership

Though privatisation looks similar to PPP, they are not exactly the same. The key differences are as follows:

Responsibility

Under privatization, the responsibility for funding and delivering a particular service rests with the private sector while PPP involves full retention of responsibility of the government for providing the service.

Ownership

While ownership rights under privatization are sold to private sector along with associated benefits and costs, PPP may continue to retain the legal ownership of assets.

Nature of Service

Under privatization the service provider determines the nature and scope of service while under PPP, the two contracting partners determine the nature and scope of service.

¹⁹⁴Dhameja, N. (2008). Public-Private Partnership for infrastructure development: Cross-country scenario. *Indian Journal of Public Administration*, 54(1), 21-33.

Risk and Reward

Under privatization, all risks inherent in the business rest with the private sector while under PPPs, all risks and rewards are shared between the private sector and the government.¹⁹⁵

PPP in MSWM in Namibia

In terms of PPP, Namibia's PPP Act 4 of 2017 aims to involve the private sector in the provision of public services or infrastructure assets. It also seeks to enhance capacity for PPP projects. Moreover, global political economic currents with their concomitants such as governance innovation and citizen empowerment create the need for alternative approaches to resource mobilisation for development. PPP is a suitable method of delivering most services commonly provided by local government and is characterized by the sharing of investment, risk, responsibility and reward between the two partners. The type of services that would be provided through PPP would differ from one local government to another depending on the policies of the government from time to time.¹⁹⁶

The Aim of PPP in Namibia

The government of the Republic of Namibia introduced PPP in order to promote industrialisation in the country through the considering the benefits that come with it. The aim of PPP is to deliver improved services and better value for money primarily through appropriate risk transfer, encouraging innovation, asset utilization and integrated life management under pinned by private financing of infrastructure and government services.

¹⁹⁵Khanom, N. A. (2010). Conceptual issues in defining public private partnerships (PPPs). *International Review of Business Research Papers*, 6(2), 150-163.

¹⁹⁶Yankson, E. (2025). New public management and smart local governance in the era of the fourth industrial revolution: Lessons from Namibia. In *Encyclopedia of Information Science and Technology, Sixth Edition* 1-20. IGI Global. <https://orcid.org/0000-0002-9652-1577>

Key Principles in the Application of PPP

In achieving the above objectives, the partnership with the private sector will be grounded on the following key principles:

(a) Value for Money

Value for money is the combination of the service outcome to be delivered by the private sector, together with the degree of risk transfer and financial implications for government. In considering the value for money the following principles will apply: The allocation of risk and related financial implication to the government will be geared towards delivering the greatest net economic benefit to the country. The benefits of private sector expertise, risk management, project management, capital, flexibility, and innovation will be maximized. The partnership provides greater value for money for the government on a whole-of-life cost basis than conventional procurement or other procurement approaches. PPPs will be underpinned by rigorous evaluation of a business case consistent with the government's existing and future fiscal policies and guidelines.

(b) Public Interest

The service provider must ensure that procuring the project as a PPP is not contrary to the public interest and after a decision has been made to procure a project as a PPP, ensuring that the procurement process is structured to ensure that the project continues to be in the public interest.

(c) Competitive Pressure

The competitive procedure and process of selection of private partners will be through a competitive tendering process using a variety of selection criteria focused on both quality of delivery (technical) and price (financial) considerations. The policy will also address the treatment of unsolicited proposals. The tendering process for PPPs will adhere to the Government's applicable procedures, policies and guidelines as set out in this Policy and subsequent Regulations.

(d) Transparency

Transparency and accountability will be ensured in the procurement of partners and subsequent delivery of services. Private sector intellectual property and commercial confidentiality will be protected as appropriate. Formal approvals of projects will form part of the government process. Disclosure policies and public consultation will protect public interests in PPP projects. Performance measures will be clearly established to ensure transparency in the quality of services and project outcomes. Government's interest in land and other government assets will be protected.

(e) Risk Allocation

The principle governing risk transfer is one of optimal risk allocation. Risk will be allocated to whoever is best able to manage it, taking into account public interest considerations, so that the resulting efficiency gains are optimal.

(f) Affordability

Affordability gauge the demand of the project on the budget and technical capacity of the relevant institution over the whole PPP project life and determine impact on government's resources. User fees will also be subjected to the test of affordability by the end users.

(g) Output Oriented

Output oriented focus will be on specification of what services are to be delivered rather than how they should be delivered in order to maximize the opportunity for innovation. Performance measures will be established to ensure that the required services are delivered in accordance with the output specification.

(h) Accountability

Agencies are responsible for the delivery of their outputs including where PPP's are used to deliver those outputs. Agencies cannot transfer this accountability to the private sector. The conduct of the public sector should always be such that

confidence in the probity of the partnership model and the way in which it is implemented can be maintained at all times.¹⁹⁷

Present Scenario of PPP in SWM in Oshakati Town Council

The Oshakati town council introduced PPP in SWM in accordance to the Oshakati Town Waste Regulations: Local Authority Act No. 250 of 1992 which is the provision for management of waste in Oshakati town. It is also supported by the Public Procurement Act of 2015 that states “*provide a legal framework for public private partnership projects; to establish the Public Private Partnership Committee; to regulate public private partnership projects through the stages of initiation, preparation, procurement, conclusion of public private partnership agreement and implementation; and to provide for incidental matters*”. The OTC drafted the public procurement guidelines that makes it easy for the operating and procedures apply to all procurement activities conducted within the organisation for the acquisition of goods, services or works that ensure effective and timely solicitation of bids, proposals, award of contracts and delivery of the goods and services required for the operations.

Oshakati town council found it essential that the waste management contract is drawn up specifically by the appropriate waste management officer or the environment health officer. These officers should be able to provide advice about appropriate waste management practices and able to evaluate the suitability of the methods proposed by the tenderers. Competition for waste management services is very intense in some geographical areas, allowing choice from a wide range of waste management. This may complicate the selection process, but it increases options for overall management of waste, and may result in a less expensive service. The waste collection tender is approved by a local tender board upon the submission of the officer concern. All potential tenders are given equal opportunities to tender and they have to submit their quotes as well as the action plan on the approach of the project.

¹⁹⁷Mutede, T. P. (2019). *Recycling solid waste: A study on an emerging raw material industry in Namibia*, (Doctoral dissertation, University of Namibia). <https://repository.unam.edu.na>

The OTC is guided by the Local Tender Board Regulations in allocation of tenders.¹⁹⁸

The OTC Contractual Framework Before Selecting PPP Beneficiaries

According to the Internal Standard Operating Procedures (ISOP) of OTC, 2020, There are stages to be followed before awarding a tender.

These are:

Stage 1: Identification of Goods, Works or Services Required

The procurement process begins after a need has been identified by the user department; which comprises of materials or resources required for the organizations operations, including the items outlined in the Annual Procurement Plan (APP).

Once a need has been identified, the request for procurement is prepared by the requesting department with an estimated cost provided from a market research; benchmark price. The request for procurement should be accompanied with detailed specifications, terms of reference and dimensions/measurements of goods or services to be procured. However, when there is a need; Procurement Management Unit (PMU) can assist the requisitioned to conduct the price benchmarking activity for the estimated cost and specifications.

Stage 2: Choice of Procurement Method

With the market research conducted in stage 1 of the process, the cost estimate determines the procurement method to be used for the procurement of the goods, services or works. If the estimated cost required is below the threshold of N\$15,000.00, it is identified as small value procurement. This request is conducted by PMU from the initiation of the procurement up until the delivery of goods or services. When the estimated cost exceeds the threshold of N\$15,000.01, the Open National Bidding.

¹⁹⁸Oshakati Town Council. (2015). *Waste management policy - 2015*, Oshakati, Namibia. Print.

Stage 3: Availability of Funds

The Finance Department verifies the budget line and then allocate the available funds, which is indicated on the Request for Procurement. The Request is submitted to the head of PMU, who reviews and recommends the request to the Accounting Officer.

Stage 4: Preparation of the Standard Bidding Document

Once the request for procurement or PC submission has been approved, the request is submitted to PMU and a file is created and maintained for each procurement that has been initiated and effected through all the methods of procurement. A Standard Bidding Document is prepared by the Procurement Management Unit and user department and a reference number is allocated as per the tracking sheet which is operational for control purposes.

Stage 5: Invitation to Bid

An invitation to bid is sent to potential bidders who are sourced from the supplier database, to submit priced offers for goods, services or works or alternatively bidders can collect the Standard Bidding Document on request at OTC office.

Stage 6: Submission of Bids

PMU is responsible for the proceedings of bid submissions; the bid should close on the date, time and place indicated in the standard bidding document; bids submitted late will not be accepted. Bidders can hand deliver the bids in a sealed envelope addressed to PMU at OTC, on or not later than the closing date and time.

Stage 7: Bid Opening Session

PMU and user department to conduct the bid opening session in accordance with Section 51 of the Public Procurement Act, 15 of 2015. The OTC shall conduct the bid opening session in the presence of the bidders or bidders' representatives who choose to attend at the address, date and time stipulated, the opening session should commence immediately after the closing date and time of the bid.

Stage 8: Bid Evaluation Examination

The bid can be evaluated by PMU and submitted to PC for recommendation and forwarded to the AO for approval. Evaluation is conducted randomly by the evaluation committee members who are appointed by Accounting Officer in accordance with Section. Once the BEC has identified the successful bidder, the report is submitted to the Procurement Committee through PMU, then PC is required to submit a report to the Accounting Officer, seeking for approval and recommendation to award or cancel the bid to the responsive bidders.

Stage 9: Selection of Award or Cancellation

Bidders should be informed accordingly on the outcome of the examination and evaluation of bids, once a decision has been established and is approved by the Accounting Officer. Once a decision to award or cancel the procurement is known to the Procurement Management Unit, a notice to the successful/award letter or unsuccessful bidder or cancellation should be sent to the bidders immediately. OTC will proceed to award the contract to the successful bidder. A copy of the award letter together with the executive summary of the bid evaluation report must be placed on OTC website and should be published in any print media widely circulated newspaper within seven days of the procurement award.

Stage 10: Generating of Purchase Requisition and Purchase Order/Contract

The Procurement Management Unit should generate a purchase requisition once the successful bidder has been notified, the purchase requisition is duly signed and approved by the Requesting Unit.

Stage 11: Receiving, Invoicing and Payment Requisition

PMU have to monitor every stage of the procurement process and ensure delivery of procurement and initiate necessary action against defaulting suppliers and contracts; in accordance with the Act. When services have been delivered the waste management department and Procurement Management Unit representatives should be present to accept as well as verify the service delivered.

Stage 12: Auditing and Filling Record

The final stage in the procurement cycle is important for all the record and bookkeeping as well as for audit purposes.¹⁹⁹

¹⁹⁹Oshakati Town Council. (2020). *Internal standard operating procedures procurement management unit*. No: 56.6/19/05/2020. <https://www.oshtc.na/wp-content/uploads/2025/06/Internal-Standard-Operating-Procedures.pdf>

Present Contractors for in PPP with OTC for Refuse Removal

Table 4.1 Contractors: Refuse Removal and Disposal Services in OTC

Serial Number	Contractor's Name	Area of Responsibility
1	Ekuwa T M Investment cc	Oshakati North, Industrial and Ompumbu
2	Gwakathimbi Trading cc	Kandjengedi North and South
3	Snow White Laundry and Cleaning Services cc	Oshoopala, Open Market, Etango, Bank Windhoek and Oshakati Extension 2, up to Oshakati Magistrate Office
4	Courts Valley Investments cc	Uupindi North
5	Maple Tree Trading Enterprises cc	Oneshila
6	Estadio cc	Evululuko West
7	Onandjeke cc	Evululuko East
8	Tuno Trading cc	Oshakati West North
9	Metete cc	Uupindi South
10	Onetime cc	Oshakati West South, Eemwandi and University of Namibia
11	Roha Investment cc	Oshakati East Red Zone
12	Barb cc	Oshakati East Residential & Extension 16
13	Matoceam cc	Onawa Location

Source: Field study conducted during November 2023 to February 2024

Table 4.1 show all contractors in partnership with OTC and their areas of responsibilities. Ekuwa T M Investment cc, Oshakati North, Industrial and Ompumbu; Gwakathimbi Trading cc, Kandjengedi North and South; Snow White Laundry and Cleaning Services cc, Oshoopala, Open Market, Etango Complex, Bank Windhoek and Oshakati Extension 2, up to Oshakati Magistrate Office; Courts Valley Investments cc, Uupindi North; Maple Tree Trading Enterprises cc, Oneshila; Estadio cc, Evululuko West; Onandjeke cc, Evululuko East; Tuno Trading cc, Oshakati West North; Metete cc, Uupindi South; Onetime cc, Oshakati West South, Eemwandi and University of Namibia; Roha Investment cc, Oshakati East Red Zone; Barb cc, Oshakati East Residential & Extension 16; and Matoceam cc, Onawa Location.

Motive for Introduction of PPP in SWM in Oshakati Town

Due to urbanisation, the quantity of solid waste has escalating and cause environmental threat to the residents. Policy makers realised that it is not only a task of the public sector but there is a need to involve PPP in waste management. Their responsibilities are of collecting, transporting and disposing of wastes. Each contractor has own trucks that collects waste from door to door in the assigned areas of the town.

Benefits of PPP in Municipal Solid Waste Management.

The aim of PPP in SWM is to provide service effectively and efficiently. This is done by the sharing of risks, responsibilities and reward between the partners for sustainable services provision. The cooperation between the two combines the skills of both public and private sectors that improves the SWM situation. It was found that PPP is a better alternative model for SWM that agreed together by all stakeholders.

Conclusion

This chapter highlighted the role of PPP in SWM in Namibia specifically in Oshakati town. The study objective of this chapter was to analyse the role of PPP in Oshakati town.

CHAPTER-V

RESULTS AND DISCUSSIONS

This chapter presents the study results and discussions. The results are in line with the research questions of the study.

Personal Background of the Respondents

In the respondent's personal background, the age, sex, religion, educational qualification, marital status and occupation of the respondents have been analysed.

Table 5.1 Age of the Respondents

Serial Number	Age of the Respondents	Municipal Officials(%)	Contractors (%)	Community Members (%)	Othingo Village Residents (%)
1.	Below 30 years	-	-	42 (32)	2 (20)
2.	31 to 40 years	1 (20)	3 (23)	45 (35)	3 (30)
3.	41 to 50 years	3 (60)	4 (31)	23 (18)	2 (20)
4.	51 years and above	1 (20)	6 (46)	20 (15)	3 (30)
Total		5 (100)	13 (100)	130 (100)	10 (100)

Source: Field study conducted during November 2023 to February 2024.

Table 5.1 above shows the age of the respondent's. Representatives of the Municipal Officials shown in the table above revealed that no respondents belong to the age group of below 30 years. About 20 percent of the respondents belong to 31 to 40 years of age group. About 60 percent of the respondents belongs to 41 to 50 years

of age group. About 20 percent of the respondents belongs to the age group of 51 years and above.

The age of the respondent's representatives of the Contractors shown in the table above reveal that no respondents belong to the age group of below 30 years. About 23 percent of the respondents belong to 31 to 40 years of age group. About 31 percent of the respondents belongs to 41 to 50 years of age group. About 46 percent of the respondents belongs to the age group of 51 years and above. Therefore, it implies that the majority of the contractors are from the age group of 51 and above.

The age of the respondent's representatives of the Community Members shown in the table above reveal that 32 percent of the respondents belong to the age group of below 30 years. About 35 percent respondents belong to 31 to 40 years of age group. About 18 percent of the respondents belongs to 41 to 50 years of age group. About 15 percent of the respondents belongs to the age group of 51 years and above.

The age of the respondent's representatives of the Othingo villagers shown in the table above reveal that 20 percent of the respondents belong to the age group of below 30 years. About 30 percent respondents belong to 31 to 40 years of age group. About 20 percent of the respondents belongs to 41 to 50 years of age group. About 30 percent of the respondents belongs to the age group of 51 years and above.

Among the four categories of respondents age group, the responding Municipal Officials age are between 41 to 50 years which implies that most of the municipal officials belongs to this age group while 31 to 40 and 51 years and above were least respondents respectively. The contractors dominated age group respondents were 51 years and above. This represents the transition from middle age into older adulthood showing that experience contractors are chosen. The majority age group of community member's respondents were between 31 to 40 years as this age group own houses more as compared to other age group. The Othingo villager's dominated group was 31 to 40 years, and 51 years and above. This implies that the majority of respondents involved in the solid waste management in the study area are 41 to 50 years.

Sex of the Respondents

The sex related details of the respondents are provided in the table below.

Table 5.2 Sex of the Respondents

Serial Number	Sex of the Respondents (%)	Municipal Officials (%)	Contractors (%)	Community members (%)	Othingo village Residents (%)
1.	Male	3 (60)	13 (100)	72 (55)	7 (70)
2.	Female	2 (40)	-	58 (45)	3 (30)
Total		5 (100)	13 (100)	130 (100)	10 (100)

Source: Field study conducted during November 2023 to February 2024

Table 5.2 above shows the sex of the respondents. Representatives of Municipal Officials related details provided in the table above reveal that 60 percent of the respondents are males and about 40 percent of the respondents belong to females.

The sex of the respondents of the representatives of Contractors related details provided in the table above reveal that 100 percent of the respondents are males and no respondents belongs to females.

The sex of the respondents of the representatives of Community Members related details provided in the table above reveal that 55 percent of the respondents are males and 45 percent of the respondents are females.

The sex of the respondents of the representatives of Othingo villagers related details provided in the table above reveal that 70 percent of the respondents are males and 30 percent of the respondents are females.

Among the two categories of respondent's sex group, from the table, it clearly indicates that majority of the respondents are males from all categories. So,

the solid waste management in Oshakati town is managed by the males in the study area.

Table 5.3 Religion of the Respondents

The religion details of the respondents are provided in table 5.3 below.

Serial Number	Religion of the Respondents	Municipal Officials (%)	Contractors (%)	Community Members (%)	Othingo Villagers (%)
1	Christian	5 (100)	13 (100)	130 (100)	10 (100)
2	Muslim	-	-	-	-
3	Hindu	-	-	-	-
4	Buddha	-	-	-	-
	Total	5 (100)	13 (100)	130 (100)	10 (100)

Source: Field study conducted during November 2023 to February 2024.

Table 5.3 above shows the details relating to the religion of the respondents. Representatives of the Municipal Officials in the above table reveal that 100 percent of the respondents are Christians, 100 percent Contractors, 100 percent Community Members, and 100 percent of Othingo villagers. This implies that Christians dominated Muslims, Hindus, and Buddhism religions in the Oshakati town.

Educational Qualification of the Respondents

The educational qualification details of the respondents are provided in table 5.4 below.

Table 5.4 Educational Qualification of the Respondents

Serial No.	Educational Qualification	Municipal Officials (%)	Contractors (%)	Community Members (%)	Othingo Village Residents (%)
1.	Illiterate	-	-	-	-
2.	Primary Education	-	6(46)	68(52)	1 (10)
3.	Secondary Education	-	7 (54)	16 (12)	7 (70)
4.	Tertiary Education	3 (60)	-	44 (34)	2 (20)
5.	Professional Education	2 (40)	-	2 (2)	-
Total		5 (100)	13 (100)	130 (100)	10 (100)

Source: Field study conducted during November 2023 to February 2024

Table 5.4 shows the education qualification of the respondents. Representatives of the Municipal Officials related details provided in the table above reveal that 60 percent of the respondents belongs to tertiary education group while 40 percent of the respondents belongs to the professional education group.

The education qualification of the respondents of the representatives of the contractors related details provided in the table above reveal that 46 percent of the respondents belong to primary education group while about 54 percent of the

respondents belongs to secondary education group.

The education qualification of the respondents of the representatives of community members related details provided in the table above reveal that 52 percent of the respondents belong to primary education group, about 12 percent of the respondents belongs to secondary education group, about 34 percent belongs to tertiary education while 2 percent of the respondents belongs to professional education group.

The educational qualifications of the respondents of the representatives from Othingo village is provided in the table above reveal that 10 percent of the respondents belong to primary education group, about 70 percent of the respondents belongs to secondary education group, and about 20 percent belongs to tertiary education group.

Among the five categories of respondent's educational qualification group, it clearly shows that due to low level of educational qualification, it affects the efficient implementation of solid waste management program in the study area.

Marital Status of the Respondents

The marital status details of the respondents are provided in the table

Table 5.5 Marital Status of the Respondents

Serial No.	Marital Status	Municipal Officials (%)	Contractors (%)	Community Members (%)	Othingo Village Residents (%)
1.	Married	4 (80)	9 (69)	26(20)	3 (30)
2	Unmarried	1 (20)	4 (31)	98(75)	7 (70)
3	Widow/widower	-	-	6(5)	-
4.	Separated	-	-	-	-
5.	Divorced	-	-	-	-
6.	Destitute	-	-	-	-
Total		5 (100)	13 (100)	130 (100)	10 (100)

Source: Field study conducted during November 2023 to February 2024

Table 5.5 of the respondents shows the marital status of the respondents of the representatives of municipal officials related details provided in the table above reveal that 80 percent of the respondents are married while 20 percent of the respondents are unmarried.

The marital status of the respondents of the representatives of the contractors related details reveal that 69 percent of the respondents are married while about 31 percent of the respondents are unmarried.

The marital status of the respondents of the representatives of community members related details reveal that 20 percent of the respondents are married, about 75 percent of the respondents are unmarried, while 5 percent are widow/widower.

The marital status of the respondents of the representatives of the Othingo villagers related details reveal that 30 percent of the respondents are married, while 70 percent of the respondents are unmarried.

Among the six categories of respondent's marital status group, it implies that married individuals dominate among the professional categories indicating relatively mature and stable workforce within these groups. On the other hand, the majority of community members and Othingo village residents are unmarried, which reflects a younger age composition among these respondents or social factors such as delayed marriage trends within the community. Overall, the analysis indicates a diverse marital composition with a clear difference between the professional and community groups.

Occupation of the Respondents

The occupation details of the respondents are provided in the table below.

Table 5.6 Occupation of the Respondents

Seria l No.	Occupation	Municip al Officials (%)	Contractor s (%)	Communi ty Members (%)	Othingo Village Resident s (%)
1.	Farmers	-	-	11(9)	4 (40)
2.	Businessmen/Wome n	-	-	17(13)	-
3.	Private Company Employees	-	13 (100)	25(19)	-
4.	Government/Parasta tals Employees	7 (100)	-	48(37)	-
5.	Unemployed	-	-	29 (22)	6 (60)
Total		7 (100)	13 (100)	130 (100)	10 (100)

Source: *Field study conducted during November 2023 to February 2024*

Table 5.6 shows the occupation relating detail of the respondents. Representatives of Municipal Officials provided in the table above reveal that 100 percent of the respondents are the government workers or government parastatals because they work for the OTC on full time basis.

The occupation relating detail of the respondents of the representatives of contractors provided in the table above reveal that 100 percent of the respondents are working for the private company.

The occupation relating detail of the respondents of the representatives of community members reveal that 9 percent of the respondents are farmers, 13 percent are Businessmen/Women, 19 percent are working for private companies, 37 percent are working for government/parastatals while 22 percent of the respondents are unemployed.

The occupation relating detail of the respondents of the Othingo villagers reveal that 40 percent of the respondents are farmers, while 60 percent are

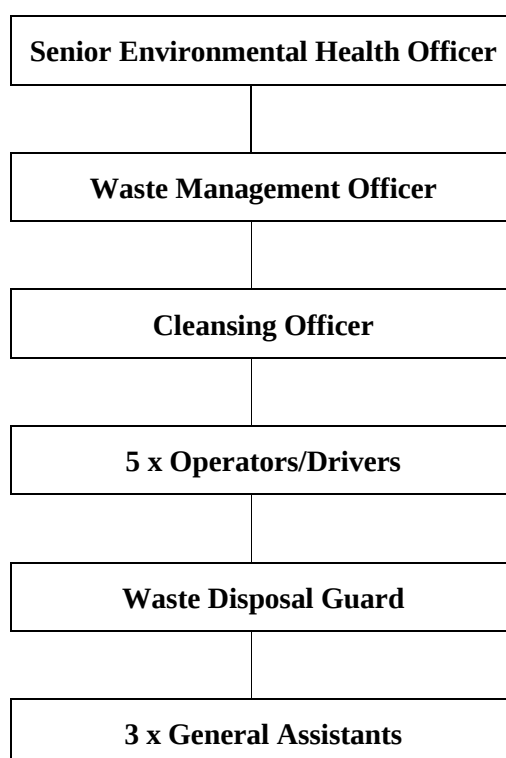
unemployed.

Among the five categories of respondent's occupation group, the occupational pattern across all groups indicates a clear distinction between urban based respondents (municipal officials and contractors) and community based respondents (community members and Othingo village residents). This occupational distribution highlights social economic disparities between urban and rural participants and provide important context for interpreting issues related to local governance, service delivery, and participation in development programmes.

Objective 1: Various Types, Sources, and Functional Elements of Municipal Solid Waste Management in Oshakati Town

Officials were asked to present the organisational structure of waste management division, their duties and total in number.

Diagram 5.1 Organisational Structure of Waste Management Division Officials of Oshakati Town Council as on 30 March 2021



Sources: Field study conducted during November 2023 to February 2024

Diagram 5.1 below shows the structure of solid waste management division comprises of: A Senior Environmental Health Officer; A Waste Management Officer; A Cleansing Officer; 5 Operators/Drivers; A Waste Disposal Guard; 3 General Assistants. There are 12 permanent employees working for waste management division of OTC.

Wastes Management Division Officials and their Duties Are:

Senior Environmental Health Officer: The overall responsibility of senior environmental officer is to find out and implement effective waste and environmental management activities. Other responsibilities include doing environmental scanning of the town on continuous basis and find out areas that require regulations to prevent health and cleanliness related problems. He/she also deals with the identification of remedial action, steps and amendments in the existing environmental policies and regulations.

Waste Management Officer: The responsibility is to develop and implement effective environmental and waste management mechanisms and measures in line with all applicable health and environment standards and regulations.

The Cleansing Officer: The main duties for the cleansing officer are for sanitation, general cleansing of the town and daily residential area inspection.

Operator/Driver: Operate the town council waste management vehicles and machines.

Waste Disposal Guard: Control and monitor the disposal site.

General Assistants: Assist the officials of the division in their day to day activities.

Various Types of Solid Waste Generated in Oshakati town.

Table 5.7 Official Responses Regarding Types of Solid Waste Generated in Oshakati Town

Query	Solid Wastes Types in Oshakati Town
What are the types of solid waste generated in Oshakati town?	Plastics, Food Scraps, Glasses, Furnitures, Papers and Cardboards, Textiles, Metals, Rubbles, Tin, Organic Waste

Source: *Field study conducted during November 2023 to February 2024*

Table 5.7 shows the Official responses regarding the types of solid waste generated in Oshakati town. These are: Plastics, Food Scraps, Glasses, Furnitures, Papers and Cardboards, Textiles, Metals, Rubbles, Tin, and Organic Waste. Solid waste in Oshakati town, like most towns, exhibits a range of physical characteristics, including varying moisture content, density, degradability, and potential hazardous content. Organic waste often dominates the composition, followed by plastic and paper.

Sources of Solid Waste in Oshakati town.

Table 5.8 Official Responses Regarding Sources of Solid Waste in Oshakati Town

Query	Sources of Solid Wastes in Oshakati Town
What are the sources of solid waste in Oshakati town?	Domestic, Commercial, Institutional, Garden, Street Sweeping, Inert

Source: *Field Study conducted during November 2023 to February 2024*

Table 5.8 shows the official responses regarding the sources of solid waste in Oshakati town. These sources are: domestic, commercial, institutional, garden, street sweeping, inert, and dead animal wastes.

Domestic Waste

The major sources of wastes generation are domestic. These wastes are not recorded as no segregation is done during storage.

Commercial Waste

Commercial businesses like shops, hotels, supermarkets generate solid wastes such as office paper, packaging, and food waste, is managed by the OTC and potentially through private waste management services. The quantity of these wastes are not recorded as there is no segregation done during storage.

Solid Waste Segregation and Storage

Officials were asked if they provide different dust bins for various waste storage.

Table 5.9 Officials Responses on Various Solid Waste Storage Facilities Provision

Query	Yes (%)	No (%)
Do you provide different dust bins for various solid waste storage?	-	5 (100)

Source: *Field study conducted during November 2023 to February 2024*

Table 5.9 shows official responses if the OTC provide different storage facilities for different solid waste. 100 percent of the respondent's responded that no specific storage provided for specific solid waste. This implies that the OTC does not have any arrangement for solid waste segregation at storage point.

Officials were asked about different types of storage facilities they provide for solid waste storage.

Table 5.10 Officials Responses on Different Storage Facilities of Solid Waste

Serial Number	Different Storage Facilities of Solid Waste
1	Dust Bin
2	Skip Container
3	Black Plastic Bags

Source: *Field study conducted during November 2023 to February 2024*

Table 5.10 shows the official responses regarding the solid waste storage facilities provided by the OTC. These sources are: dust bin, skip containers, and black plastic bags. The producer of wastes products must define, identify and store wastes correctly and prevent unauthorised access or accidental release while wait for collection. Household wastes are to be stored in a 240 Litres refuse bin, while in business sectors skip containers are used. However, this does not limit individuals that make use of other suitable materials such as empty fuel metal drums for waste storage. Garden wastes are stored outside the yard but next to the yard for collection. The Solid Waste Management Division of the OTC encourages households and business owners to purchase 240 Litres waste bins for waste storage. Other types of waste such as stones, wood, bricks, iron sheet, sand, heavy metals, tree branches and grass are to be stored somewhere but not in the wheelie bins. These are to be stored in skip containers that are distributed in some residential areas, including informal residential areas where illegal dumping of waste has been experienced. A skip container is for storing waste that cannot be stored in wheelie bins and waste generated in open spaces. In addition, black garbage bags are provided on a weekly basis to store waste generated in informal settlements and in open spaces, based on the need. These are provided by private contractors and the solid waste management division officials. Smaller garbage bins are also distributed along the streets by the solid waste management division officials to prevent littering. Provision of skips containers within the residential and business area is mainly a responsibility of the OTC solid waste management division.

The Present Scenario of Collection of Solid Waste in Oshakati Town

The collection of waste is the responsibility of OTC by collecting solid waste from house to house, businesses, institutions and other premises using compact or open truck once or twice in a week. The OTC randomly collects waste from skip containers; collects black plastic bags placed to the kerb sides of the roads, contracts private companies in PPP with the OTC to collect wastes in their areas of responsibilities. Furthermore, the OTC employs rag pickers on temporary basis to pick wastes when the need arise including sweeping sands from the streets. The Oshakati town is demarcated into 13 waste collection zones whereby each zone is allocated a private contractor for waste collection. However, it is rare for the private companies to skip one or more collections without notice. Cleaning campaigns also takes places when the waste generated in large quantities.

The Present Scenario on Solid Waste Collection Charges in Oshakati Town

The current situation regarding solid waste management in the Oshakati town is such that the collection of wastes is conducted from house to house in all parts of the town. The town is divided into thirteen (13) zones so that each household, business and other institutions have to be covered.

Table 5.11 Current Refuse Collection Charges Per Month in Oshakati Town

Category	Different Places Monthly Charges Per Bin	Amount in Namibia Dollars (N\$)	Estimated Amount in India Rupees (RS)
1	Informal Settlement- Charge Per Month	28.04	128.80
2	Residential: Basic Charge Per Month	55.76	256.50
3	Residential Charge Per Bin	59.13	272.00
4	Business: Basic Charge Per Month	163.86	753.76
5	Business Charge Per Bin	177.40	816.04

Source: [https://www.oshtc.na/refuse-removal-2/Oshakati Town Council Notice of 18 August 2021](https://www.oshtc.na/refuse-removal-2/Oshakati%20Town%20Council%20Notice%20of%2018%20August%202021) accessed on 03/12/2023

Table 5.11 shows that all thirteen contractors collect waste from the households, businesses and other institutions once or two times a week and the waste collection fees for the franchise contractors are determined by the OTC as follows: Informal settlements N\$ 28.04 (128.80 Rupees) per month; Residential basic charge N\$ 55.76 (256.50 Rupees) per month; Residential charge per bin N\$ 59.13 (272.00 Rupees); Business basic charge is N\$ 163.86 (753.76 Rupees) per month; Business charge is 177.40 (816.04 Rupees) per bin. As regards recycling, the OTC is not involved in any form of partnership in recycling instead scavengers at the dump site sort the waste as a business and later sell to recycling companies within and outside the town. However, private companies like NamWaste and Erongo Drum occasionally collect waste for recycling but not in partnership with OTC.

The OTC have a waste collection calendar that covers all corners of the town and is available on its website as well as printout available on noticeboards. All waste management activities only done five days in a week, starts from Monday to Friday as shown in Figure 10 below.

[illegible]

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Transportation of Solid Waste in Oshakati Town

The Officials were asked on how many and types of vehicles they use for the transportation of solid waste.

Table 5.12 Vehicles Used for the Transportation of Solid Waste in Oshakati Town

Vehicle Type	Quantity
Tractor Loader (Excavator)	2
Tipper Trucks	2
Bulldozer	1
Compact Trucks	1
Skip Trailers	2
Pickups	2

Source: *Field study conducted during November 2023 to February 2024*

Table 5.12 shows various vehicles used by the department of solid waste management division of Oshakati town. These are: 2 tractor loader, 2 tipper trucks, 1 bulldozer, 1 compact truck, 2 skip trailers, and 2 pickups. These vehicles are being used in all area of the town to assist PPP contractors wherever the need arise such as loading skip containers, clearing riverbeds, maintenance, and transportation of the officials.

Solid Waste Disposal of Oshakati Town

Officials were asked about the solid waste disposal method does the OTC use.

Table 5.13 Officials Responses on Solid Waste Disposal Method applied by the OTC

Serial Number	Different Solid Waste Disposal Methods
1	Landfill
2	Recycling

Source: *Field study conducted during November 2023 to February 2024*

Table 5.13 shows that the OTC applies only two methods of solid waste disposal namely: landfilling and recycling.

The NSWMSN directive says all municipalities with the population of more than 20, 000 residents are not allowed to have open burning of waste. Currently, the population of the Oshakati town is about 58, 696 residents, therefore the OTC did not apply open burning dumpsite. Waste disposal continues to be monitored and directed. The segregation of waste forms part of site operational activities. Upon each disposal, there is directive to separate the waste at separate areas zones as per their waste classification. General wastes are disposed separately from the treated hazardous wastes and building rubbles. This is to maintain the site lifespan, including smoothen the process of recycling and minimising exposure. The destruction of special waste category items is controlled for minimal environmental damage. The hazardous wastes have a separate area zone with prepared pit for co-disposal and coverage with inert materials such as demolishing and construction waste, and sand.²⁰⁰

The Present Scenario on Disposal Site (Waste Landfill) of Oshakati Town

The Oshakati town council has and use only one landfill site called Othingo duping site. It is located about five kilometres to the western side of the town. The site is measured about 10 hectors and was inaugurated in 2006. All types of wastes

²⁰⁰Ministry of Environment and Tourism. (2023). *Environmental management plan: Oshakati designated disposal site*. <https://www.meft.gov.na/service/environmental-impact-assesment-/233/>

are dumped and landfilled in the site except hazardous waste such as medical wastes which are incinerated.

The Present Scenario of Solid Waste Processing in the Oshakati Town

The OTC applied two methods of solid waste processing namely landfilling and recycling.

Solid Waste Landfilling in the Oshakati Town

The OTC have assigned a priority focus to ensuring continuous maintenance of site operations. This is particularly the case with daily waste coverage and backfilling. During the period 2020-2023, the Council has appointed a service provider for site levelling, layering, compaction and covering of landfill waste with a Bulldozer. This on-going process ensures prevention of likely occurring nuisances such as littering of site and surrounding area, including prolonging the site lifespan.

Solid Waste Recycling in the Oshakati Town

Currently, the OTC management plan is planning to construct a recycling stalls area. Currently, there is an isolated segregation area inside the site to allow for on-site recycling. The current progress includes a recycling area for segregation to allow for on-site recycling. The OTC entered into agreement with six unemployed women to do segregation work at the dump site. The OTC strategic plan budget prioritised to provide for recycling stalls instalments and development.²⁰¹

Othingo Disposal Site Control Office

Oshakati Town Council acquired a new site office at the disposal site upgrading and development. This office replaced the old office and had since been serving for entry control, site operational and management. Moreover, the office has been functioning as the assigned office for the site warden stationed at the disposal site. It consists of the weighbridge system control room, with sanitary facilities and storage area. The office serves for reception into the disposal site and for attending

²⁰¹Ministry of Environment and Tourism. (2023). *Environmental management plan: Oshakati designated disposal site*. <https://www.meft.gov.na/service/environmental-impact-assesment-/233/>

enquiries of operations to all visitors providing disposal guide control and directives. Additionally, the office has an additional extension of a shade area for operating machinery onsite used for site maintenance as per the operational procedures.

Security and Fencing

The office of the security officer was constructed and developed. The office provides security and safety patrolling inside the site and surrounding environment, including ensuring adherence to the provided site directives and instructions. The dump site is surrounded with a modern razor wire mesh fence that prevent animals and people to enter. It is envisaged that fencing the disposal site will provide public and environmental safety, whilst ensuring the prevention of unauthorised activities.

Dumping Site Maintenance

The OTC have assigned a priority focus to ensuring continuous maintenance of site operations. This is particularly the case with daily waste coverage and backfilling. During the period 2020-2023, the OTC has appointed a service provider for site levelling, layering, compaction and covering of landfill waste with a Bulldozer. This on-going process ensures prevention of likely occurring nuisances such as littering of site and surrounding area, including prolonging the site lifespan.

Dumping Site Monitoring

The OTC environmental management plan prioritises for manpower in disciplines of technical, supervision and managing key performance areas of the required activities for the plan. With regards to manpower and key performance, the OTC has a disposal site guard for overseeing and safekeeping operations. This includes ensuring adherence to compliance and disposal directives of routine site inspections, site orders, waste information recovery and inventories including liaising with management on the daily updates and performance. In addition, there is also a site security personnel serving for site patrolling and maintaining of site security directives. Addition to that, the OTC contract casual rag pickers to perform the activities of site litter picking and cleaning of the dump site surrounding. The rest of the waste management section also conduct periodic site assessments on weekly

basis to assess compliance to the environmental management plan and provide continuous improvement when necessary.

Solid Waste Record Keeping

The waste management records have a significant contribution to waste management planning. The OTC acquired a weighbridge system database to advance the previous method of measuring and keeping records manually with an automated database system. This serves vital for tracking and data quality control purposes. The attained information derived from the weighbridge are recorded further in the system database for record keeping and inventories. These records shall be periodically reviewed for inventories and assessments. The development and installation of the weighbridge has since provided daily waste information from site users on the collected and generation. In addition, the weighbridge provides a database system for the collected data, vital for waste management and planning. Most significantly, the obtained waste information will form part of waste management reporting, including providing local waste management plans and performance.

Table 5.14 Oshakati Town Waste Record for the Year 2022 - 2024

Waste Quantities in Tones	Year 2022	Year 2023	Year 2024
Bulk Waste Collected	4818.35	5078.12	4533.38
Waste Recycled	No Record	350.48	68.9

Source: *Oshakati town waste information 2025*

Table 5.14 shows the record keeping of solid waste collected from the Oshakati town and dumped at the Othingo dumping site. Due to the lack of segregation, all municipal waste in Oshakati is currently sent to the Othingo dumpsite. In 2022, an estimated of 4818.35 Tons of wastes was collected; in the year 2023, an estimated of 5078.12 Tons of waste was collected while in 2024, the estimated total of 4533.38 Tons was collected. Waste recycled during the year 2023 was 350.48 Tons while only 68.9 Tons of waste recycled during the year 2024. This show the solid waste increased with 5.39 percent between the year 2022 and year

2023, and decreased with 0.11 percent between the year 2023 and year 2024. The waste recycled during the year 2024 decreased by 0.80 percent.

Solid Waste Auditing

Waste auditing is one of the important practical aspects of waste management. In essence, waste should be audited in order to collect valuable waste statistics, for the purpose of establishing an understanding of the real situation regarding the composition of waste generated in a specific area. With reliable waste statistics, the waste management processes can be improved on how waste can be minimised.

Objective 2: Environmental Related Laws, Legislations, Policies, and Institutional Setup Existing Governing the Solid Waste Management in Oshakati Town, Namibia

Overview

This section discusses how the applicable laws, legislations and policies passed by the government of Namibia related to solid waste management applied in MSWM in Namibia, specifically in the Oshakati town. This includes central, regional and local government laws governing MSWM in Namibia, specifically of Oshakati town. Officials from the OTC were the respondents for the study. It was observed that the legal framework for solid waste management need to be tightened, and an approach for the step-by-step tightening is crucial to reach the maximum standard. Particularly, minimum standards for waste disposal need proper improvement in order to strengthen the institutional, organisational and municipal solid waste management legal framework including capacity development.²⁰²

Official Responses of the Respondents about Laws and Legislations, Policies Governing the Solid Waste Management in Oshakati Town

Officials respondents were asked if there are laws, legislations, policies governing the SWM in Oshakati town.

²⁰²Ministry of Environment and Tourism. (2017). *National solid waste management strategy for Namibia – 2017*. <http://www.oneplanetnetwork.org>

Table 5.15 Official Respondents Regarding the Applicable Laws, Legislations, and Policies Governing the Municipal Solid Waste Management in Oshakati Town

Query	Yes (%)	No (%)	No Idea (%)	Total (%)
Are there applicable laws, legislations, governing municipal solid waste management in Oshakati town?	5 (100)	-	-	5 (100)

Source: Field study conducted during November 2023 to February 2024

Table 5.15 shows the Officials Respondents from the OTC. Respondents reveal that all five officials represented 100 percent responded and agreed that there are national, regional and local government laws governing MSWM in Oshakati town. This indicates that officials are aware of laws, legislations, policies governing the MSWM in Oshakati town.

Legal Framework Strengthening MSWM

Officials were asked if there are any regulations that strengthening the MSWM operations.

Table 5.16 Legal Framework Strengthening MSWM

Query	Yes (%)	No (%)	No Idea (%)	Total (%)
Are there any legal framework strengthening the municipal solid waste management operations in Oshakati town?	4 (80)	-	1 (20)	5 (100)

Source: Field study conducted during November 2023 to February 2024

Table 5.16 shows the Official respondents regarding the legal framework strengthening solid waste management in the Oshakati town. The respondents who

responded revealed that 80 percent of the official agreed, none disagreed, and 20 percent had no idea if there are any regulations strengthening the municipal solid waste operations in Oshakati town. Furthermore, respondents figure out some Laws that are to be believed as best in strengthening the management of solid waste in Oshakati town.

The Law on Solid Waste Segregation in Oshakati Town

The producer of waste of any type must identify, define and store wastes correctly and ensure that no unauthorised access or release accidentally during the period of awaiting for collection. This simply mean wastes must be segregated before collection.

The Current Scenario on Solid Waste Segregation in Oshakati Town

In Oshakati town, no segregation taking place before storage except wastes that cannot fit in the refuse bin such as metals, building rubbles and garden wastes are placed alongside the yards for collection. In Oshakati town, there are not more than one refuse bin at household or businesses.

The Law on Solid Waste Storage in Oshakati Town

All household should have a refuse bin. All domestic wastes are to be stored in correct refuse bins while all wastes from businesses are to be stored in skip containers and refuse bins as well.²⁰³

The Current Scenario on Solid Waste Storage in Oshakati Town

All different types of household wastes are stored in refuse bin except wastes that cannot fits in such as garden refuse and building rubbles. At some businesses where skip containers are available, all wastes that fits in are stored in without segregation.

²⁰³Oshakati Town Council. (2015). *Waste management policy 2015*, Oshakati, Namibia.Print.

The Law on Solid Waste Collection in Oshakati Town

According to the Local Authorities Act 1992, the Oshakati town council is responsible for rendering a service for the collection of domestic and business waste from premises at a charge. Domestic wastes must be collected twice a week by a responsible contractor. Skip containers at business premises are to be emptied twice a week. The owner or premises owner on which business or domestic waste is generated must use the service of the town council unless authorisation is granted by the council. The owner or the occupier of premises on which the business or domestic waste is generated is individually or jointly responsible for the charge.²⁰⁴

The OTC is responsible for placing at selected points within the business areas defined by respective zoning stated in the town planning scheme or other public places suitable containers for the collection, removal and disposal of all waste generated in those areas. The Oshakati town is demarcated in 13 waste collection zones. Each zone is assigned to a private contractor for collection.

The Current Scenario on Solid Waste Collection in Oshakati Town

Once the waste generated, it should be stored at the right storage and place for collection. Though there is a law that provides how waste should be collected, at some points wastes are not being collected at all. This situation forces some residents to burn wastes that pose a threat to the environment and to the surrounding properties.

The Law on Solid Waste Transportation in Oshakati Town

According to the Local Authority Act 1992 2. (1), it is the town council's responsibility for rendering a service for the collection, removal and disposal of business and domestic waste from premises at a charge.²⁰⁵ Furthermore, the

²⁰⁴Oshakati Town Council. (2004). *Regulations relating to waste management: Local authorities act, 1992*. <https://www.lac.org.na/laws/2004/3310.pdf>

²⁰⁵Local Authorities Act 1992. (1992, August 31). <https://www.npc.gov.na/wp-content/uploads/2022/06/Regional-Councils-Act-No.-22-of-1992-.pdf>

OTCWMP 2015, stipulates that all wastes generated should be collected from storage points and transported to the disposal site by assigned contractors.

The Current Scenario on Solid Waste Transportation in Oshakati Town

Though the law stipulates that waste should be transported safely way, this is not adhered to as sometimes wastes are being transported in open trucks. This practice resulted to some wastes such as papers and plastics blown out by wind during transportation.

The Law on Solid Waste Disposal in Oshakati Town

The designated disposal site of Oshakati town is about 10 hectares located in the Othingo village about four kilometres from the centre of the town. The waste disposal site is fenced off in order to prevent animals and unauthorised entries. Wastes of all kinds generated in the town are disposed at in the landfill except building rubbles. Rubbles are being dumped at a certain place whereby builders or any individual who need it can collect it.²⁰⁶

Standards for selecting locations of new landfill sites must be 500 Metres away from nearest potential sources of surface and groundwater abstraction for drinking water and also away from any flood prone areas. Furthermore, the landfill must be 500 metres away from existing or planned housing areas, schools, hospitals, or any public place. It must be 1 kilometres or more away from national parks and other protected areas and 3 kilometres or more away from airports.²⁰⁷

The Oshakati town use a landfill sites for solid waste disposal. A landfill is basically a pit that is designed to accommodate solid waste in layers then once it is filled up, it must be covered for final disposition of waste. It avoids the open

²⁰⁶Oshakati Town Council. (2015). Waste management policy 2015, Oshakati, Namibia.Print.

²⁰⁷Ministry of Environment and Tourism. (2017). *National solid waste management strategy for Namibia – 2017*. <http://www.oneplanetnetwork.org>

dumping and this has brought significant reduction of health hazards and infections formerly associated with disposal sites.²⁰⁸

According to Local Authority Act, 1992, 19. (1) Any person who for the purpose of disposing of waste enters a sanitary landfill site or public disposal facility controlled by the OTC must comply to the rules as per the official at the site. The responsible official at the dumping site must controlled entry of both vehicles and persons to the sanitary landfill site and the prevention of illegal activities such as scavenging, cultivation on drainage structures and illegal burning of waste, taking place on the landfill site. Monitoring and control of environmental pollution due to illegal burning of waste, ground water pollution, leachate, windblown waste, dust emission and other parameters as may emanate from the operation of such sanitary landfill site. Ensure the road that leading to the sanitary landfill site is at all times in an acceptable condition to allow for the free flow of traffic. Make sure that only waste approved for disposal in accordance with waste's and landfill's classification is disposed of at a particular sanitary landfill site.²⁰⁹

The Current Scenario on Solid Waste Disposal in Oshakati Town

The OTC made improvements on adhering to the laws governing the management of solid waste at the landfill. The gap that exists in OTC is that disposal of waste remains a critical issue as they are mixed from collection points and segregation and recycling takes place at the dumping site. The location of the disposal site does not correspond with NSWMS for Namibia. Residents of the Othingo village interviewed and responded as follows:

²⁰⁸Ministry of Environment and Tourism. (2023). *Environmental management plan: Oshakati designated disposal site*. <https://www.meft.gov.na/service/environmental-impact-assesment-/233/>

²⁰⁹Oshakati Town Council. (2004). *Regulations relating to waste management: Local authorities Act, 1992*. <https://www.lac.org.na/laws/2004/3310.pdf>

Solid Waste Treatment in the Oshakati Town

The OTC uses two methods of solid waste treatment namely: recycling and landfill. Recycling is environmental friendly method of reusing waste for another purpose. Landfill is the method of burying of waste on land at the place well located and designed for that purpose.

The Law on Solid Waste Recycling in Oshakati Town

According to the Environmental Management Act 3.2 (i) states that the reduction, re-use and recycling of waste must be promoted.²¹⁰

The Current Scenario on Solid Waste Recycling in Oshakati Town

The Oshakati as other large towns in Namibia, there is a significant change in recycling expansion. Based on that, there is successful aspects of the present system of enhancing household participation through activities such as awareness raising.²¹¹ Previously, the OTC strived to promote recycling of recyclable materials by encouraging individuals to collect the reusable solid wastes.²¹² The OTC management plan made provision for recycling stalls area as part of infrastructure development. Currently, progress has been made includes a segregation area for recycling area at the site to allow for on-site recycling.²¹³

Officials were asked if the regulations strengthening the municipal solid waste management operations is satisfactory.

²¹⁰Ministry of Environment and Tourism. (2007). *Environmental management Act 7 of 2007*. <https://www.lac.org.na>

²¹¹Ministry of Environment and Tourism. (2017). *National solid waste management strategy for Namibia – 2017*. <http://www.oneplanetnetwork.org>

²¹²Oshakati Town Council. (2015). *Waste management policy - 2015*, Oshakati, Namibia. Print.

²¹³Ministry of Environment and Tourism. (2023). *Environmental management plan: Oshakati designated disposal site*. <https://www.meft.gov.na/service/environmental-impact-assessment-/233/>

Table 5.17 Official Respondents Regarding Legal Framework Satisfaction

Query	Strongly Agree (%)	Agree (%)	Disagree (%)	Strongly Disagree (%)	Total (%)
Do you think the existing legal framework satisfy the execution of solid waste management in Oshakati town?	1 (20)	4 (80)	0 (0)	0 (0)	5 (100)

Source: Field study conducted during November 2023 to February 2024

Table 5.17 shows the Official respondents regarding their satisfaction about the existing legal framework. The responses of respondents revealed that 20 percent of the official strongly agreed, 80 percent agreed, 0 percent disagreed, and 20 percent strongly disagreed and satisfied with the existing legal framework of the execution of solid waste management in Oshakati town. This indicates that the majority of the respondents agreed and only few disagreed.

Objective 3: The Role of Public Private Partnership in Solid Waste Management in Oshakati Town, Namibia

The main objective was to analyse the role of PPP on improving SWM in Oshakati town. The secondary research objectives of this chapter were: to study the principles of Public-Private Partnership; to analyse how PPP was implemented in MSWM based on NSWMS and the current mode. An attempt has been made in this chapter to present the findings of the study by analysing empirical data collected, through interviews and questionnaires. Respondent from Waste Management Department of Oshakati town and the corporate communication officer are the Official Respondents, while beneficiaries in PPP under the OTC are the 13 Contractor Respondents beneficiaries.

Official Respondents

Responses of the Official Respondents if Aware of National Solid Waste Management Strategy for Namibia and its Relationship with PPP in Solid Waste Management in Oshakati town.

The official respondents were asked if are aware of NSWMSN and its relationship with PPP in SWM under OTC.

Table 5.18 Officials Responses regarding Aware of NSWMSN and its relationship with PPP in OTC

Query	Yes (%)	No (%)	No Idea (%)	Total (%)
Is the OTC aware of NSWMSN and its relationship to PPP in Solid Waste Management?	4 (80)	0 (0)	1 (20)	5 (100)

Source: *Field study conducted during November 2023 to February 2024*

Table 5.18 shows the Official responses regarding their awareness of NSWMSN. Officials respondents who responded reveal that 80 percent are aware of NSWMSN and 20 percent have no idea about NSWMSN. This clearly show that the

large number of the respondents are aware of NSWMSN and its relationship with PPP in solid waste management in the Oshakati town.

Present Scenario of Contractors in PPP in Oshakati Town Council

Responses of the Official Respondents on Presence of PPP Contractors in Solid Waste Management in OTC

Though there are many companies seen around the town of Oshakati collecting cans, scrap metals and building rubbles, not all are in legal contract with the Oshakati town council. The OTC is only in legal contractors with thirteen waste removal companies.

Table 5.19 Official Responses Regarding Presence of Contractors in PPP in OTC

Query	Yes (%)	No (%)	No Idea (%)	Total (%)
Is the Oshakati Town Council in relationship with private contractors in Solid Waste Management?	5 (100)	0 (0)	0 (0)	5 (100)

Source: *Field study conducted during November 2023 to February 2024*

Table 5.19 shows the Official responses regarding the presence of the contractors in PPP in Oshakati town. The respondents who responded revealed that all five officials represented 100 percent responded and agreed that there are contractors in PPP with OTC in municipal solid waste management.

Rating the Performance of Contractors in PPP

Officials were asked on how do they rate the performance of the contractors in PPP in solid waste management in Oshakati town.

Table No. 5.20 Official Responses Regarding the Performance of Contractors in PPP in OTC

Query	Highly Satisfied (%)	Satisfied (%)	Not Satisfied (%)	Highly Not Satisfied (%)	Total (%)
How good is the performance of contractors in PPP in solid waste management in Oshakati town	0 (0)	4 (80)	1 (20)	0 (0)	5 (100)

Source: *Field Study conducted during November 2023 to February 2024*

Table 5.20 shows the Official Respondents regarding the performance of the contractors in PPP in the Oshakati town. The responses of the respondents revealed that 80 percent are satisfied and 20 percent not satisfied with the performance of the contractors in PPP with Oshakati town. In case where contractors fail to perform their duties as assigned within its area of jurisdiction, it must be fined. First stage, the contractors are given the warning before penalty applied depending to the level of mistake or negligence.

Contractor Respondents

Duration in PPP with the OTC in Municipal Solid Waste Management

Responses of the contractor's respondents about the duration in PPP with the OTC in SWM.

Table 5.21 Contractors Responses Regarding their Duration in PPP in Oshakati Town

Query	Less than 5 Years (%)	More than 5 Years (%)
For how long have you been in PPP in solid waste management with the OTC?	9 (69)	4 (31)

Source: *Field study conducted during November 2023 to February 2024*

Table 5.21 shows the Contractors responses regarding their duration in PPP in SWM in the OTC. The respondents were asked for how long they have been in PPP with the OTC in waste management. 69 percent of the respondents responded that they have been in PPP with the OTC in waste management for the duration of less than five years while 4 percent of the respondents revealed that they have been in PPP with the OTC in waste management. This shows that the dominating contractors have worked with the OTC for not more than 5 years while only few contractors have worked with the OTC for more than 5 years.

Responses of the Contractor's Respondents About the Number of Employees do they have for Solid Waste Management.

The respondents were asked about the number of employees they have in SWM in the Oshakati town.

Table 5.22 Contractors responses regarding the number of employees they have.

Serial No.	Contractor	Number of Employees
1	Contractor-A	3
2	Contractor-B	7
3	Contractor-C	4
4	Contractor-D	3
5	Contractor-E	6
6	Contractor-F	4
7	Contractor-G	3
8	Contractor-H	6
9	Contractor-I	5
10	Contractor-J	5
11	Contractor-K	4
12	Contractor-L	3
13	Contractor-M	6
Total	13	59

Source: *Field study conducted during November 2023 to February 2024*

Table 5.22 shows all thirteen contractors in PPP with the OTC responded regarding the number of employees they have. Contractor-A 3, Contractor-B 7, Contractor-C 4, Contractor-D 3, Contractor-E 6, Contractor-F 4, Contractor-G 3,

Contractor-H 6, Contractor-I 5, Contractor-J 5, Contractor-K 4, Contractor-L 3, and Contractor-M 6. The total number of employees of all 13 contractors in PPP in SWM are 59. This implies that the OTC contracted a total number of 59 employees through PPP.

Number of Vehicles Used by Contractors in SWM

The respondents were asked about the number and types of vehicles they use for waste management.

Table 5.23 Contractors responses regarding the number of vehicles they use in waste management.

Serial No.	Contractor	Open Truck	Tractors	Dumper Placers	Compact Vehicle	Others
1	Contractor-A	1				
2	Contractor-B	2				
3	Contractor-C	1				
4	Contractor-D	1				
5	Contractor-E	2				
6	Contractor-F	1				
7	Contractor-G	1				
8	Contractor-H	2				
9	Contractor-I	1				
10	Contractor-J	1				
11	Contractor-K	1				
12	Contractor-L	1				
13	Contractor-M	2				
Total	13	17				

Source: *Field study conducted during November 2023 to February 2024*

Table 5.23 all thirteen contractors responded regarding the number of vehicles they use in waste management. Contractor-A 1, Contractor-B 2, Contractor-C 1, Contractor-D 1, Contractor-E 2, Contractor-F 1, Contractor-G 1, Contractor-H

2, Contractor-I 1, Contractor-J 1, Contractor-K 1, Contractor-L 1, and Contractor-M 2. The total number of vehicles used by all 13 contractors in PPP in SWM are 17. This implies that a total number of 17 vehicles belongs to the contractors are being used through PPP with the OTC.

Objective 4: Opinions and Perceptions of the Community Members and their Participation in Solid Waste Management and Environmental Impact in Oshakati Town, Namibia

This section presents a discussion of the existing community members participation, views and perceptions toward solid waste management from the findings. It explores how effective is the existing forms of community participation in Oshakati town are in line with NSWMS. The study findings are contrasted and compared with related literature and reports. Qualitative data analysis was used through questionnaires, reports analysis and direct observation.

Community Participation Strategies in Municipal Solid Waste Management

Community participation is the involvement of beneficiaries in public decision-making implementation and control process of the project. This concept is used in the theory of community development whereby it means that all members of a community participate in decision-making that affect their lives, not merely in consultation or contribution. It is far more than the contribution of labour or supplies. When developmental projects are developed without regard to beneficiaries' wishes, priorities, and concerns, they always experience difficulties and often fail. On the other hand, findings of evaluative studies have shown that when projects consider beneficiaries' needs, the results are always effective.²¹⁴

Results from Community Members Regarding their Participation in SWM

Community members were asked about the method they use for waste storage.

²¹⁴Toe, L. T. (2021). *Assessment of community participation in municipal solid waste management in Monrovia City, Liberia* (Doctoral dissertation, Kampala International University).

Table 5.24 Community Members Methods of Solid Waste Storage at Source Point

Serial Number	Method of Waste Storage at Source Point	Community Members Responses (%)
1	Dust Bin	78 (60)
2	Skip Container	3 (2)
3	Black Plastic Bags	39 (30)
4	Open Area	10 (8)
5	Others	-
	Total	130 (100)

Source: Field study conducted during November 2023 to February 2024

Table 5.24 shows community member's respondents regarding waste storage. 60 percent of the respondents use dust bin, 2 percent skip container, 30 percent black plastic bags, 8 percent use open area. This implies that a large number of the community members use dust bin while only few use skip containers.

Solid Waste Segregation Before Storage

Community members were asked if they segregate their solid wastes before storage.

Table 5.25 Community Members on Solid Waste Segregation at Source Point

Query	Yes (%)	No (%)
Do you segregate solid wastes before storage?	49 (38)	81 (62)

Source: Field study conducted during November 2023 to February 2024

Table 5.25 shows the community members respondents if they segregate their solid wastes before storage. 38 percent of the respondents indicated that they segregate waste before storage while 62 percent do not segregate solid waste before

storage. This clearly shows that a large number of community members do not segregate and only few segregate solid waste before storage.

Number of Times Solid Waste Being Collected Per Week.

Community member's respondents were asked the number of times solid waste being collected per week. The responses of the respondents are provided in table 5.29 below.

Table 5.26 Community Members Responses on Number of Times Solid Waste Being Collected Per Week.

Serial Number	Waste Removal Times	Respondents Responses (%)
1	Once a week	72 (55)
2	Twice a week	58 (45)
3	More than two times a week	-
	Total	130 (100)

Source: Field study conducted during November 2023 to February 2024

Table 5.26 shows number of times solid waste being collected per week. 55 percent of the respondent responded that solid waste are being collected once a week while 45 percent responded that solid waste are being collected twice a week. This implies that in most cases, solid wastes are being collected in once a week while only in few areas solid wastes being collected twice a week.

Results from Field Observation

The researcher carried out field observation throughout the jurisdiction of the Oshakati town in order to examine the SWM practices applied by community members. These findings were complemented by the researcher field observations. The study results indicated that the various strategies used by the community members include burning of waste, use of refuse plastic bags, clean-up campaigns, collection of recyclable materials and disposal of solid waste at various designated.

The results also show that the least used SWM strategy is collection of recyclables and usage of skip containers.

Table 5.27 Observed Solid Waste Management Practices in Oshakati Town

Solid Waste Management Practices Observed	Rating
Use of refuse bags at waste collection point	High
Use of skip containers	High
Burning of waste	High
Community meetings	Medium
Recycling	Low
Clean up campaigns	Medium
House to house collection	High

Source: *Field Study conducted during November 2023 to February 2024*

Table 5.27 shows about the observation result by the researcher on the solid waste management practices in the Oshakati town. The results were rated with high as the most common practice, medium as moderate practice, and low as the less practice. The results indicated that the most practice of SWM was the use of refuse bags at waste collection point, use of skip container, burning of waste, and house to house collection. Community meetings and clean up campaigns practices were observed at moderate level while recycling is the least method observed. Through observation, the researcher observed how community members participate in solid waste management in the Oshakati town.

Community Participation on:

Use of Waste Collection Point

In some points where there are no skip containers, community members dump refuse bags in specific location alongside the road for collection.

Use of Skip Containers

The researcher observed skip containers mostly at business areas and busy public places whereby community members dump domestic and commercial wastes.

Burning of Wastes

At some areas especially in informal settlements, community members dump wastes in open areas and burn them.

Community Meetings

During the community meetings conducted by OTC officials, community members participate by advising the officials on how to manage solid waste.

Recycling

The researcher observed recycling as one of the community participation strategies in SWM. There were community members that collected recyclables on an individual basis from open spaces such as: bottles, metals, cans, plastics and afterwards sold it to a recycling business to earn an extra income. The researcher also observed recycling being done on a large scale at the dumping site.

Clean-up Campaign

The OTC in most cases organise clean up campaigns whereby individual community members, schools and institutions are involved. In some cases, community members organise themselves and clean their surroundings then inform the OTC for waste pick up.

House to House Awareness Creation

This form of participation involves house visits by a group of volunteers from the community who inform the public about the importance of managing solid waste. It also includes sharing ideas on how residents can manage their solid waste, to ensure safe storing of waste which should be taken to the waste collection point or a central location for pick-up by the assigned contractor or town council officials.

Community members clearly informed about the benefits of clean environment.

Benefits of the clean environment Are:

- Prevent diseases outbreaks due to unhygienic environment
- Economic benefits such as creation of employment
- Attract foreign and local investors
- Prevent animals from consuming pollutants such as plastics

Opinions and Perceptions of Community Members on Municipal Solid Waste Management

Participants in the study were asked to indicate whether SWM is their responsibility or is the responsibility of the OTC. Participants indicated that they believed it was equally their responsibility to manage waste and that it was not entirely the responsibility of the OTC. Some residents believed that it is the responsibility of the OTC because they are paid for it. Therefore, it is important for everyone to play a key role or be aware that your waste is your responsibility by ensuring that waste is taken to places where it is picked by the town council or contractors.

Community Members Satisfaction in MSWM Participation

Community members were asked if they are satisfied by the way they participate in SWM.

Table 5.28 Community Members Respondents Regarding their Participation Satisfaction

Query	Highly Satisfied (%)	Satisfied (%)	Not Satisfied (%)	Total (%)
Are you satisfied with participation you make in solid waste management in Oshakati town?	13 (10)	52 (40)	65 (50)	130 (100)

Source: *Field Study conducted during November 2023 to February 2024*

Table 5.28 shows the responses of respondents about participation satisfaction. The responses revealed that 10 percent of the community members highly satisfied, 40 percent satisfied, 50 percent not satisfied on their participation on solid waste management. Half of the respondents are not satisfied, followed by those who are satisfied, then only few who are highly satisfied.

Furthermore, the effectiveness of existing forms of community participation in Oshakati town was assessed by the researcher's field observations and results gathered from the participants. Participants were asked to indicate whether the current participation strategies are effective or not. Study findings indicated that some community members understand their waste management role but some believe that it is the responsibility of the OTC. Some opinions advocate for the OTC to take full responsibility of solid waste management based on literature. The study found that the current community participation forms are not effective as there are inadequate SWM infrastructures such as refuse bags and skip containers. Late collection of wastes especially at waste dropping points results to scavengers such as dogs to tear out the waste plastic bags searching for food. This cause wastes to spread out and scattered around.

OTC Approaches to Enhance Community Participation

The study found that OTC carry out different strategies in order to enhance community participation. The OTC primarily focused on creating awareness through notice boards, distribution of pamphlets, radio, newsletters, and social media such as: Facebook, LinkedIn, YouTube. The OTC provided refuse bags and skip containers for waste storage by community members.

OTC Strategies Towards Community Participation

The OTC through the Solid Waste Division mainly carries out various strategies to support community participation in SWM. Officials engage the constituency councillors to share the message of waste management via national radio in the mornings and also conducted public meetings. So, each and every month the OTC has a timetable for meeting with the community leaders and the community members in specific area.

This is followed by the clean-up campaigns and the provision of infrastructure such as skip containers in some areas and provision of refuse bags. The system that was introduced there by the OTC was to give two black bags twice a week, per household, which is collected, or transferred to the main landfill or nearest skip containers. Moreover, the results indicated that the OTC employs street sweepers as fixed term employees. Lastly, the study found that funding from the OTC for community-based projects was non-existent.

Objective 5: Problems and Challenges

5.1 Official Responses

The responses of the respondents regarding the problems and challenges faced by the officials in SWM.

Table 5.29 Problems and Challenges faced by officials in SWM.

Query	Yes (%)	No (%)	No Idea (%)	Total (%)
Do you think there are problems and challenges in SWM in Oshakati town?	3 (60)	2 (40)	0 (0)	5 (100)

Source: *Field Study conducted during November 2023 to February 2024*

Table 5.29 shows the official responses regarding problems and challenges in solid waste management. The responses of respondents shown in the table above revealed that 60 percent of the official agreed, 40 percent not agreed, if there are problems and challenges need to be adjusted between contractors and Oshakati town council in execution of solid waste management. Problems and challenges are to be discussed as follows. This indicates that many officials are aware and only few officials who are not aware of problems and challenges in solid waste management need to be adjusted.

Problems and Challenges Encountered in Execution of MSWM

Officials were asked about if any problems and challenges do they face in SWM.

Table 5.30 List of Problems and Challenges in SWM

Serial Number	Problems and Challenges
1	Administrative Challenges
2	Financial and Economic Challenges
3	Infrastructure Challenges
4	Institutional Challenges
5	Social Challenges

Source: *Field study conducted during November 2023 to February 2024*

Table 5.30 shows the official responses on problems and challenges that the OTC facing in solid waste management. These are: administrative challenges, financial challenge, infrastructure challenge, institutional challenge, economic challenge, and social challenge.

Administrative Challenges

The Department of Public Health and Environmental Management is experiencing shortage of personnel as the department is only comprising of 12 permanent employees running day to day activities on SWM of the entire town. Lack of modern technological monitoring methods such as cameras and communication devices makes it difficult for the official to monitor the situation.

Financial and Economic Challenges

Insufficient budget makes every project unsuccessful. Limited funds allocation causes SWM division to perform poorly. Industrial and Economic developments play a vital role in SWM. In the Oshakati town, solid waste recycling activities are affected by the unavailability of recycling industries that may purchase and process recycled materials. Therefore, lack of industries base for recycling activities is a common constraint for the improvement of SWM in the Oshakati town.

Table: No. 5.31 Oshakati Town Waste Management Budget Allocation for 2023/2024 Financial Year

Description	Amount in Namibia Dollars	Estimated Amount in India Rupees
New Refuse Bins	1 900 000.00	8 550 000. 00
Repairs and Maintenances	650 000. 00	2 925 000. 00
Other Expenses	4 650 000. 00	20 925 000. 00
Total Budget	7 200 000. 00	32 400 000. 00

Source: *Field Study conducted during November 2023 to February 2024*

Table No. 5.31 shows the Oshakati Town Waste Management Budget Allocation for the financial year 2023/2024. The total budget was N\$ 7 200 000. 00 that was divided as follows. The total of N\$ 1 900 000. 00 for purchase new refuse bins, N\$ 650 000. 00 for repairs and maintenances, N\$ 4 650 000. 00 for other expenses.

Infrastructure Challenges

Lack of tarred roads especially in informal settlements makes it difficult for big vehicles to reach all places easily for waste collection. Insufficient waste storage materials like skip containers increases illegal dumping.

Institutional Challenges

Officials were asked if there are problems and challenges that need to be adjusted in the current legal framework of SWM in Oshakati town.

Table 5.32 Official Respondents Regarding Problems and Challenges

Query	Yes (%)	No (%)	No Idea (%)	Total (%)
Do you think there are problems and challenges need to be adjusted in the current legal framework of solid waste management in Oshakati town?	2 (40)	0 (0)	3 (60)	5 (100)

Source: Field Study conducted during November 2023 to February 2024

Table 5.32 shows the responses of respondents about problems and challenges facing the MSWM in Oshakati town. The table shows that 40 percent of the official agreed, 0 percent not agreed, 60 percent no ideas if there are problems and challenges need to be adjusted in the existing legal framework of SWM in Oshakati town. This revealed that the majority of the respondents have no ideas and only have ideas on the needs to adjust legal frameworks on SWM in Oshakati town.

Lack of clear roles and responsibilities of the institutional mandates involved in waste management. Poor coordination among the responsive bodies is also a contributing factor. The lack of effective MSWM legislation in developing countries, is partially responsible for the roles of the relevant national agencies not being clearly defined and poor coordination among them. Example; the Local Authorities Act 1992 (Act No 23 of 1992) and the Environmental and Pollution Protection Act 2003 include some clauses on rules and regulations regarding solid waste management. It should be noted that legislation is only effective if it is enforced.

Social Challenges

Social challenges facing SWM workers especially rag pickers are disrespect for their work by some community members. In turn, this leads to low moral results to poor quality of their work. Lack of protective clothing, and modern cleaning materials and tools makes it difficult for them to perform their duties effectively.

5.2 Contractors Responses

Tools and Equipments

Contractors were asked if they have enough tools and equipment's for cleaning.

Table 5.33 Contractors Responses Regarding the Tools and Equipment's for Cleaning.

Query	Yes (%)	No (%)
Do you have enough tools and equipment's for cleaning?	- (0)	13 (100)

Source: *Field Study conducted during November 2023 to February 2024*

Table 5.33 Shows the responses of the contractor's respondents regarding the tools and equipment's for cleaning. The table shows that 100 percent of the contractor's respondents revealed that they don't have right tools and equipment's for cleaning. Furthermore, the respondents revealed that due to the limited budget, they cannot able to buy enough protective clothing and equipment's such as: gloves, safety boots, overalls, helmets, rakes, shovels, spades, hoes, and axes for use. Due to the high cost of compact vehicles and other modern vehicles, the situation forces them to use open trucks for waste transportation because of affordability. Other reason is; the PPP agreement is only last for two years then re-advertised.

Manageability of Collecting Wastes in Designated Ares

Contractors were asked if they manage to collect all wastes in the designated areas within specified time.

Table 5.34 Contractors Responses Regarding if it is Manageable to Collect Solid Wastes in Designated Area Within Specified Time.

Query	Yes (%)	No (%)
Do you manage to collect all solid wastes in the designated areas within specified time?	- (0)	13 (100)

Source: *Field Study conducted during November 2023 to February 2024*

Table 5.34 shows the responses of respondents regarding if it is manageable to collect wastes in designated area within specified time. Respondents revealed that 100 percent of the contractor's respondents revealed that is not manageable to collect all wastes in designated area within prescribed time. The reason is that in some places there are no storage facility. As a result, waste is being dumped on the ground and as a contractor, waste to be collected are those only stored in authorised storage facilities such as: skip containers, drums, plastic bags, and wheeler bins. Some areas do not have tarred roads. As a result, some trucks may get stuck. During rainy season, some areas experience flood, as a result, waste collection trucks cannot able to reach there for waste collection.

Easily Access to all Places for Solid Waste Collection

Contractors were asked at which part of the town is difficult to collect wastes and why.

Table 5.35 Contractors responses regarding which part of the town is difficult to collect wastes and why.

Serial No.	Contractor	Formal Area (%)	Informal Area (%)	Business Area (%)	Institutional Area (%)
1	Contractor-A		✓	✓	
2	Contractor-B		✓		
3	Contractor-C	✓	✓	✓	✓
4	Contractor-D		✓		
5	Contractor-E		✓		
6	Contractor-F		✓		
7	Contractor-G		✓		
8	Contractor-H		✓		
9	Contractor-I		✓		
10	Contractor-J		✓		✓
11	Contractor-K		✓		✓
12	Contractor-L		✓		
13	Contractor-M		✓		
Total	13	1 (8)	13 (100)	2 (15)	3 (23)

Source: *Field Study conducted during November 2023 to February 2024*

Table 5.35 Shows contractor's respondents regarding the accessibility of collecting solid wastes from different areas of Oshakati town. Among 13 waste collection contractors, only 8 percent of the contractors found it difficult for solid waste collection in formal areas. 100 percent of the contractors responded that it is difficult to collect solid waste in informal area. 15 percent found it difficult to collect waste in business areas, and 23 percent find it difficult in institutional area. This

implies that informal areas are more difficult to collect solid waste compared to formal areas. In formal areas all households afford and own a dust bin while in informal areas not every household can afford a dustbin. In formal areas, roads are wide enough for all types of waste collection vehicles to drive through and collect waste while in informal areas, it is difficult for solid waste collection vehicles to drive through.

5.3 Community Members Responses

Solid Waste Segregation and Storage Challenges

Respondents were asked whether they experience problems in solid waste segregation and storage.

Table 5.36 Community Members Responses Regarding Problems and Challenges in solid waste segregation and storage.

Query	Yes (%)	No (%)
Do you experience problems in segregation of solid wastes before storage?	49 (38)	81 (62)

Source: Field study conducted during November 2023 to February 2024

Table 5.36 shows the community members problems in solid waste segregation at before storage. About 38 percent of the respondent's does not have problems in solid waste segregation before storage, while 62 percent of the respondents have problems in solid waste segregation before storage. This shows that the majority of members of the community have problems in solid waste segregation while only few members of the community have no problems in solid waste segregation.

Solid Waste Collection Challenges

Table No. 5.37 Community Members Responses Regarding Problems and Challenges in Solid Waste Collection.

Query	Yes (%)	No (%)
Did you experience a time when no solid waste collection was done as per schedule?	37 (28)	93 (72)

Source: *Field Study conducted during November 2023 to February 2024*

Table 5.37 Shows the responses of respondents regarding the problems and challenges in waste collection. The respondents revealed that 28 percent of the community members agreed, 72 percent not agreed, if there are problems experienced of waste not being collected as per schedule. In this case, sometimes residents call the OTC waste management department to report the matter and assisted. Some residents search for any open area and dump the waste and sometimes burn. In some occasions, residents emptying their bins to a nearby skip container if available. If the assigned contractor fails to collect waste several times, some residents write a complain letter to the OTC waste management department for the officials to monitor the situation.

Solid Waste Transportation Challenges

In some cases, when wastes are not collected by the responsible contractor or town council, some resident's eager to transport wastes themselves to the dumping site but they have no own transport.

5.4 Community Members of Othingo Village Responses

The respondents were asked for how long they lived in the Othingo village.

Table 5.38 Duration of living in Othingo Village

Query	Less than 5 Years (%)	More than 5 Years (%)
How long have you been living in this Othingo village?	- (0)	10 (100)

Source: Field Study conducted during November 2023 to February 2024

Table 5.38 shows the respondents who responded regarding the staying duration in Othingo village. Respondents revealed that all ten Othingo Villagers represented 100 percent shows that they reside in Othingo village for more than five years.

Estimated Distance between Homesteads and the Disposal Site

The respondents were asked to estimate the distance between their homesteads and the disposal site.

Table 5.39 Estimated Distance between Homestead and the Disposal Site

Query	Less than 500 Metres (%)	More than 500 Metres (%)
How many metres between your homestead and the disposal site?	4 (40)	6 (60)

Source: Field Study conducted during November 2023 to February 2024

Table 5.39 shows the respondents who responded regarding the estimated distance between their homestead and the disposal site. Respondents revealed that four respondents representing 40 per cent of the Othingo villagers are living in less than 500 Metres while six respondents represented 60 per cent responded that they reside beyond 500 Metres from the disposal site.

Locating in the Othingo Village

The respondents were asked whether their homesteads or disposal site was located first in the Othingo village.

Table 5.40 Whether their Homestead or Disposal Site Located First in the Othingo Village.

Query	Homestead (%)	Disposal Site (%)
Is your homestead or the disposal site located first in the Othingo village?	10 (100)	- (0)

Source: Field Study conducted during November 2023 to February 2024

Table 5.40 shows the respondents who responded regarding the whether homestead or disposal site located first in the Othingo village. The respondents revealed that all ten Othingo Villagers represented 100 percent responded and agreed that they reside in the Othingo village before the location of the disposal site in the village. It shows that most homesteads located in the Othingo village first then the dumping site later.

Villagers Consultation before the locating of the Disposal Site at Othingo Village

Respondents were asked if they were consulted by the OTC before the locating of the disposal site in the Othingo village.

Table 5.41 Whether they were Consulted by the OTC before locating of the Disposal Site.

Query	Yes (%)	No (%)
Were you consulted by the OTC before the locating of the disposal site in Othingo village?	- (0)	10 (100)

Source: Field Study conducted during November 2023 to February 2024

Table 5.41 shows the respondents who responded regarding whether they were consulted before the location of the disposal site. Respondents revealed that all ten Othingo villagers represented 100 percent responded that they were not consulted

before the location of the disposal site in the Othingo village. This means the OTC did not consult the Othingo villagers about locating the dumping site.

Possible Relocating Far from the Dumping Site

Respondents were asked whether they mind of relocating from the vicinity of the disposal site if they could find suitable place. The responses of the respondents are provided in table 5.19 below.

Table 5.42 Whether They Mind to Relocate if Found Suitable Place.

Query	Yes (%)	No (%)
Do you mind of relocating your homestead from the vicinity of the disposal site if you find a suitable place?	4 (40)	6 (60)

Source: *Field Study conducted during November 2023 to February 2024*

Table 5.42 shows the respondents who responded regarding the whether the affected Othingo villagers mind to relocate if suitable place found. Respondents revealed that 40 percent of the respondent's mind to relocate from the vicinity of the dumping site if found suitable place, while 60 percent of the respondents do not mind to relocate if any suitable place found.

Conclusion

This chapter presented the personal background of the respondents such as the age, sex, educational qualification, marital status, religion and occupation of the respondents. The chapter also present the findings based on the five research questions. Question I various types and sources of solid waste in Oshakati town Namibia; questions II Environmental related laws, policies, legislations and institutional setup governing solid waste management in Oshakati town, Namibia; question III The role of public private partnership in solid waste management in Oshakati town, Namibia; question IV Opinions and perceptions of the community members and their participation in solid waste management and environmental impact in Oshakati town, Namibia; and chapter V Problems and challenges facing the Oshakati town in solid waste management.

CHAPTER-VI

SUMMARY, MAJOR FINDINGS, CONCLUSION AND SUGGESTIONS

Overview

This chapter is an overview of the whole study from chapter I the introduction. Major findings from the field study are also presented in this chapter. Problems and challenges were also presented. A researcher made a conclusion of the study and make suggestions and possible measures to be implemented in order to manage solid waste effectively and efficiently. Suggestions and recommendations helps the policy makers and the OTC officials to make further improvements wherever it possible.

Summary

The Thesis is divided into six chapters whereby introduction and background of the Republic of Namibia and of the Oshakati town; theoretical framework; literature review; research gap; and study design forms chapter one. The second chapter, covered the overview of types and sources of solid waste in Oshakati town, Namibia. The third chapter examined the environmental related laws, legislations, policies, and institutional set up existing in solid waste management in Oshakati town, Namibia. The fourth chapter identified the role of PPP in solid waste management in the OTC. The fifth chapter presented the results and discussions of the study. It presents the findings based on the research questions and interprets the study findings and explains their importance.

The objectives of the study are to assess types and sources of solid waste in Oshakati town, Namibia; the environmental related laws, legislations, policies, and institutional set up existing in solid waste management in Oshakati town, Namibia; the role of PPP in solid waste management in OTC; opinions and perceptions of the community members and their participation in solid waste management and environmental impact in Oshakati town, Namibia; problems and challenges facing the Oshakati town in rendering solid waste management services.

The study is divided into six chapters as follows:

The first chapter, an introductory chapter briefly overviews about Namibia. It explained the origin of municipal solid waste management, and elaborates the management of solid waste in Namibia. It consists of introduction, theoretical framework, review of literature, statement of the problem, scope and objectives of the study, research questions, methodology, and chapterisation.

The second chapter covered an overview of the Oshakati town profile. It further explains the organisation structure of the town, powers and functions of different departments and officials. The chapter elaborates the types and sources of solid waste in Oshakati town, Namibia. It examined the different types of solid waste, the sources where solid wastes are being generated. It also examines the solid waste prevention, segregation, storage, collection, transportation, disposal, recycling, and treatment.

Chapter three examined the environmental related laws, legislations, policies, and institutional set up existing guiding the management of solid waste in Oshakati town, Namibia. It identifies various Acts, strategies, visions, policies and plans. The institutional framework works together to ensure that the management of Solid Waste is running smoothly in Oshakati Town, Namibia.

Chapter four examined the role of Public Private Partnership in solid waste management in Namibia and Oshakati town in specific. It starts with an overview of Public-Private Partnership concept and the meaning in general, the aim, key principles, how was it applied, and benefits.

Chapter five presented the results, and discussions of the study. The researcher collected data from community members of Oshakati town; officials from the OTC; PPP contractors; and residents from the Othingo village. It started with the personal background of the respondents such as age, sex, religion, educational qualifications, marital status, and occupations.

All the participants involved in the study includes: 3 percent of OTC Officials; 82 percent of community members; 8 percent of PPP contractors; and 7 percent of Othingo villagers.

Among the four categories of respondents age group, the Municipal Officials between 41 to 50 years dominated the group while 31 to 40 years and 51 years and above were least respondents respectively. The contractors dominated age group respondents were 51 years and above while the least contractors age group was 31 to 40 years. The respondents dominated age group of the community member's respondents were between 31 to 40 years while the least respondents age group was 51 and above. The Othingo villager's dominated group was 31 to 40 years and 51 years and above. The least respondent's representatives age group among the Othingo resident's community members were below 30 years and 41 to 50 years respectively.

Among the two categories of respondent's sex group, the Municipal Officials males dominated the group while females were least respondents respectively. The contractors dominated respondents sex group were all males. The respondents dominated sex group of the community member's respondents were males, while the least respondents sex group were females. The Othingo villager's dominated sex group were males while the least respondent's representatives were females.

Among the four categories of religion group namely Christians, Muslims, Hindus, and Buddha's, all representatives of the Municipal Officials, Contractors, Community Members and Othingo villagers were Christians. This implies that Christian dominated all religions in the Oshakati town.

Among the five categories of respondent's educational qualification group, the Municipal Officials tertiary education dominated the group while professional education group were least respondents respectively. The contractors dominated education group respondents were secondary education while the least contractor's education group was primary education. The respondents dominated education group of the community member's respondents were primary education while the least respondent's education group was professional education group. The Othingo villager's dominated education group was secondary education while the least respondent's representatives were primary education group respectively.

Among the six categories of respondent's marital status group, the married

Municipal Officials are the majorities while unmarried group was least respondents respectively. The contractors dominated marital status group respondents were married while the least contractors age group were unmarried. The respondents dominated marital status group of the community member's respondents were unmarried, while the least respondent's marital status group were widow/widower. The Othingo villager's dominated marital status group was unmarried while the least respondent's representatives were married respectively.

Among the five categories of respondent's occupation group, all Municipal Officials are the fulltime employees of the OTC. All contractor's respondents are fulltime employees of their respective private companies. The respondents dominated occupation group of the community members were government/parastatal employees while the least respondent's occupation group were farmers. The Othingo villager's dominated occupation group were unemployed while the least respondent's representatives were farmers respectively.

The chapter further presented the different types and sources of solid waste in Oshakati town, Namibia; the environmental related laws, legislations, policies, and institutional set up existing guiding the management of solid waste in Oshakati town, Namibia; the role of Public Private Partnership in solid waste management in Namibia, Oshakati town; opinions and perceptions of the community members and their participation in solid waste management and environmental impact in Oshakati town, Namibia; problems and challenges facing the Oshakati town in rendering solid waste management services.

Chapter six is "Summary, Major Findings, Conclusion and Suggestions". It covers the summary of all chapters from Chapter I, II, III, IV, V, and VI. The chapter make conclusion and make recommendations based on the major findings.

Major Findings

It presents the findings in line with the research questions and interprets the study findings from the Oshakati town Officials, Community members of Oshakati town, Contractors in PPP with the OTC, and Othingo village residents.

Findings on Various Types and Sources of Solid Waste in Oshakati Town

In the Oshakati town, all types of wastes are generated except industrial waste as there are no industries in the town. It comprises of organic waste, plastic, paper, glass, and metals. Organic waste often dominates the composition, followed by plastic and paper. These wastes are being generated from various sources such as: domestic, commercial, institutional, street sweeping, building rubbles, and dead animals. Domestic waste regarded as the major sources of wastes generation in the town. Findings on solid waste segregation, storage, collection, transportation, disposal and treatment are explained as follows.

Solid Waste Segregation and Storage

There are no waste records during waste storage as there is no waste segregation taking place during waste storage. Households use 240 litres containers called wheel bins purchased from the OTC to store solid waste, however some households use any storage facilities such as empty oil drums and black plastic bags. Other types of solid waste such as stones, wood, bricks, iron sheet, sand, heavy metals, tree branches and grass are not for storing in the wheelie bins. These are to be stored in big containers called known as skip containers provided at some businesses and institutions. All respondent's responded that no specific storage provided for specific solid waste. This implies that the OTC does not apply any arrangement for solid waste segregation at storage point. Officials were asked about different types of storage facilities they provide for solid waste storage.

The solid waste storage facilities provided by the OTC are: metal dust bins, skip containers, and black plastic bags. The producer of wastes products must define, identify and store wastes correctly and prevent unauthorised access or accidental release while wait for collection. Household wastes are to be stored in a 240 Litres

refuse bin, while in business sectors skip containers are used. However, this does not limit individuals that make use of other suitable materials such as empty fuel metal drums for waste storage. Garden wastes are stored outside the yard but next to the yard for collection. The Solid Waste Management Division of the OTC encourages households and business owners to purchase 240 Litres waste bins for waste storage. Other types of waste such as stones, wood, bricks, iron sheet, sand, heavy metals, tree branches and grass are not to be stored in the wheelie bins. These are to be stored in skip containers that are distributed in some residential areas, including informal residential areas where illegal dumping of waste has been experienced. Skip containers are for storing solid waste that cannot be stored in wheelie bins and those solid waste generated in open spaces. In addition, black garbage bags are provided on a weekly basis to store solid waste generated in informal settlements and in open spaces, based on the need. These are provided by private contractors and the solid waste management division officials. Smaller garbage bins are also distributed along the streets by the solid waste management division officials to prevent littering. Provision of skips containers within the residential and business area is mainly a responsibility of the OTC solid waste management division.

The community member's respondents were asked whether they segregate their solid wastes before storage. The majority of the community member's responded that they do not segregate the solid waste because there are no inadequate storing facilities and only few responded that they segregate their wastes before storage. The reason is that the OTC sells the 240 Litres dust bins at the cost of N\$ 950, 00 equivalents to 4275 Indian Rupees. Majority of community members especially unemployed cannot afford to purchase more than one of it in order to store solid wastes as per their categories.

The community member's respondents were asked about their waste storage methods. The majority of community members responded use dust bins, followed by those use black plastic bags, followed by those use open area dumping then very few use skip containers. This indicates that there are few skip containers provided by the OTC in busy areas.

Community members were asked whether satisfied by the solid waste storage in the town. Only few communities' member's respondents were highly satisfied while the majority were not satisfied with the solid waste storage method.

Solid Waste Collection

Solid waste collection arrangement is the responsibility of OTC. The OTC contracted private companies in formal PPP with the OTC to collect wastes in 13 demarcated zones. Each contractor is responsible for its areas of responsibilities.

According to the OTC waste collection calendar, all areas of the town is covered for waste collection from house to house, businesses, institutions and other premises by randomly collects waste from skip containers; collects black plastic bags placed to the kerb sides of the roads. Official respondents were asked the quantities of solid waste generated. The responsible official respondent responded that no waste records during waste collection as in most cases no waste segregation takes place during waste storage. As per records from the year 2022, an estimated of 4818.35 Tons of wastes was collected annually; in the year 2023, an estimated of 5078.12 Tons of waste was collected while in 2024, the estimated total of 4533.38 Tons was collected. The community member's respondents were asked how many times per week solid waste being collected. About 55 percent of community members responded that only once per week, about 45 percent of the community member's respondents responded that solid waste are being collected twice a week.

Solid Waste Transportation

Solid wastes are being transported by contractors in formal PPP under the OTC to collect wastes in 13 demarcated zones. The Oshakati town council waste management department is also allocated with different types of vehicles for waste management. These are: two tractor loader, two tipper trucks, one bulldozer, one compact truck, two skip trailers, and two pickups.

Solid Waste Disposal

All wastes are being dumped at one site called Othingo Sanitary Landfill site and are weighed upon entering the site located about 4 kilometres away from the

town to the western side. The sanitary landfill covers the area of about 10 hectares and receives solid waste from all corners of the town. The Oshakati town Council objective to have this landfill is to avoid long-term and short-term impacts to the environment such as bad smell, rats and flies, and air pollution. All types of wastes are being disposed of in this landfill. However, hazardous waste such as medical waste is being incinerated.

Solid Waste Treatment

Waste treatment is the process of managing waste materials in order to minimise their quantity and negative impact to human health and to the environment. The OTC applies two methods of waste treatment namely: Recycling and Landfill. The OTC have assigned a priority focus to ensuring continuous maintenance of site operations. This is particularly the case with daily waste coverage and backfilling. During the 2020-2023 financial year, the OTC has appointed a service provider for site levelling, layering, compaction and covering of landfill waste with a Bulldozer. This on-going process ensures prevention of likely occurring nuisances such as littering of site and surrounding area, including prolonging the site lifespan.

Solid Waste Recycling

The OTC have isolated area reserved for recycling. The current progress includes a recycling area for segregation to allow for on-site recycling. The Oshakati town council employed six rag pickers to sort the waste before processing. Wastes such as cans, scrape metal, cardboards and plastics are being sorted. Rag pickers plays crucial task in waste management and recycling in the Oshakati town because there is no pre-sorted waste collection system and the only way to recover recyclables is at the dumpsite rather than the source point. The OTC strategic plan budget prioritised to construct a recycling stalls area.

Solid Waste Landfilling

There are two methods of landfilling practice namely open dumps and sanitary landfills. In Namibia, the common observed methods are controlled open

dumpsites and uncontrolled dumpsites. The Othingo dumping site practice a controlled sanitary landfill whereby wastes are being filled under the ground.

The present situation regarding SWM in the Oshakati town is such that the collection of wastes is conducted from door to door in all parts of the town. The town is divided into thirteen (13) zones so that each household, business and other institutions have to be covered.

All thirteen contractors collect waste from the households, businesses and other institutions once or two times a week and the waste collection fees are charged through monthly water bills by the OTC. The OTC have a waste collection calendar that covers all corners of the town and is available on its website as well as printout available on noticeboards. All waste management activities only done five days in a week, starts from Monday to Friday.

The NSWMSN directive stipulates that all municipalities with the population of more than 20, 000 residents are not allowed to have open burning of waste. As per NPHS of 2023, the population of the Oshakati town is about 58, 696 residents, therefore the OTC implemented a landfill site. Waste disposal continues to be monitored and directed. The segregation of waste forms part of site operational activities. Upon each disposal, there is directive to separate the waste at separate areas zones as per their waste classification. General wastes are disposed separately from the treated hazardous wastes and building rubbles. This is to maintain the site lifespan, including smoothen the process of recycling and minimising exposure. The destruction of special waste category items is controlled for minimal environmental damage. The hazardous wastes have a separate area zone with prepared pit for co-disposal and coverage with inert materials such as demolishing and construction waste, and sand.

The Oshakati town council has and only use one landfill site called Othingo Duping site. It is located about 4 kilometres to the western side of the town. The site is measured about 10 hectors and was inaugurated in 2006. All different types of wastes are dumped and landfilled in the site except hazardous waste such as medical wastes which are incinerated.

The present Scenario of Solid Waste Processing in the Oshakati Town

The OTC applied two methods of solid waste processing namely landfilling and recycling.

Solid Waste Landfilling in the Oshakati Town

The OTC have assigned a priority focus to ensuring continuous maintenance of site operations. This is particularly the case with daily waste coverage and backfilling. During the period 2020-2023, the Council has appointed a service provider for site levelling, layering, compaction and covering of landfill waste with a Bulldozer. This on-going process ensures prevention of likely occurring nuisances such as littering of site and surrounding area, including prolonging the site lifespan.

Findings on Environmental Related Laws, Legislations, Policies and Institutional Setup Governing SWM in Oshakati town, Namibia

This section discusses major findings on how the applicable laws, legislations and policies passed by the government of Namibia related to solid waste management applied in MSWM in Oshakati town, Namibia.

The OTC Officials respondents were asked if there are laws governing the solid waste management in the Oshakati town. All respondents revealed and agreed that there are national, regional and local government laws governing municipal solid waste management in Oshakati town. This indicates that the OTC officials are aware of MSWM laws, legislations, and policies governing the municipal solid waste management in Oshakati town.

Officials respondents were asked whether is there any laws strengthening the municipal solid waste management operations in Oshakati town. The majority of the official agreed, none disagreed, and only few had no idea if there are any laws strengthening the MSWM in Oshakati town. This implies that laws strengthening the MSWM strengthened laws are known by the officials.

Officials respondents were asked if they are satisfied by laws that strengthening the municipal solid waste management operations. The majority of the respondents agreed while only few disagreed.

Officials respondents were asked if there are problems and challenges that need to be adjusted in the current legal framework governing solid waste management in Oshakati town. The majority of the officials have no ideas about the problems and challenges while few are aware.

Findings on the Role of Public PPP in SWM in Oshakati town, Namibia

The main objective of the study was to analyse the role of PPP on improving SWM in Oshakati town.

Official Responses

Official Responses regarding their aware of NSWMSN and its relationship with PPP in the OTC. This clearly show that the majority of the respondents are aware of NSWMSN and its relationship with PPP in solid waste management in the Oshakati town while the minority have no idea.

Official respondents were asked regarding presence of contractors in PPP with the OTC. All official respondents responded and agreed that there are contractors in PPP with Oshakati town council in waste management. This means all official respondents knew the presence of contractors in PPP with the OTC.

Official respondents were asked on how do they rate the performance of the contractors in PPP in solid waste management in Oshakati town. The majority of the official respondents were satisfied, while only few who are not satisfied with the performance of the contractors in PPP with the OTC. In case where contractors fail to perform their duties as assigned within its area of jurisdiction, it must be fined. First stage, the contractors are given the warning before penalty applied depending to the level of mistake or negligence.

Contractors Responses

Responses of the Contractors respondents were asked about if they are in any relationship with OTC in SWM. All the contractor's respondents show that they are in official contractors with OTC. This implies that all contractors are legally in relationship in MSWM with the OTC.

Contractors responses regarding their duration in PPP in SWM in the OTC. The respondents were asked for how long they have been in PPP with the OTC in waste management. The majority of the respondents responded that they have been in PPP with the OTC in waste management for less than five years while only few contractors have been in PPP with the OTC in solid waste management. This shows that the dominating contractors have worked with the OTC for not more than 5 years while only few contractors have worked with the OTC for more than 5 years.

Contractors in PPP with the OTC responded regarding the number of employees they have. The total number of employees of all 13 contractors in PPP in SWM are 59. This implies that the OTC contracted a total number of 59 employees through PPP.

Contractors responded regarding the number of vehicles they use for waste management. The total number of vehicles used by all 13 contractors in PPP in SWM are 17 vehicles. This implies that a total number of 17 vehicles belongs to the contractors are being used through PPP with the OTC.

All contractor's respondent responded that PPP in SWM under the OTC is the right decision. This implies that PPP in MSWM is the right and best decision by the OTC.

Findings on the Community Participation in MSWM

Community member's methods of solid waste storage at source point shows that the majority use dust bins, very few use skip containers, black plastic bags and open areas. This indicate that most community members use dust bins while only very few use skip containers for solid waste storage.

Community members solid waste segregation shows that only few respondent's segregate waste before storage, while the majority of the respondents do not segregate their solid waste before storage. This shows that the majority of the community members does not segregate their waste at source point and only few members segregate their wastes at source point.

Community member's response on number of times solid waste being collected from storage point per week. The results show that the majority of the respondent's waste are being collected once a week while only few of the respondent's waste are being collected twice a week. No respondent shows that waste being removed more than two times a week.

The OTC carry out different strategies encouraging community members to participate in solid waste management. These are creating awareness through notice boards, distribution of pamphlets, radio, newsletters, and social media such as: Facebook, LinkedIn, YouTube. The OTC provided refuse bags and skip containers for solid waste storage to the community members. It was found that some community members understand their waste management role but some believe that it is the only responsibility of the OTC. Cleaning campaign was found that is the method where most community members participate in solid waste management.

Results from Field Observation by the Researcher

The researcher carried out field observation throughout the jurisdiction of the Oshakati town in order to examine the SWM practices applied by community members. These findings were complemented by the researcher field observations. The study results indicated that the various strategies used by the community members include burning of waste, use of refuse plastic bags, clean-up campaigns, collection of recyclable materials and disposal of solid waste at various designated. The results also show that the least used SWM strategy is collection of recyclables and usage of skip containers.

The researcher observed the solid waste management practices in the Oshakati town. The results indicated that the most practice of SWM was the use of refuse bags at waste collection point, use of skip container, burning of waste, and

house to house collection. Community meetings and clean up campaigns practices were observed at moderate level while recycling is the least method observed. Through observation, the researcher observed how community members participate in solid waste management in the Oshakati town. In some points where skip containers are not available, community members dump refuse bags in specific location alongside the road for collection. The researcher observed skip containers mostly at business areas and busy public places whereby community members dump domestic and commercial wastes. At some areas especially in informal settlements, community members dump wastes in open areas and burn them. During the community meetings conducted by OTC officials, community members participate by advising the officials on how to manage solid waste. The researcher observed recycling as one of the community participation strategies in SWM. There were community members that collected recyclables on an individual basis from open spaces such as: bottles, metals, cans, plastics and afterwards sold it to a recycling business to earn an extra income. The researcher also observed recycling being done on a large scale at the dumping site. The OTC in most cases organise clean up campaigns whereby individual community members, schools and institutions are involved. In some cases, community members organise themselves and clean their surroundings then inform the OTC for waste pick up. In some occasions, a group of volunteers from the community members inform the public about the importance of managing solid waste. It also includes sharing ideas on how residents can manage their solid waste, to ensure safe storing of waste which should be taken to the waste collection point or a central location for pick-up by the assigned contractor or town council officials.

Community Members Opinions and Perceptions in MSWM

Participants in the study were asked to indicate whether SWM is their responsibility or is the responsibility of the OTC. Participants indicated that they believed it was equally their responsibility to manage waste and that it was not entirely the responsibility of the OTC. Some residents believed that it is the responsibility of the OTC because they are paid for it. Therefore, it is important for everyone to play a key role or be aware that your waste is your responsibility by

ensuring that waste is taken to places where it is picked by the town council or contractors.

The community member's respondents about participation satisfaction in solid waste management. The responses revealed that half of the community members are highly satisfied, the rest are satisfied and not satisfied on their participation on solid waste management.

The effectiveness of existing forms of community participation in Oshakati town was assessed by the researcher's field observations and results gathered from the participants. Some community members understand their waste management role but some believe that it is only the responsibility of the OTC. Some opinions advocate for the OTC to take full responsibility of solid waste management based on literature.

The study found that the current community participation forms are not effective as there are inadequate SWM infrastructures such as refuse bags, dust bins, and skip containers. Late collection of wastes especially at waste dropping points results to scavengers such as dogs to tear out the waste plastic bags searching for food. This cause wastes to spread out and scattered around.

OTC Approaches to Enhance Community Participation

The study found that OTC carry out different strategies to enhance community participation. The OTC primarily focused on creating awareness through notice boards, distribution of pamphlets, radio, newsletters, and social media such as: Facebook, LinkedIn, YouTube. The OTC provided refuse bags and skip containers for waste storage by community members.

OTC Strategies Towards Community Participation

The OTC through the Solid Waste Division mainly carries out various strategies to support community participation in SWM. Officials engage the constituency councillors to share the message of waste management via national radio in the mornings and also conducted public meetings. So, each and every month

the OTC has a timetable for meeting with the leaders of the community and the community members in specific area.

This is followed by the clean-up campaigns and the provision of infrastructure such as skip containers in some areas and provision of refuse bags. The system that was introduced there by the OTC was to give two black bags twice a week, per household, which is collected, or transferred to the main landfill or nearest skip containers. Moreover, the results indicated that the OTC employs street sweepers as fixed term employees. Lastly, the study found that funding from the OTC for community-based projects was non-existent.

Problems and Challenges Facing the OTC in Solid Waste Management.

Official Responses

The OTC official's responses regarding the problems and challenges in solid waste management.

The responses of respondents revealed that many officials agreed, while few did not agree, if any problems and challenges need adjustment between contractors and Oshakati town council in execution of solid waste management. This indicates that many officials are aware and only few officials who are not aware of problems and challenges in solid waste management need to be adjusted.

Most cities and towns in the world are facing solid waste management problems especially in developing countries. When people clean their houses and businesses automatically generate wastes in their surroundings and it affect the environment and the community at large.

Official responses on problems and challenges that the OTC facing in solid waste management. The officials listed problems and challenge and explained them further. These are: administrative challenges, financial challenge, infrastructure challenge, institutional challenge, economic challenge, and social challenge.

Administrative Challenges: The OTC waste management Division of Public Health and Environmental Management is experiencing lack of human resources to be deployed in all suburbs and come up with new solid waste management planning.

The department is only comprising of 12 permanent employees to deal with solid waste of the entire town. Many office personnel in solid waste management have little knowledge on waste management. Lack of research and development activities in waste management makes it difficult for solid waste management decision makers to put into force the right decisions.

Financial Challenges: Sufficient budget makes every project a success. Limited funds allocation causes solid waste management department to perform poorly. The OTC waste management budget allocation for the financial year 2023/2024 shows that the total budget was N\$ 7 200 000. 00 that was divided as follows. The total of N\$ 1 900 000. 00 for purchase new refuse bins, N\$ 650 000. 00 for repairs and maintenances, N\$ 4 650 000. 00 for other expenses.

Infrastructure Challenges: Lack of tarred roads especially in informal settlements makes it difficult for big vehicles to reach all places easily for waste collection. Insufficient waste storage materials like skip containers, dust bins increase illegal dumping. Lack of different types of solid waste storage facilities for various wastes makes it difficult to community members to segregate wastes at storage point.

Institutional Challenges: There are no clear functions and roles of the institutional mandates involved in waste management. The lack of coordination among the stakeholders results in different agencies becoming the national counterpart to other external support agencies for different solid waste management collaborative projects. This leads to wasting of resources, duplication of efforts, and unsustainability of overall solid waste management programmes.

The lack of effective solid waste management legislation is partially responsible for the roles of the relevant national agencies not being clearly defined and the lack of cooperation among them. Legislation related to solid waste management is fragmented, and several acts for example in Namibia, the Local Authorities Act 1992 (Act No 23 of 1992) and the Environmental and Pollution Protection Act 2003 include some clauses on rules and regulations regarding solid

waste management. It should be noted that legislation is only effective if it is enforced.

Economic Challenges: Industrial and economic developments play a vital role in solid waste management. An enhanced economy opens the way for more funds to be allocated for solid waste management, providing a more sustainable financial basis. However, developing countries like Namibia have unstable economic bases and, hence, little funds for sustainable development of solid waste management systems. In the Oshakati town, solid waste recycling activities are affected by the unavailability of industries to buy and process recycled materials. Therefore, lack of industries base for recycling activities is the most constraint for the improvement of solid waste management in the Oshakati town.

Social Challenges: The social status of some solid waste management workers especially rag pickers are very low. Due to the disrespect for their work, it leads to low morale and poor quality of their work. Insufficient resources lead to poor salaries, protective clothing, modern cleaning materials and tools makes it difficult to perform their duties effectively.

Contractors Responses

Contractors were asked if they are equipped with enough tools and equipment's for cleaning.

Responses of the contractor's respondents regarding the tools and equipment's for cleaning shows that all the contractor's respondents do not have right tools and equipment's for cleaning. Furthermore, the respondents revealed that due to the limited budget, they cannot able to purchase enough protective clothing and equipment's such as: gloves, safety boots, overalls, helmets, rakes, shovels, spades, hoes, and axes for use. Due to the high cost of compact vehicles and other modern vehicles, the situation forces them to use open trucks for waste transportation because of affordability. Other reason is that the PPP agreement with the OTC only last for two years then re-advertised.

Contractors were asked if they manage to collect all wastes in the designated areas within specified time.

Responses of respondents regarding if it is manageable to collect wastes in designated area within specified time revealed that all contractor's respondents revealed that is not manageable to collect all wastes in designated area within prescribed time. The reason is that in some places there are no storage facility. As a result, waste is being dumped on the ground and as a contractor, waste to be collected are those only stored in authorised storage facilities such as: skip containers, drums, plastic bags, and wheeler bins. Some areas do not have tarred roads. As a result, some trucks may get stuck on sand or mud roads. During rainy season, some areas experience flood, as a result, waste collection trucks cannot able to reach there for waste collection.

Contractors were asked at which part of the town found difficult to collect wastes and why.

Contractors respondents regarding the accessibility of collecting solid wastes from different areas of Oshakati town. Among 13 waste collection contractors, only very few contractors found it difficult for solid waste collection in formal areas. All contractors responded that it is difficult for collecting solid waste in informal area. Few contractors found it difficult to collect waste in business areas, and few also find it difficult in institutional area. This implies that informal areas are more difficult to collect solid waste compared to formal areas. In formal areas all households afford and own a dust bin while in informal areas not every household can afford a dustbin. In formal areas, roads are wide enough for all types of waste collection vehicles to drive through and collect waste while in informal areas, it is difficult for solid waste collection vehicles to drive through.

Problems and Challenges Facing the Community Members Participation in Solid Waste Management

The respondents were asked whether they experience any problems in solid waste segregation and storage.

The community member's problems in solid waste segregation at before storage. Only few respondent's does not have problems in solid waste segregation before storage, while the majority of the respondent's experience problems and challenges in solid waste segregation before storage. This shows that the majority of the community members have problems in solid waste segregation while only few community members have no problems in solid waste segregation.

The responses of respondents regarding the problems and challenges in waste collection revealed that only few community members agreed while the majority did not agree, if there are problems experienced of waste not being collected as per schedule. In this case, sometimes residents call and report the matter to OTC waste management division for assistance. Some residents search for any open area and dump the waste and sometimes burn. In some occasions, residents discard the waste to a nearby skip container if available. If the assigned contractor fails to collect waste several times, some residents write a complain letter to the OTC waste management department for the officials to familiarise themselves.

In some cases, when wastes are not collected by the responsible contractor or town council, some resident's eager to transport wastes themselves to the dumping site but they have no own transport.

Problems and Challenges Facing the Community Members of Othingo Village

The respondents were asked for how long they lived in the Othingo village. The respondents who responded regarding the staying duration in the Othingo village revealed that they reside in Othingo village for more than five years.

The respondents were asked to estimate the distance between their homesteads and the disposal site. The respondents who responded regarding the estimated distance between their homestead and the disposal site revealed that only few respondents are living in less than 500 Metres while the majority responded that they reside beyond 500 Metres from the disposal site. This indicates that most residents are living in the vicinity of the dumping site and is not in line with the NSWMSN which says the dumping sit must not be within 500 Metres closer to the residential area.

The respondents were asked whether their homesteads or disposal site was located first in the Othingo village. The respondents who responded regarding the whether homestead or disposal site located first in the Othingo village revealed and agreed that they reside in the Othingo village before the location of the disposal site. It shows that most homesteads located in the Othingo village first then the dumping site.

The respondents were asked whether they were consulted by the OTC before the location of the disposal site in the Othingo village. All respondents revealed that they were not consulted before the location of the disposal site in the Othingo village. This means the OTC did not consult the Othingo villagers about locating the dumping site in their vicinity.

The respondents were asked whether they mind of relocating from the vicinity of the dumping site if they could find suitable place. The respondents who responded regarding whether the affected Othingo villagers mind to relocate if suitable place found. Few respondents revealed that they mind to relocate from the vicinity of the dumping site if found suitable place, while most of the respondents do not mind to relocate if any suitable place for relocation found.

The study was aligned to Waste Management Theory as the main guiding theory supported by various related theories as well. WMT was founded on the expectation that waste management is to prevent waste that causing harm to human health and the environment.

Institutional Theory has been frequently used to describe the adoption of the practices of organisation. Practices of other influential organisations, consulting firms, industry trade associations and voluntary reporting guidelines act as mimetic pressures.

Integrated Sustainable Waste Management theory is applicable on recycling of solid waste. The organisation works to transform waste into opportunity through advising on urban environment and development.

Community Engagement consists of people living together in some form of social organization and cohesion. It is member share in varying degrees of political, economic, social and cultural characteristic as well as interest. It is also the process by which individuals and families take responsibility for their own health and wellbeing and for those of community and develop their capacity and to contribute to the community development.

Collective Action Theory Assumes that human beings are important to the environment and creatures. It states that people can voluntarily participate in social development and processes to achieve goals if their common interests are matched and justified from the economic point of view. It also acknowledges the value of individuals forming groups to make rational choices and self-interest, which can lead to decision-making.

Social Capital Theory: Has the potential to enhance community engagement through various means. Firstly, it can enhance the dissemination of information and expertise among members of a community, thereby enabling individuals to stay informed about critical matters and act. Moreover, it has the potential to facilitate the development of solidarity within a community and a shared sense of identity, thereby incentivising collaborative efforts toward shared goals.

New Public Administration Theory. NPA focus in administration towards political or policy making process specifically in public programmes. NPA is a new and qualitatively different phase in the growth of public administration infused with political values such as social justice, equity, and commitment.

NPM in local government outsource private-sector to perform duties and responsibilities on behalf of the public sector. This enhance efficiency, performance, and good customer service in local government. NPM focuses on the management of public services carried out by the private sector with management changes. PPPs s the transfer and control of a good or a service currently provided by the public sector, either in whole or in part, to the private sector.

New Public Service elaborates a set of norms and practices that focus on democracy and citizenship as basis for the practices of public administration theory.

New Public Service addressed questions about the nature of public service, the role of administration in governance, and the value tensions surrounding bureaucracy, efficiency, equity, responsiveness, and accountability.

Conclusions

Municipal solid waste management is the responsibilities of all municipalities. All municipalities try by all means to ensure that community members are in waste free environment. Sources and types of solid waste need to be addressed correctly in terms of waste generation up to waste treatment. Legal framework is very crucial as it regulates the operations of municipal solid waste management. The community member's involvement and contracting out of solid waste management makes it easy for the municipalities to meet their goals.

Suggestions

Based on the findings of the study, it is recommended that the OTC should take the following necessary precautions to address the solid waste management challenges.

Suggestions on Various Types and Sources of Solid Waste in Oshakati Town

Solid waste segregation: The OTC should introduce segregation of solid waste before storage. This can be only done if every waste generation point has more than one waste storage bin. The OTC should encourage community members to segregate solid waste at storage point. This can be only done if every waste generation point has more than one waste storage bin. The OTC should introduce a "Clear Refuse Bag" a system used by the City of Windhoek in Namibia. This system, clear plastic refuse bags are being used for specific types of waste storage only.

Solid waste storage: The waste storage facilities are costly and skip containers are not enough especially in open areas. The OTC should provide free waste storage facilities as they are costly. Correct and different storage facilities are needed.

Solid waste collection: The OTC and contractors should collect waste on time to avoid waste being exposed by dogs and cats as they search for food. Delays on solid waste collection pose threat especially to kids when playing on open areas.

Solid waste transportation: Solid waste should be transported by canvas covered vehicles to prevent them falling down during transportation. Bad roads make it difficult to reach every corner of the city easily. Solid waste transportation in open trucks pose threat to other road users if falls down during transportation.

Solid waste disposal: Solid waste should be disposed far away from residential, businesses and other institutions. Solid waste disposal landfill is closer to the community members and pose health hazards to humans. Solid waste recycling at the dumping site rather than before storage. There should be investments in a composting facility in the town or region to reduce the amount of organic waste dumped at the dumpsite. With the above recommendations in mind, more studies should be done in the town targeted at particular aspects such as waste generation patterns, public opinions on waste management and new technologies that can be applied presently and in the future.

Solid waste processes: Recycling should be enforced to reduce the amount of waste being landfilled. Waste to energy should be introduced. Residents should be taught on how to composting waste also.

Suggestion on Environmental Related Laws, Legislations, Policies and Institutional Setup Governing Municipal Solid Waste Management in Oshakati town, Namibia

Laws and regulations should be improved for proper waste management practices at local levels and at national levels as the community would be more willing to practice proper waste dumping, waste separation and recycling once the regulation is in place. There must be awareness programmes about the laws and regulations and they should be monitored and evaluated regularly. The media, posters, pamphlets and public notices should be used more to increase the awareness in the community and integrating the waste management with development strategies is vital.

Sustainable development and good governance cannot be separated, therefore the use of policies, laws, and regulations towards the management of waste in Oshakati town is acknowledged, as they are elements of governance for promoting sustainable development. The process of speeding up the implementation of environmental policies is highly needed. The OTC should introduce and implement various by-laws in order to control waste management easily. This can be collective if the OTC also introduce a City Police for the town rather than relying on Namibian Police Force. Legal framework need to be improved in order to give enough power to the town council to act.

Suggestions on the Role of Public Private Partnership in Solid Waste Management in Oshakati town, Namibia

Contractors should employ ethical business practices while fulfilling their contractual obligations. Furthermore, they also need to become more innovative and creative in seeking to expand the service coverage, quality and affordability of the service to the poor. Contractors should also have enough personnel in order to fulfil the job faster in their area of responsibilities.

Timely release of funds from the OTC to the contractors would go a long way in effective implementation of PPP in OTC. Furthermore, it is suggested that funds be released to the designated contractor immediately upon the contract is granted.

Suggestions on the Community Participation in Solid Waste Management Oshakati Town, Namibia

There should be more educational programs for the public and in schools to promote waste reduction and public participation in waste management.

Different dust bins for different solid waste storages should be provided to the community members who cannot afford to purchase them free of charge by the OTC. Waste segregation at storage bins should be introduced as they will help encourage recycling in the town and generally ensure that less recyclables end up in dumpsites. This may help community members to earn some money from recyclable materials for living.

Solid waste bins should all be clearly and accurately labelled, so that residents will be fully aware of which bin in which to throw recyclables such as papers, grasses, plastics, metals, organic waste etc.

Enough skip containers should be provided at all well-known waste generation points especially at business areas.

Various enhancing participatory platforms should be created for the community members to take part in decisions that affects their livelihoods.

Contractors should ensure that they employ ethical business practices while fulfilling their contractual obligations so that they collect wastes as per agreement with the OTC.

There should be a proper monitoring and evaluation process for the management of the landfill site. More platforms and programmes to educate people on solid waste management are needed. The central government should be involved in monitoring the SWM process to mitigate impacts on the environment.

Limitations for the Study

Firstly, the study was constrained by both time and financial constraints, thus making it difficult to expand the scope of key stakeholders in the MSWM sector. This limitation was mitigated by carefully selecting participants in the study through a purposive non-probability sampling method, to ensure that the key stakeholders in MSWM were included.

Secondly, the researcher did not get access to data related to the budget and/or finances allocated to the waste management sector from the municipality as expected. Therefore, the analysis of the economic costs involved in the MSWM in OTC could not be considered in this study.

Thirdly, effective and successful collection of data involving people was hindered by the mood and attitude of the participants; hence, the biggest concern was the reliability and validity of the data collected. These limitations were mitigated by explaining to the participants the purpose of the study and assuring them a high degree of confidentiality.

Scope of Future Research

Future research should include Community Based Organisations and Non-Governmental Organisations involvement in solid waste management. The role of the rag-pickers in SWM should be studied. The markets for recyclable waste collected in Oshakati town. The use of deposit and refund method as a solution to SWM and landfilling in Oshakati town. Furthermore, future study must also include the quantity of skip containers placed in all areas of town, number of dust bins sold by the OTC per year.

APPENDICES

APPENDIX-I

Department of Public Administration

Mizoram University

Interview-Schedule for the Oshakati Town Council Officials

The below interview-schedule has been prepared in connection with data collection for the award of the degree of Doctor of Philosophy under the Department of Public Administration, School of Social Science, Mizoram University. The data and information collected will be treated as confidential and used for academic purposes only.

Section A: Demographic Information (Please Make a Cross)

1. How old are you?

Below 30 Years:	☐	31 – 40:	☐
41-50:	☐	Above 60:	☐

2. Sex

Male: ☐ Female: ☐

3. Religion

Cristian: ☐ Muslim: ☐ Hindu: ☐ Buddha: ☐

4. Educational Qualification

Illiterate: ☐ Primary Education: ☐ Secondary Education: ☐

Tertiary Education: ☐ Professional Education: ☐

5. Marital status

Married: ☐ Unmarried: ☐ Widow/Widower: ☐

Separated: ☐ Divorced: ☐ Destitute: ☐

6. Occupation

Farmer: ☐ Businessman/Businesswomen: ☐
Private Company: ☐ Government Parastatal: ☐
Unemployed: ☐

Section B

1. Various Types and Sources of Solid Waste in Oshakati town

1.1 Can you please describe the organization structure for waste management team and their responsibilities?

.....

1.2 How many employees are working for solid waste management in Oshakati town?

.....

1.3 What are the types of solid waste generated in the Oshakati town?

.....

1.4 What are the sources of solid waste in the Oshakati town?

Please specify

1.5 Do you provide different dust bins for various solid waste storage? Yes:

☐ No: ☐

1.6 What storage methods being used for solid waste in the town of Oshakati?

Please Specify

1.7 How many and types of vehicles does the OTC use for solid waste management?

.....

1.8 What type of solid waste disposal method does the OTC use?

Landfill/Dumpsite: ☐ Combustion: ☐ Recycling: ☐

Composting: ☐ Plasma Gasification: ☐ Others ...

1.10 Have you experienced any complaints from residents living in the surrounding of the dumpsite?

Yes: ☐ No: ☐

If yes, what are the complaints all about?

1.11 Does municipal solid waste management have a portion in the municipal annual budget?

Yes: ☐ No: ☐

If Yes, how much allocated for the municipal waste for the current financial year 2023/2024?

.....

1.12 Does the amount allocated enough to cater all waste management needs?

Good enough: ☐ Enough: ☐

Little: ☐ Very Little: ☐

2. Environmental Related Laws, Legislations, Policies and, and Institutional Setup Existing in Municipal Solid Waste Management in Oshakati town, Namibia

2.1 Are there National, Regional and Local Government Legal framework that governing municipal solid waste management in Oshakati town?

Yes: ☐ No: ☐ No idea: ☐

If Yes, please mention and their priorities.

.....

2.2 Are there any regulations strengthening the municipal solid waste management operations in Oshakati town?

Yes: ☐ No: ☐ No idea: ☐

If Yes, please mention and explain.

.....

2.3 Do you think the existing legal framework satisfy the execution of solid waste management in Oshakati town?

Strongly Agree: ☐ Agree: ☐ Disagree: ☐ Strongly Disagree: ☐

3. Public Private Partnership (PPP) in Municipal Solid Waste Management

3.1 Is the Oshakati Town Council aware of National Solid Waste Management Strategy of Namibia and its relationship to PPP in Municipal Solid Waste Management?

Yes: ☐ No: ☐

If yes, please explain

3.2 Is the Oshakati Town Council in relationship with private contractors in Solid Waste Management?

Yes: ☐ No: ☐

If yes, please explain

3.3 How good is the performance of the contractors in PPP in solid waste management in Oshakati town?

Please explain

Highly Satisfied: ☐

Satisfied: ☐

Poor: ☐

Very: ☐

4. Problems and Challenges

4.1 Do you think there are problems and challenges need to be adjusted in execution of solid waste management in Oshakati town?

Yes: ☐ No: ☐

4.2 Could you please mention the problem and challenges facing the municipal solid waste management in Oshakati town?

.....

Any suggestions:

.....

The End!

APPENDIX-II

Department of Public Administration

Mizoram University

Interview–Schedule for the Contractors in Public Private Partnership (PPP) with the Oshakati Town Council.

The below interview-schedule has been prepared in connection with data collection for the award of the degree of Doctor of Philosophy under the Department of Public Administration, School of Social Science, Mizoram University. The data and information collected will be treated as confidential and used for academic purposes only.

Section A: Demographic Information (Please Make a Cross)

1. How old are you?

Below 30 Years:	☐	31 – 40:	☐
41-50:	☐	Above 60:	☐

2. Sex

Male: ☐ Female: ☐

3. Religion

Cristian: ☐ Muslim: ☐ Hindu: ☐ Buddha: ☐

4. Educational Qualification

Illiterate: ☐ Primary Education: ☐ Secondary Education: ☐

Tertiary Education: ☐ Professional Education: ☐

5. Marital status

Married: ☐ Unmarried: ☐ Widow/Widower: ☐

Separated: ☐ Divorced: ☐ Destitute: ☐

6. Occupation

Farmer: ☐ Businessman/Businesswomen: ☐ Private Company: ☐
Government Parastatal: ☐ Unemployed: ☐

Section B

1. How long have you been involved in cleaning the Oshakati town?

Less than 5 Years: ☐ More than 5 Years: ☐

2. How many employees do you have for solid waste management?

.....

3. How many and types of vehicles do you use for solid waste management?

Please mention and explain

4. Do you have all the right tools and equipment's for cleaning?

Yes: ☐ No: ☐

If No, Why?

5. Is it manageable to collect all wastes in your area of responsibility on specified time?

Yes: ☐ No: ☐

If No, Why?

6. Which part of the town is difficult to collect waste and why?

Informal area: ☐ Formal area: ☐ Industrial area: ☐

Business area: ☐ Others:

Why do you find it difficult to clean in the area mentioned?

.....

7. Any other problems do you experience during the cleaning process?

.....

The End!

APPENDIX-III

Department of Public Administration

Mizoram University

Interview-Schedule for the Community Members of Oshakati Town

The below interview-schedule has been prepared in connection with data collection for the award of the degree of Doctor of Philosophy under the Department of Public Administration, School of Social Science, Mizoram University. The data and information collected will be treated as confidential and used for academic purposes only.

Name of your Suburb:

Section A: Demographic Information (Please Make a Cross)

1. How old are you?

Below 30 Years: ☐ 31 – 40: ☐ 41-50: ☐ Above 60: ☐

2. Sex

Male: ☐ Female: ☐

3. Religion

Cristian: ☐ Muslim: ☐ Hindu: ☐

Buddha: ☐ Others, Specify

4. Educational Qualification

Illiterate: ☐ Primary Education: ☐ Secondary Education: ☐

Tertiary Education: ☐ Professional Education: ☐

5. Marital status

Married: ☐ Unmarried: ☐ Widow/Widower: ☐

Separated: ☐ Divorced: ☐ Destitute: ☐

6. Occupation

Farmer: ☐ Businessman/Businesswomen: ☐

Private Company: ☐ Government Parastatal: ☐ Unemployed: ☐

7. How long have you been living in Oshakati?

0 – 5years: ☐ 6-10 years: ☐ Over 10 years: ☐

Section B: Community Participation in Solid Waste Management in Oshakati Town

2.1 Do you segregate solid waste before storage?

Yes: ☐ No: ☐

2.2 What method do you store solid waste you generate?

Dust Bin: ☐ Skip Containers: ☐ Black Plastic: ☐

Open Area: ☐ Others Please Specify

2.3 How many times the refuse normally collected?

Once a week: ☐ Twice a week: ☐

More than Three times a week: ☐ Never: ☐

2.4 Did you experience a time when no waste collection was done as per schedule?

Yes: ☐ No: ☐

If yes, what is your action?

2.5 Are you satisfied with the way solid waste is managed in your town?

Highly Satisfied: ☐ Satisfied: ☐ Poor: ☐ Very: ☐

If not satisfied, how solid waste management should be improved?

.....

2.6 Any other comments

.....

The end!

APPENDIX-IV

Department of Public Administration

Mizoram University

Interview-Schedule for the Community Members of Othingo Village

The below interview-schedule has been prepared in connection with data collection for the award of the degree of Doctor of Philosophy under the Department of Public Administration, School of Social Science, Mizoram University. The data and information collected will be treated as confidential and used for academic purposes only.

Section A: Demographic Information (Please Make a Cross)

1. How old are you?

Below 30 Years: ☐ 31 – 40: ☐ 41-50: ☐ Above 60: ☐

2. Sex

Male: ☐ Female: ☐

3. Religion

Cristian: ☐ Muslim: ☐ Hindu: ☐ Buddha: ☐

4. Educational Qualification

Illiterate: ☐ Primary Education: ☐ Secondary Education: ☐

Tertiary Education: ☐ Professional Education: ☐

5. Marital status

Married: ☐ Unmarried: ☐ Widow/Widower: ☐

Separated: ☐ Divorced: ☐ Destitute: ☐

6. Occupation

Farmer: ☐ Businessman/Businesswomen: ☐ Private Company: ☐
Government Parastatal: ☐ Unemployed: ☐

Section B

7. For how long have you been living in Othingo village?

Less than 5 Years: ☐

More than 5 Years: ☐

8. Can you please estimate the distance between the dumping site and your house?

Less than 500 Metres: ☐

More than 500 Metres: ☐

9. Between your homestead and the disposal site, who was the first to locate to this area?

Household: ☐

Disposal site: ☐

10. Were you consulted for the dumping site to be located in your village?

Yes: ☐ No: ☐

If Yes, how was the agreement?

.....

11. What are the problems associated by living closer to the dumping site?

.....

12. Do you mind of relocating your homestead out from the vicinity of the disposal site area if you could find a suitable place?

Yes: ☐ No: ☐

13. According to your suggestions, what should be done by the OTC about the dumping site?

.....

The end!

APPENDIX-V

Photo Gallery of Field Visit (during October 2023 - February, 2024)

Fig 11 Skip Container Loaded in a Skip Trailer



Source: *Field study conducted between October 2023 to February 2024*

Fig 12 A 240 Litres Dust Bin Placed at the House in Oshakati Town



Source: *Field study conducted between October 2023 to February 2024*

Fig 13 Oshakati Waste Disposal Site Entrance



Source: *Field study conducted between October 2023 to February 2024*

Fig 14 Maintenance Machinery (Bulldozer) Currently Used on the Dumping Site



Source: *Field study conducted between October 2023 to February 2024*

Fig 15 Oshakati Dumping Site Recycling Area



Source: *Field study conducted between October 2023 to February 2024*

Fig 16 Solid Waste Ready for Landfilling at the Oshakati Dumping Site



Source: *Field study conducted between October 2023 to February 2024*

Fig 17 Solid Waste Being Dumped in Open Area in Oshakati Town



Source: *Field study conducted between October 2023 to February 2024*

Fig 18 Skip Container Placed in Business Centre of Oshakati Town



Source: *Field study conducted between October 2023 to February 2024*

Fig 19 Solid Waste Collection Truck on Weighbridge at Othingo Dumping Site



Source: *Field study conducted between October 2023 to February 2024*

Fig 20 Solid Waste Collection Truck During the Cleaning Campaign



Source: *Field study conducted between October 2023 to February 2024*

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BIO-DATA OF THE CANDIDATE

Name of the Candidate	:David Tsikila Hango
Nationality	:Namibian
Father's Name	:Simon Hango
Mother's Name	:Elise Hango
Gender	:Male
Date of Birth	:29 th April 1982
Marital Status	:Married
Educational Qualification	:Master's Degree in Public Policy and Management :Bachelor of Technology (B-TECH) in Public Management
Address	:1223, Okuryongava, Windhoek, Namibia, 9000
Contact No.	:+919233043918 or +264812400808
Email Address	:davidhango2@gmail.com

PARTICULARS OF THE CANDIDATE

Name of the Candidate	:David Tsikila Hango
Degree	:Doctor of Philosophy (Ph.D)
Department	:Public Administration
Title of the Thesis	:Municipal Solid Waste Management in Oshakati Town, Namibia: An Empirical Analysis
Date of Admission	:03.06.2022
Approval of Research Proposal:	
1. DRC	:24.03.2023
2. Board of Studies	:03.05.2023
3. School Board	:26.05.2023
MZU Registration No.	:2200251
Ph.D. Registration No.	:MZU/Ph.D./2034 of 03.06.2022
Extension	:Nil

(Prof. LALNEIHZOVI)

Senior Professor & Head

Department of Public Administration

Mizoram University

ABSTRACT

MUNICIPAL SOLID WASTE MANAGEMENT IN OSHAKATI TOWN, NAMIBIA: AN EMPIRICAL ANALYSIS

**AN ABSTRACT SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF
PHILOSOPHY**

DAVID TSIKILA HANGO

MZU REGISTRATION NO.: 2200251

Ph.D. REGISTRATION NO.: MZU/Ph.D./2034 of 03.06.2022



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NAMIBIA: AN EMPIRICAL ANALYSIS**

BY

DAVID TSIKILA HANGO

Department of Public Administration

Supervisor

Prof. A. MUTHULAKSHMI

Submitted

**In partial fulfillment of the requirement of the Degree of Doctor of Philosophy
in Public Administration of Mizoram University, Aizawl**

MUNICIPAL SOLID WASTE MANAGEMENT IN OSHAKATI TOWN, NAMIBIA: AN EMPIRICAL ANALYSIS

ABSTRACT

Waste is defined as any discarded materials that the owner has no further use. Solid waste can be considered Municipal Solid Waste (MSW) is the waste generated from the residential commercial and other places within the boundaries of a city or town. Municipal Solid Waste Management (MSWM) is one of the mandate of every municipality in order to keep the environment of the town clean and free from diseases. The purpose of the study was to study of MSWM in Oshakati town, Namibia. It outlines various types and sources of solid waste and analyse how they are managed. Examine the environmental laws and legislations in Namibia and of the Oshakati town. The role of Public Private Partnership (PPP) in solid waste management under the Oshakati Town Council. Furthermore, the opinions and perceptions of the community members and the environmental impacts of solid waste were assessed.

Purposive non-probability sampling method was applied for the study. Descriptive statistical data analysis was used for presentation of the findings. The study found that in the Oshakati town, all types of wastes are generated except industrial waste as there are no industries in the town. It comprises of organic waste, plastic, paper, glass, and metals. Organic waste often dominates the composition, followed by plastic and paper. These wastes are generated from various sources such as: domestic, commercial, institutional, street sweeping, building rubbles, and dead animals. Domestic waste regarded as the major sources of wastes generation in the town. Solid wastes are being segregated, stored, collected, transported, disposed and recycled or landfilled at Othingo sanitary landfill. Legal framework in MSWM is existing, however it need to be enforced. Public Private Partnership is also in place whereby the Oshakati town council outsourced private contractors to perform waste management duties. Community participation is also existing; however, more education is needed to all community members. Based on the findings of the study, it is recommended that the Oshakati Town Council should take the following necessary

precautions to address the solid waste management challenges. Enhancing participatory should be created for the community to be present when decisions are taken that affects their livelihoods. There should be a proper monitoring and evaluation process for the management of the landfill site. More platforms and programmes to educate people on solid waste management are needed. The central government should be involved in monitoring the SWM process to mitigate impacts on the environment. Laws and regulations should be improved for proper waste management practices at local levels and at national levels as the community would be more willing to practice proper waste dumping, waste separation and recycling once the regulation is in place. There must be awareness programmes about the laws and regulations and they should be monitored and evaluated regularly

Theoretical Framework

Theoretical framework is the foundational review of existing theories that serves as a roadmap for developing the arguments that a researcher uses in the study.

Waste Management Theory (WMT)

WMT is founded on the expectation that waste management is to prevent waste causing harm to human health and the environment. There are practical values of WMT namely: Predicting the waste management actions outcomes; Provides guidelines for choosing waste management options; Supporting Legislation on how to prescribe activities upon waste; Providing answers to conceptual questions by explaining waste concepts; Laying a foundation for how and when to select and integrate waste management options. Waste management theory, as differentiated from waste management practice, represents a more in-depth account of the domain and contains conceptual analyses of waste, the activity upon waste, and a holistic view of the functions and goals of waste management. This theory is the best as it will give an account of an in-depth analysis in the goals of successful waste

management.¹

Community Engagement

Community engagement in MSWM falls under the two theories namely: Collective Action Theory (CAT) and Social Capital Theory (SCT) as explained below.

Collective Action Theory

CAT assumes that human beings are important to the environment and creatures. It states that people can voluntarily participate in social development and processes to achieve goals if their common interests are matched and justified from the economic point of view. It also acknowledges the value of individuals forming groups to make rational choices and self-interest, which can lead to decision-making. CAT forms a part of this study to analyse collective action of community involvement in solid waste management in Oshakati town.²

Social Capital Theory

Social capital has the potential to enhance community engagement through various means. Firstly, it can enhance the dissemination of information and expertise among members of a community, thereby enabling individuals to stay informed about critical matters and act. Moreover, it has the potential to facilitate the development of solidarity within a community and a shared sense of identity, thereby incentivising collaborative efforts toward shared goals.³

¹Pongracz, E., Phillips, P. S., Keiski, R. L. (2004). *Evolving the theory of waste management: Defining key concepts*. Mass and Heat Transfer Process Laboratory, University of Oulu, Finland. <https://www.witpress.com/Secure/elibrary/papers/WM04/WM04046FU>

²Oh, J., & Hettiarachchi, H. (2020). Collective action in waste management: A comparative study of recycling and recovery initiatives from Brazil, Indonesia, and Nigeria using the institutional analysis and development framework. *Recycling*, 5(1), 4.

³Kafula, N. (2024). *Exploring the role of community participation in sustainable solid waste management: A case study of Moses//Garoeb and Samora Machel informal settlements in Windhoek, Namibia* (Doctoral dissertation, Stellenbosch University). <https://core.ac.uk/download/pdf/642874827.pdf>

Integrated Sustainable Waste Management Theory (ISWMT)

ISWMT is a theory that allows studies of complex and multi-dimensional systems in an integral way. The model was developed by waste advisers on urban environment development and partners or organizations working in developing countries in the mid-1980s and further developed by the collaborative working group on solid waste management in the mid-1990's. This theory acknowledges the importance of three dimensions when analysing, developing or changing a waste management system. The dimensions are: the stakeholders that have an interest in solid waste management, the elements or stages of the movement or flow of materials from the generation points towards treatment and final disposal and the aspects through which the system is analysed.⁴

New Public Administration (NPA)

The new public administration theory focus in administration towards political or policy making process specifically in public programmes. Public administration was influenced and shaken by the social turbulence and crisis-ridden period during 1960s. as from 1968, the public administration evolving discipline has come to be enriched by emerging to NPA.⁵

New Public Management (NPM)

NPM focuses on the management of public services carried out by the private sector with management changes. NPM basically discussed fundamental changes to the power relationships between the main players in the system of government and requires significant attitudinal changes on the part of bureaucrats. NPM tries to ensure better governance with less cost and deliver services in low cost. NPM theory says agencies can share their resources when they need.⁶

⁴Wilson, D. C., Velis, C. A., & Rodic, L. (2013). Integrated sustainable waste management in developing countries. *Proceedings of the Institution of Civil Engineers-Waste and Resource Management, ICE Publishing*, 166(2), 52-68.

⁵Basu, R. (2022). *Public administration: Concepts and theories* (5th ed.). Sterling Publishers (P) Ltd.

⁶Muneera, M. N. F. (2012). *Public-Private Partnership (PPP) in solid waste management: Literature review of experiences from developing countries with special attention to Sri Lanka*. [Master Thesis, Norwegian University]. <http://hdl.handle.net/11250/265466>

New Public Service

The New Public Service elaborates a set of norms and practices that focus on democracy and citizenship as basis for the practices of public administration theory. New Public Service addressed questions about the nature of public service, the role of administration in governance, and the value tensions surrounding bureaucracy, efficiency, equity, responsiveness, and accountability. It was organized around core arguments related to the role of the public service in facilitating citizenship and promoting democratic governance.⁷

The current study adopted these theories namely: Waste Management Theory; Collective Action Theory; Integrated Sustainable Waste Management Theory; Social Capital Theory; New Public Management Theory; and New Public Administration Theory.

Review of Literature

These are the reviews of what other researchers and authors had explored already related to this study. Literature review is crucial as it justifies a research and identifies the aim of the study. Published literature sources such as journal articles, newspapers and books are to be used as literature reviews. Various researches and articles in the similar study conducted elsewhere will also be a part of a literature review.

Hasheela, (2009), in her research, *Municipal Waste Management in Namibia: The Windhoek Case Study* conducted the study investigated the current status of municipal waste management in Namibia, specifically in the city of Windhoek. Literature survey, questionnaires, personal interviews, on site data gathering and data analysis were used as a methodology by the researcher. Windhoek was acknowledged as the cleanest city in Africa, due to its proper SWM. The municipality of Windhoek make sure that all wastes generated are collected,

⁷Denhardt. J. V., & Denhardt. R. B. (2010). *Public administration*. Cengage Learning India Private Limited.

transported and disposed at the right disposal site. Household wastes are collected by its own division, while business generated wastes are collected by both the SWM division and private companies. In Windhoek, the waste disposal is very exciting as there are six general landfill sites for rubbles and garden refuse. These sites are located in Khomasdal, Eros, Havana, Pioneerspark, Ludwisdorf and Olympia. There is special engineered landfill site known as Kupferberg located about 11 Kilometres away from the city centre for general and hazardous wastes. Two separate cells are to be found on this site whereby hazardous wastes are being disposed in the hazardous cells while general wastes generated from households, commercials and industrial activities are disposed in general cells. The findings of this study suggest that the MSWM of the city of Windhoek is the best in Namibia and all towns in the country are encouraged to adopt it.⁸

Abul, S. (2010), conducted the study on *Environmental and Health Impact of Solid Waste Disposal at Mangwaneni Dumpsite in Manzini: Swaziland*. The study was design to determine the effects of the dumpsite on the surrounding human settlement in the Mangwaneni area of the Golf Course dumpsite in Manzini city. Data were collected from 78 household heads, through the use of self-administered questionnaires. Households heads were divided into strata, with 39 nearby less than 200m and 39 far away more than 200m of the Mangwaneni area. It was also noted that the residents whose houses are within 200 meters from the dumpsite are victims of malaria, chest pains, cholera, and diarrhea. However, residents whose houses are in the distance of over 200 meters are also affected with the chest pain and bad smell from the dumpsite, but mainly when wind is blowing in their direction. The study concludes that dumpsites should be located at least 200 meters away from human settlements. Therefore, the study recommends that dumpsites should be properly located and managed to minimise its effects on the environment. The study recommended that government and municipalities should revise laws regarding the

⁸Hasheela, R. (2009). *Municipal waste management in Namibia: The Windhoek case study* [Doctoral thesis, Universidad Azteca]. Chalcode de Diaz Covarrubias, Mexico. <http://the-eis.com>

locations of the dumpsites to be at reasonable distance.⁹

Iqbal, Naved, (2012), in their book, *Textbook of Solid Waste Management* identifies three types of landfills. Depending upon the availability of land and disposal methods, landfills are classified as: slope landfills, area landfills, and trench landfills. Slope landfills are erected in hilly areas. Solid wastes are disposed by local foothills after providing a suitable liner and a leachate collection system. Slopes of 30 to 35 degrees is recommended to be safe, depending on the solid waste characteristics. Area landfills is on-ground landfills. It is provided where natural or man-made depressions are not available and excavation difficult. Waste are to be covered with a suitable materials and in most cases with soil that is to be brought from other area. Trench landfills is one of the most widely used method in the world. It is suitable for the areas where natural or man-made depressions are available and a very deep water table.¹⁰

Vanlalhlinpui, (2013), in her dissertation, *Public-Private Partnership in Municipal Solid Waste Management in Aizawl* elaborated Public Private Partnership (PPP) as the agreement between the government and the private sector in a certain project or rendering services to the public. After the establishment of the first Aizawl Municipal Council (AMC) and the election of local council in all nineteen wards under AMC, the SWM fell under the AMC as per powers and functions stipulated in Aizawl Municipal Act of 2007. The AMC guideline stipulates that MSW are to be collected and transported in every locality by SWMC. SWMC is to arrange the collection of MSW from all areas including for deep areas where vehicles may not enter easily. In non-accessible areas, the SWMC provides information in advance as

⁹Abul, S. (2010). Environmental and health impact of solid waste disposal at Mangwaneni dumpsite in Manzini: Swaziland. *Journal of Sustainable Development in Africa*, 12(7), 64-78.

¹⁰Iqbal, H. K., & Naved, A. (2012). *Textbook of solid waste management* (5th ed.) CBS Publishers & Distributors PVT. LTD.

where, when, and time residents have to drop their waste for pick up.¹¹

Mughal, (2014), in his thesis, *Waste Management in Northern Towns of Namibia* conducted the study in three towns of northern Namibia namely: Ondangwa, Ongwediva and Oshakati. Results from Ondangwa town revealed that, there are five contracts in PPP responsible for recycling, collecting, and transportation of wastes. Each company have more than one truck that collect waste from door-to-door in its area of responsibility. In most cases, the contractor hires community members to segregate recyclable waste manually. This agreement aims to assure that PPP contractors are fully accomplish their duties.¹²

Nawa, W., (2014), in a project report, *Solid Waste Management in Northern Namibia (Oshakati Case Study)* pronounces that waste can be a health hazard if not well managed and can cause serious harm to the environment. The study aimed to establishing the current state of solid waste management in Oshakati town by focusing on the applied methods of waste management. All types of solid waste in Oshakati ends up at the dumpsite where recyclables are sorted by scavengers and collected by recycling companies that transport them to Windhoek, Walvis Bay or to the Republic of South Africa. Multiple challenges are currently hindering the Oshakati town council's efforts to conduct proper solid waste management including; lack of funding, trained stuff and poor public participation in waste management programs. A lot should be done in order to target particular aspects of waste management in Oshakati town, and the entire country.¹³

Ndhlovu, (2018), in her dissertation, *Investigating the Effectiveness of a Community Based Approach Towards Solid Waste Management in Windhoek's*

¹¹Vanlalhlmpuii, J. (2013). *Public-Private Partnership in municipal solid waste management in Aizawl* [Master's thesis, Mizoram University], Aizawl, India. <https://scholar.google.com/scholar?hl>

¹²Mughal, M. I. (2014). *Waste management in northern towns of Namibia* [Bachelor's thesis, Tampere University of Applied Sciences], Tampere, Finland. <http://core.ac.uk>

¹³Nawa, W., (2014). *Solid waste management in northern Namibia (Oshakati Case Study)* [Bachelor of Science Research Project, University of Namibia]. <https://www.scribd.com/document/469763612/solid-waste-management-in-northern-namibia-oshakati-case-study>

Okahandja Park found out some SWM challenges. Due to the increasing diversity of waste characteristics and lack of effective implementation of consistent waste policies in urban resulted to solid waste management has become a big challenge. The researcher used mixed method approach for gathering the data where questionnaires and interviews were conducted. Despite the adoption of the Open Space Street cleaning project, solid waste management in informal settlements where many of the urban poor live is still a critical problem. It has negatively affected them socially and economically. Results show that a large portion of the population perceive the five R's of zero waste (refuse, reduce, recycle, reuse and rot) negatively. Poor communication, lack of skill influenced informative programmes and negative attitudes have been a problem. The solution to have strict laws on solid waste mismanagement and involve people of different social, ethnic, gender and religious groups in the reconstruction of SWM systems to create typical win-win situations will improve their perceptions towards solid waste.¹⁴

Mutobe et al. (2022), in their study, *Residents' Participation in Solid Waste Management in Solwezi District, Zambia*. *Journal of Environment* highlighted that community participation in solid waste management is currently seen as a determinant of successful solid waste management. The study revealed that the low community participation in solid waste management in Solwezi was attributed to failure to adequately sensitize residents by the municipal council. Residents' attitudes towards sustainable management of solid waste and community engagement in decisions related to solid waste management by the local authority was token at best. The study recommended sensitization in community participation as well as incentivising champions of community waste management as a way of improving

¹⁴ Ndlovu, L. N. (2018). *Investigating the effectiveness of a community based approach towards solid waste management in Windhoek's Okahandja Park* [Master's thesis, University of Namibia], Windhoek, Namibia. <http://www.repository.unam.edu.na>

community participation in solid waste management.¹⁵

Nambahu, (2023), in her dissertation, *Evaluation of Municipal Solid Waste Management Practices in Karibib, Namibia* revealed that the collection of MSW in Karibib town was not in line with the NSWMS requirements as it failed to cover all the populated areas in the town. The urban poor living in informal residential areas were found to be suffering most from the lack of collection services, which in turn exacerbated illegal dumping and littering. Transportation for MSW was found to be sufficient in the town; however, challenges were the lack of garages in the town and problems accessing parts that had to be acquired from elsewhere, hampering the collection process. The disposal of MSW was also found to not be in line with the requirements set out in the NSWMS, which jeopardised public health and the environment. No processing of MSW was found to be taking place in the town.¹⁶

Research Gap

Little work has been done on MSWM in Oshakati town of Namibia. As a result, no clear and enough findings had been made to combine all aspects of the functions of MSWM starting from waste generation, segregation, storage, collection, transportation, disposal and processing. Mughal (2014), conducted a study on waste management in northern towns of Namibia where Oshakati town was a part of the study. The study does not include functions, legal aspects, public private partnership, and community involvement in MSWM of Oshakati town, Namibia. Furthermore, his study did not fully examine laws, policies and legislations that are governing the municipal waste management in Oshakati town, Namibia.¹⁷

¹⁵Mutobe, B., Nchito, W. S., & Mubanga, K. H. (2022). Residents' participation in solid waste management in Solwezi District, Zambia. *Journal of Environment*, 2(1), 19–38. <https://doi.org/10.47941/je.778>

¹⁶Nambahu, T. M. N. (2023). *Evaluation of municipal solid waste management practices in Karibib, Namibia* (Doctoral dissertation, Stellenbosch: Stellenbosch University). <https://scholar.google.com/scholar?hl>

¹⁷Mughal, M. I. (2014). *Waste management in northern towns of Namibia* [Bachelor's thesis, Tampere University of Applied Sciences], Tampere, Finland. <http://core.ac.uk>

Due to the unfilled gaps in their studies, a researcher would like to conduct an empirical study based on sources, types and MSWM functions; legal framework, Public Private Partnership, and community participation and perception.

Statement of the Problem

The Ministry of Environment and Tourism (MET) is the custodian body spearheading the management of SW in Namibia. As a result of rapid waste threat in Namibia, the National Solid Waste Management Strategy (NSWMS) was drafted in 2017. The aim was to ensure that the future regulations, directions, funding and action plans for SWM improvements are properly co-ordinated and consistent with national policy, and to facilitate co-operation with all stakeholders. The strategy directed that all municipalities with a population of more than 20 000 residents at National Population and Housing Census of 2011 are required to have no open burning of waste but to cover the waste on a weekly basis. Furthermore, the dumping waste must be at least 500 metres away from residential or planned housing area. There are some key strategies of NSWMS that a researcher aligning to this study:

1. The waste collection system at most municipalities is generally operating to an adequate standard compared to waste disposal. However, there is scope for improvement at all municipalities and there are particular shortfalls with waste collection from informal areas of housing;
2. The legal framework for solid waste management is weak, and an approach for the step-by-step tightening of standards is needed. In particular, minimum standards for waste disposal need to be adopted and implemented;
3. There is significant interest from the private sector in solid waste management services, but more support is needed from the central government to facilitate private sector participation;
4. Participation of households through more awareness raising activities is needed.¹⁸

¹⁸Ministry of Environment and Tourism. (2017). *National solid waste management strategy for Namibia – 2017*. <http://www.oneplanetnetwork.org>

The OTC Waste Management Policy statement of 2015 outlines the system of work that will: “Enable the Oshakati Town Council and its staff members to ensure that all wastes are disposed off correctly, without endangered human health and without using processes or methods which could harm the environment”.¹⁹

Residents who are living in informal settlements of the Oshakati town are more suffering compared to those staying in formal residential area. Residents living in informal settlements of Oshakati east such as Kandjengedi and Oneshila are longing for better hygiene services. The town council does not have enough skip containers where residents who does not have dumping bins drop wastes for collection. This situation forces some residents to dump wastes in open area and as a result it attracts dogs and flies. Some residents unlawfully burn those rubbish possibly on dry grasses surrounding that may cause uncontrolled fire and smoke. This situation pose threat especially to their kids when playing around. They expressed that, wastes are being dumped in streets and on uncovered ditches and during rainy season, they become full of water and mosquitoes breeds in.²⁰

The researcher would like to fill the gap between directives from NSWMS of 2017 by empirically find how the Oshakati town is complying to it.

Scope of the Study

The scope of the study is narrowed to analyse the types, sources and functional element of municipal solid waste management; solid waste management related laws, policies, legislations and institutional set up; role of public private partnership in municipal solid waste management; and community participation, opinions and perceptions in municipal solid waste management in Oshakati town.

¹⁹Oshakati Town Council. (2015). *Waste management policy - 2015*, Oshakati, Namibia. Print.

²⁰ Ashipala, N. (2019, August 29). Municipal services elude Oshakati east. *New Era*. <https://neweralive.na/posts/municipal-services-elude-oshakati-east>

Significance of the Study

The study oversees the achievement of NSWMS on improving the SWM in Oshakati town. It will promote awareness on waste prevention and find the effective and efficient way of waste management. Furthermore, it drives the Oshakati town council to find a sustainable way of waste management and make improvements. This will benefit the entire Oshakati town residents and of Othingo village where the landfill site is located to live in a healthy environment.

Objectives of the Study

1. To study various types and sources, of solid waste in Oshakati town, Namibia,
2. To examine the environmental related laws, policies, legislations and institutional setup existing in the Oshakati town, Namibia,
3. To study the role of Public Private Partnership in solid waste management in Oshakati town, Namibia,
4. To assess the opinions and perceptions of the community members and their participation in solid waste management and environmental impact in Oshakati town, Namibia and
5. To find out the problems and challenges facing the Oshakati town in rendering solid waste management services.

Research Questions

In light of the problem statement above, the research questions were as follows:

1. What are the various types and sources of solid waste in Oshakati town, Namibia?
2. What are the environmental related laws, policies, legislations and institutional set up existing in Oshakati town, Namibia?
3. What is the role of Public Private Partnership in solid waste management in Oshakati town, Namibia?

4. What are the opinions and perceptions of community members and their participation in solid waste management and environmental impact in Oshakati town, Namibia?
5. What are the problems and challenges facing the Oshakati town in rendering solid waste management services

Methodology

In study design, an attempt has been made to figure out the statement of the problem, objectives, research questions, methodology, and the respondents personal background.

Design of the Study

In the methodology of the research, scope of the study, data source, design of the study, sampling design, respondent's selection, interview schedule, data collection, data collection method, data processing, data analysis and presentation of the report is explained.

Sources of Data

Both primary and secondary data sources were used for the study. Primary sources of data were gathered from the interviews with officials belonging to the waste management department and members of the public. Secondary sources of data from previous studies such as journals, documentary analysis and books were explored as well and used for the study.

Study Design

As this is an empirical study, no hypothesis test was done. Hence, the study aims to gain familiarity through exploratory on solid waste management practices in Oshakati town.

Sampling Design

The Oshakati town residents, Waste management officials, contractors in PPP with Oshakati town, and the Residents of Othingo village where the dumping site is

located form a part of the study. The present study is based on descriptive design whereby mixed method approach was adopted to collect primary data for the study. For selecting study sample, purposive non-probability sampling method was adopted to select sample.

The researcher distributed questionnaires to 10 household heads from each zone totalling to 130. A researcher walked around in the Oshakati town and observe the condition of refuse. Furthermore, the researcher selected ten households in the surrounding of Othingo dumpsite. The researcher wanted to contact all officials of OTC but only contacted five. The five officials of OTC are as follows: Corporate Communication Officer (Town Spokesperson); Manager of Public Health and Environmental Management; Waste Management Officer; Waste Collection and Disposal Officer (Cleansing Officer); and Transport (Operator/Driver). There are 13 operating refuse removal contractors in PPP with the Oshakati town. Each driver from waste remover contractor was given questionnaires for primary data purpose. The population of the study in the general town for the larger group from which the sample was selected for the present study was 158 respondents.²¹

Data was presented and interpreted in tables and narrative form.

Selection of the Respondents

As the study is on solid waste management in Oshakati town, hence the targeted respondents are from Oshakati town.

Methods of Data Collection

The following data collection techniques were used: A desk study, field data collection, semi-structured interviews and observation. The researcher found these techniques suitable as it collects data in different forms. The desk study comprises of a review of existing documents published by previous researchers on the same topic worldwide while the field data collection involved primary and secondary data.

²¹Oshakati Town Council. (2015). *Waste management policy - 2015*, Oshakati, Namibia. Print.

Direct observation and interviews forms a part of primary data while hard copy documents that were not accessible online provided by the town council officials form a part of secondary data. The interviews were semi-structured and contained open-ended questions conducted on a face to face basis with Senior Environmental Health Officer of Oshakati Town Council. Direct observations were done by capturing photographs by using phone camera and taking notes. All the three data collecting techniques were self-designed.

Data Processing

Data processing was done using descriptive statistics and inferences in the form of simple percentages and averages.

Data Analysis

Analysis of data is an explicit step in theoretically interpreting data collected by using specific strategies to transform the raw data into a process form of data. Analysis of data involves working with data, organising it, breaking it down, synthesizing it, searching for patterns, discovering what is important, what is to be learnt and deciding what a researcher will tell others. This made it easier for a researcher to examine the interview transcript and documentary notes before identifying the pattern and organising the data into categories. Descriptive statistical data analysis was used for presentation of the findings.²²

Report Presentation

When raw data was processed and analysed, report writing followed. Enough care was considered to present the report as required by the study designed earlier.

²²Kumar, R. (2014). *Research methodology* (4thed.). Los Angeles: Sage Publications Ltd

Chapterisation

The study was divided into six Chapters as follow:

Chapter I: Introduction

In this chapter, Municipal Solid Waste Management was briefly elaborated, and how is managed in Namibia towns in general and in Oshakati town specifically. It comprises of introduction, literature review, problem statement, scope and objectives of the study, research questions, and the methodology applied for the study.

Chapter II: Types and Sources of Municipal Solid Waste Management in Oshakati town, Namibia.

This chapter examines the different types of solid waste, the sources where solid wastes are being generated. Furthermore, the study examines the solid waste segregation, storage, collection, transportation, disposal, recycling, and incineration.

Chapter III: Environmental related Laws, Legislations, Policies, and Institutional set up Existing Guiding the Management of Solid Waste Management in Oshakati town, Namibia.

This chapter elaborates how the legal and institutional framework works together to ensure that the management of solid waste is running smoothly in Oshakati Town, Namibia.

Chapter IV: The Role of Public Private Partnership in Solid Waste Management in the Oshakati Town.

This chapter highlighted an overview of Public-Private Partnership concept and its meaning in general and how applied generally in Namibia and in Oshakati town in specific.

Chapter V: Results and Discussions

This chapter presents the findings based on the study objectives and interpretations. The fourth and fifth study objectives are presented together in this

chapter.

Chapter VI: Summary, Major Findings, Conclusions, and Suggestions.

This chapter presents the summary of the study, major findings, conclusions, and suggestions. It presents the findings based on the research questions and interprets the study findings from the Oshakati town Officials, Community members of Oshakati town, Contractors in PPP with the OTC, and Othingo village residents.

Findings on Various Types and Sources of Solid Waste in Oshakati Town

Findings in line with the research questions and interprets the study findings from the Oshakati town Officials, Community members of Oshakati town, Contractors in PPP with the OTC, and Othingo village residents.

Findings on Various Types and Sources of Solid Waste in Oshakati Town

In the Oshakati town, all types of wastes are generated except industrial waste as there are no industries in the town. It comprises of organic waste, plastic, paper, glass, and metals. Organic waste often dominates the composition, followed by plastic and paper. These wastes are being generated from various sources such as: domestic, commercial, institutional, street sweeping, building rubbles, and dead animals. Domestic waste regarded as the major sources of wastes generation in the town. Findings on solid waste segregation, storage, collection, transportation, disposal and treatment are explained as follows.

Solid Waste Segregation and Storage

There are no waste records during waste storage as there is no waste segregation taking place during waste storage. Households use 240 litres containers called wheel bins purchased from the OTC to store solid waste, however some households use any storage facilities such as empty oil drums and black plastic bags. Other types of solid waste such as stones, wood, bricks, iron sheet, sand, heavy metals, tree branches and grass are not for storing in the wheelie bins. These are to be stored in big containers called known as skip containers provided at some businesses and institutions. All respondent's responded that no specific storage provided for specific solid waste. This implies that the OTC does not apply any arrangement for

solid waste segregation at storage point. Officials were asked about different types of storage facilities they provide for solid waste storage.

The solid waste storage facilities provided by the OTC are: metal dust bins, skip containers, and black plastic bags. The producer of wastes products must define, identify and store wastes correctly and prevent unauthorised access or accidental release while wait for collection. Household wastes are to be stored in a 240 Litres refuse bin, while in business sectors skip containers are used. However, this does not limit individuals that make use of other suitable materials such as empty fuel metal drums for waste storage. Garden wastes are stored outside the yard but next to the yard for collection. The Solid Waste Management Division of the OTC encourages households and business owners to purchase 240 Litres waste bins for waste storage. Other types of waste such as stones, wood, bricks, iron sheet, sand, heavy metals, tree branches and grass are not to be stored in the wheelie bins. These are to be stored in skip containers that are distributed in some residential areas, including informal residential areas where illegal dumping of waste has been experienced. Skip containers are for storing solid waste that cannot be stored in wheelie bins and those solid waste generated in open spaces. In addition, black garbage bags are provided on a weekly basis to store solid waste generated in informal settlements and in open spaces, based on the need. These are provided by private contractors and the solid waste management division officials. Smaller garbage bins are also distributed along the streets by the solid waste management division officials to prevent littering. Provision of skips containers within the residential and business area is mainly a responsibility of the OTC solid waste management division.

The community member's respondents were asked whether they segregate their solid wastes before storage. The majority of the community member's responded that they do not segregate the solid waste because there are no inadequate storing facilities and only few responded that they segregate their wastes before storage. The reason is that the OTC sells the 240 Litres dust bins at the cost of N\$ 950, 00 equivalents to 4275 Indian Rupees. Majority of community members especially unemployed cannot afford to purchase more than one of it in order to store solid wastes as per their categories.

The community member's respondents were asked about their waste storage methods. The majority of community members responded use dust bins, followed by those use black plastic bags, followed by those use open area dumping then very few use skip containers. This indicates that there are few skip containers provided by the OTC in busy areas.

Community members were asked whether satisfied by the solid waste storage in the town. Only few communities' member's respondents were highly satisfied while the majority were not satisfied with the solid waste storage method.

Solid Waste Collection

Solid waste collection arrangement is the responsibility of OTC. The OTC contracted private companies in formal PPP with the OTC to collect wastes in 13 demarcated zones. Each contractor is responsible for its areas of responsibilities.

According to the OTC waste collection calendar, all areas of the town is covered for waste collection from house to house, businesses, institutions and other premises by randomly collects waste from skip containers; collects black plastic bags placed to the kerb sides of the roads. Official respondents were asked the quantities of solid waste generated. The responsible official respondent responded that no waste records during waste collection as in most cases no waste segregation takes place during waste storage. As per records from the year 2022, an estimated of 4818.35 Tons of wastes was collected annually; in the year 2023, an estimated of 5078.12 Tons of waste was collected while in 2024, the estimated total of 4533.38 Tons was collected. The community member's respondents were asked how many times per week solid waste being collected. About 55 percent of community members responded that only once per week, about 45 percent of the community member's respondents responded that solid waste are being collected twice a week.

Solid Waste Transportation

Solid wastes are being transported by contractors in formal PPP under the OTC to collect wastes in 13 demarcated zones. The Oshakati town council waste management department is also allocated with different types of vehicles for waste

management. These are: two tractor loader, two tipper trucks, one bulldozer, one compact truck, two skip trailers, and two pickups.

Solid Waste Disposal

All wastes are being dumped at one site called Othingo Sanitary Landfill site and are weighed upon entering the site located about 4 kilometres away from the town to the western side. The sanitary landfill covers the area of about 10 hectares and receives solid waste from all corners of the town. The Oshakati town Council objective to have this landfill is to avoid long-term and short-term impacts to the environment such as bad smell, rats and flies, and air pollution. All types of wastes are being disposed of in this landfill. However, hazardous waste such as medical waste is being incinerated.

Solid Waste Treatment

Waste treatment is the process of managing waste materials in order to minimise their quantity and negative impact to human health and to the environment. The OTC applies two methods of waste treatment namely: Recycling and Landfill. The OTC have assigned a priority focus to ensuring continuous maintenance of site operations. This is particularly the case with daily waste coverage and backfilling. During the 2020-2023 financial year, the OTC has appointed a service provider for site levelling, layering, compaction and covering of landfill waste with a Bulldozer. This on-going process ensures prevention of likely occurring nuisances such as littering of site and surrounding area, including prolonging the site lifespan.

Solid Waste Recycling

The OTC have isolated area reserved for recycling. The current progress includes a recycling area for segregation to allow for on-site recycling. The Oshakati town council employed six rag pickers to sort the waste before processing. Wastes such as cans, scrap metal, cardboards and plastics are being sorted. Rag pickers play a crucial task in waste management and recycling in the Oshakati town because there is no pre-sorted waste collection system and the only way to recover

recyclables is at the dumpsite rather than the source point. The OTC strategic plan budget prioritised to construct a recycling stalls area.

Solid Waste Landfilling

There are two methods of landfilling practice namely open dumps and sanitary landfills. In Namibia, the common observed methods are controlled open dumpsites and uncontrolled dumpsites. The Othingo dumping site practice a controlled sanitary landfill whereby wastes are being filled under the ground.

The present situation regarding SWM in the Oshakati town is such that the collection of wastes is conducted from door to door in all parts of the town. The town is divided into thirteen (13) zones so that each household, business and other institutions have to be covered.

All thirteen contractors collect waste from the households, businesses and other institutions once or two times a week and the waste collection fees are charged through monthly water bills by the OTC. The OTC have a waste collection calendar that covers all corners of the town and is available on its website as well as printout available on noticeboards. All waste management activities only done five days in a week, starts from Monday to Friday.

The NSWMSN directive stipulates that all municipalities with the population of more than 20, 000 residents are not allowed to have open burning of waste. As per NPHS of 2023, the population of the Oshakati town is about 58, 696 residents, therefore the OTC implemented a landfill site. Waste disposal continues to be monitored and directed. The segregation of waste forms part of site operational activities. Upon each disposal, there is directive to separate the waste at separate areas zones as per their waste classification. General wastes are disposed separately from the treated hazardous wastes and building rubbles. This is to maintain the site lifespan, including smoothen the process of recycling and minimising exposure. The destruction of special waste category items is controlled for minimal environmental damage. The hazardous wastes have a separate area zone with prepared pit for co-disposal and coverage with inert materials such as demolishing and construction waste, and sand.

The Oshakati town council has and only use one landfill site called Othingo Duping site. It is located about 4 kilometres to the western side of the town. The site is measured about 10 hectors and was inaugurated in 2006. All different types of wastes are dumped and landfilled in the site except hazardous waste such as medical wastes which are incinerated.

The present Scenario of Solid Waste Processing in the Oshakati Town

The OTC applied two methods of solid waste processing namely landfilling and recycling.

Solid Waste Landfilling in the Oshakati Town

The OTC have assigned a priority focus to ensuring continuous maintenance of site operations. This is particularly the case with daily waste coverage and backfilling. During the period 2020-2023, the Council has appointed a service provider for site levelling, layering, compaction and covering of landfill waste with a Bulldozer. This on-going process ensures prevention of likely occurring nuisances such as littering of site and surrounding area, including prolonging the site lifespan.

Findings on Environmental Related Laws, Legislations, Policies and Institutional Setup Governing SWM in Oshakati town, Namibia

This section discusses major findings on how the applicable laws, legislations and policies passed by the government of Namibia related to solid waste management applied in MSWM in Oshakati town, Namibia.

The OTC Officials respondents were asked if there are laws governing the solid waste management in the Oshakati town. All respondents revealed and agreed that there are national, regional and local government laws governing municipal solid waste management in Oshakati town. This indicates that the OTC officials are aware of MSWM laws, legislations, and policies governing the municipal solid waste management in Oshakati town.

Officials respondents were asked whether is there any laws strengthening the municipal solid waste management operations in Oshakati town. The majority of the official agreed, none disagreed, and only few had no idea if there are any laws

strengthening the MSWM in Oshakati town. This implies that laws strengthening the MSWM strengthened laws are known by the officials.

Officials respondents were asked if they are satisfied by laws that strengthening the municipal solid waste management operations. The majority of the respondents agreed while only few disagreed.

Officials respondents were asked if there are problems and challenges that need to be adjusted in the current legal framework governing solid waste management in Oshakati town. The majority of the officials have no ideas about the problems and challenges while few are aware.

Findings on the Role of Public PPP in SWM in Oshakati town, Namibia

The main objective of the study was to analyse the role of PPP on improving SWM in Oshakati town.

Official Responses

Official Responses regarding their aware of NSWMSN and its relationship with PPP in the OTC. This clearly show that the majority of the respondents are aware of NSWMSN and its relationship with PPP in solid waste management in the Oshakati town while the minority have no idea.

Official respondents were asked regarding presence of contractors in PPP with the OTC. All official respondents responded and agreed that there are contractors in PPP with Oshakati town council in waste management. This means all official respondents knew the presence of contractors in PPP with the OTC.

Official respondents were asked on how do they rate the performance of the contractors in PPP in solid waste management in Oshakati town. The majority of the official respondents were satisfied, while only few who are not satisfied with the performance of the contractors in PPP with the OTC. In case where contractors fail to perform their duties as assigned within its area of jurisdiction, it must be fined. First stage, the contractors are given the warning before penalty applied depending to the level of mistake or negligence.

Contractors Responses

Responses of the Contractors respondents were asked about if they are in any relationship with OTC in SWM. All the contractor's respondents show that they are in official contractors with OTC. This implies that all contractors are legally in relationship in MSWM with the OTC.

Contractors responses regarding their duration in PPP in SWM in the OTC. The respondents were asked for how long they have been in PPP with the OTC in waste management. The majority of the respondents responded that they have been in PPP with the OTC in waste management for less than five years while only few contractors have been in PPP with the OTC in solid waste management. This shows that the dominating contractors have worked with the OTC for not more than 5 years while only few contractors have worked with the OTC for more than 5 years.

Contractors in PPP with the OTC responded regarding the number of employees they have. The total number of employees of all 13 contractors in PPP in SWM are 59. This implies that the OTC contracted a total number of 59 employees through PPP.

Contractors responded regarding the number of vehicles they use for waste management. The total number of vehicles used by all 13 contractors in PPP in SWM are 17 vehicles. This implies that a total number of 17 vehicles belongs to the contractors are being used through PPP with the OTC.

All contractor's respondent responded that PPP in SWM under the OTC is the right decision. This implies that PPP in MSWM is the right and best decision by the OTC.

Findings on the Community Participation in MSWM

Community member's methods of solid waste storage at source point shows that the majority use dust bins, very few use skip containers, black plastic bags and open areas. This indicate that most community members use dust bins while only very few use skip containers for solid waste storage.

Community members solid waste segregation shows that only few respondent's segregate waste before storage, while the majority of the respondents do not segregate their solid waste before storage. This shows that the majority of the community members does not segregate their waste at source point and only few members segregate their wastes at source point.

Community member's response on number of times solid waste being collected from storage point per week. The results show that the majority of the respondent's waste are being collected once a week while only few of the respondent's waste are being collected twice a week. No respondent shows that waste being removed more than two times a week.

The OTC carry out different strategies encouraging community members to participate in solid waste management. These are creating awareness through notice boards, distribution of pamphlets, radio, newsletters, and social media such as: Facebook, LinkedIn, YouTube. The OTC provided refuse bags and skip containers for solid waste storage to the community members. It was found that some community members understand their waste management role but some believe that it is the only responsibility of the OTC. Cleaning campaign was found that is the method where most community members participate in solid waste management.

Results from Field Observation by the Researcher

The researcher carried out field observation throughout the jurisdiction of the Oshakati town in order to examine the SWM practices applied by community members. These findings were complemented by the researcher field observations. The study results indicated that the various strategies used by the community members include burning of waste, use of refuse plastic bags, clean-up campaigns, collection of recyclable materials and disposal of solid waste at various designated. The results also show that the least used SWM strategy is collection of recyclables and usage of skip containers.

The researcher observed the solid waste management practices in the Oshakati town. The results indicated that the most practice of SWM was the use of refuse bags at waste collection point, use of skip container, burning of waste, and

house to house collection. Community meetings and clean up campaigns practices were observed at moderate level while recycling is the least method observed. Through observation, the researcher observed how community members participate in solid waste management in the Oshakati town. In some points where skip containers are not available, community members dump refuse bags in specific location alongside the road for collection. The researcher observed skip containers mostly at business areas and busy public places whereby community members dump domestic and commercial wastes. At some areas especially in informal settlements, community members dump wastes in open areas and burn them. During the community meetings conducted by OTC officials, community members participate by advising the officials on how to manage solid waste. The researcher observed recycling as one of the community participation strategies in SWM. There were community members that collected recyclables on an individual basis from open spaces such as: bottles, metals, cans, plastics and afterwards sold it to a recycling business to earn an extra income. The researcher also observed recycling being done on a large scale at the dumping site. The OTC in most cases organise clean up campaigns whereby individual community members, schools and institutions are involved. In some cases, community members organise themselves and clean their surroundings then inform the OTC for waste pick up. In some occasions, a group of volunteers from the community members inform the public about the importance of managing solid waste. It also includes sharing ideas on how residents can manage their solid waste, to ensure safe storing of waste which should be taken to the waste collection point or a central location for pick-up by the assigned contractor or town council officials.

Community Members Opinions and Perceptions in MSWM

Participants in the study were asked to indicate whether SWM is their responsibility or is the responsibility of the OTC. Participants indicated that they believed it was equally their responsibility to manage waste and that it was not entirely the responsibility of the OTC. Some residents believed that it is the responsibility of the OTC because they are paid for it. Therefore, it is important for everyone to play a key role or be aware that your waste is your responsibility by

ensuring that waste is taken to places where it is picked by the town council or contractors.

The community member's respondents about participation satisfaction in solid waste management. The responses revealed that half of the community members are highly satisfied, the rest are satisfied and not satisfied on their participation on solid waste management.

The effectiveness of existing forms of community participation in Oshakati town was assessed by the researcher's field observations and results gathered from the participants. Some community members understand their waste management role but some believe that it is only the responsibility of the OTC. Some opinions advocate for the OTC to take full responsibility of solid waste management based on literature.

The study found that the current community participation forms are not effective as there are inadequate SWM infrastructures such as refuse bags, dust bins, and skip containers. Late collection of wastes especially at waste dropping points results to scavengers such as dogs to tear out the waste plastic bags searching for food. This cause wastes to spread out and scattered around.

OTC Approaches to Enhance Community Participation

The study found that OTC carry out different strategies to enhance community participation. The OTC primarily focused on creating awareness through notice boards, distribution of pamphlets, radio, newsletters, and social media such as: Facebook, LinkedIn, YouTube. The OTC provided refuse bags and skip containers for waste storage by community members.

OTC Strategies Towards Community Participation

The OTC through the Solid Waste Division mainly carries out various strategies to support community participation in SWM. Officials engage the constituency councillors to share the message of waste management via national radio in the mornings and also conducted public meetings. So, each and every month

the OTC has a timetable for meeting with the leaders of the community and the community members in specific area.

This is followed by the clean-up campaigns and the provision of infrastructure such as skip containers in some areas and provision of refuse bags. The system that was introduced there by the OTC was to give two black bags twice a week, per household, which is collected, or transferred to the main landfill or nearest skip containers. Moreover, the results indicated that the OTC employs street sweepers as fixed term employees. Lastly, the study found that funding from the OTC for community-based projects was non-existent.

Problems and Challenges Facing the OTC in Solid Waste Management.

Official Responses

The OTC official's responses regarding the problems and challenges in solid waste management.

The responses of respondents revealed that many officials agreed, while few did not agree, if any problems and challenges need adjustment between contractors and Oshakati town council in execution of solid waste management. This indicates that many officials are aware and only few officials who are not aware of problems and challenges in solid waste management need to be adjusted.

Most cities and towns in the world are facing solid waste management problems especially in developing countries. When people clean their houses and businesses automatically generate wastes in their surroundings and it affect the environment and the community at large.

Official responses on problems and challenges that the OTC facing in solid waste management. The officials listed problems and challenge and explained them further. These are: administrative challenges, financial challenge, infrastructure challenge, institutional challenge, economic challenge, and social challenge.

Administrative Challenges: The OTC waste management Division of Public Health and Environmental Management is experiencing lack of human resources to be deployed in all suburbs and come up with new solid waste management planning.

The department is only comprising of 12 permanent employees to deal with solid waste of the entire town. Many office personnel in solid waste management have little knowledge on waste management. Lack of research and development activities in waste management makes it difficult for solid waste management decision makers to put into force the right decisions.

Financial Challenges: Sufficient budget makes every project a success. Limited funds allocation causes solid waste management department to perform poorly. The OTC waste management budget allocation for the financial year 2023/2024 shows that the total budget was N\$ 7 200 000. 00 that was divided as follows. The total of N\$ 1 900 000. 00 for purchase new refuse bins, N\$ 650 000. 00 for repairs and maintenances, N\$ 4 650 000. 00 for other expenses.

Infrastructure Challenges: Lack of tarred roads especially in informal settlements makes it difficult for big vehicles to reach all places easily for waste collection. Insufficient waste storage materials like skip containers, dust bins increase illegal dumping. Lack of different types of solid waste storage facilities for various wastes makes it difficult to community members to segregate wastes at storage point.

Institutional Challenges: There are no clear functions and roles of the institutional mandates involved in waste management. The lack of coordination among the stakeholders results in different agencies becoming the national counterpart to other external support agencies for different solid waste management collaborative projects. This leads to wasting of resources, duplication of efforts, and unsustainability of overall solid waste management programmes.

The lack of effective solid waste management legislation is partially responsible for the roles of the relevant national agencies not being clearly defined and the lack of cooperation among them. Legislation related to solid waste management is fragmented, and several acts for example in Namibia, the Local Authorities Act 1992 (Act No 23 of 1992) and the Environmental and Pollution Protection Act 2003 include some clauses on rules and regulations regarding solid

waste management. It should be noted that legislation is only effective if it is enforced.

Economic Challenges: Industrial and economic developments play a vital role in solid waste management. An enhanced economy opens the way for more funds to be allocated for solid waste management, providing a more sustainable financial basis. However, developing countries like Namibia have unstable economic bases and, hence, little funds for sustainable development of solid waste management systems. In the Oshakati town, solid waste recycling activities are affected by the unavailability of industries to buy and process recycled materials. Therefore, lack of industries base for recycling activities is the most constraint for the improvement of solid waste management in the Oshakati town.

Social Challenges: The social status of some solid waste management workers especially rag pickers are very low. Due to the disrespect for their work, it leads to low morale and poor quality of their work. Insufficient resources lead to poor salaries, protective clothing, modern cleaning materials and tools makes it difficult to perform their duties effectively.

Contractors Responses

Contractors were asked if they are equipped with enough tools and equipment's for cleaning.

Responses of the contractor's respondents regarding the tools and equipment's for cleaning shows that all the contractor's respondents do not have right tools and equipment's for cleaning. Furthermore, the respondents revealed that due to the limited budget, they cannot able to purchase enough protective clothing and equipment's such as: gloves, safety boots, overalls, helmets, rakes, shovels, spades, hoes, and axes for use. Due to the high cost of compact vehicles and other modern vehicles, the situation forces them to use open trucks for waste transportation because of affordability. Other reason is that the PPP agreement with the OTC only last for two years then re-advertised.

Contractors were asked if they manage to collect all wastes in the designated areas within specified time.

Responses of respondents regarding if it is manageable to collect wastes in designated area within specified time revealed that all contractor's respondents revealed that is not manageable to collect all wastes in designated area within prescribed time. The reason is that in some places there are no storage facility. As a result, waste is being dumped on the ground and as a contractor, waste to be collected are those only stored in authorised storage facilities such as: skip containers, drums, plastic bags, and wheeler bins. Some areas do not have tarred roads. As a result, some trucks may get stuck on sand or mud roads. During rainy season, some areas experience flood, as a result, waste collection trucks cannot able to reach there for waste collection.

Contractors were asked at which part of the town found difficult to collect wastes and why.

Contractors respondents regarding the accessibility of collecting solid wastes from different areas of Oshakati town. Among 13 waste collection contractors, only very few contractors found it difficult for solid waste collection in formal areas. All contractors responded that it is difficult for collecting solid waste in informal area. Few contractors found it difficult to collect waste in business areas, and few also find it difficult in institutional area. This implies that informal areas are more difficult to collect solid waste compared to formal areas. In formal areas all households afford and own a dust bin while in informal areas not every household can afford a dustbin. In formal areas, roads are wide enough for all types of waste collection vehicles to drive through and collect waste while in informal areas, it is difficult for solid waste collection vehicles to drive through.

Problems and Challenges Facing the Community Members Participation in Solid Waste Management

The respondents were asked whether they experience any problems in solid waste segregation and storage.

The community member's problems in solid waste segregation at before storage. Only few respondent's does not have problems in solid waste segregation before storage, while the majority of the respondent's experience problems and challenges in solid waste segregation before storage. This shows that the majority of the community members have problems in solid waste segregation while only few community members have no problems in solid waste segregation.

The responses of respondents regarding the problems and challenges in waste collection revealed that only few community members agreed while the majority did not agree, if there are problems experienced of waste not being collected as per schedule. In this case, sometimes residents call and report the matter to OTC waste management division for assistance. Some residents search for any open area and dump the waste and sometimes burn. In some occasions, residents discard the waste to a nearby skip container if available. If the assigned contractor fails to collect waste several times, some residents write a complain letter to the OTC waste management department for the officials to familiarise themselves.

In some cases, when wastes are not collected by the responsible contractor or town council, some resident's eager to transport wastes themselves to the dumping site but they have no own transport.

Problems and Challenges Facing the Community Members of Othingo Village

The respondents were asked for how long they lived in the Othingo village. The respondents who responded regarding the staying duration in the Othingo village revealed that they reside in Othingo village for more than five years.

The respondents were asked to estimate the distance between their homesteads and the disposal site. The respondents who responded regarding the estimated distance between their homestead and the disposal site revealed that only few respondents are living in less than 500 Metres while the majority responded that they reside beyond 500 Metres from the disposal site. This indicates that most residents are living in the vicinity of the dumping site and is not in line with the NSWMSN which says the dumping sit must not be within 500 Metres closer to the residential area.

The respondents were asked whether their homesteads or disposal site was located first in the Othingo village. The respondents who responded regarding the whether homestead or disposal site located first in the Othingo village revealed and agreed that they reside in the Othingo village before the location of the disposal site. It shows that most homesteads located in the Othingo village first then the dumping site.

The respondents were asked whether they were consulted by the OTC before the location of the disposal site in the Othingo village. All respondents revealed that they were not consulted before the location of the disposal site in the Othingo village. This means the OTC did not consult the Othingo villagers about locating the dumping site in their vicinity.

The respondents were asked whether they mind of relocating from the vicinity of the dumping site if they could find suitable place. The respondents who responded regarding whether the affected Othingo villagers mind to relocate if suitable place found. Few respondents revealed that they mind to relocate from the vicinity of the dumping site if found suitable place, while most of the respondents do not mind to relocate if any suitable place for relocation found.

The study was aligned to Waste Management Theory as the main guiding theory supported by various related theories as well. WMT was founded on the expectation that waste management is to prevent waste that causing harm to human health and the environment.

Institutional Theory has been frequently used to describe the adoption of the practices of organisation. Practices of other influential organisations, consulting firms, industry trade associations and voluntary reporting guidelines act as mimetic pressures.

Integrated Sustainable Waste Management theory is applicable on recycling of solid waste. The organisation works to transform waste into opportunity through advising on urban environment and development.

Community Engagement consists of people living together in some form of

social organization and cohesion. It is member share in varying degrees of political, economic, social and cultural characteristic as well as interest. It is also the process by which individuals and families take responsibility for their own health and wellbeing and for those of community and develop their capacity and to contribute to the community development.

Collective Action Theory Assumes that human beings are important to the environment and creatures. It states that people can voluntarily participate in social development and processes to achieve goals if their common interests are matched and justified from the economic point of view. It also acknowledges the value of individuals forming groups to make rational choices and self-interest, which can lead to decision-making.

Social Capital Theory: Has the potential to enhance community engagement through various means. Firstly, it can enhance the dissemination of information and expertise among members of a community, thereby enabling individuals to stay informed about critical matters and act. Moreover, it has the potential to facilitate the development of solidarity within a community and a shared sense of identity, thereby incentivising collaborative efforts toward shared goals.

New Public Administration Theory. NPA focus in administration towards political or policy making process specifically in public programmes. NPA is a new and qualitatively different phase in the growth of public administration infused with political values such as social justice, equity, and commitment.

NPM in local government outsource private-sector to perform duties and responsibilities on behalf of the public sector. This enhance efficiency, performance, and good customer service in local government. NPM focuses on the management of public services carried out by the private sector with management changes. PPPs s the transfer and control of a good or a service currently provided by the public sector, either in whole or in part, to the private sector.

New Public Service elaborates a set of norms and practices that focus on democracy and citizenship as basis for the practices of public administration theory. New Public Service addressed questions about the nature of public service, the role

of administration in governance, and the value tensions surrounding bureaucracy, efficiency, equity, responsiveness, and accountability.

Conclusions

Municipal solid waste management is the responsibilities of all municipalities. All municipalities try by all means to ensure that community members are in waste free environment. Sources and types of solid waste need to be addressed correctly in terms of waste generation up to waste treatment. Legal framework is very crucial as it regulates the operations of municipal solid waste management. The community member's involvement and contracting out of solid waste management makes it easy for the municipalities to meet their goals.

Suggestions

Based on the findings of the study, it is recommended that the OTC should take the following necessary precautions to address the solid waste management challenges.

Suggestions on Various Types and Sources of Solid Waste in Oshakati Town

Solid waste segregation: The OTC should introduce segregation of solid waste before storage. This can be only done if every waste generation point has more than one waste storage bin. The OTC should encourage community members to segregate solid waste at storage point. This can be only done if every waste generation point has more than one waste storage bin. The OTC should introduce a "Clear Refuse Bag" a system used by the City of Windhoek in Namibia. This system, clear plastic refuse bags are being used for specific types of waste storage only.

Solid waste storage: The waste storage facilities are costly and skip containers are not enough especially in open areas. The OTC should provide free waste storage facilities as they are costly. Correct and different storage facilities are needed.

Solid waste collection: The OTC and contractors should collect waste on time to avoid waste being exposed by dogs and cats as they search for food. Delays on solid waste collection pose threat especially to kids when playing on open areas.

Solid waste transportation: Solid waste should be transported by canvas covered vehicles to prevent them falling down during transportation. Bad roads make it difficult to reach every corner of the city easily. Solid waste transportation in open trucks pose threat to other road users if falls down during transportation.

Solid waste disposal: Solid waste should be disposed far away from residential, businesses and other institutions. Solid waste disposal landfill is closer to the community members and pose health hazards to humans. Solid waste recycling at the dumping site rather than before storage. There should be investments in a composting facility in the town or region to reduce the amount of organic waste dumped at the dumpsite. With the above recommendations in mind, more studies should be done in the town targeted at particular aspects such as waste generation patterns, public opinions on waste management and new technologies that can be applied presently and in the future.

Solid waste processes: Recycling should be enforced to reduce the amount of waste being landfilled. Waste to energy should be introduced. Residents should be taught on how to composting waste also.

Suggestion on Environmental Related Laws, Legislations, Policies and Institutional Setup governing Municipal Solid Waste Management in Oshakati town, Namibia

Laws and regulations should be improved for proper waste management practices at local levels and at national levels as the community would be more willing to practice proper waste dumping, waste separation and recycling once the regulation is in place. There must be awareness programmes about the laws and regulations and they should be monitored and evaluated regularly. The media, posters, pamphlets and public notices should be used more to increase the awareness in the community and integrating the waste management with development strategies is vital.

Sustainable development and good governance cannot be separated, therefore the use of policies, laws, and regulations towards the management of waste in Oshakati town is acknowledged, as they are elements of governance for promoting

sustainable development. The process of speeding up the implementation of environmental policies is highly needed. The OTC should introduce and implement various by-laws in order to control waste management easily. This can be collective if the OTC also introduce a City Police for the town rather than relying on Namibian Police Force. Legal framework need to be improved in order to give enough power to the town council to act.

Suggestions on the Role of Public Private Partnership in Solid Waste Management in Oshakati town, Namibia

Contractors should employ ethical business practices while fulfilling their contractual obligations. Furthermore, they also need to become more innovative and creative in seeking to expand the service coverage, quality and affordability of the service to the poor. Contractors should also have enough personnel in order to fulfil the job faster in their area of responsibilities.

Timely release of funds from the OTC to the contractors would go a long way in effective implementation of PPP in OTC. Furthermore, it is suggested that funds be released to the designated contractor immediately upon the contract is granted.

Suggestions on the Community Participation in Solid Waste Management Oshakati Town, Namibia

There should be more educational programs for the public and in schools to promote waste reduction and public participation in waste management.

Different dust bins for different solid waste storages should be provided to the community members who cannot afford to purchase them free of charge by the OTC. Waste segregation at storage bins should be introduced as they will help encourage recycling in the town and generally ensure that less recyclables end up in dumpsites. This may help community members to earn some money from recyclable materials for living.

Solid waste bins should all be clearly and accurately labelled, so that residents will be fully aware of which bin in which to throw recyclables such as papers, grasses, plastics, metals, organic waste etc.

Enough skip containers should be provided at all well-known waste generation points especially at business areas.

Various enhancing participatory platforms should be created for the community members to take part in decisions that affects their livelihoods.

Contractors should ensure that they employ ethical business practices while fulfilling their contractual obligations so that they collect wastes as per agreement with the OTC.

There should be a proper monitoring and evaluation process for the management of the landfill site. More platforms and programmes to educate people on solid waste management are needed. The central government should be involved in monitoring the SWM process to mitigate impacts on the environment.

Limitations for the Study

Firstly, the study was constrained by both time and financial constraints, thus making it difficult to expand the scope of key stakeholders in the MSWM sector. This limitation was mitigated by carefully selecting participants in the study through a purposive non-probability sampling method, to ensure that the key stakeholders in MSWM were included.

Secondly, the researcher did not get access to data related to the budget and/or finances allocated to the waste management sector from the municipality as expected. Therefore, the analysis of the economic costs involved in the MSWM in OTC could not be considered in this study.

Thirdly, effective and successful collection of data involving people was hindered by the mood and attitude of the participants; hence, the biggest concern was the reliability and validity of the data collected. These limitations were mitigated by explaining to the participants the purpose of the study and assuring them a high degree of confidentiality.

Scope of Future Research

Future research should include Community Based Organisations and Non-Governmental Organisations involvement in solid waste management. The role of the rag-pickers in SWM should be studied. The markets for recyclable waste collected in Oshakati town. The use of deposit and refund method as a solution to SWM and landfilling in Oshakati town. Furthermore, future study must also include the quantity of skip containers placed in all areas of town, number of dust bins sold by the OTC per year.

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