Challenges and Opportunities of Water Bottle PlasticWaste Collection Work in Hawassa City,Ethiopia

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ABSTRACT:
Aim: The study aims to assess the challenges and opportunities associated with the collection of water bottle plastic waste in Hawassa City, Ethiopia.
Study Design: The research employs a descriptive cross-sectional study design, which involves the collection and analysis of data at a single point in time. This approach allows for a comprehensive assessment of the current status of water bottle plastic waste collection in Hawassa City by capturing a snapshot of the challenges and opportunities faced by the stakeholders involved.
Place and Duration of Study: The study was conducted in Hawassa City, Ethiopia, over six days from August 1 to August 7, 2024.
Methodology: Data were collected using questionnaires and interviews. Questionnaire were collected from 123 recycled water bottle plastic waste collectors and interview were made with municipal officials. The data were analyzed using descriptive statistics, including frequency distributions and percentages, to identify key challenges and opportunities.
Results: The findings reveal that the primary challenges in plastic collection include low public awareness, and lack of government support. Many people throw away their bottles instead of keeping in a constant place, leading to pollution environmental harm. In some areas, plastic bottles are illegally dumped in large quantities, creating environmental hazards and making collection difficult. Bottles exposed to the elements can become contaminated with dirt, debris, and other harmful substances, making them unsuitable for recycling.However, opportunities such as the abundant supply, growing demand for recycled materials,reduced landfill burden, and the potential for income generation were identified.
Conclusion: The study concludes that while there are significant challenges in the collection of recycled water bottle plastics in Hawassa City, there are also substantial opportunities that can be leveraged to improve the efficiency and effectiveness of the recycling process. The study recommends increased government involvement, public awareness campaigns, and investment in recycling infrastructure to address the identified challenges.

INTRODUCTION

Plastic waste, particularly from single-use items such as water bottles, has become one of the most pressing environmental challenges of the 21st century (Geyer et al., 2017). Globally, the consumption of plastic has risen exponentially, with billions of water bottles being produced and discarded each year. This pervasive use of plastic has led to severe environmental consequences, including pollution of oceans, rivers, and landfills (Pilapitiya and Ratnayake, 2023). The non-biodegradable nature of plastic means that once it is discarded, it can persist in the environment for centuries, contributing to the degradation of ecosystems, threatening wildlife, and impacting human health (MacLeod et al., 2021).

On a global scale, plastic waste management has become a significant concern, as countries struggle to balance economic growth with environmental sustainability (Browning et al., 2021). The production of plastic has surged and with it, the challenges of managing the resulting waste. In many

regions, inadequate waste management systems have exacerbated the problem, leading to the accumulation of plastic waste in landfills, waterways, and oceans. International efforts to curb plastic pollution, such as the Global Plastic Action Partnership and various national initiatives reflect the urgency of addressing this issue (Lau et al., 2020). Despite these efforts, the global plastic waste problem continues to grow highlighting the need for innovative and effective solutions (Borrelle et al, 2020).

In Africa, the challenges of plastic waste management are particularly acute. The continent's rapid urbanization and economic development have led to an increase in plastic consumption while waste management infrastructure often lags behind (Benson et al., 2021). Many African countries struggle with inadequate waste collection systems, limited recycling facilities, and a lack of public awareness about the environmental impacts of plastic waste(Schroeder et al., 2023). However, Africa also presents unique opportunities for addressing the plastic waste crisis. Several countries have implemented progressive policies, such as bans on single-use plastics, and there is growing momentum for innovative recycling initiatives and community-led waste management programs (Babayemi et al., 2019). These efforts underscore the potential for Africa to lead in the global fight against plastic pollution, despite the significant challenges it faces.

Ethiopia, like many other African countries, is grappling with the environmental and health challenges posed by plastic waste(Godfrey et al., 2020). The rapid urbanization and population growth in Ethiopian cities have led to an increase in plastic consumption, particularly of single-use items like water bottles. The country's waste management infrastructure, however, has struggled to keep pace with this growth. In many urban areas, including the capital Addis Ababa, plastic waste collection and recycling systems are either inadequate or non-existent, leading to widespread environmental pollution (Yodit, 2023). Despite these challenges, there are also emerging opportunities in Ethiopia's plastic waste management sector. The government, along with various non-governmental organizations and private sector actors, is beginning to recognize the importance of addressing plastic waste and is taking steps to improve waste collection and recycling efforts.

Hawassa City, a rapidly growing urban center in southern Ethiopia, exemplifies both the challenges and opportunities of plastic waste management in the country. The city's expansion, driven by industrial growth and an increasing population, has led to a surge in the consumption of plastic, particularly water bottles. However, the city's waste management infrastructure has not kept pace with this growth, leading to significant environmental pollution and public health concerns. Plastic waste, including discarded water bottles, is often seen littering the streets, clogging drainage systems, and accumulating in the city's water bodies. Therefore, this study aimed to explore the challenges and opportunities of water bottle plastic waste collection work in Hawasa city, Ethiopia. By examining the local context, this research aims to contribute to the broader understanding of plastic waste management in urban settings, to enhance environmental sustainability & public health.

2. METHODOLOGY

The methodology section outlines the research design, data sources, sampling methods, data collection tools, and data analysis techniques employed in this study. This chapter provides a detailed explanation of the procedures and techniques used to ensure the reliability and validity of the findings on the challenges and opportunities of water bottle plastic waste collection work in Hawassa City, Ethiopia.

2.1. Research Design

The research design adopted for this study is descriptive, aiming to provide a comprehensive overview of the current state of water bottle plastic waste collection in Hawassa City. A descriptive research design is appropriate for this study as it seeks to identify and describe the key challenges and opportunities faced by waste collectors and municipal officials. This design allows for an in-depth analysis of the situation, providing insights that are essential for understanding the complexities of waste management in the context of Hawassa City.

The study utilized a mixed-methods approach, combining both quantitative and qualitative data collection techniques. Quantitative data were gathered through structured questionnaires distributed to recycled water bottle plastic waste collectors, while qualitative data were obtained through semi-structured interviews with municipal officials. The integration of these methods provides a holistic understanding of the research problem, capturing both the numerical trends and the contextual insights that are critical for addressing the research objectives.

2.2. Data Sources

The study relied on both primary and secondary data sources. Primary data were collected directly from individuals involved in the water bottle plastic waste collection process and municipal officials responsible for waste management in Hawassa City. These data were essential for capturing first-hand information about the challenges and opportunities in waste collection.

Secondary data were also reviewed to provide a broader context for the study. These included reports, policy documents, and previous studies related to plastic waste management in Ethiopia and other similar contexts. The secondary data helped to contextualize the findings within the larger framework of plastic waste management efforts in the country and globally.

2.3. Sample Size and Sampling

The study targeted two main groups: recycled water bottle plastic waste collectors and municipal officials in Hawassa City. The sample size for the questionnaire survey was determined based on the total population of waste collectors in the city. A sample of 123 waste collectors was selected, ensuring a representative sample that could provide reliable insights into the challenges and opportunities in the waste collection process.

A non-probability sampling technique, specifically purposive sampling, was employed to select the municipal officials for the interviews. This approach was chosen because it allowed the researcher to focus on key informants who have direct involvement in waste management and policy implementation in Hawassa City. The officials selected for interviews included those responsible for overseeing waste collection, environmental management, and urban planning, as their insights were crucial for understanding the broader policy and operational challenges in plastic waste management.

2.4. Data Collection Tools

Data collection was carried out using two primary tools: structured questionnaires and semi-structured interviews.

Questionnaires: questionnaires were designed to collect quantitative data from the 123 recycled water bottle plastic waste collectors. The questionnaire included a series of closed-ended questions aimed at gathering information on the demographic characteristics of the waste collectors, the methods and frequency of waste collection, the challenges they face, and their perspectives on

potential opportunities for improving waste collection practices. The use of questionnaires allowed for the efficient collection of data from a large number of respondents, ensuring that the findings were statistically significant and could be generalized to the larger population of waste collectors in Hawassa City.

Interviews: Semi-structured interviews were conducted with selected municipal officials to gather qualitative data. These interviews were guided by a set of open-ended questions designed to explore the officials' views on the current state of plastic waste management in the city, the effectiveness of existing policies, and the challenges and opportunities they perceive in improving waste collection and recycling efforts. The semi-structured format of the interviews provided the flexibility to probe deeper into specific issues, allowing for a richer understanding of the complexities involved in waste management.

2.5. Data Analysis

The data collected from the questionnaires and interviews were analyzed using descriptive statistics and qualitative analysis techniques, respectively.

Quantitative Data Analysis: The quantitative data obtained from the questionnaires were analyzed using descriptive statistics, including frequency distributions and percentages. These statistical tools were employed to summarize the responses of the waste collectors, providing a clear picture of the common challenges they encounter and the opportunities they see in their work. The use of descriptive statistics allowed for the identification of key trends and patterns in the data, facilitating a better understanding of the overall situation in Hawassa City's plastic waste collection sector.

Qualitative Data Analysis: The qualitative data from the interviews were analyzed using thematic analysis. This involved identifying, analyzing, and reporting patterns (themes) within the data. The thematic analysis helped to distill the qualitative insights from the municipal officials, highlighting the critical issues and perspectives that are not easily captured through quantitative methods. This analysis provided a deeper understanding of the policy and operational context of plastic waste management in Hawassa City, complementing the findings from the quantitative data.

3. RESULT AND DISCUSSION

This chapter presents the findings of the study on the challenges and opportunities of water bottle plastic waste collection in Hawassa City, Ethiopia. The results are organized into three main sections: background characteristics of bottled water plastic waste collectors, challenges faced in plastic waste collection, and opportunities available in the plastic waste collection sector.

4.1. Background Characteristics of Bottled Water Plastic Waste Collectors

The study collected background information from the 123 recycled water bottle plastic waste collectors who participated in the survey. This information includes demographic data such as age, gender, level of education, and years of experience in waste collection. Understanding these characteristics is essential for contextualizing the challenges and opportunities they face.

Table 1.Demographic Characteristics of Plastic Waste Collectors

Demographic Variable	Frequency	Percentage (%)
Gender		
Male	98	79.7
Female	25	20.3
Age		
18-25 years	35	28.5
26-35 years	60	48.8
36-45 years	20	16.3
46 years and above	8	6.4
Level of Education		
No formal education	25	20.3
Primary education	50	40.7
Secondary education	40	32.5
College certificate	8	6.5
Years of Experience		
Less than 1 year	30	24.4
1-3 years	55	44.7
4-6 years	25	20.3
More than 6 years	13	10.6

The findings reveal that the majority of plastic waste collectors in Hawassa City are male (79.3%), with most falling within the 26-35 years age range (48.8%). This suggests that the sector is driven by a relatively young, physically capable male workforce, highlighting a potential opportunity to increase gender inclusivity. The educational level of these collectors is relatively low, with 40.7% having only completed primary education and a mere 6.5% holding a college certificate, indicating that the sector primarily attracts individuals with limited formal education. Given that nearly half of the respondents (44.7%) have between 1-3 years of experience, the workforce is moderately experienced, but there may be gaps in knowledge that could be addressed through targeted training and educational programs.

4.2. Challenges in Water Bottle Plastic Waste Collection

The study identified several challenges that impede the effectiveness of water bottle plastic waste collection in Hawassa City. These challenges include low public awareness, lack of government support, and contamination of plastic bottles due to exposure to the elements. The following tables summarize the survey responses to various statements related to these challenges, using a Likert scale to gauge the extent of the problem.

Table 2.Low Public Awareness

Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
Most people do not understand the importance of recycling.	8.9	15.4	20.3	35.0	20.3
People often throw away bottles instead of recycling them.	4.9	9.8	15.4	39.8	30.1
There is a general lack of knowledge about waste management.	8.1	12.2	24.4	35.0	20.3
Mean (SD)	3.40(0.89)				

The data indicates that a significant portion of the population in Hawassa City is unaware of the importance of recycling, with 55.3% of respondents agreeing or strongly agreeing that most people do not understand the significance of recycling. Additionally, 69.9% of respondents believe that people often throw away bottles instead of recycling them, and 55% agree that there is a general lack of knowledge about waste management. The findings indicate that low public awareness is a significant barrier to effective plastic waste collection in Hawassa City. With a mean score of 3.40 and a standard deviation of 0.89, the respondents largely agree that the general public lacks adequate knowledge about the importance of recycling and waste management. This lack of awareness leads to improper disposal practices, such as discarding bottles instead of recycling them, which exacerbates environmental pollution and makes waste collection efforts more challenging. The key informats also informed that public awareness campaigns are often lacking or ineffective, leading to low participation in recycling programs. To address this challenge, targeted educational campaigns and community engagement initiatives should be prioritized to raise awareness about the benefits of recycling and proper waste disposal practices.

Table 3. Lack of Government Support

Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
The government provides adequate support for waste collection.	30.1	39.8	20.3	4.9	4.9
There are sufficient policies in place to support waste collectors.	25.2	35.0	25.2	9.8	4.9
Financial incentives for waste collectors are lacking.	9.8	20.3	14.6	35.0	20.3
Mean (SD)	2.77(0.95)				

The results reveal a perception of inadequate government support among the waste collectors. A significant 69.9% of respondents disagree or strongly disagree that the government provides adequate support for waste collection, and 60.2% feel that sufficient policies to support waste collectors are not in place. Additionally, 55.3% of respondents agree that financial incentives for waste collectors are lacking, pointing to a critical area where governmental intervention could improve the situation.The study reveals a perceived lack of government support, with a mean score of 2.77 and a standard deviation of 0.95. The respondents expressed concerns about inadequate

governmental policies, financial incentives, and logistical support for waste collectors. The key informats highlights the critical role of government involvement in the success of waste management programs. They further argued that in cities where governments have actively supported waste collection initiatives through subsidies, policy frameworks, and infrastructure development, the outcomes have been markedly better. In Hawassa City, enhancing government support could involve implementing supportive policies, providing financial incentives, and establishing partnerships with private sector entities to bolster waste collection efforts.

Table 4.Contamination of Plastic Bottles Due to Exposure

Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
Bottles exposed to the elements become unsuitable for recycling.	4.9	9.8	20.3	35.0	30.1
Environmental contamination reduces the quality of collected bottles.	8.1	12.2	17.9	39.8	22.0
Dirty bottles are often rejected by recycling facilities.	7.3	9.8	25.2	39.8	17.9
Mean (SD)	3.41(0.88)				

The survey responses indicate that contamination of plastic bottles due to exposure to environmental elements is a significant challenge in the waste collection process. Approximately 65.1% of respondents agree or strongly agree that bottles exposed to the elements become unsuitable for recycling, and 61.8% believe that environmental contamination reduces the quality of collected bottles. Additionally, 57.7% of respondents agree that dirty bottles are often rejected by recycling facilities, underscoring the importance of proper handling and storage of collected bottles.Contamination of plastic bottles is another significant challenge identified in the study, with a mean score of 3.41 and a standard deviation of 0.88. The data suggest that bottles exposed to environmental elements often become contaminated with dirt, debris, and other harmful substances, rendering them unsuitable for recycling. The key informatsunderscores the importance of proper handling and storage of collected bottles. It also points to the need for infrastructural improvements, such as the provision of designated collection bins and sheltered storage areas to minimize contamination. Addressing this challenge is crucial for maintaining the quality of recyclable materials and ensuring the efficiency of the recycling process.

4.3. Opportunities in Water Bottle Plastic Waste Collection

Despite the challenges, several opportunities have been identified in the water bottle plastic waste collection sector in Hawassa City. These include the abundant supply of plastic bottles, growing demand for recycled materials, potential income generation, and reduced landfill burden. The following tables present the survey responses related to these opportunities.

Table 5. Abundant Supply of Plastic Bottles

Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
There is an abundant supply of plastic bottles in the city.	4.9	8.1	9.8	48.8	28.5
Collectors rarely face shortages of bottles to collect.	7.3	9.8	11.4	47.2	24.4
The supply of bottles has been increasing over time.	5.7	12.2	14.6	48.0	19.5
Mean (SD)	3.74(0.83)				

The data suggests that there is a substantial supply of plastic bottles available for collection in Hawassa City. A significant majority of respondents (77.3%) agree or strongly agree that there is an abundant supply of plastic bottles in the city, and 71.6% believe that collectors rarely face shortages. Furthermore, 67.5% agree that the supply of bottles has been increasing over time, indicating a consistent and reliable source of recyclable materials. On the positive side, the study identifies an abundant supply of plastic bottles in Hawassa City, with a mean score of 3.74 and a standard deviation of 0.83. The respondents noted that they rarely face shortages of bottles to collect, which indicates a consistent and reliable source of recyclable materials.This finding presents a significant opportunity for the waste collection sector. The key informats also added that the continuous availability of plastic bottles ensures that waste collectors have a steady stream of resources to collect, which can sustain their livelihoods and support the growth of the recycling industry in the city. Leveraging this abundant supply effectively could lead to increased recycling rates and reduced environmental pollution.

Table 6. Growing Demand for Recycled Materials

Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
The demand for recycled materials is growing.	8.1	12.2	14.6	45.5	19.5
Recycling facilities are increasingly purchasing collected bottles.	4.9	10.6	19.5	47.2	17.9
Market opportunities for recycled materials are expanding.	5.7	12.2	17.9	48	16.3
Mean (SD)	3.58(0.84)				

The survey results indicate a positive outlook for the recycling industry in Hawassa City, with 65% of respondents agreeing or strongly agreeing that the demand for recycled materials is growing. Additionally, 65.1% believe that recycling facilities are increasingly purchasing collected bottles, and 64.3% see expanding market opportunities for recycled materials. The growing demand for recycled materials was another key opportunity identified, with a mean score of 3.58 and a standard deviation of 0.84. The respondents observed that recycling facilities are increasingly purchasing collected bottles, and there are expanding market opportunities for recycled materials. The key informants indicated that the demand for recycled materials is on the rise as industries seek to reduce

their environmental impact. In Hawassa City, capitalizing on this growing demand could involve enhancing the capacity of recycling facilities, improving market access for waste collectors, and fostering partnerships between collectors and recycling companies.

Table 7. Income Generation Potential

Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
Collecting plastic bottles provides a steady income source.	4.9	9.8	17.1	43.1	25.2
Income from plastic collection is sufficient for basic needs.	8.1	12.2	22.0	39.8	17.9
There are opportunities to expand income through recycling.	7.3	9.8	19.5	45.5	17.9
Mean (SD)	3.47(0.87)				

The results from Table 7 showed that a significant 68.3% of respondents agree or strongly agree that collecting plastic bottles provides a steady income source, while 57.7% believe that the income generated is sufficient to cover basic needs. Furthermore, 63.4% of respondents see opportunities to expand their income through recycling activities. Finally, the study highlights the income generation potential of plastic waste collection, with a mean score of 3.47 and a standard deviation of 0.87. Many respondents view plastic waste collection as a viable source of steady income, with opportunities for expansion as the market for recycled materials grows. The key informants suggests that plastic waste collection can be a significant economic activity, especially for low-income individuals in Hawassa City. By supporting and formalizing the sector, it can be developed into a more sustainable livelihood option, contributing to poverty reduction and economic development in the region.

CONCLUSSION

The study reveals a complex landscape in Hawassa City's plastic waste collection sector, highlighting both substantial challenges and promising opportunities. On the one hand, the sector is hindered by significant obstacles such as low public awareness, which leads to improper disposal practices, a lack of government support that limits the development of necessary infrastructure and policies, and the contamination of plastic bottles due to exposure to environmental elements, rendering them less suitable for recycling. These challenges create barriers to effective waste management and threaten the environmental health of the city. On the other hand, the sector is buoyed by several encouraging factors, including an abundant supply of plastic bottles, which ensures a steady flow of recyclable materials, a growing demand for recycled products driven by both local and global markets, and the income generation potential that plastic waste collection offers, especially for low-income individuals. These opportunities not only provide economic benefits to collectors but also contribute to the city's broader environmental goals. By addressing the challenges through targeted interventions such as public education campaigns, increased government involvement, and improved waste handling practicesand by capitalizing on the existing opportunities, Hawassa City could significantly enhance the effectiveness and sustainability of its plastic waste collection efforts, leading to improved environmental outcomes and economic empowerment for those involved in the sector.

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COMPETING INTERESTS
The author declares that there are no competing interests associated with this study.

AUTHORS' CONTRIBUTIONS
The research was conducted and written by AschalewKifleKachara. The guidance and supervision provided by Dr. Sukhdev Singh were crucial in shaping and refining the study. Both authors contributed to the development and finalization of this work, ensuring its rigor and academic integrity.

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