The plastic bag ban in Kenya

A study on consumer perceptions and attitudes following the plastic bag ban in Nairobi, Kenya

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Abstract

In 2017, Kenya's government banned plastic bags, to reduce plastic waste and protect the environment. Today Kenya has one of the strictest plastic bag bans in the world.

This study examines the perception of the plastic bag ban by different income classes in Nairobi, as well as what factors influence people's support for the plastic bag ban in Nairobi.

The result indicates that the majority of respondents expressed strong support for the plastic bag ban, citing environmental concerns and the need for sustainable practices. However, a small segment of the population remained skeptical about the effectiveness and feasibility of the ban. The opinions of respondents that the ban was not strict enough is an indicator that the government still needs to do more and work towards a better environment. Factors such as age and education level emerged as influential factors in shaping individuals' perceptions. However, the relationship was not enough to influence opinion on supporting the ban.

Consumer behaviors and awareness about environmental factors were mainly significant in influencing the opinions of residents in supporting the ban. This suggests that people that have reduced their plastic bag usage and are environmentally conscious, are more likely to support the plastic bag ban.

In conclusion, the findings from this study contribute to the public’s opinion on this strict plastic bag ban, in Kenya. The results emphasize the importance of promoting awareness and education to ensure the successful implementation and acceptance of the plastic bag ban. These findings can inform policymakers, environmental organizations, and other stakeholders in designing effective strategies to address plastic waste and promote sustainable practices.

Keywords: Plastic bag ban, Kenya, Nairobi, behavioral change, attitude, perception.

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1. Introduction

This section provides background information on the thesis' problem. Here the purpose and research questions are described as well as the limitations. Lastly, the disposition is presented.

1.1 Problem background

Over the course of the last five decades, 8.3 billion tons of plastic were produced, only to be tossed away, with 6.3 billion tons of that plastic ending up in landfills (IEMA, 2017). Despite this, however, eight million tons of plastic waste annually, lands in the oceans, posing an existential threat to marine life and the fragile ecosystem (Jambeck et al., 2015). Even though in our modern lives, plastic is an essential material. Globally, plastic waste poses a major threat to human health and the environment (Geyer et al., 2017).

One of the worst plastics for the environment is plastic bags. A plastic bag is a nonwoven poly-grade container that is used to store, transport, and package a variety of items. It takes an average plastic bag 15 to 1000 years to decompose in nature. Plastic bags release toxic substances into the soil when they are destroyed by sunlight, and when they are burned, they release large quantities of toxic substances into the atmosphere, causing air pollution (Battsetseg et al., 2022). Each year, supermarkets give out over 8 million plastic bags. Most of them are so thin that they cannot be recycled.

The plastic waste problem is significant in Kenya. In the country plastic bags are often improperly disposed of and end up in rivers, oceans, and landfills, which contribute widely to environmental degradation (Kamau, 2018).

In 2017, Kenya's government banned plastic bags, establishing a milestone in the fight against waste (UNEP, 2021). The reason behind this was to reduce disposal, improve waste management, and protect the environment. This action, led Kenya to become one of few African countries to ban plastic bags, setting an example for other countries in Africa and the world. Today many low-income countries tend to look up to Rwanda and Kenya as 'role models' in plastic bag regulation.

Although the plastic bag ban was implemented successfully, it faced several challenges. This was warned by Omondi (2019) and Njuguna (2018), who believed that the plastic bag

industry in Kenya, would be impacted by the ban and therefore cause disturbance. They also mentioned that alternative packaging materials are not available and affordable for everyone, which could affect consumers' behavior and preferences (Njuguna, 2018).

1.2 Purpose

The purpose of the study is to examine consumer perceptions and attitudes toward the plastic bag ban, following the plastic bag ban in Nairobi, Kenya. I am interested in studying what factors influence people's support for the plastic bag ban in Nairobi.

I chose to use Kenya as a case study though the country has the world's strictest plastic bag ban (Nwafor & Walker, 2020). Anyone found producing, selling, or even just carrying a plastic bag, faces up to four years in prison. By visiting Nairobi and conducting semi-structured interviews, a structured survey, and observing the environment, I intend to answer the research questions mentioned in the next section.

1.3 Research Questions

This study attempts to answer the following research questions:
What is the perception of the plastic bag ban by different citizens in Nairobi?
What factors influence people's support for the plastic bag ban in Nairobi?

1.4 Limitations

In this study, all data used was collected in Nairobi, Kenya. The data collection process was limited to four areas in Nairobi, which includes, the central district, Buruu, Kibera and Westlands. The choice of approach was used for practical reasons, such as feasibility and resource constraints. The focus was to capture the perspectives of residents from Nairobi, who were present in the selected areas, when conducting the surveys, but did not necessarily live in the areas. However, the limitation of data collection within these four areas meant that the results of this study may not be fully representative of the entire population of Nairobi.

I must admit that this study may be subject to selection bias, as the sample only represents the individuals from the selected areas who were willing to participate in the survey. Those who declined to participate or reside in other areas may have different perspectives or experiences.

The study may also present demographic bias if the sample within the selected areas does not adequately represent the diverse demographic characteristics of the entire city.

Additionally, since this study mainly looked at four specific neighborhoods in Nairobi, it might miss the perspectives of people in other parts of the city who are more strongly affected by the plastic bag ban. Different areas in Nairobi have their unique economic, cultural, and environmental characteristics, which the study did not cover.

1.5 Disposition

In the introductory paragraphs, the reader is given a brief about the problem, the aim of the study, the research question, and the limitations of the study. A contextual analysis of Kenya is later presented in the background followed by an explanation of the plastic bag evolution, the history of the Kenyan plastic bag ban, and the waste management bill. An explanation of theories followed by relevant previous studies is then presented. Later, a description of the method is presented which includes the design of the study, a description of chosen variables, a multinomial logistic regression model as well as criteria for assessing the method. The result part presents data analysis and findings. Lastly, the discussion and conclusion, relate the results to the theory and previous studies. References and the appendix are included at the end.

2. Background

This section provides a background including the context analysis of Kenya, the plastic bag evolution, the history of the Kenyan plastic bag ban, and the Kenyan Waste Management Bill.

2.1 Context Analysis of Kenya

Kenya is a country in East Africa that borders, Tanzania to the South, South Sudan and Ethiopia to the north, Uganda to the west, and Somalia to the East.
It is considered East Africa's largest Economy with a Gross Domestic Product (GDP) estimated to grow by 5.6 percent in 2021 (Kamer, 2023).

In terms of business, finance, and transportation, Kenya is East Africa's largest and most important hub (United States Department of State, 2022). A major part of the economy is devoted to agriculture: tea, coffee, and fresh flowers. Kenya exports more than 70% of its total flower production to the European Union, creating 500,000 direct and indirect jobs for Kenyans in Kenya. Kenya's Gross National Income is 1,840, which makes it a lower-middle-income country. In addition to the service industry, tourism is also a major economic driver. Kenya is also a member of the East African Community; however, some international trade organisations classify Kenya as the Greater Horn of Africa (Swiss development cooperation 2023). The African continent is Kenya's largest export market, followed by the European Union (Trtafrika, 2023).

There are over 40 ethnic groups in Kenya with two official languages: Swahili and English. The population of the country is estimated at 50 million in 2023, where the majority of the people live in urban areas. Nairobi is the capital city of Kenya and is an African headquarter hub for many international organization including the United Nations.

2.2 The Plastic Bag Review

To comprehensively understand the role of plastic in Kenya’s society today, it is crucial to consider its multifaceted impacts (UNEP, 2021). Plastic offers a wide range of benefits, particularly in terms of sanitation and convenience (Kumar et. Al, 2021). However, it is equally important to examine its environmental consequences, which can be significant (J Huang et. Al, 2022).

In 1933, at a chemical plant in Northwich, England, polyethylene, which is another term for plastic was accidentally created. It was an important breakthrough, as polyethylene up until that point had only been manufactured in small batches. It is thought that the accidental synthesis of polyethylene paved the way for the mass production of plastics in the industrial era by paving the way for its industrialization (UNEP, Dec. 2021).

The invention of high-density polyethylene (the most common type of plastic used for disposable bags) was not made until the mid-1950s (Evans, 2019).

In 1965 a Swedish company called Celloplast, patented the one-piece polyethylene shopping bag that was designed by engineer Sten Gustaf Thulin. Thanks to its convenience and

durability, the design, the one-piece polyethylene quickly replaced the use of cloth and other bags in Europe and became the go-to option for shoppers and retailers.

In 1979 Europe controlled 80 % of the plastic bag market, which later spread to the United States of America and other countries around the world. Single-use plastic products began to be aggressively marketed as superior to paper and reusable bags by plastic manufacturers. Plastic bags were also marked as more affordable, stronger, and convenient, which attracted customers to their use, leading to an increase in their popularity around the world.

In 1982 The United States' two largest supermarket chains, Safeway, and Kroger, switched to plastic bags. Although shoppers were first hesitant to accept single-use plastic bags, the bags were more affordable than alternatives, which influenced other stores to switch to plastic bags. Because of the increased popularity and demand during that time, plastic bags were predicted to replace paper bags across the globe.

In 1997 scientist and sailor Charles Moore discovered an ocean gyre in which enormous amounts of plastic had accumulated. This is called the Great Pacific garbage patch. This Pacific garbage gyre represented the negative effect that single-use plastic has on marine life long-term. This discovery sparked urgent attention to address the detrimental effects of single-use plastics on the environment as well as the resulting health risks.

In 2002 plastic bags contributed to clogging drainage systems in Bangladesh, which resulted in catastrophic flooding. To tackle this problem, Bangladesh became the first country in the world to ban plastic bags. In the wake of this action, more countries began to take similar measures to mitigate the environmental impacts caused by thin plastic bags and to raise awareness about the problems they pose.

In 2017 Kenyan government introduced a new law banning all plastic bags for household and commercial use to combat plastic pollution. The purpose of this significant initiative was to reduce the environmental impact of plastic bags as well as promote the use of sustainable alternatives. It was a crucial step in addressing the plastic waste problem of plastic in Kenya and encouraging consumer practices aimed at reducing plastic waste (WWF, 2018).

2.3 History of Kenyan plastic bag ban

Kenya has a long and proud history of environmental leadership, with conservationists such as Wangari Maathai, the first African woman to receive the Nobel Peace Prize for working tirelessly to protect the environment (Nobel Prize, 2005).

In 2005, the government put into effect a “ten-point strategy” for dealing with plastic waste which focused on banning the use of particularly thin plastic bags. Due to a lack of resources, however, it failed to gain ground, even though it provided the services needed to manage plastic waste (Kiprop 2017).

Two years after, in 2007, the Kenyan government implemented a 120 percent tax increase on those same bags with a thickness of less than 30 microns. This was a decision made by the Kenyan the East African Community (EAC) finance ministers, who had this discussion with fellow EAC member countries, Burundi, Rwanda, South Sudan, Tanzania, and Uganda, who were following the footsteps (Wakabi, 2013). However, The Kenya Association of Manufacturers (KAM) home to over 170 warehouses, employing over 60,000 employees, and other plastic producers, protested and resisted the implementation of the tax. This resulted in the court's decision to not implement the 120 percent tax increase. In return state refunded those who paid excessive fees once it realized they had been paid in excess (Onyango 2011). The following year, the Rwandan government passed a law on plastic bags in 2008 (Danielsson 2017). Making it one of the first African countries to implement a plastic bag ban.

In 2011 the Kenya Bureau of Standards issued a ban on plastic bags that were less than 60 microns thick. This time the Kenya Bureau of Standards proposed the International Trade Commission (ITC) to enforce the ban. However, once again the ban was strongly opposed by medium and large-sized businesses, as well as by large chain supermarkets that distribute plastic bags (Behuria, 2021).

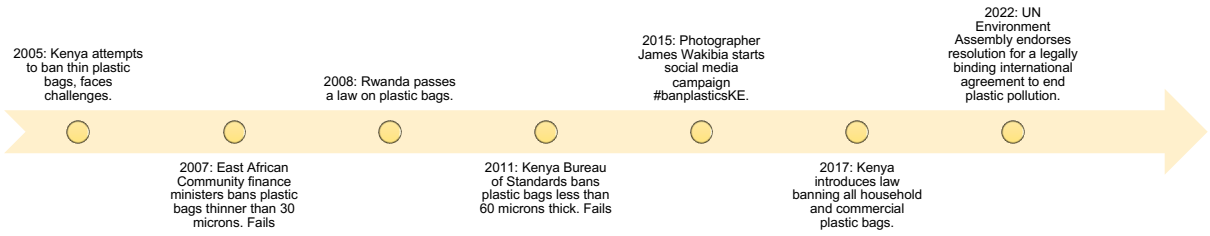
In 2015, James Wakibia, an activist photographer, reignited a national debate regarding banning plastic bags, by launching the hashtag #banplasticsKE social media movement in Kenya (UNEP, 2018). This campaign caught the attention of Judi Wakhungu, the cabinet secretary for environment and regional development authorities, who two years later

announced the plastic bag ban. Wakibia's campaign focused on demonstrating the hazards posed by pollution, and the effect it has on floods across the country (UNEP, 2018). Kenya experiences exceptionally heavy rainfall during the rainy seasons from March to May and from October to December (Hughes, 2018). During this rainy period, most of the nation's garbage ends up in drainage systems, which become overburdened with waste, including non-biodegradable plastics (UNEP, 2018). Plastic bags have been identified as the main obstruction causing these blockages in Kenya. When drains are clogged, flooding occurs in areas that are not adequately prepared to handle it. Due to contaminated water backups, diseases such as cholera and malaria can spread. Simultaneously floods sweep cars away, killing civilians, and contaminating other water sources. In rural areas, plastic bags are commonly consumed by livestock (Behuria, 2021).

In the year 2017, the world's strictest plastic bag ban was officially announced and implemented. A person caught violating the ban, would receive up to four years in prison or a fine of more than 30,000 euros (Houreld & Ndiso, 2017), (Goitom, 2017).

As part of the UN Environment Assembly in Nairobi on March 2, 2022, heads of state and ministers of the environment endorsed a resolution aimed at ending plastic pollution and establishing, a legally binding international agreement by 2024. Among the topics covered in the resolution include plastic production, design, and disposal. In 2024, the Intergovernmental Negotiating Committee will submit a draft of a legally binding global agreement (UNEP, 2022). Figure 2 presents a timeline illustrating the key milestones of the Kenyan plastic bag ban.

Figure 2. Timeline of Kenyan plastic bag ban



The timeline (Figure 2) demonstrates Kenya's journey in addressing plastic pollution, from early efforts in the mid-2000s to the world's strictest plastic bag ban in 2017. The ban aimed to combat plastic pollution and its environmental consequences, reflecting the government's

commitment to environmental stewardship. This timeline helps contextualize the development of the ban within a broader regional and global context.

2.4 Kenyan Waste Management Bill

It is essential to understand the Kenyan Waste Management Bill when it comes to the plastic bag ban. Understanding the Kenyan Waste Management Bill is essential because it provides the legal foundation for waste management, including plastic waste. It outlines regulations, enforcement, and environmental considerations, making it crucial to comprehend how the plastic bag ban aligns with broader waste management and environmental goals. After joining the Climate and Clean Air Coalition (CCAC) in 2014, Kenya developed a National Waste Policy and drafted a Waste Management Bill. During this time the government realized the importance of moving Kenya toward a circular approach, while wanting to get rid of mixed waste (Climate and Clean Air Coalition, 2022). A wide range of civil society groups, independent recyclers, and waste picker associations were consulted throughout the development of the bill.

In 2021, the Sustainable Waste Management Bill was developed, introducing extended producer responsibility schemes, a circular economy, take-back plans, and pollution labeling systems. Through this bill, Kenya aims to, improve public health, reduce air pollution, create green jobs in the waste management and recycling industry, and encourage individual waste disposal and behavior changes for households (Climate and Clean Air Coalition, 2022).

In addition to providing a legislative framework for sustainable development of the environment, the bill provides services that will enhance the environment. As part of the bill, the National Environment Authority is mandated to develop standards for sustainable waste management, ensure that county governments comply with waste management legislation, and mainstream waste management into county planning and budgeting processes. In the Bill, it specifies that products that may adversely affect the environment must be returned to the seller (Kenya Gazette Supplement, 2022). County governments are obligated to enact legislation on sustainable waste management, establish waste recovery, recycling, and

sanitary landfill facilities, promote waste collection and separation at source, and develop a county waste management plan (National Assembly Bills, 2021).

It's important to recognise the potential challenges in translating legal frameworks into practical implementation. This distinction is a crucial consideration in the context of environmental legislation, such as the Kenyan Waste Management Bill.

The effectiveness of environmental legislation depends on various factors, including enforcement and compliance, resource allocation, political will, and public awareness and participation. The extent to which regulatory agencies enforce the provisions of the law and ensure that individuals and entities comply with waste management regulations is vital (Goldthau, & Witte, 2010).

This insight helps us see where institutions might need to do more, allocate more resources, or make changes to the rules to make sure the difference between what's written in the laws and what happens in reality is smaller. The goal of the waste management bill is to better protect the environment and make sure our actions lead to a healthier and more sustainable future.

3. Theory

The following chapter discusses theories on institutional theory, the theory of planned behavior, and the Nudge theory. Note; This thesis uses the augmented based on behavioral economics theories and does therefore not use the usual economic growth models.

4.1 Institutional theory

Immergut (1998) primarily focuses on the approaches within the broader framework of new institutionalism, rather than comprehensive singular theory. Instead, she highlights three approaches used to define this theory, namely historical institutionalism, rational choice institutionalism, and sociological institutionalism, which were developed in response to behavioral theory. All of the explanations offer different perspectives on how institutions shape social and political outcomes. His work recognises as well as distinguishes the three approaches as they all collectively contribute to the understanding of institutional theory.

Rather than focusing on 'functionalism,' historical institutionalism focuses on structural conflict in the organization and economy. Immergut (1998) describes historical institutionalism as a system of informal or formal norms, procedures, routines, and conventions embedded within the institutional structure of a political system. A constitution, a bureaucracy's common operating procedures, a trade union's conventions, or even a bank's relationship with its customers can constitute a rule. The institutions associated with organizations are usually governed by rules or conventions adopted by formal organisations.

Immergut (1998) argues that historical institutionalists often emphasise the role that institutions play in politics, but they do not say institutions are the only factors at play. Other factors, including socioeconomic development and ideas diffusion, often play a role in the causal chain of institutions. The rational choice institutionalists propose a complex world in this respect, in contrast to tastes and institutions postulated in rational choice theory

At the same time, Immergut (1998) describes rational choice institutionalism as a second form of 'new institutionalism' that emerged alongside historical institutionalism. Behavioral assumptions are characteristic of rational choice institutionalists. The theory holds that the relevant actors have fixed preferences or tastes (usually based on conditions like transitivity), and act in a highly strategic manner requiring extensive calculations to achieve those preferences by acting entirely instrumentally.

Additionally, rational choice institutionalists also purvey a distinctive image of politics, whether such images are those of a 'struggle for power,' an 'education process,' or something similar. The way they see politics is as a series of dilemmas requiring collective action. This can be explained by identifying instances in which individuals acting in an effort to maximize their own preferences are likely to produce a collectively suboptimal outcome (There may be another outcome that benefits at least one actor without harming any others). A lack of institutional arrangements usually prevents actors from taking a collectively superior course of action. 'Prisoner's dilemma' and 'tragedy of the commons' are classic examples, and political situations present a variety of such dilemmas.

Moreover, rational choice institutionalism has made an important contribution to the understanding of strategic interaction in politics. In other words, they claim that an actor's behavior is primarily driven by a strategic decision, rather than by impersonal historical forces, and, secondly, that this decision is strongly influenced by the actor's expectations

about how others will behave. Interactions of this kind are governed by institutions, which influence the alternatives on the choice agenda or provide the necessary information and enforcement mechanisms**.** Thus, actors are able to make particular calculations that lead to better social outcomes due to a reduction in uncertainty about what others will do and allowing 'gains from exchange.

The sociological institutionalism movement argues that a great number of institutional forms and procedures adopted by modern organizations aren't merely efficient for the task at hand, but reflect some transcendent 'rationality' at work. In other words, for sociological institutionalism, even the most bureaucratic practices must be explained culturally. As a result, an organization's values and beliefs are reflected in its practices and procedures.

It is important to note that sociological institutionalists define institutions much broader than political scientists do, including symbol systems, cognitive scripts, and moral templates that provide the framework for human action as well as formal rules, procedures, and norms. By defining institutions as cultural, the conceptual divide between institutions and cultures is broken down.

In the sociological institutionalists' view, the public imposes many practices on societal organizations by government decree due to the expansion of regulatory scope in the modern state. Some argue that professionalization has led to the creation of professional communities with the authority to impose standards in a wide range of fields.

To sum up, even though there are different approaches, with strengths and weaknesses to how to describe new institutionalism, they all increase our understanding of the political world we function in, while understanding how our political and social behaviors are influenced by institutions.

4.2 Theory of planned behavior

Ajzen (1991) developed the theory of planned behavior (TPB) model to understand the psychosocial determinants of human social behavior. This model has since been applied to a wide variety of social sciences such as sociology, psychology, and marketing as well as pro-environmental behavior and intentions (Greaves et al., 2013; Ohtomo & Ohnuma, 2014; Sun et al., 2017; Wan et al., 2017; Wang et al., 2016).

According to Ajzen (1991), attitudes and subjective norms (SN) play an important role in determining behavior, which can be characterized as perceived behavioral control (PBC) and can be interpreted as a measure of perceived behavioral control (PBC), which is how significant others perceive the difficulty or ease of performing a behavior. Simply put, attitude does not directly influence behavior; it conditions it indirectly through behavioral intention (Ohtomo and Ohnuma, 2014).

There are three factors that affect behavior: attitude toward behavior, perceived social pressure/ subject norm, and perceived behavioral control (Ajzen 1991; Ajzen 2006 and Fischbein 2000). Depending on an individual's attitude toward a particular behavior, the intention of that behavior influences the actual behavior (Arslan et al. 2012; Wu and Mweemba 2010; Sudarmadi et al. 2001). Fishbein and Ajzen (1975) found that subjective norms are the result of others' expectations and the individual's willingness to fulfill these expectations.

Another way of looking at it is the effort that people are willing to put in in order to execute a behavior as a result of their intentions (De Groot, 2007). People's intentions on the other hand can be predicted by perceived behavioral control, attitude towards behavior as well as subjective norms. Figure 3 presents a model illustrating the theory of planned behaviour

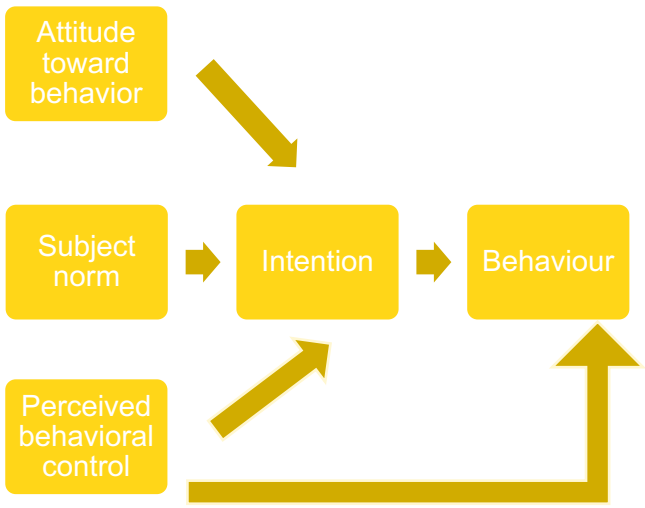


Figure 3. Theory of Planned Behavior framework model

Figure 3 visually represents the Theory of Planned Behavior (TPB) framework, a model used to understand and predict behavior. TPB includes three key components: Attitude (judgment of behavior), Subjective Norms (social pressure perception), and Behavioral Control (ease or difficulty of behavior). It illustrates how these elements influence intentions and actions.

Leonard (2004) describes attitude as the judgment of good or bad behavior. A person's subjective norms are based on how they perceive social pressures from significant others (Ajzen, 1991). While a subjective norm indicates how an individual feels about the social pressure he or she encountered about a particular behavior. Behavioral Control on the other hand is described as "the perceived ease or difficulty of performing a behavior" (Ajzen, 1991). It is the degree of control an individual has over a behavior (Han, 2010; Taylor and Todd, 1995). Ajzen (1991) argues that perceived behavioral control can influence behavior in two ways; it affects intentions and directly predicts behavior (Ajzen, 1991, 2006). Ajzen, 1991, 2006) states that people determine the amount of effort they are willing to put into a given task based on their intentions.

In a study conducted by Tonglet, et al. (2004); Knussen et al. (2004); Ohtomo and Ohnuma (2014); They used the Theory of Planned Behavior (TPB) to examine psychological factors influencing environmental sensitivity and recycling behaviors. They found that recycling behavior was determined by the TPB. However, according to Davies et al. (2002), other variables within the TPB framework might influence recycling behavior, which is in line with several other studies that have pointed out that perceived behavioral control is unreliable for predicting recycling behavior. Recent studies have shown that TBP is limited in its ability to predict behavior since it focuses mainly on intentional or deliberate choices (Gerrard et al. 2008). Bamber and Masterser (2007) found that on average 27 % of variance in environmental behavior could be explained by that variance. In addition, Webb, and Sheeran (2006) found that behavioral changes were relatively rare following changes in intention in their meta-analysis of TBP model studies. Also, model elements, social pressure, and demographic variables have been shown to have a significant impact on behavior (Bamberg et al. 2003). Because of this, TPB also allows additional variables to be incorporated into the model (Ajzen 1991).

4. Previous Studies

This chapter presents previous studies that have been conducted on plastic bag bans and their effect on people's behavior.

A Case study of Kenyan plastic bag - new institutionalist perspective

Enge's (2018) explores how Kenya's ban on plastic bags impacts Nairobians' attitudes and behaviors. Her main objective is to understand the perceptions on the plastic bag ban, which includes, " how people observe and interpret their surroundings" following the ban. In order to understand how theories such as of human rationality theory as well as new institutionalisms influence behavior, Enge (2018) conducted interviews and a small survey among inhabitants in different parts of Nairobi, one year after the ban. By analyzing changes in behavior, attitudes, and perceptions of the ban's consequences, she sheds light on the immediate effects of the ban. She points out that although plastic bags are banned in Kenya, there is a lack of cost-friendly alternatives to plastic bags in informal settlements, which affects consumers negatively. According to Enge (2018), it is crucial to avoid stereotypical misrepresentations and sweeping generalizations when discussing assumptions and biases. It is also important to explore inequality and standard of living regarding plastic bags in Nairobi despite possible misinterpretations or oversimplifications. She points out that there is a correlation between the plastic bag ban and the decreased demand for plastic bags. However, Enge's (2018) argues that, although banning plastic bags is good, it does not address fundamental issues, such as inadequate waste management.

A case study of Rwanda, Kenya Uganda – the role of business power

Using three East African countries, Rwanda, Kenya, and Uganda, Behuria's (2019) paper examines why plastic bag bans have varied across the three East African countries. In the paper, he argues that it is often assumed that plastic manufacturers and the broader manufacturing sector have blocked the implementation of anti-plastic bag policies, in other mentioned East African countries, because of business power. By using qualitative analysis and comparatively examine why there has been variation in implementing bans on plastic bags, using the examples of three East African countries: Rwanda, Kenya and Uganda, Behuria (2019) argues that the plastic bag ban has been more successfully implemented in Rwanda than in Uganda and Kenya as a result of business power.

Rwanda has a relatively small and weak plastic industry, compared to Kenya and Uganda, business power may partially explain the success of the ban in Rwanda. However, the differences between implementation in Kenya and Uganda cannot be explained by only the business power arguments. While both countries have repeatedly announced anti-plastic bag actions, they have struggled to implement them, with Kenya being more committed and less constrained than Uganda (Behuria, 2019). By conducting a qualitative analysis and comparing the implementation of plastic bag bans in Rwanda, Kenya, and Uganda, the study aims to provide a nuanced understanding of the role of business power in shaping policy outcomes.

According to Behuria (2019), it is possible that the differences in plastic bag bans across Rwanda, Kenya, and Uganda are due to pressures from three levels: business power, the local environment, and external pressures. Regardless, the paper argues that one should take a broader view of the local and external pressures that play when examining why implementation has been more serious in some countries than others.

The Chinese government combined plastic bag regulation and education.
He (2012) analyzes consumer behavior and consumption patterns in his study. From late April to early May of 2008, a prior survey was conducted, and from October to November, an ex-post survey was conducted.

The study found that environmental policies can have a significant impact on consumer behavior. For example, He (2012) found that policies that taxed thicker plastic bags and banned ultra-thin plastic bags were effective measures for reducing plastic bag use. These policies also included public education. Additionally, incentives were provided to developers of alternative bags as part of the public education campaign (He, 2012).

In comparison to the first survey, the second survey indicated a decrease in the use of plastic bags by 49 percent, while buying bags when shopping at open markets or supermarkets decreased by 64 percent. Due to this policy's success, alternative bags became more popular, therefore contributing to the growth of the economy. A key component of promoting sustainable consumption is educating the public about sustainable consumption patterns, according to the study.

To conclude, the Chinese plastic bag regulation was successful in raising public awareness of the adverse effects of plastic waste on the environment, as well as encouraging consumers to make sustainable choices (He, 2012).

Studies that compared the impact of taxes, fees, and bonuses on plastic bags

Convery, McDonnell, and Ferreira (2007) in their article on the irish plastic bag levy, examined the impact and the success of plastic bag regulations in reducing consumption and waste in the Republic of Ireland.

They interviewed households and leaders in the retail sector for their study and found that plastic bag regulations, which include environmental taxes and bans, reduced the amount of plastic bags used and the amount of waste generated. For example, the Republic of Ireland introduced a 15 eurocent tax on plastic shopping bags, in the year 2002, and since then, there has been a successful 90% reduction in the consumption of plastic bags in the country.

This is also true for Homonoff's (2018) research where he used survey data from 16,000 shoppers in three counties in the Washington Metropolitan Area during 2011 and 2012, to examine the impact of taxes versus bonuses on the use of disposable bags. In this study, two similar policies aimed at reducing disposable bag usage were studied: a $0.05 tax on disposable bags and a $0.05 bonus on reusable bags. With the relatively small size of the tax, the tax policy reduced disposable bag usage by over half, encouraging consumers to choose reusable bags instead.

Researchers Muralidharan and Sheehan (2016) found "plastic bag taxes" to be more effective than "fees" for consumers who are less environmentally conscious. In their research, they looked at American ads, where both of the ads encouraged shoppers to bring reusable bags to grocery stores. Failure to do so would result in either paying a tax or avoiding a fee. By using online surveys, they found that consumers would bring reusable bags if they were penalized rather than if they were taxed.

Studies that use awareness or education as a tool to decrease the usage of plastic

Ohtomo and Ohnuma (2014) investigated the effect of reducing plastic bag use in supermarkets in Hokkaido, Japan. This study used a dual motivation model, a model used to

explain” prejudice in terms of two basic and universally human motivational goals”(Duckitt & Sibley, 2017) as determinants of the attitude-behavior relationship to study why people use plastic bags. As part of the study, cashiers gave out plastic bags automatically to customers during the first week of the study (the "control" week), explained the environmental consequences of bags, and then asked them whether they would like plastic bags during the second week (the "intervention" week). In the study, the use of free plastic bags was observed and measured using a questionnaire. The study showed that 78 % of the customers accepted the free plastic bags in the pre-intervention stage, while 22 % declined. In contrast, 73% of shoppers refused free plastic bags after the intervention. It was found that there was a significant difference between pre- and post-intervention ratios of customers who accepted free plastic. Based on these results, it appears that customers followed a dual motivation model for their behavior change. According to their findings, psychological interventions, such as raising consumer awareness about the environmental consequences of plastic bag use, can effectively influence consumer behavior. Additionally, by encouraging individual efforts aimed at reducing plastic bag usage, the voice input/prompt of cashiers reduced unintentional plastic bag use.

In a study conducted by Jayaraman (2011) from 9 March 2010 through 25 March 2010, 96 respondents from different parts of Malaysia were surveyed on their attitudes and usage of plastic bags when packaging hot edible items. Despite public campaigns against plastic bags, consumers seem unconcerned about environmental hazards. There were two concerns raised with plastic bags: solid waste disposal and food safety. The study found that consumers thought that plastic bags could be used to store hot edibles without posing environmental or health hazards. As a result, the government was unable to reduce the use of plastic bags to package hot edible items. Even though awareness/publicity and regulations were all important factors, according to Jayaraman (2011) they had very little impact on consumers' decisions to use plastic bags for hot edible items.

Paul and Mironga, (2020) focused on examining whether Kenyan's ban on plastic bags has been effective in reducing plastic waste and promoting environmentally friendly habits. A survey, observation schedule, and interviews were conducted in Nakuru to assess how the ban impacts plastic waste management and consumer behavior. In their study, Paul and Mironga found that while the plastic bag ban reduced plastic bag usage in the city and promoted reusable bags, it has not reduced plastic waste significantly. Instead, plastic bag smuggling in

the area had increased as a result. In conclusion, the study suggests that in order to reduce plastic waste to a significant level, Kenya should regulate plastic waste, educate, and encourage the public to be involved in campaign awareness.

Mustafa and Nabil (2019) in Sana'a, Yemen, examined the use and disposal of plastic bags and their impact on the environment. A survey of 500 residents in various neighborhoods of the city was conducted to gather information about residents' usage of plastic bags, disposal habits, and awareness of plastic bag impacts on the environment.
Plastic bags were primarily used to carry groceries and other shopping items by the majority of respondents. Other methods of disposing of plastic bags include throwing them away, burning them, or reusing them. Plastic bag disposal without control had significant impacts on the environment, including littering and pollution, according to the study.

The result indicated that many respondents were unaware of the negative effects of plastic bags on the environment and expressed a desire for more education and awareness campaigns. Based on the results of the study, several strategies were recommended for reducing plastic bag use, this affected the Capital Secretariat, including promoting reusable bags, implementing a plastic bag tax, and implementing waste segregation and recycling programs. Table 1 provides a comprehensive summary of previous studies relevant to the subject matter under investigation.

Table 1. Previous studies summary

Author	**Year**	**Method used**	**Country/City**	**Major findings**
Enge (2018)	23 April – 7 June 2018	Interviews, surveys, and a field study.	Kenya, Nairobi	Banning plastic bags may alleviate some problems, but does not address the fundamental issues like insufficient waste management or insufficient alternatives.
Behuria (2019)	2019	Comparative Literature review	Rwanda, Kenya, and Uganda	Business power, local environment, and external environment may influence a developing country's.

He (2012)	2008	*Prior to* and *ex-post* surves to compare results.	China	Environmental policies have the potential to significantly affect consumer behavior. Because of certain policy.
Convery, McDonnell and Ferreira (2007)	2007	Interviews	Republic of Ireland	Plastic bag regulations including environmental taxes and bans were very successful and effective in the reduction of the amount of plastic bag usage.
Homonoff (2018)	2011 and 2012	Survey	USA: Montgomery County tax in three counties in the Washington Metropolitan Area: Washington, DC.	The tax policy reduced the overall demand for disposable and force consumers to turn to reusable alternatives.
Muralidharan and Sheehan (2016)	July 2015	Survey	Online, USA	Plastic bag taxes" were more effective than "fees" for consumers.
Ohtomo and Ohnuma (2014)	2007	Dual motivation model and questionnaire.	Hokkaido, Japan	Psychological interventions, such as raising consumer awareness about the environmental consequences of plastic bag use, can effectively influence consumer behavior.
Jayaraman (2011)	March 2010	Questionnaire	Malaysia	Despite public campaigns against plastic bags, consumers seem continued to use plastic bags as normal.
Paul and Mironga (2020)	2020	A questionnaire, schedule and an interview	Kenya, Nakuru	Ban has been effective in reducing the usage of plastic bags in the country, but has not reduced plastic waste significantly.
Mustafa and Nabil (2019)	2019	Surveys	Yemen	Many respondents were unaware of the negative effects

				of plastic bags on the environment and expressed a need for more education and awareness campaigns.

Table 1 offers a structured summary of previous studies, presenting essential information, including the author, year of publication, research method employed, the location (country/city) of the study, and the major findings.

5. Method

This section outlines the approach, methods, and techniques employed to collect and analyze data, ensuring the reliability, and validity of the study. In this chapter, we will discuss the research design, data collection methods, data analysis techniques, and ethical considerations adopted.

5.1 Introduction

5.2Design of the study

To examine how the plastic bag ban in Nairobi has affected perception and impact, this study adopted a quantitative approach. A cross-sectional research design was used to capture a snapshot of participants' perceptions, attitudes, behaviors, and opinions at a particular point in time.

The target population for this study consisted of individuals who had been affected by the plastic bag ban. This study was conducted between 27 Jan 2023 - 27 March 2023 in Nairobi, Kenya. The research sample comprised of 13 semi-structured interviews and 247 individuals who completed structured surveys. The participants were randomly selected from four different areas in Nairobi including Buru Buru, Central district area, Westland and Kibera. The areas were identified according to low-income, middle-income, high-income, and upper-high-income areas. The full structure of Nairobi’s constituencies divided into classes can be found in Appendix 3.

The sample was selected using a convenience sampling technique, where every other consumer was given a survey to fill in on paper or an online link to the Google survey, to

ensure representation from different demographic groups such as gender, age and occupation without being biased. The survey was inspired and created based on information from relevant literature (Jayaraman et al. 2011; Ohtomo and Ohnuma 2014; Ohtomo and Hirose 2007). Previous literature significantly impacted the questionnaire in selecting relevant questions, language, and terminology as well as the design structure. In conclusion, previous literature played a crucial role in shaping the questionnaire while providing information on existing research that has been made,

During the data collection process, efforts were made to maintain a neutral and non-biased approach. The survey was administered by volunteers who explained the purpose of the study and ensured that participants understood the questions before providing their responses. Participants were assured of the confidentiality and anonymity of their responses.
The data collection phase was conducted over a specified period, and participants were encouraged to provide accurate and honest responses. Completed questionnaires were collected and stored securely for subsequent data analysis.

5.3 Mixed method approach

In this study I have chosen a mixed-methods approach, combining quantitative survey data with qualitative interviews. I will mostly rely on the quantitative survey for data when explaining my result, while the interviews are used as an added supplement for the discussions. During this fieldwork, unstructured observations were made as well. The advantage of a survey is that it can give a general impression of a person's behavior and attitude. However, the disadvantage is that it does not provide detailed information or follow-up questions that would clarify or explain the results. Becker et al (2012), emphasizes that quantitative and qualitative findings shouldn't be separated in a truly mixed method of research. By combining survey data, qualitative interviews, and unstructured observations, I have tried to create a natural complement to my analysis.

A visual observation

No systematic observations were conducted by me or the volunteers. Instead as part of the research I asked participants questions, I took notes whenever I saw people buying bags at the supermarkets or bringing their own bags, or where in previous situations plastic bags would have been used. I also took notes of times when people threw trash out of moving vehicles as

well as the visible littering on the streets of Nairobi. I visited the Dandora dumpsite in Nairobi and conducted an interview with one of the workers at the site. I also attended the EU-Kenya Business Forum event under the motto “Connected Green” on the 21 of February 2023.

5.4 Sampling

Convenience sampling was used to recruit respondents on the street. The advantage of using this method is that it is relatively easy to get and analyse samples, however, the disadvantage is however that it’s hard to duplicate and that the result from the surveys has no ability cannot make a general population, as well as biased results (Etikan, Musa & Alkassim, 2016).

The ideal scenario would have been to get a random sample of the population, however, due to lack of resources and time, that was not possible. Another option would have been knocking on doors systematically, however, this would have been difficult in informal settlements. The Embassy of Sweden in Kenya (2023) Advised foreigners not to walk around alone in foreign areas, because of safety reasons I chose to follow the advice given. It’s good to point out that a protest broke out during my time in the country, however, this did not affect the sampling, since a large enough sample for the research was already collected.

I am aware that choosing the participant nearby as well as those who were willing to participate in the survey, increases the chance of selection bias and decreases the chances of generalisation. However, convenience sampling can still be useful and laying the groundwork for future research (Naderifar et al. 2017).

The survey was conducted in person, and participants were given time to complete the questionnaire. The questionnaire included items related to participants' perception of the plastic bag ban, their support or opposition towards the ban, knowledge of environmental impact, and environmental actions. The survey also collected demographic information to examine potential variations in perceptions across different groups.

The survey questionnaire included closed-ended questions. The closed-ended questions allowed participants to select predefined response options that captured their perception of the plastic bag ban and their support or opposition to it. To ensure the quality and reliability of the

data, the survey questionnaire was carefully designed and pilot-tested before the actual data collection.

5.5 Variables

Several variables were included in the data collection process to capture relevant information related to the impact of the plastic bag ban. These variables were chosen based on their significance in addressing the research objectives and understanding the impact of the plastic bag ban in Nairobi. The following variables were collected and divided into categories:

Demographic Variables: These variables included gender, age, district of residence, educational level, and income. They provided insights into the demographic characteristics of the participants and helped identify any variations in perception across different groups. Consumer behavior variables: These were included in the data collection process to gain insights into participants' behaviors and attitudes towards the plastic bag ban. These variables were designed to capture various aspects of consumer behavior related to bag usage and decision-making including frequency of buying bags and types of bags used before and after the ban. The study aimed to gain insights into participants' bag usage patterns, preferences, attitudes, and motivations. Analyzing these variables provided a deeper understanding of consumer behavior in the context of the plastic bag ban and its implications for sustainable consumption. Much of the earlier literature used similar categorical variables when setting up surveys, however based them on different sources, depending on the case study and country. Enge (2018) based her demographic categorical variable, on information from the Kenya National Bureau of Statistics. She mentioned for example the difficulty of gathering detailed information about people's income in informal settings, which was the reason why she divided her income categories into three options. Similarly, I used information from the Kenya National Bureau of Statistics (KNBS 2021) when dividing my income category into three alternatives.

Environmental awareness variables: In addition to consumer behavior variables, the data collection process also included variables related to environmental awareness. These variables aimed to assess participants' level of knowledge, attitudes, and behaviors towards environmental sustainability and the plastic bag ban. The main areas were the negative impact

of the plastic bags on people’s health, blocked drainage, death of sea animals and choking of land animals. I am aware however that the phrase of my survey questions could create pro-ban bias, potentially influencing peoples responses Understanding participants' environmental awareness provided a context for interpreting their perceptions and support for the ban, as well as their potential willingness to engage in sustainable practices beyond bag usage. However, to avoid potential biases my questions could have been more neutral.

Opinions on ban variables: the data collection process also included variables related to participants' opinions on the plastic bag ban. These variables aimed to capture participants' subjective views, beliefs, and attitudes towards the ban. Understanding participants' opinions provided a deeper understanding of their perspective on the ban's effectiveness, benefits, disadvantages, and their willingness to embrace alternative bag options.

Environmental action variables: These variables aimed to assess participants' actual behaviors and actions towards environmental conservation and sustainability. The participants were asked their views on environmental responsibility and the ban increasing their level of awareness. An open-ended question was also included to understand the activities they participated in for environmental conservation.

5.6 Data analysis and presentation

The collected data were analyzed using both descriptive and inferential statistical methods to gain meaningful insights and draw conclusions from the study. The data analysis process involved the following steps:

Data Cleaning and Preparation

The raw data were checked for errors, missing values, and inconsistencies. Any necessary data transformations or recoding were performed to ensure the data were in a suitable format for analysis.

The raw string responses collected from the dataset were initially pre-processed to ensure consistency and facilitate statistical analysis. These responses were converted into categorical variables for ease of interpretation and modeling. In the case of binary questions, the responses were mapped to either 0 or 1, representing the two possible answers. For questions

with more than two choices, multichotomous coding was used, wherein responses were categorized into 0, 1, or 2, depending on the number of options available.

After the initial transformation, the data underwent an outlier analysis to identify any anomalous values that could skew the results or introduce bias into subsequent analyses. Various techniques, such as visualization plots and Z-score calculations, were employed to detect these outliers. Upon identification, the outlying values were not immediately discarded; instead, they were corrected using measures of central tendencies like the mean or median of the dataset. This approach was taken to preserve the maximum amount of data while still achieving a high level of consistency and reliability.
This comprehensive data cleaning and transformation process ensured that the dataset was well-suited for further statistical modeling and analysis.

5.7 Statistical procedures

Cross-tabulations

Cross-tabulations, or contingency tables, were generated to examine the relationships between categorical variables. This analysis helped identify any associations or dependencies between different variables.

Chi-square test

The chi-square test is a statistical test used to determine if there is a significant association between two categorical variables. It assesses whether the observed frequencies of the variables in a contingency table deviate significantly from the expected frequencies. The test statistic is

$$\boldsymbol{\chi^2} = \sum \frac{(\mathbf{O}_i - \mathbf{E}_i)}{\mathbf{E}_i}$$

Where:

$\boldsymbol{\chi^2}$ is the chi-square test statistic value, $\mathbf{O}_i$ is the observed frequency in each category of the contingency table and $\mathbf{E}_i$ is the expected frequency in each category of the contingency table.

To measure the correlation and perform correlation analysis the Cramer's V and Pearson's R were used:

Cramer's V

Cramer's V is a measure of association used to quantify the strength and direction of the relationship between two categorical variables in a contingency table. It is based on the chi-square statistic and is commonly used when analyzing large contingency tables or when comparing associations across different tables. Cramer's V ranges from 0 to 1, where 0 indicates no association between the variables and 1 indicates a perfect association. The interpretation of Cramer's V is similar to the interpretation of correlation coefficients. A value close to 0 suggests a weak association, while a value close to 1 indicates a strong association. Cramer's V considers the dimensions of the contingency table and is calculated as follows:

$$\mathbf{V} = \mathbf{Sqrt}\left(\frac{\boldsymbol{\chi}^{\mathbf{2}}}{\mathbf{n} * (\mathbf{min}(\mathbf{r}, \mathbf{c}) - \mathbf{1})}\right)$$

where: **V** is the value of Cramer's V, $\boldsymbol{\chi}^{\mathbf{2}}$ is the chi-square test statistic, **n** is the total number of observations, **r** is the number of rows in the contingency table, **c** is the number of columns in the contingency table.

Cramer's V is not influenced by the sample size and is interpreted in conjunction with the associated p-value. A statistically significant p-value indicates that the association between the variables is unlikely to have occurred by chance. Cramer's V provides a standardized measure of association that allows for meaningful comparisons of the strength of relationships between categorical variables and is used when all the assumptions of the chi-square test are met.

Pearson's correlation coefficient

Pearson's correlation coefficient (r) is a measure of the linear relationship between two continuous variables. It is the ratio between the covariance of two variables and the product of their standard deviations thus, it is essentially a normalized measurement of the covariance. The Pearson's r takes values between −1 and 1 whereby a negative value implies there is negative correlation between variables, a positive value implies there is positive correlation between variables and 0 implies no correlation.

Pearson's correlation coefficient is calculated as follows:

$$\mathbf{r} = \frac{\left(\sum((x - \bar{x})(y - \bar{y}))\right)}{\mathbf{sqrt}(\sum(x - \bar{x})^2 \sum(y - \bar{y})^2)}$$

where:

r is the value of Pearson's correlation coefficient, **x** and **y** are the paired values of the two variables $\bar{x}$ and $\bar{y}$ are the means of **x** and **y** respectively.

5.8 Multinomial logistic regression

Multinomial logistic regression is a statistical method used to analyze categorical outcomes with more than two categories. It can be seen, for instance, when the outcomes are; yes, no, I'm not sure, maybe. Binary logistic regression differs from logistic regression in that it has two outcomes, whereas logistic regression has three or more outcomes (Xie, 2016).

The purpose of multinomial logistic regression is to examine the relationship between a set of predictor variables and a categorical outcome variable with multiple categories. It allows one to estimate the probability of each category of the outcome variable based on the predictor variables. The support ban variable was used as the response variable and interest was to come up with a model that will evaluate the significant variables that influence the opinion of people in Nairobi towards the plastic bag ban.

Multinomial logistic regression uses a linear predictor function $f(k,i)$ to predict the probability that observation i has outcome k, of the following form:

$$f(k,i) = \beta_{0,k} + \beta_{1,k}x_{1,i} + \beta_{1,k}x_{1,i} + \ldots + \beta_{M,k}x_{M,i}$$

where $\beta_{m,k}$ is a regression coefficient associated with the mth variable and the kth outcome. The expression can be written in compact form as:

$$f(k,i) = \boldsymbol{\beta}_k \mathbf{X}_i$$

where $\boldsymbol{\beta}_k$ is the set of regression coefficients associated with outcome k, and $\mathbf{x}_i$ is a row vector of the set of explanatory variables associated with observation i. To arrive at the multinomial logit model, the starting point is the logistic regression model with K possible outcomes. K-1 independent binary logistic regression models, in which one outcome is chosen as a "pivot" and then the other K-1 outcomes are separately regressed against the pivot outcome is the run. If outcome K is chosen as the pivot, the K-1 regression equations are:

$$\ln \frac{\Pr(Y_i = k)}{\Pr(Y_i = K)} = \boldsymbol{\beta}_k \cdot \mathbf{X}_i \quad , \quad k < K$$

This formulation is also known as the alr transform commonly used in compositional data analysis. If we exponentiate both sides and solve for the probabilities, we get:

$$\Pr(Y_i = k) = \Pr(Y_i = K)\ e^{\boldsymbol{\beta}_k \cdot \mathbf{X}_i} \quad , \quad k < K$$

Using the fact that all K of the probabilities must sum to one, we find:

$$Pr(Y_i = K) = 1 - \sum_{k=1}^{K-1} \Pr(Y_i = k) = 1 - \sum_{k=1}^{K-1} \Pr(Y_i = K)\ e^{\boldsymbol{\beta}_k \cdot \mathbf{X}_i}$$

$$\Rightarrow \quad \Pr(Y_i = K) = \frac{1}{1 + \sum_{k=1}^{K-1} e^{\boldsymbol{\beta}_k \cdot \mathbf{X}_i}}$$

We can use this to find the other probabilities:

$$\Pr(Y_i = k) = \frac{e^{\boldsymbol{\beta}_k \cdot \mathbf{X}_i}}{1 + \sum_{k=1}^{K-1} e^{\boldsymbol{\beta}_k \cdot \mathbf{X}_i}} \quad , \quad k < K$$

5.9 Qualitative analysis

Interviews with a semi-structured format

Most interviews were done virtually, and others were done at coffee shops, offices, or outside. Cameras were on during most interviews, however, sometimes the network caused a disturbance that interrupted the interview. One volunteer assisted when conducting the interview in the Dandora dumpsite as well as in Kibera on 13 Feb 2023. Generally, most interviewers were comfortable speaking English and had no problem communicating throughout the interviews. Bryman (2012) argues that qualitative interviews are a good measurement to use to get a better understanding of the social context. The terms of conditions included the reason for the interview as well as assurance, that their identity would not be published under the EU law. It also included the interview questions, in case they needed preparation. Interviews were found through, recommendations, research on Google,

news articles, as well as LinkedIn and were selected after a phone conversation. The fully structured interview question, questionnaire can be found in Appendix 1 of the document.

5.10 Criteria for assessing

Reliability

Bryman (2012), argues that the most important criteria for evaluating social research are validity, reliability as well as replication. The principles are the same for qualitative and quantitative research however the measurements used differ. One way of avoiding errors and biases is keeping the method procedures transparent and identifying challenges that are likely to occur. When it comes to reliability, data collected for the study was collected six years after the ban was imposed. Although the survey was and can be replicated, the results are not likely to be the same in every experiment. According to Bryman (2012), respondents may also adapt their answers depending on who is asking the questions and what they perceive as "socially desirable". One must therefore understand that the data collected from interviews are of course subjective. The manner in which the questions were asked, as well as the interview setting, can all influence the results. Bryman (2012) argues that qualitative research lacks the goal of replicability and generalisation of its results. Instead, he mentioned that one can use a set of criteria to measure if the study is trustworthy. It’s good for example to be aware that even though the questions are clear, the perceptions of them might differ from respondent to respondent.

Validity

The validity of research methods is determined by whether the concepts being measured can be reliably measured with the methods used. My purpose here is to explain why some measurements are weaker than others and how they are operationalized. In my case, a good example of this is asking people if their choice of using a cotton bag instead of a plastic bag indicates an increased environmentally friendly behavior. This might not be the most accurate measurement though people could choose the cotton bag though is the only available option, not because of concern for the environment.

5.11 Ethical considerations and challenges

Confidentiality and identification

As part of the project, personal data was collected and processed, so the Swedish National Data Service (SND) was notified. A data management plan was created about how data should be processed, managed stored and who is responsible for personal within the research project. All the participants were asked to read and understand the informed consent form prior to answering the question. They were also asked to indicate whether they agree or disagree with taking part in the research.

No sensitive information was collected about participants since they were anonymized. In spite of combining background information, it can still be possible to identify an individual indirectly, which is why it is important to store the data securely. Anonymizing data is not a foolproof method of protecting it. It is important to ensure that the data is stored securely to prevent unauthorized access. Additionally, data should only be accessed by personnel with the appropriate clearance.

Interpretation and representation

The study by Berg and Lune (2012) emphasizes the fact that humans are viewed differently based on research. What they mean is that researchers will interpret findings differently depending on their knowledge and views and their analytical framework. In other words, different interpretations of the same data can lead to different conclusions. This means that one should strive to be as comprehensive and inclusive as possible.

During interviewing, it is possible to interpret or simplify responses incorrectly. When discussing plastic bags in Nairobi, I believe inequality and living standards should be highlighted. This is an important issue because the use of plastic bags has a negative environmental impact, and it disproportionately affects those with lower incomes.

Despite this, stereotypical misrepresentations and generalizations should be avoided when discussing issues of justice and difference. It is important to recognize that there is a need to consider all perspectives when discussing plastic bag use in Nairobi.

Among other challenges

Practicality and neutrality were two factors that led to the questionnaire being only printed in English. In Nairobi, most people speak English fluently, but translators was sometimes needed. Even though I speak some Swahili, explanations of local slang words and expressions were also helpful. Being able to communicate with someone from the local area was helpful even for understanding the local context.

Recruiting survey respondents was relatively easy, but some asked for money. This was obviously declined. There were others who didn't want to participate because they believed the study was part of a government program.

The information I received during interviews was often difficult to confirm, despite my best efforts. I was advised to look for the information online or to email other people. I am careful not to make too many assumptions regarding the process due to the lack of an overview of what will be accessible.

6. Results

This section entails the presentation of the dataset and the findings obtained after analysis. The data was statistically analyzed in R and the results were presented in tables, charts and R outputs.

6.1 The dataset

The data set includes the following variables described bellow.

6.2 Demographic

There were five demographic variables in the survey: Age, Gender, Level of education, District of response and total monthly income. The respondents' characteristics were captured categorically and were evenly distributed in the various demographic levels.

Age

The largest proportion of participants fell into the "26-35 years" category, comprising approximately 34% of the sample. The second-largest group was the "18-25 years" category, accounting for approximately 33.6% of the participants. There were two respondents aged 66

years in the study and five respondents in the “56-65 years” age group; the rest of the respondents were in the “36-45 years” age group, taking up approximately 30% of the total respondents.

Gender

There were more males than females who took part in the study. The males accounted for 55.5% of the total respondents while the females were 43.7%. There was a distinct distribution in the gender variability in the sample. 2 respondents did not identify as either male or female. The sample size was large enough to offer a reasonable approximation of gender distribution, and the gender ratios in this study closely align with the overall population statistics for Nairobi according to Kenya National Bureau of Statistics report (2021), making it a plausible and representative sample for our research.

Education

Most of the respondents were university and college graduates, with university graduates accounting for 50% of the respondents in the survey while college graduates accounted for 25% of the respondents. 15% of the survey respondents had high school education while 1% were post graduates with a masters or an MBA. This implies the survey participants were verily aware and informed on the main factors pertaining to the survey, the plastic bags ban and the environmental factors in general. According to the Kenya National Bureau of Statistics 2021 report, the education level in Nairobi is predominantly graduate-level, supported by the presence of almost seven universities in the city. Therefore, our sample, which has a high number of university graduates, is actually representative of Nairobi's educational landscape.

Income

The respondents’ income was in the range Ksh 10,000 to 50,000per month accounting for 31% of the total respondents. 31% of the respondents had earnings above 50,000 while 10% were either students or had no income at all. It is evident that the sample was evenly distributed in the various economic classes of the society.

6.3 Impact of ban on consumer behaviors

The respondents were inquired on the number of times they used to pay for a bag (plastic or non-plastic) in a week during grocery shopping before the ban and the majority of the responses were 3 to 4 times. This accounted for 27% of the survey respondents, while 17% and 16% of the respondents bought bags 5 to 6 and 3- 4 times a week respectively.

The behavior changed drastically after the ban, whereby a majority of the customers, approximately 50%, had to buy an alternative bag 1-2 times a week during grocery shopping. This implies after the ban; customers had the tendency to buy bags more often, with a small percentage of individuals not buying bags at all.

Number of times the bag is paid during grocery shopping before ban

3 to 4 times	**5 to 6 times**	**3 to 4 times**
27%	17%	16%
Number of times the bag is paid during grocery shopping after ban		
1 to 2 times		
50%		

Type of bags

The main type of bag used before the ban was the branded supermarket bag which was usually given freely to customers followed by the small and big black bags respectively. The main type of bags used now after the ban is locally fabricated bags and cotton bags. A small percentage still use plastic bags.

6.4 Environmental awareness

Most of the respondents, approximately 41% agreed that plastic bags have a high negative impact on people's health. However it is important to mention, that perception may be influenced by varying perspectives on the role of plastic bags, with considerations for both

sanitation and environmental concerns. This underscores the complexity of public perceptions around plastic bag usage. A majority of the respondents, approximately 63% indicated that plastic bags have a high negative impact on blocked drainage. A majority of the respondents, approximately 46% indicated that plastic bags have a high negative impact on death sea animals. Most of the respondents, approximately 39% indicated that plastic bags have a high negative impact on choking land animals.

Improved awareness

Many of the respondents were positive that the ban had improved their level of awareness on matters of waste management as well as environmental pollution. This accounted for 82% of the respondents, while 11% of the respondents were not sure whether the ban improved their awareness. There were 7% of the respondents who were positive that the ban did not improve awareness.

6.5 Opinions on ban

The survey evaluated the opinions of the respondents in relation to various factors associated with the plastic bag ban. The variables were captured as categorical and a single case of a scale numeric variable.

Support ban

Approximately 87% of the respondents supported the plastic bag ban, while 7% of the respondents were against the ban. A minority group, approximately 5% of the respondents, are not sure of whether to support the ban or not.

Thoughts on ban enforcement

Majority of the respondents approximately 44% argue that the ban is not strict enough while 43% of the respondents insist that the ban is quite fair. There are approximately 11% of the respondents who complained that the ban is very strict while 2% had no opinion to note. This shows a variation in the thoughts of people towards the plastic bag ban.

Strict policy

The opinions on the strictness of the ban were relatively normally distributed amongst the respondents at varying degrees. A majority of the respondents, approximately 25% rated the

strictness as 4 while 21% rated the strictness at 5.

Alternatives ban

Most of the respondent's opinions, approximately 36% were geared towards the development of a recycling system. 23% respondents proposed that giving out reusable bags for free is a better alternative while 20% proposed awareness raising to individuals.

Discount bags

Many of the respondents, approximately 32% agree that discount for customers with bags will lower the use of plastic bags.

6.6 Effect of environmental actions

A majority of the respondents believe that each and every individual has a responsibility to work towards a better environment. Similarly, most of the respondents support that the ban has increased environmental awareness.

6.7 Bivariate analysis

Bivariate tests were conducted in order to identify relationships between variables. Bivariate analysis is significant in identifying association between variables. It aims to understand the association, correlation, or dependency between two variables and explore how they interact with each other.

Chi-square test

The chi-square test is a statistical test used to determine whether there is a significant association between two categorical variables. It is commonly employed in bivariate analysis to examine the relationship between two variables and test for independence or dependence.
The hypothesis used is:
Null: The variables are independent
Alternative: There is an association or relationship between variables.
The decision rule was to reject the null hypothesis if the p-value was less than the 0.05 level of significance. The chi-square test was used to check for association between various

variables as follows.

6.8 Demographic variables and opinions on ban

Support ban

P-values of all the variables were greater than the level of significance; hence we fail to reject the null hypothesis and conclude that there is no relationship or association between the demographic variables of the respondents and their opinions on supporting the ban.

Thoughts ban

P-values of age, education and district variables were greater than the level of significance; hence we fail to reject the null hypothesis and conclude that there is no relationship or association between the age, education and district of the respondents and their thoughts about the ban.

P-values of gender and income were less than the level of significance; hence we reject the null hypothesis and conclude that there is a relationship or association between the income and gender of the respondents and their thoughts about the ban.

Strict policy

P-values of all the variables were greater than the level of significance except the level of education variable; hence we fail to reject the null hypothesis and conclude that there is no relationship or association between age, gender, district and income of the respondents and their opinions on the strictness of the ban policy.

The P-value of education was less than the level of significance; hence we reject the null hypothesis and conclude that there is a relationship or association between the level of education of the respondents and their opinions on the strictness of the ban policy.

Alternatives ban

P-values of education, district and income were greater than the level of significance; hence we fail to reject the null hypothesis and conclude that there is no relationship or association between education, district and income of the respondents and their opinions on the

alternatives to the existing ban.

P-values of age and gender were less than the level of significance; hence we reject the null hypothesis and conclude that there is a relationship or association between the age and gender of the respondents and their opinions on the alternatives to the existing ban.

Demographic variables and environmental awareness variables Health people

P-values of all the variables were greater than the level of significance; hence we fail to reject the null hypothesis and conclude that there is no relationship or association between the demographic variables of the respondents and their awareness about the impact of the plastic bag ban on peoples' health.

Blocked drainage

P-values of all the variables except age were greater than the level of significance; hence we fail to reject the null hypothesis and conclude that there is no relationship or association between the demographic variables of the respondents and their awareness about the impact of plastic bags ban on blocked drainage.

The P-value of age was less than the level of significance; hence we reject the null hypothesis and conclude that there is a relationship or association between the age of the respondents and their awareness of the impact of the plastic bag ban on blocked drainage.

Death sea animals

P-values of education, district and income were greater than level of significance hence we fail to reject the null hypothesis and conclude that there is no relationship or association between the demographic variables of the respondents and their awareness about the impact of plastic bags ban on death sea animals.

P-value of age and gender was less than level of significance hence we reject the null hypothesis and conclude that there is a relationship or association between the age of the respondents and their awareness about the impact of plastic bags ban on blocked drainage.

Choking animal land

P-values of all the variables were greater than the level of significance; hence we fail to reject the null hypothesis and conclude that there is no relationship or association between the

demographic variables of the respondents and their awareness about the impact of the plastic bag ban on choking land animals.

Improved awareness

P-values of all the variables except age were greater than the level of significance; hence we fail to reject the null hypothesis and conclude that there is no relationship or association between the demographic variables of the respondents and improved awareness.

The P-value of age was less than the level of significance; hence we reject the null hypothesis and conclude that there is a relationship or association between the age of the respondents and improved awareness.

Support ban and environmental awareness variables

P-values of all the environmental awareness variables were less than the level of significance; hence we reject the null hypothesis and conclude that there is a relationship or association between the response on the impact of plastic bags on the environment by the respondents and their opinion on supporting the ban.

Support ban and environmental actions variables All environmental responsibility

The P-value of all environmental responsibility was greater than the level of significance; hence we fail to reject the null hypothesis and conclude that there is no relationship or association between the opinion of the respondent to support the ban and the response on whether everyone has a role in working towards a better environment.

Ban increase awareness

The P-value of ban increase awareness was less than the level of significance; hence we reject the null hypothesis and conclude that there is a relationship or association between the opinion of the respondent to support the ban and the opinion on whether the plastic bag ban increased environmental awareness.

Correlation analysis

Correlation analysis is a statistical technique used to measure the strength and direction of the relationship between two variables. It helps determine if there is a linear association between the variables and the extent to which they vary together. Cramer's V test statistic was used to

test the correlation between categorical variables while Pearson's R was used to test correlation between numeric variables. The Cramer's V and Pearson's R ranges from 0 to 1, with 0 indicating no association between variables and 1 indicating strong association between variables.

The test statistics were used in the following instances:

Demographic variables and opinions on ban

The correlation between each of the demographic variables and all the opinions of the respondents on the plastic bag ban was evaluated is shown in table 3.

Table 3 Demographic variables correlation to opinion of the bag.

Variable A	Variable B	Cramer's V
Support ban	Age	0.169
	Gender	0.073
	Education	0.159
	District	0.322
	Income	0.098
Thoughts ban	Age	0.136
	Gender	0.226
	Education	0.184
	District	0.345
	Income	0.185
Strict Policy	Age	0.175
	Gender	0.175
	Education	0.223
	District	0.392
	Income	0.121
Alternatives ban	Age	0.187
	Gender	0.184
	Education	0.188
	District	0.364
	Income	0.111

Source: own calculation

The strength of association in Cramér's V ranges from 0 to 1, values between 0.1 and 0.2 suggests a moderate strength of association which imply that there is a discernible connection between the variables, but it may not be as strong as values closer to 1. From the table we can see for example that age in all categories takes the values between 0.1 to 02. Similarly, values between 0.2-0.4 suggest a moderately strong strength of association which implies a substantial connection between the variables, but it may not be as strong as values closer to 1.

Demographic variables and environmental awareness variables

The correlation between each of the demographic variables and all the environmental awareness variables was evaluated and can be seen in Tabel 4.

Table 4. Correlation between each of the demographic variables and all the environmental awareness

Variable A	Variable B	Cramer's V
Health people	Age	0.187
	Gender	0.169
	Education	0.171
	District	0.367
	Income	0.176
Blocked drainage	Age	0.266
	Gender	0.109
	Education	0.192
	District	0.342
	Income	0.144
Death animal sea	Age	0.233
	Gender	0.24
	Education	0.182
	District	0.382
	Income	0.145
Choking animal land	Age	0.17
	Gender	0.178
	Education	0.209

	District	0.394
	Income	0.179
Improved awareness	Age	0.184
	Gender	0.113
	Education	0.181
	District	0.337
	Income	0.119

Source: own calculation

Support ban and environmental awareness variables

The correlation between the support ban variable and the environmental awareness variables was obtained and can be seen in Table 5.

Table 5. Correlation between the support ban variable and the environmental awareness

Variable A	Variable B	Cramér's V
Support ban	Health people	0.336
	Blocked drainage	0.344
	Death animal sea	0.262
	Choking animal land	0.304
	Improved awareness	0.334

Source: own calculation

The magnitude of association: Cramér's V values suggest a relatively strong relationship between the variables. It indicates a noticeable association beyond random chance.

Strength of association: Considering that Cramér's V ranges from 0 to 1, these values suggest a moderately strong strength of association. It indicates a substantial connection between the variables, but it may not be as strong as values closer to 1.

support ban and environmental actions variables

The correlation between the support ban variable and the environmental action variables was obtained and can be seen in Table 6.

Table 6. Correlation between the support ban variable and the environmental action

Variable A	Variable B	Cramér's V
Support ban	All environmental responsibility	0.336
	Ban increase awareness	0.344

The magnitude of association: Cramér's V values suggest a relatively strong relationship between the variables. It indicates a noticeable association beyond random chance.
Strength of association: Considering that Cramér's V ranges from 0 to 1, these values suggest a moderately strong strength of association. It indicates a substantial connection between the variables, but it may not be as strong as values closer to 1.

Environmental awareness variables vs environmental action

Pearson's R was used to evaluate the correlation between numerical variables. The correlation values were represented in a correlation matrix in table 7

Tabel 7. Correlation matrix

	Health people	Blocked drainage	Death anima sea	Choking animal land	All environmental responsibility	Ban increase awareness	Strict Policy	Discount bags
Health people	1	0.80	0.75	0.56	0.34	0.10	0.00	0.1
Blocked drainage	0.67	1	0.56	0.47	0.20	0.12	0.00	0.01
Death animal sea	0.63	0.61	1	0.51	0.32	0.24	0.02	0.12
Choking animal land	0.54	0.56	0.59	1	0.34	0.12	0.00	0.05
All environmental responsibility	0.23	0.25	0.34	0.38	1	0.65	0.04	0.15

Ban increase awareness	0.27	0.26	0.29	0.28	0.45	1	0.08	0.20
Strict Policy	0.01	0.04	0.08	0.09	0.05	0.04	1	0.1
Discount bags	0.02	0.01	0.03	0.01	0.05	0.05	0.04	1

The bright colors in the correlation matrix imply strong correlation between variables while lighter colors imply weak correlation. It was evident that correlation between environmental variables was substantial taking values between 0.4 and 0.6. This implies that environmental awareness on the impact of plastic ban by respondents was consistent. The correlation between environmental variables and environmental action variables was low and some instances negative correlation was evident. The awareness of the respondents on the impact of the plastic bags on the environment did not influence their opinions on the ban or actions towards a better environment.

Feature evaluation and selection

Feature selection is a significant step in developing predictor models in statistics. To perform multinomial regression this study used univariate feature selection by bivariate chi-square analysis results to select significant variables. The results from bivariate analysis using chi-square test to test the relationship between the variables and support ban variable were obtained and generalized.

The univariate feature selection by chi-square tests shows that 8 variables have a significant relationship with the support ban variable. These variables are show in table 8.

Table 8. Chi-square test

Variable	P-Value
Health people	0.021
Blocked drainage	0.012
Death animal sea	0.013
Choking animal land	0.041
All environmental responsibility	0.023
Ban increase awareness	0.038
Strict Policy	0.019
Discount bags	0.032

Source: own calculation

6.9 The multinomial model

A multinomial regression model was then built with support ban as the response variable with eight predictor variables. The following results were obtained:

The multinomial logistic regression model has a residual deviance of 122.4444 and an AIC of 202.4444. The residual deviance represents the discrepancy between the observed data and the fitted model. A lower residual deviance suggests a better fit of the model to the data. In this case, a residual deviance of 122.4444 indicates that the model explains a significant portion of the variation in the data. The AIC is a measure of model selection that balances the trade-off between model complexity and goodness-of-fit. A lower AIC value indicates a better balance between model fit and complexity. In this case, an AIC of 202.4444 suggests that the current model is relatively good, but it can potentially be improved. This can be shown in Table 9.

Table 9. The Deviance and ACI results from the multinomial logistic regression model

Deviance	**AIC**
122.4	202.4

The coefficients of the predictor variables were obtained with the intercept representing the reference category in this case, no to supporting the ban. The intercept represents the log odds of the reference category for each dependent variable category when all independent variables are zero. The coefficients represent the difference in log odds between each category in the variables and the reference category. Negative coefficients indicate a decrease in log odds compared to the reference category, and positive coefficients indicate an increase. The p-values were also obtained as follows: The odds ratio was also obtained, the odds of the outcome variable for the "Not sure" group are approximately 3.975 times higher compared to the reference category while holding other variables constant. For the "Yes" group, the odds are approximately 29.306 times higher.

The odds of the outcome variable for individuals in the "Not sure" group within the age range of 26-35 are approximately 0.217 times lower compared to the reference category while holding other variables constant. For the "Yes" group, the odds are approximately 0.391 times lower.

Perception of the plastic bag ban on different demographic members

This study aimed to answer the research question of the perceptions of the plastic bag ban on different demographic members in Nairobi. To answer this question, the frequencies of the opinions of the respondents and their opinions on the ban were cross-tabulated and can be demonstrated in Table 10.

Table 10. Cross table.

Demographic		**Support ban**			**Thoughts ban**			
	Categories	No	Not sure	Yes	Don't know	Not strict	Fair	Very strict
Gender	Female	5	5	98	4	42	46	16
	Male	13	8	116	1	66	58	12
	Prefer not to say	0	0	2	1	0	1	0
Age	18-25	4	5	74	3	30	43	7
	26-35	10	4	70	3	35	35	11
	35-55	2	4	67	0	37	26	10

	56-65	2	0	3	0	4	1	0
	66	0	0	2	0	2	0	0
Education	None	0	0	3	0	2	1	0
	Primary	0	1	2	0	2	0	1
	High school	2	2	33	2	12	15	8
	College	4	6	52	2	23	32	5
	University	10	4	110	2	61	51	10
	Post graduate	0	0	4	0	1	2	1
	Prefer not to say	2	0	12	0	7	4	3
Income	No income	1	1	23	2	6	13	4
	0-10,000	3	1	25	0	7	19	3
	10,000-50,000	5	4	70	1	42	27	9
	50,000-100,000	6	2	39	0	25	18	4
	Above 100,000	1	2	26	0	11	14	4
	Prefer not to say	2	3	33	3	17	14	4

The values in the cross tables provide an overview of the distribution of responses within each category of the demographic variables for the perception of the plastic bag ban in their opinions as well as their thoughts. It allows us to compare the responses across different demographic groups and assess any potential differences in the perception of the ban. The variability is minimal in relation to the various variables as once the main opinion was geared towards the opinion of supporting the ban it was consistent in the respondent's opinions despite their gender, income, level of education or age. The respondents show strong support for the plastic bag ban which implies clear understanding of the impact of the plastic bags on the environment. There is evidence that more needs to be done on the strictness of the ban

since variability in the ban being fair and not strict was competitively varying in all the demographic variables.

6.10 Ban influence on environmentally friendly behavior

The study also investigated whether the plastic bag ban influenced environmentally friendly behavior. The respondent's responses to whether the ban improved their awareness about the environment, the ban increases awareness and the activities were evaluated:
Improved awareness: 202 respondents amongst the 247 responded that the ban had improved their awareness and matters involving the environment. This implies that after the plastic bag, a section of the population, approximately 82%, improved their awareness about the environment after the plastic bag ban.

Ban increase awareness:208 respondents had their responses approximately sure that the ban helped raise environmental awareness in individuals in our country. Ninety-one respondents were sure the ban improved environmental awareness, therefore influencing civilians on environmentally friendly behavior.

The study also evaluated the activities respondents engaged in due to the plastic bag ban. The findings reveal that 130(53%) respondents recycle household waste at home, 126(51%) respondents have volunteered in environmentally friendly activities in the country, while 40(16%) collect and sell used items/waste. 32(13%) are members of (or work for) an environmental organization, while29(12%) respondents have donated money to an environmental organization. Two respondents were involved in waste disposal. The findings imply that the ban has influenced multiple environmentally friendly behaviors in individuals.

7. Discussion & Conclusion

The aim of this section is to present and discuss the findings from the analysis of the data collected and present a conclusion, on the impact of the plastic bag ban in Nairobi. Here you will also find the answers to the problem statement clearly.

7.1 Discussion

The purpose of the study is to examine consumer perceptions and attitudes following the plastic bag ban in Nairobi Kenya. By answering the research questions, what is the perception of the plastic bag ban by different income classes in Nairobi? as well as what factors influence people's support for the plastic bag ban in Nairobi?

Most respondents expressed strong support for the plastic bag ban, citing environmental concerns and the need for sustainable practices. However, a small segment of the population remained skeptical about the effectiveness and feasibility of the ban. The theory of planned behavior argues that there are three factors that affect behavior: attitude toward behavior, perceived social pressure/ subject norm, and perceived behavioral control (Ajzen 1991; Ajzen 2006 and Fischbein 2000). Depending on an individual's attitude toward a particular behavior, the intention of that behavior influences the actual behavior (Arslan et al. 2012; Wu and Mweemba 2010; Sudarmadi et al. 2001). The positive attitudes toward the plastic bag ban, expressed by participants suggest that most income classes in Nairobi perceive the ban as a necessary tool to decrease plastic waste. It is likely they also believe, reducing plastic bags contributes to a cleaner environment and aligns with their values. An important factor here is the perceived social pressure and the perceived norm of others regarding a particular behavior. When it comes to the plastic bag ban, some people may perceive using cotton or reusable bags as socially acceptable and are even encouraged to use it, rather than using banned plastic bags. To conform to society's expectations, they may comply with the ban due to their perception of social pressure. In addition to perceptions of behavioral control, the theory emphasizes the importance of how individuals perceive their ability to perform certain actions. A ban on plastic bags is more likely to be supported and committed to, by those who can adapt to the ban, are able to find alternative solutions and can integrate reusable bags into daily routines.

To understand the perception of the plastic bag ban by different income classes in Nairobi, the institutional theory needs to be used. Institutionalism is a system of informal or formal norms, procedures, routines, and conventions embedded within the institutional structure of a political system. The plastic bag ban is a policy that restricts or prohibits the usage of plastic bags, to reduce plastic waste. In this case, the ban is a regulation established by formal

institutions, such as government policies that shape the citizen's attitudes and behaviors, to reduce plastic bag consumption. As the institutional theory suggests individuals are influenced by the norms, rules, and regulations. Informally the ban signals to the citizen what behaviors are acceptable and the legal consequence that happens if the behavior is not followed. It communicates the priority of reducing plastic in society and the new culture of using fewer bags, or reusable bags.

Government implementing policies to create behavioral change has been demonstrated in previous studies. Enge's (2018) theoretical framework views institutions as social practices that can influence society's distribution of resources and power dynamics. She argues that policy instruments can alter institutions, lower transaction costs, shape perceptions, change preferences, and influence actions. She also emphasises the importance of investigating the inequality and standard of living, in other words, the different income classes in relation to plastic bags in Nairobi, which cannot be overstated or oversimplified. This means that policies such as the plastic bag ban can impact Kenyans differently depending on their income level. A person with a low income might be facing several challenges including affording alternative bags to plastic and might have different priorities because of their circumstances.

In the results, from this study there is no strong correlation between supporting the ban and income. The reason might be that each income category includes a wide range of circumstances, and each person has unique needs and experiences. In addition, a small segment of the population remained skeptical about the ban's effectiveness and feasibility. It is also evident from the interviews where statements like “The ban on plastic bags was only on high-density polyethylene supermarket bags and nothing else.” Despite the ban on plastic bags, you still see plastic bags, particularly single-use plastic bags, in supermarket packaging. This suggests that although the ban is in place, there may be a perception gap between its intent and its implementation. Furthermore, observations and interviews reveal that even though individuals support the ban, they still lack an understanding of environmental cleanliness. Even with a policy such as the plastic bag ban, other plastics, and materials, can still be found littering the streets. A concerning trend is the discarding of empty plastic bottles and other types of littering from moving vehicles, often with the belief that it is someone else's job to deal with it. This type of lack of personal responsibility and understanding of the environmental causes of their action may hinder the government's fight against waste.

Based on the result we can see that the main factors as to why a person supports the ban include: How many bags they used before the ban, how many bags they use now, how much negative impact they believe plastic bags have on the health of the people, blocked drainage, death of animals in the sea, livestock as well as their improved awareness of waste management following the ban.

The result indicates that there is a strong correlation between citizens' usage of plastic bags, their awareness of the plastic environmental impact on the environment, as well as their awareness and support for the plastic bag ban. This is important in understanding what factors influence people's support for the plastic bag ban in Nairobi. If people for example if people have reduced their plastic bag usage, they are more likely to be in favor of the ban. Perceptions, concerns, and beliefs regarding plastic negative impact on public health, drainage blockages, and wildlife are significant factors according to the results. Issues like these impact citizens in Nairobi visibly, directly, and daily. According to previous studies, plastic bags are the primary cause of such blockages in Kenya. Blockages in drains can lead to flooding in areas that lack resources to handle it. Consequently, this can lead to the spread of diseases such as cholera and malaria, as well as vehicle accidents that pose risks to civilians due to flooding. Furthermore, livestock in rural areas were commonly ingesting plastic bags (Behuria, 2021). Consumer behaviors and awareness about environmental factors were mainly significant in influencing the opinions of residents in supporting the ban. The residents who were aware mainly participated in one or more environmental actions and believed that environmental protection is a responsibility to all. Factors such as age, education level, and awareness emerged as influential factors in shaping individuals' perceptions and awareness of the environment. However, the relationship was not enough to influence the opinion supporting the ban. The findings also shed light on the potential impact of the plastic bag ban on consumer behavior and the adoption of alternative eco-friendly practices. There is need to educate as well as impact environmental actions all in relation to the plastic bags which are becoming a menace.

7.2 Conclusion

In conclusion, it takes a long time and a lot of effort to change ingrained behaviors and attitudes. What institutions and policies do is that they create pathways, long-term structures, and systems to achieve certain results. In this sense a certain behavior, which stops using plastic and perhaps better waste management and therefore a circular economy in Kenya. To

be successful, environmental policies must be accompanied by public awareness campaigns, accessible alternatives, accessible infrastructure, and commitments to transparency and stakeholder participation.

The analysis of the data provides valuable insights into the perceptions and attitudes towards the plastic bag ban. The findings contribute to the understanding of public opinion on this environmental initiative. The results emphasize the importance of promoting awareness and education to ensure the successful implementation and acceptance of the plastic bag ban.

These findings can inform policymakers, environmental organizations, and other stakeholders in designing effective strategies to address plastic waste and promote sustainable practices.

8. References

This section will provide the sources, and literature upon which the study has been made.

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9. Appendix

This section will provide interview manual and the survey , tables and graphs including descriptive statistics, correlation matrices, relationship between the variables of interest in this study. Furthermore econometric tests will be provided here.

Appendix 1.

Request for participation in research project (master thesis)

Background and Purpose

This study is a part of a master's thesis in Environmental Economics. It is conducted by Sauda Luzze, student at the Swedish Södertörns University.

The purpose of the study is to examine Kenyan citizens' consumer attitudes and behaviours following the plastic bag ban in Nairobi Kenya. Participants are recruited via organisations, research, networks, or via recruitments in streets, shops, and other places where plastic bags are distributed or used.

What does participation in the project imply?

Interviews, questionnaires, and observations are used to gather the data for this project. A variety of questions will be asked about you, including general information, habits associated with plastic bags before and after the ban, environmental awareness about plastic bags, and your opinion on the current ban on plastic bags, along with whether you have acted more environmentally conscious daily. As part of the interview process, participants will fill out a survey form, or participants in recordings by the interviewer, pictures as well as note taking.

What will happen to the information about you?

Data about individuals will be treated confidentially. Access to the collected data will be restricted to the researcher and supervisor. To ensure confidentiality, the data, pictures, notes, and recordings will not be associated with your name. A general description of the participants will be provided in the thesis, for example, "worker at Kenyan non-governmental organization". The description will be informed to you so that you may consent to a wording that you are comfortable with.

It is estimated that the project will be completed by the end of 2023. Any information that can be indirectly linked to an individual, such as location, age, gender, or occupation will not be used, except

for the purpose of this project. That information will be stored in accordance with ethical guidelines and deleted once it has concluded. A copy of the transcribed interviews and other notes will be stored securely by Södertörns University following the deletion of all recordings.

Voluntary participation

Participation in this project is voluntary, and you may withdraw your consent at any time. Your personal data will be anonymized if you withdraw.

In case of questions about this project, please do not hesitate to contact:
Researcher: Sauda Luzze, Sauda.luzze@gmail.com, 0759744757 or +46720206504
Supervisors: Joseph Kimani (Kenya) and Franklin Amuakwa-Mensah (Sweden)

By signing this form, I consent to participate in the study. I may consent verbally or in writing. Based on the information I've received, I'm interested in participating in the project.

(Signed by participant, date)

Interview guide

The interview guide was adjusted and followed to a varying degree depending on the participant and setting. Here I have gathered the main questions for each participant group.

- Information about the participant: title / role description
- Date, place.

Questions for all participants:

- Intro: Tell me a bit about yourself and what you do.
- Did you agree on the ban on plastic bags - why / why not?
- Why do you think a strict ban was the preferred policy option?
- Do you think any other solution could have worked better? ‘

• What is the biggest difference in Nairobi after the ban?

• Do you think some people or groups are more affected than others? - if so, who/in what way? • What do you think about the alternatives available to the bags?

• When did you know the ban was coming - what information did you receive?

- When did you stop using the plastic ban
- Why did you stop using the plastic bag
- If the plastic bag was reintroduced to the market would you use it again?
- Has the plastic bag ban changed your thoughts about how you consume plastic?

• Do you think the ban will last - why / why not? • How would you feel if bags became legal again?

• End: Is there anything I haven't asked that you think I should know / that you want to add?

For regular inhabitants / vendors:

• Who are your customers, what do you sell?

• What did you use plastic bags for?

• What alternatives do you use now? - if still plastic bags – why?

• What do you think about enforcement? - have you heard of arrests?

• Was flying toilets an issue here? - if so, how is it now?

For professionals / people involved in the policy process or enforcement:

• What is your view on Kenya's history with plastic bags?

• Can you describe the debate / previous attempts to deal with plastic bags?

• Have you been involved in the process of adopting the new policy on plastic bags? - if so, in what way?

• What was your advice/opinion on how to solve the plastic waste problem?

• Who do you think are the main stakeholders in this situation?

• What do you think was the reason the levy and policy package introduced in 2005 failed?

• How was the ban communicated to the public?

• What are alternatives to plastic bags? - how were they chosen?

• What are the biggest challenges ahead?

For manufacturers:

• What type of products did you make before and now? - Describe the factory, number of workers and activities.

• Explain the transition process – what changes were made, and when/how?
• How did the previous tax and regulation for plastic bags work?
• How were you informed, any contact with NEMA / KAM?
• How does the exemptions work, have you applied for a licence? • Can you recycle bags and other plastics here – if so, how / why not?

Appendix 2. Survey

A Behavioral Questionnaire of Nairobi citizens' experience and opinions, regarding the use of Plastic bags and the ban on plastic bags.

Date_____ Place_____

*NOTE: Participants must currently reside in Nairobi and be above the age 18!

1. Have you been informed of the nature and the purpose of this study?
□Yes □No?

Please tell us just a bit about yourself

2. Your age
Please fill in your age
□ 18-25 □ 26-35 □ 35-55 □ 56-65 □66+

3. Your gender
□ Female □Male □Prefer not to say

4. Your Education Level

□Non □Primary □Some high school □High school graduate

□Collage / university graduate □Prefer not to say

5. Where in Nairobi do you live?

(Please select constituency)

□Dagoretti N □Dagoretti S □Embakasi E □Embakasi C □Embakasi N □Embakasi S

□Embakasi W □Kamukunji □Kasarani □Kibra □Langata □Makadara □ Mathare

□Roysambu □Ruaraka □Starehe □Westlands

6. What is the monthly income of your household (approximately)?

□0-10.000 KSH □10.000 – 50.000KSH □50.000-100.000KSH □>100.000KSH

□Student (no income) □Prefer not to respond

Effect of the ban on behavior

7. Before the ban, how often a week did you pay for plastic bags as a result of grocery or market shopping?

□None □1-2 □3-4 □5-6 □7-8 □9-10 □11+

8. Now with the ban, approximately how many <u>new</u> reusable carrier bags do you buy per week, when you go grocery or market shopping?

□None □1-2 □3-4 □5-6 □7-8 □9-10 □11+

9. Which plastic bag did you commonly use before the ban?

□ No bag. □Small black bag □Big black bag □Big colored bag □Branded supermarket bag □Thin clear bag □other

10. What shopping bag do you mostly use now?

□ Cotton □ Plastic □ Locally fabricated □ Other

Environmental awareness regarding plastic bags

(Answer the question using a scale of 1-7 where;
1= Extremely small; 2= very small; 3= small; 4= moderate; 5= large; 6= Very large; and 7= Extreme)

How much negative impact do you think plastic bags have on the following things:

11. Health of the people?

□ 1 Extremely small □2 □3 □4 Moderate □5 □6 □ 7 Extreme

12. Blocked drainage?

□ 1 Extremely small □2 □3 □4 Moderate □5 □6 □ 7 Extreme

13. Death of animals in the sea?

□ 1 Extremely small □2 □3 □4 Moderate □5 □6 □ 7 Extreme

14. Choking of animals on land?

□ 1 Extremely small □2 □3 □4 Moderate □5 □6 □ 7 Extreme

15. Has the ban improved your awareness of waste management and plastic pollution?

□Yes □no □not sure

Opinion on the banning of plastic bag

16. Do you support the plastic ban?

□Yes □ no □ not sure

17. What do you think about the enforcement of the ban so far?

□Very strict □ Quite fair □Not strict enough □Don't know

18. Do you think any of the following alternatives could have worked better than a ban?

□High fees on plastic bags

□ Awareness raising/information campaigns

□System for recycling

□A tax for producers

□Giving out reusable bags for free

19. Do you believe that if supermarkets offered discounts to shoppers who brought their own cloth bags, you would use fewer plastic bags?

□1 strongly disagree □2 □3 □4 Maybe □5 □6 □7 strongly agree

Effect of environmental actions because of the plastic bag ban

(How much do you agree with the following statements?)

20. Do you believe that everyone has the responsibility to work toward a better environment?

□1 strongly disagree □2 □3 □4 Maybe □5 □6 □7 strongly agree

21. Do you believe that the plastic bag ban has helped raise awareness about environmental issues in Kenya?

□1 strongly disagree □2 □3 □4 Maybe □5 □6 □7 strongly agree

22. Have you engaged in any of the following activities as a result of the plastic bag ban?

(You can cross more than one)

□I am a member of (or work for) an environmental organization
□I have volunteered in environmentally friendly activities (such as cleaning up pollution, conservation, etc.)
□I have donated money to an environmental organization
□I recycle household waste at home
□Collecting and selling used items/waste

Feedback on the questions in the survey (optional)

Appendix 3.

5.5 The survey areas

Although the survey collected data from four areas, including Buru Buru, Central District area, Westland and Kibera, the goal was to have a diverse range of applicants, with surveys from all areas of Nairobi. Due to the fact that people are mobile and do not necessarily operate where they live.

According to the Kenya National Bureau of Statistics, Nairobi has 17 constituencies that can be divided into three categories: high-end constituencies, upper-middle constituencies, and lower-income constituencies Cytonn (2023).

These constituencies include the following areas:

High-End Constituencies:

- Westlands- In Westlands, a quarter of all Kenyan embassies and consulates are located. In addition to upmarket residential estates, commercial centers, and hotels, the area is home to several luxury hotels.

- Dagoretti North- is one of Nairobi's most wealthy and upper-middle-class neighborhoods. Several upscale shopping malls and residential estates can be found there.
- Langata - is a high-income area with some upper-middle income parts. There are several universities here, as well as several upmarket residential estates in the area.

Upper-Middle Constituencies:

- Dagoretti South - constituency lies adjacent to Dagoretti North. It is a middle-income neighborhood with several informal settlements.
- Kibra - The largest slum in Kenya, Kibera is located in Kibra, a low-income area. Additionally, it includes Upper Hill, one of Nairobi's most expensive suburbs.
- Roysambu - In Roysambu, there are a number of informal settlements with lower middle-incomes.
- Kasarani - is the second most populous and largest middle-income area. Aside from the Moi International Sports Centre, the area is home to several residential estates.
- Embakasi South -, several informal settlements are located in a low-income area.
- Embakasi North - there is the largest dumpsite in Dandora which is located in a low-income district.
- Embakasi Central - is a predominantly low-income area without any major government establishments.
- Embakasi East - In Nairobi's Embakasi East district, the largest and most prominent planned residential estate is Nyayo Estate.

Lower-Income Constituencies:

- Starehe - In Starehe, you'll find the Central Business District and parts of the Industrial Area.

- Mathare - Nairobi's smallest constituency, Mathare, is a low-income area. Numerous informal settlements are located here, and there are no major banks.
- Kamukunji - located in the eastern part of Nairobi, is one of the poorer areas of the city.
- Makadara - With several informal settlements, Makadara is a middle-income area.
- Ruaraka - Several informal settlements and several industrial facilities can be found in Ruaraka, a low-income neighborhood.
- Embakasi West -there are several commercial and industrial activities owing to its middle-income status.

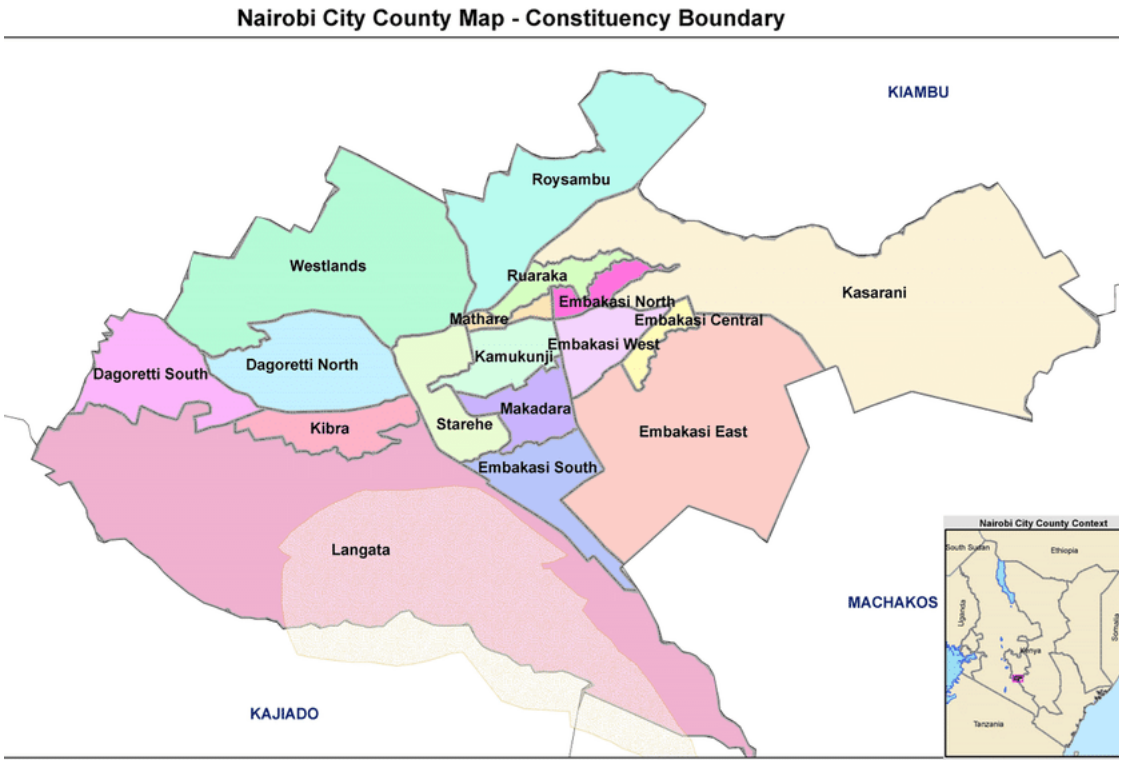


Figure 4. Image of Nairobi City-County map showing constituencies and associated boundaries.

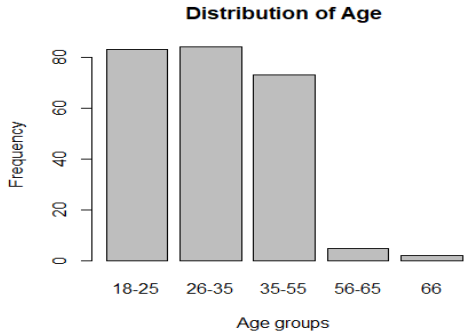
Appendix 4.

This includes tables and graphs including descriptive statistics, correlation matrices, and relationships between the variables of interest in this study.Furthermore, econometric tests will be provided here.

Age

In this study, age was evaluated as a categorical variable. There were five distinct classes: "18-25 years", "26-35 years", "36-55 years", "56-65 years" and "66 years". The various groups were distributed as follows:

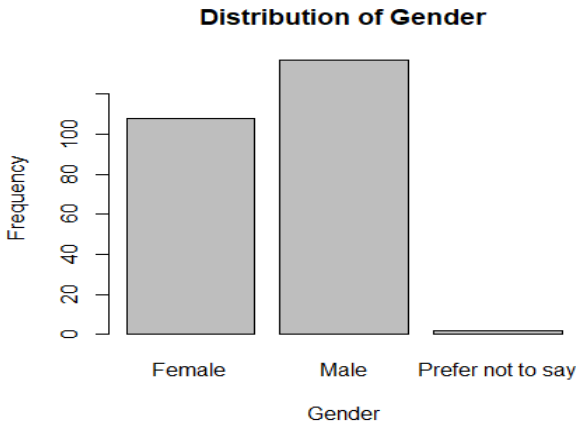
	var	cat	n	n_total	percent
1	age	18-25	83	247	33.6032389
2	age	26-35	84	247	34.0080972
3	age	35-55	73	247	29.5546559
4	age	56-65	5	247	2.0242915
5	age	66	2	247	0.8097166



45 years" age group, taking up approximately 30% of the total respondents.

Gender

In the survey, respondents' gender was categorized as either male, female or prefer not to say. The distribution of the respondents' gender was as follows:

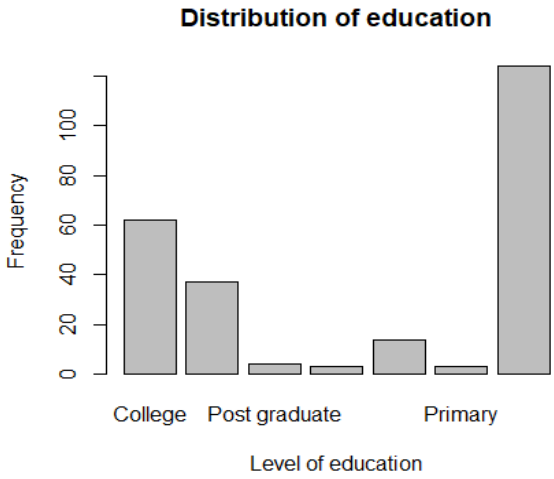


There were more males than females who took part in the study. The males accounted for 55.5% of the total respondents while, the females were 43.7%. There was a distinct distribution in the gender variability in the sample. 2 respondents did not identify as either male or female.

Education

The respondents' level of education was a major tool in the survey and it was categorized into 10 categories as follows:

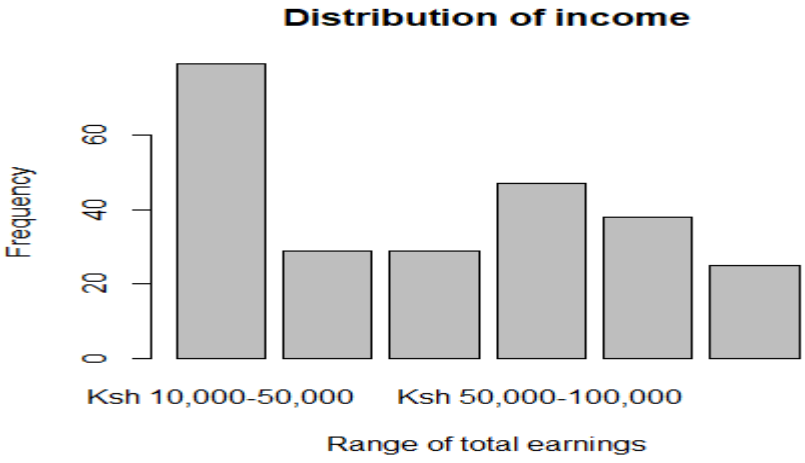
	var	cat	n	n_total	percent
1	Education	College	62	247	25.1012146
2	Education	High school	29	247	11.7408907
3	Education	Masters	1	247	0.4048583
4	Education	MBA	1	247	0.4048583
5	Education	Non	3	247	1.2145749
6	Education	Post graduate	2	247	0.8097166
7	Education	Prefer not to say	14	247	5.6680162
8	Education	Primary	3	247	1.2145749
9	Education	Some high school	8	247	3.2388664
10	Education	university graduate	124	247	50.2024291



Income

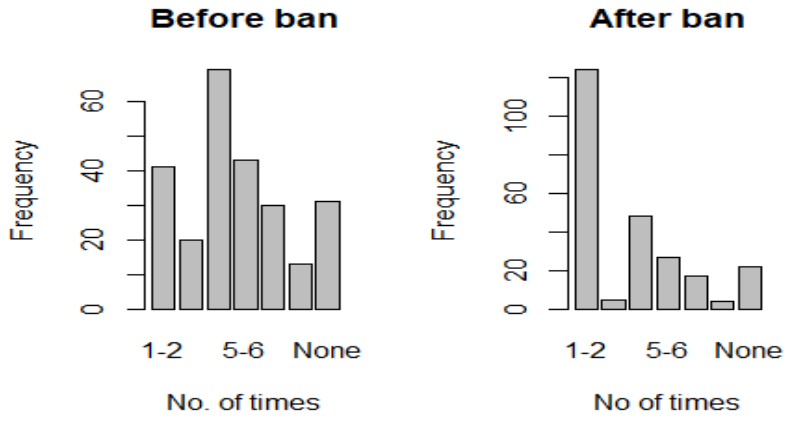
The survey also evaluated the income of the respondents. The total earnings were evaluated as a categorical variable with six levels. The distribution in the various classes is as follows:

	var	cat	n	n_total	percent	se
1	income	Ksh 10,000-50,000	79	247	31.98381	2.973745
2	income	Above Ksh 100,000	29	247	11.74089	2.052403
3	income	Ksh 0-10,000	29	247	11.74089	2.052403
4	income	Ksh 50,000-100,000	47	247	19.02834	2.502646
5	income	Prefer not to respond	38	247	15.38462	2.300385
6	income	Student (no income)	25	247	10.12146	1.923012



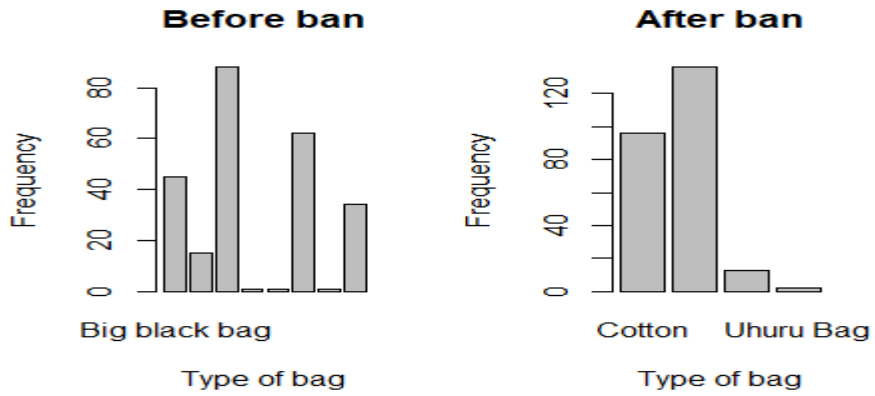
Impact of ban on consumer behaviors

The survey evaluated the impact of the plastic bag ban on consumer behaviors by categorizing the responses of the respondents into a number of variables. The respondents were inquired on the number of times they used to pay for a bag in a week during grocery shopping before the ban and the majority of the responses were 3 to 4 times. This accounted for 27% of the survey respondents, while 17% and 16% of the respondents bought bags 5 to 6 and 3- 4 times a week respectively.



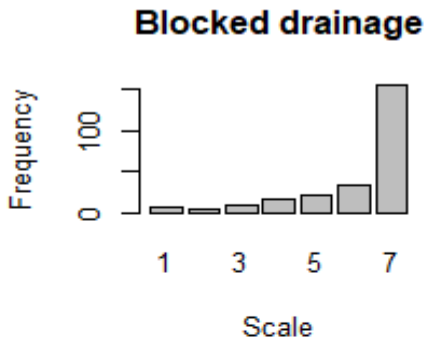
Type of bags

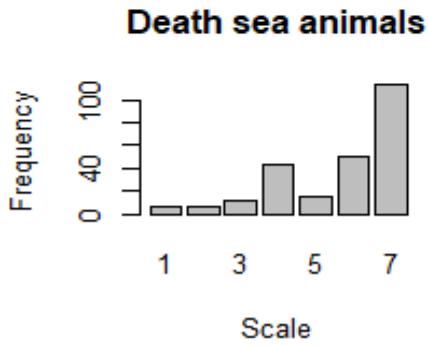
The main type of bag used before the ban was the branded supermarket bag which was usually given freely to customers followed by the small and big black bags respectively.

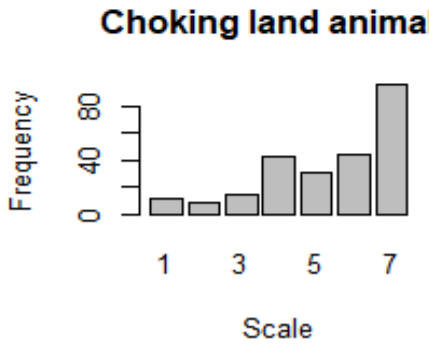


Environmental awareness

The survey evaluated the level of environmental awareness in the population. The respondents were asked to rate the negative impacts plastic bags have on people's health, death of sea animals, blocked drainage and choking land animals. This was evaluated on a numerical scale of attitude values 1 to 7. Their responses were distributed as follows:

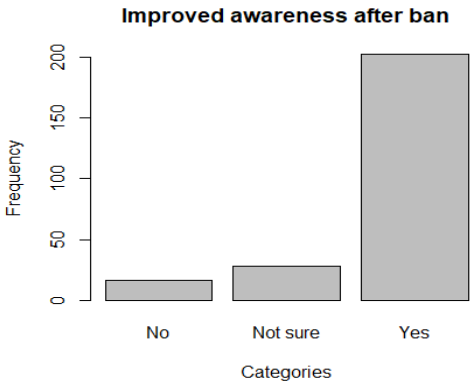






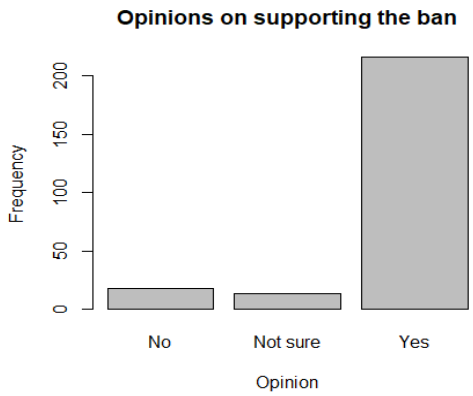
Improved awareness

The respondents were asked if the plastic bags ban had improved their level of awareness on waste management and waste pollution.



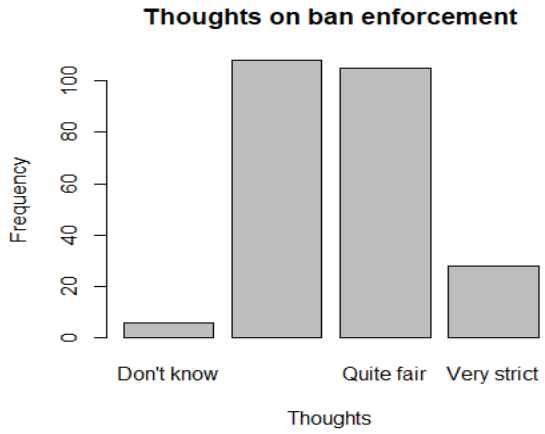
Support ban

The respondents were inquired on their opinions on supporting the plastic bag ban. Their opinions were distributed as follows:



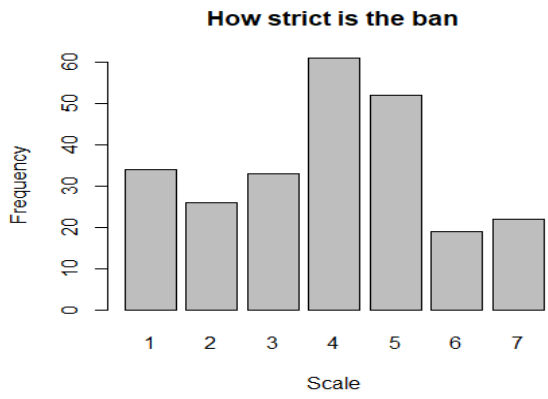
Thoughts on ban enforcement

The respondents were asked of their thoughts and opinions with regard to the enforcement of the ban. Their opinions were distributed as follows:



Strict policy

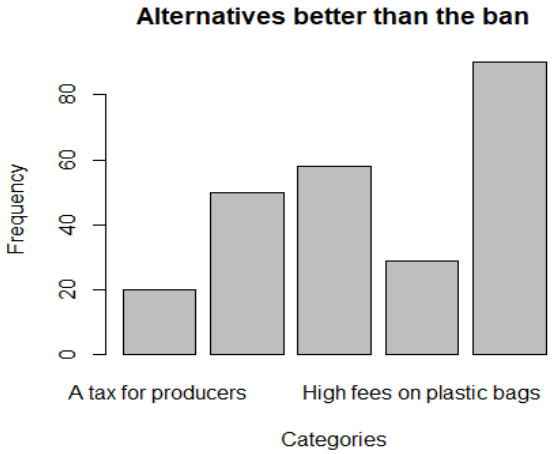
The respondents were asked to rate the level of strictness of the ban. This was rated on 7-point numeric scale with 7 indicating high level strictness as follows:



Alternatives ban

The respondents were asked their opinions on alternative methods that were better than the ban. Their responses were as follows:

	var	cat	n	n_total	percent
1	alternatives_ban	A tax for producers	20	247	8.097166
2	alternatives_ban	Awareness rasing	50	247	20.242915
3	alternatives_ban	Giving out reusable bags for free	58	247	23.481781
4	alternatives_ban	High fees on plastic bags	29	247	11.740891
5	alternatives_ban	System for recycling	90	247	36.437247

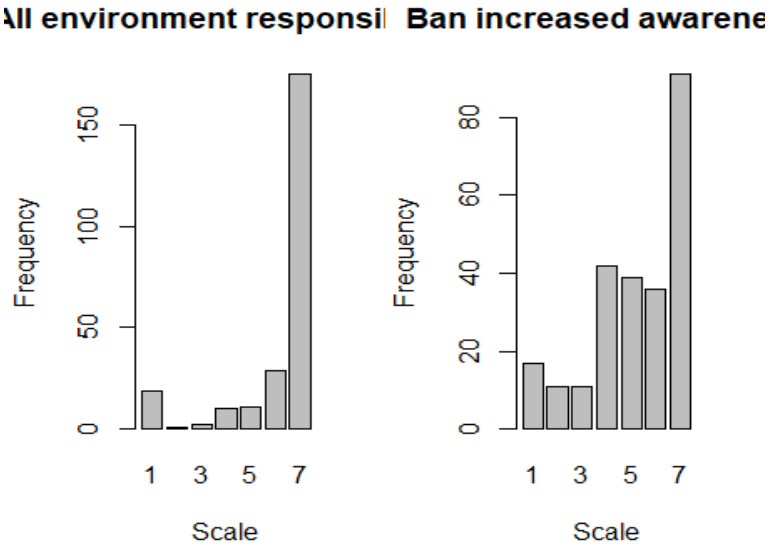


Discount bags

The respondents were asked their beliefs if supermarkets offered a discount to each and every customer who brought their own cloth bag during shopping would reduce the use of plastic bags. This was captured on a 7-point scale with 7 indicating strongly agree.

Effect of environmental actions

The survey evaluated the awareness and effect of environmental actions on the plastic bag ban. The individuals were asked their opinions on whether the protection of the environment is a responsibility to all and if the plastic ban increased their awareness on environmental actors. Their responses were recorded on a 7-point scales as follows:



The multinomial model

A multinomial regression model was then built with support ban as the response variable with eight predictor variables. The following results were obtained:

The multinomial logistic regression model has a residual deviance of 122.4444 and an AIC of 202.4444. The residual deviance represents the discrepancy between the observed data and the fitted model. A lower residual deviance suggests a better fit of the model to the data. In this case, a residual deviance of 122.4444 indicates that the model explains a significant portion of the variation in the data. The AIC is a measure of model selection that balances the trade-off between model complexity and goodness-of-fit. A lower AIC value indicates a better balance between model fit and complexity. In this case, an AIC of 202.4444 suggests that the current model is relatively good, but it can potentially be improved.

The coefficients of the predictor variables were obtained with the intercept representing the reference category in this case, no to supporting the ban. The intercept represents the log odds of the reference category for each dependent variable category when all independent variables are zero. The coefficients represent the difference in log odds between each category in the variables and the reference category. Negative coefficients indicate a decrease in log odds compared to the reference category, and positive coefficients indicate an increase. The p-values were also obtained as follows:

```
         (Intercept) data$Before_bags11 data$Before_bags3-4 data$Before_bags5-6
Not sure   0.2290088          0.0000000                   0           0.1557162
Yes        0.0000000          0.7295986                 NaN                 NaN
         data$Before_bags7-8 data$Before_bags9-10 data$Before_bagsNone data$Now_bags11
Not sure          0.08459414                   0            0.3891351       0.0000000
Yes               0.79289957                 NaN            0.4157831       0.2779794
         data$Now_bags3-4 data$Now_bags5-6 data$Now_bags7-8 data$Now_bags9-10
Not sure                0        0.5020272        0.0000000         0.0000000
Yes                     0        0.1038432        0.1926037         0.4610544
         data$Now_bagsNone data$Health_people data$Blocked_drainage
Not sure                 0          0.9385552             0.5017592
Yes                      0          0.8333541             0.6702675
         data$Death_animal_sea data$Choking_animal_land data$improved_awarenessNot sure
Not sure             0.9686269                0.7521555                    1.810905e-10
Yes                  0.9566360                0.6638630                    9.338881e-01
         data$improved_awarenessYes data$ban_increase_awareness
Not sure                 0.08752811                   0.8983534
Yes                      0.17130090                   0.4415344
```

The odds ratio was also obtained, the odds of the outcome variable for the "Not sure" group are approximately 3.975 times higher compared to the reference category while holding other variables constant. For the "Yes" group, the odds are approximately 29.306 times higher. The odds of the outcome variable for individuals in the "Not sure" group within the age range of 26-35 are approximately 0.217 times lower compared to the reference category while holding other variables constant. For the "Yes" group, the odds are approximately 0.391 times lower.