



**INDIRA GANDHI NATIONAL OPEN UNIVERSITY SCHOOL OF
GRADUATE STUDIES**

**“Production and Managements of Bottled Drinking Water and Its Associated
Plastics and Plastic Bottles Disposal, A case Study in Sabbata Hawas Woreda,
Oromia Regional State, Ethiopia”**

A Thesis submitted to the School of Graduate Studies, Indira Gandhi National
Open University in partial fulfillment of the requirement for the Degree of Master
of Arts in Rural Development (MARD)

BY

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20 November, 2017

DECLARATION

I hereby declare that the Dissertation entitled **“Production and Managements of Bottled Drinking Water and Its Associated Plastics and Plastic Bottles Disposal, A case Study in Sabbata Hawas Woreda, Oromia Regional State, Ethiopia”** submitted by me for the partial fulfillment of the M.A (RD) in Rural Development to Indira Gandhi National Open University, (IGNOU) New Delhi is my own original work and has not been submitted earlier either to IGNOU or to any other institution for the fulfillment of the requirement for any course of study. I also declare that no chapter of this manuscript in whole or in part is lifted and incorporated in this report from any earlier work done by me or others.

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This is to certify that Mr. GEMEDA SAFOYE HALAKE student of M.A (RD) from Indira Gandhi National Open University, New Delhi was working under my supervision and guidance for his Project Work for the Course MRDP-001 his project work entitled ***“Production and Managements of Bottled Drinking Water and Its Associated Plastics and Plastic Bottles Disposal, A case Study in Sabbata Hawas Woreda, Oromia Regional State, Ethiopia”*** which he is submitting, is his genuine and original work.

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List of Acronyms

EIA: Environmental Impact Assessment
EPA: Environmental Protection Authority
EFMHACA: Ethiopian Food, Medicines, Healthcare Administration and Control Authority
FDRE: Federal Democratic Republic of Ethiopia
IBWA: International Bottled Water Association
IWMI: International Water Management Institute
IGNOU: Indira Gandhi National Open University
JMP: Joint Monitoring Programs of WHO and UNICEF
MVA: Manufacturing Value Added
MARD: Master of Arts in Rural Development
MDG: Millennium Development Goals
NCA: Norwegian Church Aid
MJ: Mega Joule
MoWR: Ministry of Water Resources
MW: Mega Watt
PET: Polyethylene Terephthalate
POPs: Persistent Organic Pollutants (POPs)
UDI: Urban Development Indicators
UN: United Nations
USAID: United States Agency for International Development
UNESCO: United Nations Education, Science & Cultural Organization
UNICEF: United Nations International Children's Fund
UNEP: United Nations Environmental Program
WASH: Water, Sanitation and Hygiene
WHO: World Health Organization
WSSCC: Water Supply & Sanitation Collaborative Council
WBCSD: World Business Council for Sustainable Development
WRI: World Resource Institute:

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ABSTRACT

The objective of this study was to investigate/assess the production and managements of bottled drinking water brands and associated plastic packaging or bottles disposals at the production site or factories until retail marketers and end users level in Sabbata Hawas Woreda, Oromia Region, Ethiopia.

The study has adopted descriptive and explanatory research types. The data collected through different survey tools were analyzed in relevant software EPI Info Software, Version 3.5.3, Microsoft Excel and interpreted accordingly.

Exposing the bottled drinking water products to direct sunlight was termed as bad practice to its quality and the human health by 100% of the respondents and everywhere, the bottled drinking water products were also responded as not protected from environmental influences like heat, moisture, high temperatures by 96.6% of the survey respondents.

Regarding, the disposal methods of plastics or the plastic bottles in the survey area, the survey respondents replied as disposing the plastic bottles anywhere by 52.9%

The general public or the communities including the survey respondents were not well aware about the negative or positive impacts of the bottled drinking water productions, the management of the bottled drinking water brands and the disposal of the associated plastic bottles or plastic materials by responding as disagree 72.9%

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Among the woredas in the Oromia Special Zone surrounding Addis Ababa City, with high concentration of Water Bottling Companies, Sabbata Hawas Woreda Capital and its neighboring villages are the most known ones in the special zone. The establishment of these water bottling factories in the area is a very important factor for the development of the area by bringing potable water sources and self-employment to the community and also by creating job opportunities to the local people and other citizens.

Achieving water security for regions, nations and individuals are one of the greatest development challenges the world today. (USAID Water and Development Strategy (2013-2018)

The great majority of the rural community water supply in Ethiopia relies on groundwater through shallow wells, deep wells and springs as well as surface running rivers. People who have no access to improved supply usually obtain water from rivers, unprotected springs and hand-dug wells. Wells, rivers and springs can be contaminated and can cause waterborne diseases. Rainwater harvesting is also the common features Ethiopian people are practicing in some places.

Ethiopia has 12 river basins with an annual runoff volume of 122 billion m³ of water and an estimated 2.6 - 6.5 billion m³ of ground water potential. This corresponds to an average of 1,575 m³ of physically available water per person per year, a relatively large volume. However, due to large spatial and temporal variations in rainfall and lack of storage, water is often not available where and when needed (IWMI, 2007). Only about 3% of water resources are used, of which only about 11% (0.3% of the total) is used for domestic water supply (WRI, 2010)

To improve access to safe clean water, the government of Ethiopia has prepared a water and sanitation policy document as an integral part of the country's water management policy. MoWR (1999) clearly indicated the right of every Ethiopian to get access to adequate and quality water to satisfy their basic needs in order to achieve rapid socio economic development through better health care and productivity.

According to figures used by the Ministry of Finance and Economic Development for planning purposes, however, access was much higher. In 2010, access to drinking water was estimated at 68.5%: 91.5% in urban areas (within 0.5 km) and 65.8% in rural areas (within 1.5 km).

In 1990 access to improved water supply had been estimated at only 17%, and access to improved sanitation had been estimated at only 4%. There thus has been a significant increase in access for water supply and sanitation, which spans both urban and rural areas. More than 138,000 improved community water points were constructed and rehabilitated from 2008 to 2010 UNICEF/WHO. The recent development regarding safe and improved water sources UNICEF/WHO are as stated below.

The 2015 assessment report by the UNICEF/WHO Global Joint Monitoring Program for Water and Sanitation (JMP) indicated that Ethiopia has met the target of 57 per cent of the population using safe drinking water and has attained the target by halving the number of people without access to safe water since 1990. The current JMP estimates showed that by 2015 access to improved drinking water has increased to 57 per cent and access to improved sanitation has increased to 28 per cent. As to improved sanitation, during the MDG period, it was estimated that use of improved sanitation facilities rose from 54 per cent to 68 per cent globally. The global MDG target of 77 per cent has therefore been missed by nine percentage points and almost 700 million people including Ethiopia.

According to the *USAID-Water and Development, 2013-2018* also, Ethiopia achieved its Millennium Development Goal target of 57 percent access to safe drinking water, halving the number of people without access to safe water since 1990. Yet access to improved sanitation remains stubbornly low at only 28 percent nationwide up from three percent in 1990. Despite these strides, safe water, sanitation and hygiene (WASH) coverage remains insufficient. Inadequate access to safe water and sanitation services and poor hygiene practices negatively impact health and nutrition; diarrheal disease is one of the leading causes of under-five mortality in Ethiopia.

When it comes to the emergence of Bottled Drinking Water delivery services, it is also an important part of potable water supply both for households and institutions. It is assumed to be a safer and more dependable utility service which is essential to scale up the health status of the users.

For homes and offices, it is a convenient way to receive cost effective, high quality drinking water on a regular basis. Studies conducted by Matiwos Ensermu, 2014, have shown that use of purified water in the workplace increases productivity and improve the overall health of the workforce. For instance, according to the International Bottled Water Association (IBWA, 2007), consumption of bottled water in the US continues to rise – from 9.1 billion gallons in 2011 to 9.67 billion in 2012. Americans drink more than 73 billion half- liter bottles of water a year.

According to the study made by Matiwos Ensermu in 2014 on plastic trashes or plastic materials in Ethiopia, however, it was feared that the plastic materials were believed to dangerously pollute the environment thereby negatively impacting the health status of humans and other animals. This situation seems to be eminent in the Ethiopian Urban Areas and their peripheries. The trend of negligently utilizing plastic bags and bottles is on the rise. This seems to indicate that the worse is to come.

Plastic bag wastes pose serious environmental pollutions and health problems in humans and animals. The situation is worsened in economically disadvantaged countries like Ethiopia. The trend of utilization of plastic bags is increasing from time to time in spite of a good deal of awareness of the residents of Addis Ababa City about the adverse effects of these products

The surrounding rural areas of Sabbata Town is accommodating many bottled drinking water factories that are bottling and marketing the differently branded water products to the study area and the whole country. In these water bottling and marketing operations, many organizations are involved. Some of them are involved in legally enforcing and regulating the activities of water bottling in that particular area and in the entire country. Some of them in drawing guidelines and directives to guide the operations of water bottling and others in providing water wells to the water bottling companies as well as collecting taxes and revenues for the government from the water bottling companies' incomes and profits. Above all, the water bottling and marketing companies are the lead organizations who were importing the plastic materials or bottles into the country and utilizing them for water bottling and other purposes, but without paying any due attentions to the enormous environmental damaging effects of the plastic bottles or materials. In the operations of water bottling, the manner in which the bottled water products are being managed by all the concerned parties, that are, the producers, sellers, end-users or the whole

community remained under question. Also the regulating activities of these water bottling operations and the benefits that might have been brought to the areas or to the communities need to be addressed and assessed in the future in addition to the plastic bottles disposal or plastics materials disposal issues.

I.2 Statement of the Problem

Bottled Drinking Water branding and marketing businesses are expanding at a faster rate due to the acceptance of the products in many places like working areas, recreation centers, homes and hotels and other areas in the country. However, the technologies and the knowledge of water bottling and associated activities are new to the people. So, the management aspects of these products like productions, storage, transportation and handling of the bottled water products and the disposal and management aspects of the associated plastic bottles or materials used for packaging are also new to the community. The developmental contributions of these products to the local people by creating employment opportunities in the country in general and in the study area in particular, access to bottled drinking water, the methods of the plastics waste disposal, the impacts of water bottling by the industries are not well known and documented.

So far in this country, nothing has been said or written about the merits and demerits of water bottling and marketing as well as the positive or negative impacts of massive productions of the plastic bottles or materials in the country.

Additionally, the fates and effects of tons of plastic bottles, bags and plastic materials imported into the country are not well known and documented as well.

Making the plastic for all those water bottles in far off countries and transporting the finished products over hundreds or thousands of miles consumes energy, pollutes the environment, and contributes to global warming. In this regards, here in Ethiopia, the adverse effects of plastics including the drinking water plastic bottles like Polyethylene Terephthalate (PET)) are not familiar with the users and adapted to the ways of the lives of the population.

These days, similar to other beverages bottling companies, drinking water bottling companies are working in a highly volatile or changing environment, where man-made products are challenging and negatively impacting the human health, the human life and the natural environments. This is true in Ethiopia too. The water bottling companies and the beneficiaries of the bottled water, that are converting the public water into easy profits should be managed with care and responsibilities in the country, because the unwise and unplanned use of existing water can easily deplete the underground water and suddenly expose the local communities and the whole country into water scarcities and chaos.

Therefore, the major aim of this study was the assessment of the bottled drinking water production managements and associated plastic bottles or materials disposal in relation to the operation guidelines of the water bottling in the areas. In addition to the study of the production conditions, management practices of the bottled drinking water and associated plastic bottles/materials was done in light of the *Requirements of the Compulsory Ethiopian Standards and Food, Medicines and Health Care Administration and Control Authority of Ethiopia* and other relevant human and environmental concern directives or guidelines of the country.

I.3 Objectives of the Study

I.3.1 General Objective:

The general objective of this study was to investigate/assess the issues related to the bottled drinking water brands production and managements and its associated plastic bottles disposal challenges being posed by the plastic packaging or bottles at the production sites or factories until retail marketers and end user levels.

I.3.2 The Specific Objectives of the Study

To investigate whether the requirements in the Compulsory Ethiopian Standards for the quality of Bottled Drinking Water and other related Guidelines and Directives are properly exercised by

bottled drinking water producing and marketing companies, the retail traders and individual end-users.

To assess how the concerned Governmental Organizations or Authorities are enforcing the *Requirements of the Compulsory Ethiopian Standards and EFMHACA Regulations* in productions and management practices of Bottled Drinking Waters (storage, transportation and handling etc.) processes in the areas.

To know the perceptions of the users or communities about Bottled Drinking Waters productions and management practices in relation to the Compulsory Ethiopian Standards and other guidelines set for the quality management practices of bottled drinking waters and others.

To assess the perceptions of the producers and the end-users of bottled drinking water brands about the problems posed by the plastic bottles or materials disposal in the study area.

1.4 Significance of the Study

This particular study is expected or believed to contribute

To enhance the perceptions of the community or users on production, storage, handling and distribution of bottled drinking water products and impacts of the plastic bottles or materials on health and the natural environment.

To find out or explore the problems related to the management practices of bottled drinking water, among bottled drinking waters manufacturing and marketing companies as well as the retailers and end users of the bottled drinking waters in the country.

To provide inputs for individual researchers who are interested in this new subject matter to undertake similar study exercises.

This study is also, significant for future researchers in that it can help them as a springboard to carry out similar studies in a different context.

To provide supporting inputs for law enforcing and regulatory organizations, like Ministry of Water Resources Development, Ministry of Health, Ministry of Natural Resources and Environment, Ethiopian Agency of Quality and Standards, Ethiopian Food, Medicine and Health Care Management and Control Authority etc. in their efforts to regulate, monitor, enforce and manage these important and crucial activities in the county.

I.5 Scope of the Study

The scope of this study is limited to overviewing or assessing the production management practices of the bottled drinking waters and the impacts/challenges of plastic bottles or packaging materials used for bottling and its ultimate disposal activities. The study covers some of the water bottling companies that are engaged in producing, bottled water brands and transporting them as well as storing these products in Sabbata Hawas Woreda of the Oromia Region. The study also included the retailers and end users of these products as direct respondents in the above mentioned area. The research had focused on those water bottling factories or companies that have been in the process of water bottling, distributing, managing and marketing businesses for some two or more years. The governmental authorities and offices who were involved in legalizing, regulating and supporting the water bottling companies were included in these study exercises as key informants and as sources of legal benchmarks.

Moreover, this study paper has reviewed the theoretical and practical importance of bottled drinking water. Based on this study exercises, the researcher has summarized the major findings, concluded and recommended the important issues or points which could improve the production and the products management practices of bottled drinking waters. The important aspects of the plastic packaging or bottles in some concerned water bottling companies, retail marketers and end users in these specific areas in particular and in the country in general were summarized.

I.6 Limitations of the Study

In conducting this research, time was the first constraint the researcher has faced or encountered. The absence of research outputs like references or adequate and relevant literatures or publications

on the managements of bottled water brands and the disposal and impacts of plastic bottles or materials in the country on the subject matter, as well as the financial problems were the major limiting factors of the study exercises, since the researcher was self-sponsored.

A lot depended on how the selected governmental organizations, bottled water manufacturing companies' managements, employees and the retailer groups and end users of bottled drinking waters appreciated and cooperated with the researcher. Also, a lot of issues depended on the organizations working on the implementations of the requirements of the Compulsory Ethiopian Standards or laws enforcing governmental institutions at different levels reacted to the study positively and appreciated the study being undertaken by the researcher. It would be limited by responses which were given and efforts made to assist the researcher to complete the work in the given timeframe effectively and efficiently.

The study was an assessment on selected bottled drinking water producing and marketing companies' practices and challenges in productions, storage conditions and management practices of the product. Thus, the finding of this study cannot be taken as a generalization to all bottled drinking waters manufacturing and marketing factories practices.

However, the recommendations which were based on the findings can be used as a source of information for other similar firms in analyzing their own practices of the bottled drinking water production conditions, storage and management practices.

CHAPTER TWO: LITERATURE REVIEW

2.1 Theoretical literature review

Safe and readily available water is important for public health, whether it is used for drinking, domestic use, food production or recreational purposes. Improved water supply and sanitation, and better management of water resources, can boost countries' economic growth and can contribute greatly to poverty reduction.

Ethiopia like any other developing countries has many constraints to make potable water easily accessible. Only 38% of total population and 26% of rural population have access to safe and clean water (WHO /UNICEF, 2010). Moreover, Ethiopia is off track to meet the MDG target of access to safe drinking water by 2015 (WHO/UNICEF, 2010).

This situation now has improved due to the immense effort exerted by the government and its partners in 2015. To improve access to safe clean water, the government of Ethiopia has prepared a water and sanitation policy document as an integral part of the country's water management policy. (MoWR, 1999) clearly indicates the right of every Ethiopian to get access to adequate and quality water to satisfy their basic needs in order to achieve rapid socio economic development through better health care and productivity.

In 2010, the UN General Assembly explicitly recognized the human right to water and sanitation. Everyone has the right to sufficient, continuous, safe, acceptable, physically accessible and affordable water for personal and domestic use.

2.2 Water Rights in Ethiopia

Water Rights issue in Ethiopia can be explained from two perspectives or from social equity and economic efficiency point of view. Consistent to underlying Government laws and international conventions, every Ethiopian citizen has the fundamental right to have access to safe domestic water for basic needs. Citizens in Ethiopia, as conditions permit, shall not be left without safe water, no matter their capacity to afford for the services provided. The other aspect water Right issues in Ethiopia are those related to persons, public or private organizations that have the desire and plan to involve themselves in the development and management of water resources. As long as

these entities request or apply for water permits and certification of their competence within the set legal framework and operational procedures, they are rightly entitled to involve in water resources development and management regardless of its origin or location within the territorial boundary of the Federal Democratic Republic of Ethiopia. (UNESCO, *World Water Assessment Program/National Water Development Report for Ethiopia, December, 2004*).

2.2.1. Water Resources Management

Water is a precious and scarce resource. It has many uses for which there is no substitute and is therefore needed in many different ways for our survival and endurance. Thus, safe drinking water holds great value and to maintain its safety the public needs to stay educated and aware. These facts apply for all types of water, be it bottled or municipally supplied as usually known Tap Water.

Water resources development and utilization will be integrated with Ethiopia's overall socio-economic development objectives, and guided by those objectives at the federal and regional levels of the government. Alternative options for water resources development will be systematically evaluated, giving full consideration to the alternative supply and demand options

Water allocation for drinking and sanitation purposes will hold the highest priority followed by water requirements for livestock in any water allocation plan. Rest will be allocated to the uses yielding highest socio-economic benefits (MoWR, 2001)

2.2.2 Water Resources Management Regulations

Water is one of the basic necessities of human life and supply of clean water is absolutely necessary for healthy life, (UDI, 2010).

The (WHO, 2000) reported that seventy five percent of all diseases in developing countries arise from polluted drinking water. The lack of access to water also limits sanitation and hygiene practices in many households because of the priority given for drinking and cooking purposes.

When human beings do not have access to potable water; they not only suffer physically and emotionally but also socio-economically.

To develop and manage water resources, the UN Millennium Development Goal 7C calls to halve by 2015 the proportion of the population without sustainable access to safe drinking water. While the safe drinking water target was met in 2010, 783 million people still do not have access to safe drinking water, and major issues related to equity of access, water quality, and sustainability of water supplies remain (WHO/UNICEF, 2012).

2.3. Improved and unimproved water sources

Because definitions of improved sanitation facilities and drinking-water sources can vary widely within and among countries and regions, and because JMP is mandated to report at global level and across time, JMP has defined a set of categories for “improved” and “unimproved” sanitation facilities and drinking-water sources that are used to analyze the national data on which the MDG trends and estimates are based. WHO/UNICEF JMP, 2010

An improved drinking-water source is one that by the nature of its construction adequately protects the source from outside contamination, in particular with faecal matter. **An improved sanitation facility** is one that hygienically separates human excreta from human contact.

2.4. Sanitation

The sanitation situation in Ethiopia is very inopportune; the development is very limited and has not been a main concern. Most of the populations in rural and urban areas do not have access to safe and reliable sanitation facilities. Majority of households do not have sufficient understanding of hygienic practices regarding food, water and personal hygiene.

As a result, above 75 % of the health problems in Ethiopia are due to communicable diseases attributed to unsafe and inadequate water supply, and unhygienic waste management, particularly human excreta. (UNESCO, UN-WATER/WWAP/2006/7).

According to the WHO/UNICEF Joint Monitoring Program/JMP, Ethiopia is off track to meet the MDG target of access to sanitation facilities by 2015 (WHO/ UNICEF, 2015) and the below mentioned statements characterizes the country's sanitation situation nowadays.

The sanitation situation in the country has not been a priority in the past and the development is very low and in need of efforts and attention. The major health problems of Ethiopia, like that of any other developing nation are communicable diseases related to water and sanitation. The status of water and sanitation services in the country is very poor and majority of the population do not have access to potable water supplies and sanitation facilities.

Many infectious diseases are associated with human excreta; the most common association is that the disease causing organisms leave an infected person by way of the feces and urine. Human excreta are therefore associated with a large number of diseases. With proper disposal of human excreta by inexpensive methods, these diseases can be brought under control and the entire sanitation situation of the country can be improved.

Human excreta are thus, the principal source for the transmission and spread of a wide range of diseases that are the chief causes of sickness and death in society.

The hygienic management and disposal of human excreta are thus of central importance in the control of excreta related diseases. It is estimated that less than 10% of the population in the country has access to excreta disposal facilities of any kind, (WHO/UNICEF, 2015)

As a consequence of this, diseases that are directly or indirectly related to poor sanitary condition are prevalent in most parts of the country. This is especially true in urban areas where overcrowding is very high. These all show that the sanitation status in Ethiopia is very poor and the deficit of latrines and other various sanitation facilities are enormous and call for the attention of the government.

In Ethiopia, the use of sanitary latrines is very limited. There are only few data available showing the severe condition of the country.

However, from the results of various reports and sample surveys made by governmental and non-governmental organizations at different periods that the sanitation status of the country is without doubt at the lowest level. The situation is most serious and major plans are required if any

considerable impact is to be made on the problem in the next few decades. UNESCO, UN-WATER/WWAP/2006/7.

2.5 MDG Targets and the WASH JMP Movement

The WHO/UNICEF Joint Monitoring Program for Water Supply and Sanitation, known as the JMP, reports every two years on access to drinking water and sanitation worldwide and on progress towards related targets under Millennium Development Goal 7 (MDG) These reports of JMP were based on data gathered from household surveys and censuses, including both recent and older data sets that have come to the attention of the JMP.

Also in addition to the MDG Goals, in 2010, the UN General Assembly explicitly recognized the human right to water and sanitation. Everyone has the right to sufficient, continuous, safe, acceptable, physically accessible and affordable water for personal and domestic use.

When it comes to Ethiopian contexts, the Ethiopian Ministry of Water Resources (MoWR, clearly indicated the right of every Ethiopian to get access to adequate and quality water to satisfy their basic needs in order to achieve rapid socio economic development through better health care and productivity (MoWR, 1999).

The UN WHO/UNICEF has said once the following regarding access to safe, clean water and sanitation in Ethiopia. "Ethiopia like any other developing countries has many constraints to make potable water easily accessible. Only 38% of total population and 26% of rural population have access to safe and clean water (WHO/ UNICEF, 2010). Moreover, Ethiopia is off track to meet the MDG target of access to safe drinking water by 2015 (WHO/ UNICEF, 2010). To improve access to safe clean water, the government of Ethiopia has prepared a water and sanitation policy document as an integral part of the country's water management policy.

2.5.1 Progress on Drinking Water, 1990–2015

As to the (WHO/UNICEF, 2015), the MDG target called for the proportion of the population without sustainable access to safe drinking water to be halved between 1990 and 2015. During the

MDG period it was estimated that, globally, use of improved drinking water sources rose from 76 per cent to 91 per cent. The MDG target of 88 per cent was surpassed in 2010, and in 2015, 6.6 billion people used an improved drinking water source. There are now only three countries with less than 50 per cent coverage, compared with 23 in 1990. Additionally, the JMP stated, despite the achievements of the MDG period, a great deal remains to be done. Behind the global headline figures, huge disparities in access remain. While many developed regions have now achieved universal access, coverage with improved drinking water sources varies widely in developing regions. The lowest levels of coverage are found in the 48 countries designated as the least developed countries by the United Nations, particularly those in sub-Saharan Africa.

2.5.2 Progress on Sanitation, 1990–2015

The MDG target called for halving the proportion of the population without sustainable access to basic sanitation between 1990 and 2015. During the MDG period, it was estimated that use of improved sanitation facilities rose from 54 per cent to 68 per cent globally. The global MDG target of 77 per cent has therefore been missed by nine percentage points and almost 700 million people.

Despite encouraging progress on sanitation, much unfinished business remains from the MDG period. In addition to the shortfall against the global target, large disparities in access still exist. Almost all developed countries have achieved universal access, but sanitation coverage varies widely in developing countries. Since 1990, the number of countries with less than 50 per cent of the population using an improved sanitation facility has declined slightly, from 54 to 47, and countries with the lowest coverage are now concentrated in sub-Saharan Africa and Southern Asia. (WHO/UNICEF 2015)

2.5.3 WASH Progress in Ethiopia and MDG Targets

Ethiopia meets MDG 7c target for drinking water supply

The 2015 assessment report by the UNICEF/WHO Global Joint Monitoring Program for Water and Sanitation (JMP) indicated that Ethiopia has met the target of 57 per cent of the population

using safe drinking water and has attained the target by halving the number of people without access to safe water since 1990.

According to the UN JMP, the total population reached with safe water between 1990 and 2015 was 48 million. There are still 42 million Ethiopians without access to safe water. Of the 42 million Ethiopians who are not using improved water supplies, an estimated 33 million people are residing in rural areas and peri urban communities and 9 million are living within towns and cities.

The JMP estimates for Ethiopia were updated following a joint mission to Addis Ababa from 26-27 November 2014 and included data from the most recent nationally representative surveys. The current JMP estimates showed that in the 1990 baseline year access to drinking water was 14 per cent and access to sanitation was 3 per cent. This means that Ethiopia's MDG target for drinking water was 57 per cent and for sanitation was 52 per cent. The current JMP estimates showed that by 2015 access to improved drinking water has increased to 57 per cent and access to improved sanitation has increased to 28 per cent.

(WHO, June 2015), in 2015, 91% of the world's population had access to an improved drinking-water source, compared with 76% in 1990. 6.6 billion People have gained access to an improved drinking-water source since 1990. 4.2 billion people now get water through a piped connection; 2.4 billion access water through other improved sources including public taps, protected wells and boreholes. 663 million people rely on unimproved sources, including 159 million dependent on surface water. Globally, at least 1.8 billion people use a drinking-water source contaminated with faeces.

Contaminated water can transmit diseases such as diarrhea, cholera, dysentery, typhoid and polio. Contaminated drinking-water is estimated to cause 502 000 diarrheal deaths each year. By 2025, half of the world's population will be living in water-stressed areas. In low- and middle-income countries, 38% of health care facilities lack any water source, 19% do not have improved sanitation and 35% lack water and soap for hand washing.

Inadequate drinking-water, sanitation and hygiene are estimated to cause 842,000 diarrheal disease deaths per year and contribute substantially to the other diseases. (WHO, 2014)

2.6 Bottled Drinking Water Productions

Bottled drinking water delivery service is an important part of potable water supply both for households and institutions. It is assumed to be a safer and more dependable utility service which is essential to scale up the health status of the users.

For homes and offices, it is a convenient way to receive cost effective, high quality drinking water on a regular basis. Studies have shown that use of purified water in the workplace increases productivity and improve the overall health of the workforce. For instance, according to the International Bottled Water Association, consumption of bottled water in the US continues to rise from 9.1 billion gallons in 2011 to 9.67 billion in 2012. Americans drink more than 73 billion half-liter bottles of water a year. (IBWA 2007) sabotage any meaningful discussion of addressing issues related to water quality. (Mark Miller San Marcos, TX 2006)

2.6.1. Bottled Water Productions and Environmental Impact

In 2006, Americans consumed about twenty-eight gallons (106 liters) of bottled water per person per year (nearly one twelve-ounce [350 ml] bottle per day). Because bottled water seems to have become an important part of the daily average diet, let's look at how much energy bottled water consumption requires and how this compares with energy related to total food consumption.

The total amount of energy required to package and transport water, as well as to produce and dispose of the containers, depends on a number of factors, including the type of water (carbonated or not, local or nonlocal), the type of bottle (plastic or glass), and the transportation distance. Depending on the type of bottled water you choose, a one-quart (1-liter) bottle contributes between 0.3 to 1.7 pounds (130 to 780 grams) of carbon dioxide to the atmosphere.

For example, drinking one quart (1 liter) of local bottled water each day for a month produces the same amount of carbon dioxide as driving a car twenty-five miles (40 km) or leaving a car idling in the driveway for three hours. However, unrefrigerated tap water is at least two hundred times

more energy efficient compared to bottled water. Thus, switching from bottled water to tap water is a good step toward reducing carbon emissions. (GREEN NINJA, 2015)

2.7 Plastic Bottles or Plastic Wastes Managements

Development projects are instrumental to Ethiopia's economic growth. Yet, there have been cases of such projects degrading the very basis for sustained development by exploiting natural resources without adequate concern for the maintenance of environmental quality. Economic growth which proceeds without attention to the proper management and maintaining of Ethiopia's environmental resource base cannot be sustained. Development and conservation must go together.

Plastic is an incredibly useful material, but it is also made from toxic compounds known to cause illness, and because it is meant for durability, it is not biodegradable.

Industrial activities are concentrated in and around Addis Ababa, accounting for about two thirds of the manufacturing value added (MVA) (FDRE-EPA, 2000). This has resulted in a major water pollution problem in Addis Ababa. The limited number of project specific river basin studies carried out so far by the Government bodies, have indicated that industrial/urban pollution of water resources is a problem especially in the Awash River and Rift Valley Lakes Basin. Furthermore, the new economic policy adopted by the government is envisaged to encourage the acceleration of local as well as foreign investment in the industrial and agricultural sectors of the country. The expected rapid development will have both positive and negative impacts. The economic development will improve the standards of living of citizens. However, the associated pollution could outweigh the benefits, particularly in Ethiopia which has poor infrastructure for public health and environmental protection (FDRE-EPA, 2000).

Ethiopia is one of the worst affected countries in the world by pollutions of any type due to its developmental stages and the ability and culture of people to prevent pollution. In Ethiopia, the pollution issues are not limited to urban centers as usually known and accepted, but also the rural areas are equally being affected. This is because; the environmental pollutants

including plastic materials are being produced in the country as well as brought indiscriminately into the country. Imported and locally produced pollutants are severely impacting the country i.e., its waters, soils, air, humans, plants life and the whole ecosystem.

Plastic trashes are however feared to dangerously pollute the environment thereby negatively impacting the health status of humans and other animals. This situation seems to be eminent in the Ethiopian Urban Areas and their peripheries. The trend of negligently utilizing plastic bags and bottles is on the rise. This seems to indicate that the worse is to come.

Plastic bags and bottles wastes pose serious environmental pollutions and health problems in humans and animals. The situation is worsened in economically disadvantaged countries like Ethiopia. The utilization of plastic bottles or bags is increasing from time to time in addition to the zero or non-existent of awareness of the residents about the adverse effects of these products.

With the mounting concern over global warming due to greenhouse gas emissions the carbon dioxide emissions of the plastics industry require discussion. The plastics industry generated greater than 2% of the total carbon emissions from U.S. manufacturers. In 1994 the U.S. plastics industry was responsible for 4.7 million metric tons of carbon dioxide emissions. The plastics industry had the third highest carbon emissions in the chemical sector behind industrial organic chemicals and industrial inorganic chemicals. The total carbon emissions resulting from energy consumption for the chemical industry were 78.3 million metric tons of carbon dioxide. In the intervening years plastics production has increased and one can assume that carbon emissions have increased as well. (Brian Mamoni, 2009).

Plastic productions, in addition to polluting the natural environments and negatively impacting the human health, as it was mentioned above, the plastic production activities are highly contributing to worrisome phenomenon of global warming.

As it is widely known, plastic materials are the most notorious type of pollutants and they can pollute any type of ecosystems

Put simply, plastic pollution is when plastic has gathered in an area and has begun to negatively impact the natural environment and create problems for plants, wildlife and even human population. Often this includes killing plant life and posing dangers to local animals.

2.8 Water: Basic Human Natural Resource

The majority of human uses require fresh water. Water is the most essential natural resource in the world, without it, man's existence will be impossible. Next to air, water is the most esteemed requirement for survival on earth. The search for domestic water has been man's utmost concern since the beginning of Civilization. Bustanmante et al. (2004) defined domestic water as commonly understood to include the water needs of families for drinking, cooking, washing and sanitation or hygienic purposes.

Water is a prime natural resource and a basic human need. Without having the access to potable water every human activity becomes meaningless and the right to use other resources will be violated (Pratiksha et al, 2012). Access to water is a fundamental need and constitutes one of the most important human rights. Peoples' lives and livelihoods depend on water. Demand for clean water increases continually in line with world population growth (WSSCC, 1990). Fresh water is a natural resource with high significance to the overall development contributing its lion share to all sectors including agriculture and for domestic supplies (Michael H., 2006). The management and protection of regional, national and international fresh water sources have reached a crucial period (Gleick, P. et al, 2001). By its very nature and multiple uses, water is a complex subject.

Natural resources are materials and components (something that can be used) that can be found within the environment. Every man-made product is composed of natural resources (at its fundamental level). A natural resource may exist as a separate entity such as fresh water, soil, and air, as well as a living organism such as a fish, plant or it may exist in an alternate form which must be processed to obtain the resource such as metal ores, oil, and most forms of energy.

Nowadays, there is much debate worldwide over natural resource allocations; this is partly due to increasing scarcity (depletion of resources) but also because the explorations, extractions,

exploitations and exporting of natural resources is the basis for many economies (particularly for developed and developing nations).

Water can be considered as a renewable material or resource, when carefully controlled usage, treatment, and release are followed. If not, it would become a non-renewable resource at that particular location. For example, groundwater is usually removed from an aquifer at a rate much greater than its very slow natural recharge, and so groundwater is considered non-renewable. Removal of water from the pore spaces may cause permanent compaction (subsidence) that cannot be renewed. 97.5% of the water on the Earth is salt water, and 3% is fresh water; slightly over two thirds of this is frozen in glaciers and polar ice caps (Earth's Water Distribution). The remaining unfrozen freshwater is found mainly as groundwater, with only a small fraction (0.008%) present above ground or in the air (Scientific facts on water).

Water is a natural resource of fundamental importance. It supports all forms of life and creates jobs and wealth in the water sector, tourism, recreation and fisheries (Ntengwe, 2005). Without water life as it exists on our planet is impossible (Asthana and Asthana, 2001). It is estimated that 8% of worldwide water use is for household purposes (WBCSD). These include drinking water, bathing cooking, sanitation, and gardening. Basic household water requirements have been estimated by Peter Gleick at around 50 liters per person per day, excluding water for gardens. Drinking water is water that is of sufficiently high quality so that it can be consumed or used without risk of immediate or long term harm. Such water is commonly called potable water. In most developed countries, the water supplied to households, commerce and industry is all of drinking water standard even though only a very small proportion is actually consumed or used in food preparation.

2.8.1. Access to Water

The Millennium Development Goal (MDG 7) on drinking-water was met globally in 2010. The target was to halve the proportion of the world's population without sustainable access to safe water. The 48 least developed countries did not meet the target, but substantial progress has been made with 42 per cent of the current population in these countries gaining access to improved drinking-water sources since 1990.

In the world, sharp geographic, sociocultural and economic inequalities persist, not only between rural and urban areas but also in towns and cities where people are living in low-income, informal or illegal settlements usually have less access to improved sources of drinking-water than other residents.

2.8.2. Water and Health

Although difficult to measure, the link that exists between water and health is indispensable. The World Health Organization estimates that, in developing countries, 25 million deaths a year occur due to the consumption of water contaminated by pathogens and pollution. To the same causes of death are attributed to the deaths of 4 out of 14 million children, less than 5 years old, who die each year. 80% of these diseases are due to the lack of access to a wholesome water supply and the absence of sanitation. (Water Solidarity Network (GRET), Water and Health in Underprivileged Urban Areas, February, 1994)

Contaminated water and poor sanitation are linked to transmission of diseases such as cholera, diarrhea, dysentery, hepatitis A, typhoid and polio. Absent, inadequate, or inappropriately managed water and sanitation services expose individuals to preventable health risks. This is particularly the case in health care facilities where both patients and staff are placed at additional risk of infection and disease when water, sanitation and hygiene services are lacking. (ibid)

Inadequate management of urban, industrial and agricultural wastewater in a country means the drinking-water of hundreds of millions or billions of people is dangerously contaminated or chemically polluted.

In urban areas of the developing world, at least 170 million people lack access to clean water for drinking, cooking, and washing; in rural areas, more than 855 lack clean water. Water supplies are contaminated by disease-bearing human waste and, in some regions, by toxic chemicals and heavy metals that are hard to remove from drinking water with standard purification techniques. Use of polluted water spreads diseases that kill millions and sicken more than one billion each year (World Resources Institute 1994-95)

Some 842 000 people are estimated to die each year from diarrhea as a result of unsafe drinking-water, sanitation and hygiene. But diarrhea is largely preventable, and the deaths of 361 000 children aged under 5 each year could be avoided each year if these risk factors were addressed. Where water is not readily available, people may decide hand washing is not a priority, thereby adding to the likelihood of diarrhea and other diseases. (ibid)

Diarrhea is the most widely known disease linked to contaminated food and water but there are other hazards. Almost 240 million people are affected by schistosomiasis an acute and chronic disease caused by parasitic worms contracted through exposure to infested water.

In many parts of the world, insects that live or breed in water carry and transmit diseases such as dengue fever. Some of these insects, known as vectors, breed in clean, rather than dirty water, and household drinking-water containers can serve as breeding grounds. The simple intervention of covering water storage containers can reduce vector breeding and may also have a co-benefit of reducing fecal contamination of water at the household level.

2.8.3. Economic and Social Effects

When water comes from improved and more accessible sources, people spend less time and effort in physically collecting it, meaning they can be productive in other ways. It can also result in greater personal safety by reducing the need to make long or risky journeys to collect water. Better water sources also mean less expenditure on health, as people are less likely to fall ill and incur medical costs, and are better able to remain economically productive.

With children particularly at risk from water-related diseases, access to improved sources of water can result in better health and therefore better school attendance, with longer-term consequences for their lives.

2.8.4. Water Sources

The MDG water target is measured by the proxy indicator of use of 'improved' or 'unimproved' drinking-water sources. But 'improved sources' are not necessarily safe. At least 1.8 billion people

use a drinking-water source that is contaminated with faecal matter. A substantial proportion of water supplied through pipes is contaminated, especially where water supply is intermittent or treatment is inadequate. Even where the source is good, water can be contaminated while being transported or stored, especially in environments where sanitation is inadequate and poor. WHO/UNICEF JMP, 2010

2.8.5. Challenges

Climate change, increasing water scarcity, population growth, demographic changes and urbanization already pose challenges for water supply systems. By 2025, half of the world's population will be living in water-stressed areas. Re-use of wastewater, to recover water, nutrients, or energy, is becoming an important strategy. Increasingly, countries are using wastewater for irrigation in developing countries this represents 7% of irrigated land. While this practice if done inappropriately poses health risks, safe management of wastewater can yield multiple benefits, including increased food production. *(February 1994, Water Solidarity Network).*

2.9. Drinking Water Supply and Sanitation

An estimated 80 per cent of all diseases and over one third of deaths in developing countries are caused by the consumption of contaminated water and on average as much as one tenth of each person's productive time is sacrificed to water related diseases. Concerted efforts during the 1980s brought water and sanitation services to hundreds of millions of the world's poorest people. The most outstanding of these efforts was the launching in 1981 of the International Drinking Water Supply and Sanitation Decade, which resulted from the Mar del Plata Action Plan adopted by the United Nations Water Conference in 1977. The commonly agreed premise was that " peoples, whatever their stage of and their social and economic conditions have the right to have access to drinking water in quantities and of a quality equal to their basic needs" (February, 1994) (Water and Health in Underprivileged Urban Areas), Water Solidarity Network.

WHO/UNICEF, (2014) the MDG drinking water target coverage of 88% was met in 2010. Whereas 76% of the global population had access to an improved drinking water sources in 1990. 89% of the global population had access in 2012, an increase of 2.3 billion people. Fifty six percent of the global population, almost four billion people, now enjoys the highest level of access: a piped drinking water connection on premises.

The MDG sanitation target aims to reduce the proportion of population without access to improved sanitation from 51% in 1990 to 25% in 2015. Coverage of improved sanitation increased from 49% in 1990 to 64% in 2012. Between 1990 and 2012, almost two billion people gained access to an improved sanitation facility, and open defecation decreased from 24% to 14 %, WHO/UNICEF, (2014)

Although the world met the MDG drinking water target, 748 million people most of them the poor and marginalized still lack access to an improved drinking water sources. Of these, almost a quarter (173 million) rely on untreated surface water, and over 90% live in rural areas. If current trends continue, there will still be 547 million people without unimproved drinking water supply in 2015. (WHO/UNICEF, 2014).

2.10 Access to Water and Sanitary Facilities

World Bank (1980), globally, the coverage of drinking water and sanitation needs is glaringly insufficient. Approximately, one and a half billion people in the world do not have access to drinking water and close to 2 billion are not served by sanitary facilities.

The World Bank estimates that in 1980, 62% of urban populations in developing countries had access to drinking water, and that a third among them benefited from sanitation networks. In general, more than 95% of urban effluent in developing countries is disposed of without any treatment.

2.11. Water Supply and Sanitation in Ethiopia

Ethiopia achieved the largest decrease in the proportion of the population practicing open

defecation (from 92 percent in 1990 to 29 percent in 2015); a reduction over five times greater than the regional average for the same period. Open defecation was practiced by 44.3 million Ethiopians in 1990 and 28.3 million in 2015; an average reduction of over 4 percentage points per year over 25 years. (WHO/UNICEF, 2015 JMP Reports)

Access to water supply in Ethiopia is amongst the lowest in Sub-Saharan Africa. While access has increased substantially with funding from foreign aid, much still remains to be done to achieve the MDG of halving the share of people without access to water by 2015, to improve sustainability and service quality.

Some factors inhibiting the achievement of these goals are the limited capacity of water bureaus in the country's nine regions and water desks in the 550 districts of Ethiopia (woredas); insufficient cost recovery for proper operation and maintenance; and different policies and procedures used by various donors, notwithstanding the Paris Declaration on Aid Effectiveness (WHO/UNESCO,2010).

In 2001 the government adopted a water and sanitation strategy that called for more decentralized decision-making; promoting the involvement of all stakeholders, including the private sector; increasing levels of cost recovery; as well as integrating water supply, sanitation and hygiene promotion activities. Implementation of the policy apparently was uneven.

In 2005 the government announced highly ambitious targets to increase coverage in its Plan for Accelerated Sustained Development and to End Poverty (PASDEP) for 2010. The investment needed to achieve the goal was about US\$300 million per year, compared to actual investments of US\$39 million in 2001-2002. In 2010 the government presented the equally ambitious Growth and Transformation Plan (GTP) 2011-2015, which aims at increasing drinking water coverage, based on the government's definition, from 68.5% to 98.5% (Mo FED: GTP, 2010), while donors have committed substantial funds to the sector, effectively spending the money and to ensure the proper operation and maintenance of infrastructure built with these funds remained a challenge.

According to MoWR (2005a and b) the coverage of safe water in the year 2005 for urban areas of Ethiopia was 80 % while the rural coverage was 35%. However, when it came to access only 38% of the total and 26% of rural population have access to safe and clean water sources (WHO/UNICEF, 2010). In addition, as noted by MoWR (2005a and b) the quality and quantity of water available did not meet demand and for supply at an appropriate time when consumers

should get service. Moreover, the physically powerful urban bias on the part of succeeding government since the early 1970s has kept back water supply savings in the rural areas, quite low. Accessible information in the water treatment of the country exposed that; urban people in the country had improved access to water supply service than rural areas.

2.12 Bottled Drinking Water Productions

2.12.1 History of the Bottled Water Industry

The earliest modern bottled water company was founded in the United States in the middle of the 19th century. In 1845, the Ricker family of Maine bottled and sold water from a so-far unidentified source. Their small operation quickly grew; capitalizing on the spring's supposed medicinal properties, eventually becoming the Poland Springs Water Company. (polandspringinns.com, 2006). Mirroring the Ricker success, in 1905, the Ozarka Spring Water Company was founded in Eureka Springs, Arkansas. Since then, the bottled water landscape has expanded tremendously. This expansion has come mostly recently, and it seems to the author to be the acceleration of a slowly expanding industry. Between the early part of the 20th century and its end, there was little activity in the bottled water industry. The bottling companies eventually formed their own lobbying group in 1950 in order to promote their product, and have only been recently successful.

Now, there are hundreds of companies and thousands of brand names of bottled water, and worldwide consumption is in the billions of dollars. Currently, both the Ozarka and Poland Spring brands are owned by Nestlé, and are part of Nestlé's seventy-five US water brands (US Water News, 2003).

2.13 Waste Disposal and Environmental Concerns

According to the data obtained from Environmental Protection Authority, the existing level of non-point source of water pollution and point source of water pollution are highly deviating from the

International Standard and this calls for considering environmental issues as a major development strategy. (UDI 2002)

Environmental problems are also among the most serious challenges of socio-economic development of the country. Any types of waste cause pollutions. In nature, pollutants are many in the environment depending on the location of the natural environment.

2.14. What and where of Pollutions?

Pollution, we hear it every other day at schools, colleges and read about it in newspapers. So what is it? Pollution occurs when pollutants contaminate the natural surroundings; which brings about changes that affect our normal lifestyles adversely. Pollutants are the key elements or components of pollution which are generally waste materials of different forms. Pollution disturbs our ecosystem and the balance in the environment. With modernization and development in our lives pollution has reached its peak; giving rise to global warming and human illness.

Water pollution is the most serious environmental problems facing developing countries because of its direct effect on human welfare and economic growth (World Development Report, 1992).

2.15 Plastic Bottles or Wastes Disposal

Plastics have proliferated so readily throughout the modern world because of their versatility. Plastics can be flexible or rigid, brittle or resilient, clear or colored, and have many other useful properties. Some plastics are electrically conductive while others are excellent insulators. It is widely divergent properties such as these that allow a plastic to perform almost any role. In general plastics have a high strength to weight ratio that allows products made of plastics to be lighter and less bulky. Plastics are also less costly alternatives to metals and wood for many applications, such as packaging. The ability to add pigments directly to plastics instead of applying paint is also a benefit. To summarize, plastics have not become popular because they are a superior material but rather that they are many superior materials. *Brian Momani, March 2009*

Plastics are a specific subset of polymers. Therefore to understand plastics one must first understand polymers. A polymer is a molecule made up of a large number of small repeating subunits. A polymer subunit is called a monomer. Polymers come in three major varieties. Inorganic polymers are substances such as concrete or glass. DNA, proteins, and polysaccharides such as cellulose and glycogen are examples of natural organic biopolymers. The monomer units of DNA are nucleic acids. The monomer units of proteins are amino acids. The monomers of polysaccharides are sugars. A single protein often contains hundreds or even thousands of amino acid monomers, which are called residues.

The final class of polymers is synthetic organic polymers. Most plastics are synthetic organic polymers. The word organic in this name means carbon based. The reaction by which monomers bond to form a polymer is called polymerization. Polyvinyl chloride or PVC as it is commonly known was the first synthetic organic polymer to be produced. It was polymerized accidentally in 1838 but at the time could not be made into a viable plastic. *Brian Momani, March 2009*

The practice of plastic materials disposals are unknown to Ethiopia and due to the pressures created by massive wastes produced in the country people have now started to think about it from time to time. We shall take and see the experiences of other countries in order to help us understand and combat the ill effects of plastics or plastic materials accumulations in the country.

Figure 2.1: - Accumulation of Plastic Bottles Wastes in one place



Source: - Current or Own Survey

The final stage in the life cycle of plastics in some case is disposal. For instance, in India, there are three common ways of getting rid of plastics by dumping them in landfills, by burning them in incinerators or by littering them.

Landfill is the least preferable option for the management of plastic waste since no use is made of any of the resources represented by plastics. Although it requires space, it is still the most commonly practiced waste disposal method in the majority of countries. Due to the low costs of landfilling, alternative waste management options are often unattractive from the economics point of view.

In the case of **littering**, plastic wastes fail to reach landfills or incinerators. It is the improper way of disposing plastics and is identified as the cause of manifold ecological problems.

Incineration is a process in which plastic and other wastes are burnt and the energy produced. As a result, the energy is tapped. In Sweden, 95 percent of the heat generated from incineration is used for district central heating thereby covering roughly ten per cent of the country's total need [Policy-Makers in India too advocate it as a sound option]. Several big cities like Mumbai and Chennai have entered into agreements for converting waste to energy plants. In Chennai, for

instance, a 14.85 MW waste to energy plant will be set up in the next two years where 6,000 tons per day of municipal solid waste would be converted to electricity. Incineration of plastic wastes also significantly reduces the volume of waste requiring disposal. It is believed that the volume reduction brought about by incineration ranges from 80 to 95%. It is also a suitable option for disposing waste that cannot be recycled further or is non-recyclable. (EIA, 2012)

Open burning is not an environmentally acceptable solution for any kind of waste. Special regard must be given to the obligations and responsibilities set out in the Stockholm Convention on Persistent Organic Pollutants (POPs) with respect to the goal of preventing the formation of unintentional POPs from incineration operations. (UNEP, 2002)

The pollution that occurs in the disposal stage is largely during incineration and when plastic wastes fail to reach landfills or incinerators. Given the limited recyclability of plastics, a large amount of plastic waste is burnt in incinerators. Even in some of the villages in India, plastic and other portions of the waste stream are frequently burned in "back-yard" fires. But the burning of these chlorine-containing substances releases toxic heavy metals and emits noxious gases like dioxins and furans. The latter two are two of the most toxic and poisonous substances on earth and can cause a variety of health problems including damage to the reproductive and immune systems, respiratory difficulties and cancer. In fact, dioxin has been shown to have hormonal activity and is an endocrine disruptor.

It has been observed that due to an inefficient and faulty waste collection and transit systems, a large amount of plastic waste fails to reach landfills or incinerators. Instead they are left behind to find their way into the soil, the sewage system and the water bodies. They choke the gutters and drains and during the rainy seasons, flood streets causing severe health problems. When plastic wastes get dispersed in urban fringes or in rural zones, they clog the soil preventing the free flow of water through it and depleting its fertility. It is also said that when plastics reach the rivers, seas and oceans, they pose a serious threat to marine animals like sea turtles, seabirds and fish. If marine animals mistaking them to be authentic food, consume plastic objects and pellets, they can clog their intestines leading to death out of starvation or malnutrition. (Brittany Turner & Jessica Sutton, March 2012)

2.15.1 Plastics: The Common Chemical Product with Diverse Applications

Plastics are organic polymeric materials consisting of giant organic molecules. Plastic materials can be formed into shapes by one of a variety of processes, such as extrusion, molding, casting or spinning. Modern plastics (or polymers) possess a number of extremely desirable characteristics; high strength to weight ratio, excellent thermal properties, electrical insulation, resistance to acids, alkalis and solvents, to name but a few. They are usually synthetic, most commonly derived from petrochemicals, but many are partially natural. Most of the plastics we use today have been developed within the last 50 years or so. The majority of them is man-made and is usually described as synthetic products, or in other words, they are made by a process of building up from simple chemical substances

2.15.2. Biodegradability of Plastic Products

Biodegradable plastics break down (degrade) upon exposure to sunlight (e.g., ultra-violet radiation), water or dampness, bacteria, enzymes, wind abrasion, and in some instances rodent pest or insect attack are also included as forms of biodegradation or environmental degradation. Some modes of degradation require that the plastic be exposed at the surface, whereas other modes will only be effective if certain conditions exist in landfill or composting systems. Starch powder has been mixed with plastic as a filler to allow it to degrade more easily, but it still does not lead to complete breakdown of the plastic. Some researchers have actually genetically engineered bacteria that synthesize a completely biodegradable plastic, but this material, such as Biopol, is expensive at present. The German chemical company BASF makes Ecoflex, fully biodegradable polyester for food packaging applications, (City Government of Addis Ababa, EPA 2012).

2.15.3 Plastic Grocery Bags: The Ecological Footprint

These are the simplest products we know and observe here and there. Forgetting plastic bottles and other plastic products of bigger diameters, we can easily take and understand the impacts of plastic grocery bags in our immediate environments, because plastic grocery bags are everywhere, in the air, water bodies, agricultural fields, soils, landfills, in our drawers, kitchens etc. Therefore, to easily understand the effects and impacts of plastic materials and their management issues, let's take plastic grocery bags or locally known as '*festal*' for our easy and simple understanding.

One of the most common items in our modern world is the ubiquitous plastic grocery bags. Highly convenient, strong and inexpensive, plastic grocery bags are appealing to both customers and businesses as a reliable way to deliver goods from the store to home. However, there are several issues associated with the production, use, and disposal of plastic grocery bags which may not be initially apparent to most users, but which are nonetheless extremely important. By assessing the lifecycle of plastic grocery bags, we can better understand the full ecological footprint of the plastic bag or other plastic materials, and find more effective means of dealing with the associated negative impacts.

2.16. Potential Adverse Impacts With Respect To Manufacturing

2.16.1. Impacts of Energy Requirements

The energy used to make one high-density polyethylene (HDPE) plastic bag is 0.48 mega joules (MJ). To give this figure perspective, a car driving one kilometer is the equivalent of manufacturing 8.7 plastic bags. If a country such as Ireland, with approximately 1.23 million shoppers, switched 50 % of plastic bag users to cotton, 15,100 tons of CO₂ emissions would be saved per annum. This is equivalent to one person driving around the world 1,800 times. The Ireland study illustrates the immense environmental impacts to be made through a cultural shift to more ecologically responsible choices. The societal acceptance of plastic shopping bags is an integral part of the entire ecological footprint. *Brian Momani, 2009*

2.16.2. Air and Water Pollution

The pollution created from plastic bags or plastic materials is a growing problem and can be seen in many different forms. In developed societies, plastic bags are discarded in landfills where they take up a significant portion of landfill space. Not only is space an issue, but it takes hundreds of years for plastic bags to completely decompose. Meanwhile, the decaying particles have negative effects on the soil and water surrounding landfills. Unfortunately, plastic bags are not confined to landfills. The amount of pollution plastic bags create cover open streets and in oceans. Analyzing the growing marine debris centers, such as “trash islands,” can help to understand plastic bags’ or plastic materials role in ocean pollution.

The other potential adverse impacts from the general perspectives of manufacturing projects of plastic shopping/grocery bags encompasses the adverse impacts with respects of the corresponding sources and cause of impacts. Thus the impacts as a result of energy requirement, process emissions, shipping and transportation of raw materials and human health are accordingly given or illustrated in the following sub sections.

Air pollution caused by the emission of toxic chemicals and CO₂ during the manufacturing of plastic bags is a significant part of the environmental impact of this product. According to the study for Lifecycle Environmental Assessment, the manufacturing of two plastic bags produces 1.1 kg of atmospheric pollution, which contributes to acid rain and smog. Acid rain is recognized as a serious threat to natural and human-made environments, particularly in regions which have historically relied heavily on coal, such as Eastern Europe. Smog is also a well-documented and significant problem, particularly concerning human health. Additionally, the manufacturing of two plastic grocery bags produces 0.1 g of waterborne waste, which has the capability of disrupting associated ecosystems, such as waterways and the life that they support. To exacerbate the problems of air and water pollution, most plastic shopping bags are made in countries with few environmental regulations, such as China, which results in even greater impacts on the environment and human health. (City Government of Addis Ababa, EPA 2012).

2.16.3. Shipping and Transportation

Following manufacturing, the plastic grocery bags are subsequently shipped all over the world; Australia alone imports 4 billion bags annually. Container ships used to transport these bags to each consumer country use fuels which produce high levels of pollutants, such as Sulphur. Annual trips multiply this environmental damage as manufacturers try to accommodate the increasing demand to numerous countries.

To illustrate, of the estimated 4 to 5 trillion plastic bags produced per year, North America and Western Europe account for nearly 80 per cent, with the U. S. eventually throwing away 100 billion plastic grocery bags annually. Australia uses 7 billion plastic bags annually, of which 53 % come from supermarkets. The United Kingdom consumes between eight and 10 billion bags annually, and in Taiwan this number rises to 20 billion. The ecological footprint of the plastic bag grows with each increasing statistic.

2.16.4. Health Impacts

Toxic emissions produced during the extraction of materials for the production of plastic grocery bags, their manufacturing, and their transportation contribute to acid rain, smog, and numerous other harmful effects associated with the use of petroleum, coal, and natural gas, such as health conditions of coal miners and environmental impacts associated with natural gas and petroleum retrieval.

2.17. Use and Immediate Disposal of Plastic or Grocery Bags

Plastic grocery bags have been a part of daily life in developed countries since their introduction in 1977), and in more recent years, their use has spread to many developing countries as well. Unfortunately, the most common final resting place for garbage bags is the garbage bin, resulting in countless numbers of bags filling landfills and spilling over onto essentially every other surface of

the planet. It is the very prevalence of these bags that result in several critical environmental and social impacts associated with their use and immediate disposal.

2.17.1. Potential Adverse Impacts with Respect to Use and Disposal

2.17.1A. Land Pollution

Due to many factors, not the least of which is their ready availability, 96 per cent of all grocery bags are thrown into landfills. However, plastic bags decompose very slowly, if at all. In fact, a bag can last up to 1000 years, inhibiting the breakdown of biodegradable materials around or in it.

Lightweight plastic grocery bags are additionally harmful due to their propensity to be carried away on a breeze and become attached to tree branches, fill roadside ditches or end up in public waterways, rivers or oceans. These features are what we always see on Ethiopian soils. In one instance, Cape Town, South Africa, had more than 3000 plastic grocery bags that covered each kilometer of road. In this century, an estimated 46,000 pieces of plastic are floating in every square kilometer of ocean and seas worldwide polluting the marine environment.

Plastic and plastic debris in our oceans is a man-made, unnatural phenomenon that is bound to have repercussions on ecosystems and animals within those ecosystems. Entire food webs can be affected. The micro-plastics and other debris that accumulate on top of the surface can block sunlight from reaching organisms below. Giant garbage patches have an overwhelming effect on the amount of sunlight being absorbed by those regions. Blocking the sunlight entering the ocean organisms that produce their own nutrients from oxygen, carbon, and sunlight. These communities are threatened when the debris blocks sunlight and nutrients from reaching them. Many animals in the marine community depend on algae as their primary source of nutrients. Animals such as fish and turtles will in turn be affected if the population of algae and plankton decreases. Consequently, animals that feed on fish and turtles, such as tuna, sharks, and whales may also suffer. It is important to be aware of how a single-use plastic grocery bag will hold your eggs and bread, but may end up littering the oceans and contributing to the overall harm of marine debris. Plastic and plastic bag pollution has consequences affecting marine life in many ways: harming habitats, marine life, and the overall food web. (Brittany Turner & Jessica Sutton, 2012)

2.17.1B. Impacts on wildlife and other domestic animals

Most distressing, over a billion seabirds and mammals die annually from ingestion of plastics. In Newfoundland, 100,000 marine mammals are killed each year by ingesting plastic. However, the impact of plastic bags does not end with the death of one animal; when a bird or mammal dies in such a manner and subsequently decomposes, the plastic bag will again be released into the environment to be ingested by another animal.

2.18. Social Impacts

2.18.1 Impacts on Human Health

Impacts on human health are perhaps the most serious of the effects associated with plastic grocery bags or the plastic materials, ranging from health problems associated with emissions, to death. Earlier in history, the city of Mumbai, India experienced massive monsoon flooding, resulting in at least 1,000 deaths, with additional people suffering injuries. City officials blamed the destructive floods on plastic bags which clogged gutters and drains, preventing the rainwater from leaving the city through underground systems. Similar flooding happened in 1988 and 1998 in Bangladesh, which led to the banning of plastic bags in 2002. By clogging sewer pipes, plastic grocery bags also create stagnant water; stagnant water produces the ideal habitat for mosquitoes and other parasites which have the potential to spread a large number of diseases, such as encephalitis and dengue fever, but most notably malaria.

2.18.2. Impacts on Livelihood

Loss of livelihood is another major social impact connected to the use of plastic grocery bags; two primary examples are the loss of livestock and impacts on tourism. Concerning livestock, plastic grocery bags are often caught in trees or along fences, where they are mistakenly eaten by animals, leading to suffocation or blockage of digestive tracts, and eventually death. South Africa, Kenya, Somaliland, and India are four nations that report high levels of these problems, with as many as

100 cows dying per day in India. Plastic grocery bags or all sorts of wastes or garbage materials also have the potential to leach their chemical components and toxins into soil and water sources, which can be passed on to humans, resulting in health dangers such as neurological problems and cancers.

Figure 2.2 A Leachate/dissolved chemicals flowing from the Addis Ababa Central Trash Hill or Qoshe and Polluting the Surrounding Environment (A video show)



VID_20160919_170549.3gp

Source: - Current or Own Survey

In many countries tourism is vital to the livelihoods of local people and national governments; this industry is also impacted by plastic grocery bags, both in terrestrial and marine environments. In the Himalayan Mountains, plastic bags became such a problem, particularly because of their disruptiveness to the visual beauty of tourist spots, that the Indian state of Himachal banned them and imposed a fine of up to \$2000 US for the use, production, selling, storing or distribution of polythene bags. In marine environments, bags can entangle, suffocate, or cause blockage in digestive tracts in marine animals, including marine birds, turtles, seals and whales, impacting the appeal of marine tourism. Plastic grocery bags also significantly contribute to beach litter, which requires expensive cleanup projects at tourist resorts.

2.18.3. Impacts on Government and Politics

The production and use of plastic grocery bags have several important political impacts. Because Western Nations have infrastructures that are able to deal well with waste and recycling, these nations generally do not feel the same effects of plastic bags in the environment. However, this is far from the case in developing nations like ours where waste management is not well established or is non-existent.

The effects of plastic bags are most severely felt in poor and rural areas, where shopping bags are dispensed and used widely but not disposed of properly. The footprint of plastic grocery bags or materials also includes high civic costs to governments, most of which are incurred through clean-up efforts. Plastic grocery bags or materials can litter roads, sewers and waterways, making litter

collection and disposal difficult and costly. High costs are being shouldered by governments and taxpayers, which results in the loss of funds from other services offered by the government. Because of this myriad of problems, many governments have banned plastic grocery bags or trashes entirely, or imposed levies on their use.

Figure 2.3 Plastic Wastes or Trashes Dispersed on Addis Ababa City Asphalt Ring Road



Source: - Current or Own Survey

2.19. Waste Management and Recycling

2.19.1. Managing Waste

Although plastic bags can be used over and over again, particularly in comparison to a paper bag, they are most commonly thrown into the garbage once they are no longer useful since recycling services for plastic bags are not yet available in the country. The recycling rates for plastic bags are extremely low, only 1-3 per cent, primarily attributed to three reasons.

First, plastics are made from many different resins, and because they cannot be mixed, they must be sorted and processed separately. Such labor-intensive processing is expensive in high-wage countries like the United States and Canada. Most plastics also contain stabilizers and other chemicals that must be removed before recycling.

Second, recovering individual plastic resins does not yield much material because only small amounts of any given resin are used per product.

Third, the price of oil used to produce petrochemicals for making plastic resins is so low that the cost of virgin plastic resins is much lower than that of recycled resins. As a result, recycling is not a simple and viable solution to lessen the ecological footprint of the plastic grocery bags.

2.19.2. Recycling, Incineration and Disposal

In all stages of a plastic bags' or plastic materials life, from manufacturing to disposal, negative social and environmental impacts are evident. The planet's environment, including its soil, water and air, is affected directly in numerous ways, beginning with the extraction and use of fossil fuels during the manufacturing process of plastic bags or materials. Emissions resulting from this process are also very harmful to both humans and the physical environments, and the transportation of plastic bags from their country of origin to their place of use also contributes significantly to the environmental footprint of this product. Further negative impacts are found during the use and immediate disposal of plastic bags or materials, particularly in non-industrial nations like Ethiopia where waste management services are not well-developed or non-existent. In these regions, plastic bags or materials are found everywhere, from remote tourist destinations to city streets where they can clog drain pipes, contributing to massive flooding which has already cost thousands of lives in many other countries.

Example in our country is the oldest *Abba Samuel Dam in Akaki area*, which is highly polluted. The waste such as plastics carried down the courses of rivers polluted the farm land too. The farmers must remove all sorts of wastes dropped by the rivers during flooding, which is extra activity to cultivation (RCDE 2012).

Plastic bags or materials are also problematic to concerning the livelihoods of local people and national governments, both in terms of the loss of agricultural potential like in areas of Akaki and Sabbata Hawas Woredas and impacts on tourism, in addition to the high cost of cleanup which falls to local and national governments. Reducing the economic footprint through recycling and therefore reducing the use of landfills, incinerators, and raw materials is not as important as the

other benefits of recycling, which reveal how the net economic, health, and environmental benefits far outweigh the costs. Correcting our faulty economic system in which the market price of a product does not include the harmful environmental health costs associated during its life cycle could reveal the true costs of plastic bags or materials consumption.

The question of plastic bags ultimately comes down to the issue of use. If people are willing and able to use environmentally-friendly alternatives, such as reusable cloth or plastic bags, the decreasing use of plastic bags will reduce their overall footprint. However, without educating the public concerning the impacts of plastic grocery bags or constructing barriers to their use, business will continue as usual. Many governments have chosen the route of taxes or levies on plastic bags, to great success. Perhaps in a culture where convenience often comes before environmental concern, speaking to consumers' pocketbooks may be the only way to effectively deal with this ever-increasing problem.

CHAPTER THREE: RESEARCH METHODOLOGY

The methodology section focuses on the system of the research. These are research design, description of study area, sampling methods, data collection approach, methods of data analysis and presentation. It considered the full range of possibilities for data collection in the study and organized by their degree of predetermined nature, their use of closed-ended or open-ended questioning methods.

3.1. Research Area Description

The Sabbata Hawas Woreda Administration is one of the woredas of the Oromia Regional State of Ethiopia; part of the Oromia Special Zone surrounding Finfinne, with its administrative seat in Sabbata Town. Sabbata Town is located at 25 km to the South-West of Addis Ababa City Administration along Jimma main road. Prior to Sabbata Hawas Woreda was named, the woreda was called Alemgana Woreda until 1998 E.C/2006 G.C. Locationally the Woreda is situated

between 08°37'N-09°03'N latitude and 38°25'-38°46'E Longitude. The Woreda shares common boundary with Walmara Woreda and Addis Ababa City Administration to the North and East, Akaki Woreda in the South- East, Ilu, Ejere and Tole Woredas to the West and Qarsa Malima Woreda to the South. The Awash River separates this woreda from Mirab Shewa Zone of the Oromia Region. The total surface of the woreda is 68,825 hectares. The altitude of the woreda ranges from 1,750 meters above sea level to about 3,385 meters. The mean annual rainfall of the woreda is about 1,033mm and its mean annual temperature is about 21.5°C. The woreda has some vegetation covers. The vegetation cover is dominated with cutpurses *lusitania*, *olia africana*, *juniperus procera*, *eucalyptus tree*, *cordia africana*, *acacia abysinica* and *casuarina equistifolia*. However, wild life protections have been less exercised in the district/woreda. The soil type that existed in the woreda is black (65%), red (15%) & mixed soil (20%) Source (Oromia BOFED, 2014).

The total area of the Woreda is 72,542 hectares, of these, the cultivated is 60,719, pasture land 2,254, forest 2,148, and degraded land 5138, the land used for investment 2,283 has been found respectively (Oromia BOFED, 2014).

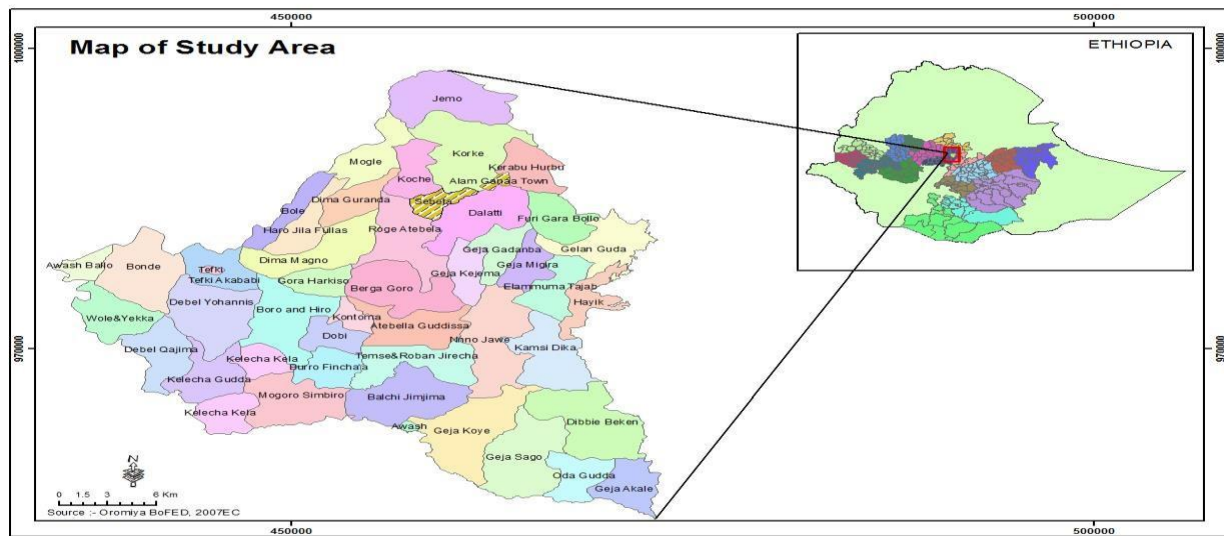
The woreda consists of 39 rural kebeles and 2 town centers (Tefki and Awash- Melkakunturre). This woreda's total population Census for 2007 projected is 219,141 including urban dwellers, of which 111,481 (50.88%) are males while 107,660 (49.12%) are females (CSA, 2007). With regards to the ratio of rural urban population of the district, the rural population accounts for 115,554 while the urban population is 103,587. Population density of the Woreda is very high because Sabbata Hawas Woreda and its capital are found nearest to the Capital City of the country and it is the industrial area.

Both Livestock rearing and crop production are the main economic activities of the majority of communities. Teff, Wheat, and Barley are the major crops grown in the woreda. The major livestock reared in the woreda include cattle, sheep, goats and horses. Many farmers have no adequate farm land. More than 55% of the farmer households have owned less than 1.5 hectares of land-holding per household (BOFED, 2014). As a result, farmers produce less number of animals and reduced amount of crops.

Out of total population 88 percent of the populations have been engaged in mixed economic

activities (both crop production and livestock rearing). The woreda also has mineral resources such as white stone, black stone, sand stone and red sand (scoria). With the exception of the two town/urban centers and five of the rural kebeles all the rest have no access to electricity. In the district there are 38 healthy posts, 6 healthy centers, 28 first cycles (1-4) 33 primary secondary cycles (5-8). (Oromia BOFED, 2014)

Figure 3.1 Locations of Sabbata Hawase Woreda



Source: Oromia Finance and Economic Development Bureau, (2007 E.C)

3.2. Research Design

The study has adopted descriptive and explanatory research types. The reason is that it attempted to understand and describe the managements of the bottled drinking water production and the associated plastic bottles or plastic materials disposal situations as well as its social and environmental challenges. This helped the researcher to describe information in depth. Due to this, the researcher followed the descriptive and explanatory design method to undertake this study and the results were described in depth. Finally, research objectives based findings, conclusion, and recommendations were drawn, as stated under each topic.

The purposes of this study were

To investigate whether the requirements in the Compulsory Ethiopian Standards for the quality of Bottled Drinking Water are properly exercised by bottled drinking water producing and marketing companies, the retail traders and individual end-users.

To assess how the concerned Governmental Organizations or Authorities are enforcing the Requirements of the Compulsory Ethiopian Standards and other directives by concerned parties in productions and management practices of Bottled Drinking Waters (storage, transportation and handling etc.) processes in the areas.

To know the perceptions of the users or communities about Bottled Drinking Waters products qualities and management practices in relation to the Compulsory Ethiopian Standards and other directives by concerned parties set for the quality management practices of bottled drinking waters.

To assess the perceptions of the producers and users about the problems posed by the plastic bottles or materials in the areas.

So, the research design that was carried out in the specific areas of Sabbata Hawas Woreda has focused on bottled water production and products managements and associated plastic bottles or materials disposal issues.*3.3. Research Approach*

Research approach used was qualitative and quantitative. The reason is, because, the research has dealt with the management aspects of bottled drinking water and its associated plastic bottles or plastic materials disposal situation analysis. For social bottled drinking water situation analysis, qualitative and quantitative approaches were more appropriate. Similar to this, qualitative and quantitative research involved the use of qualitative and quantitative data, such as focus group discussions, interviews on the perceptions of groups like end-users and sellers of bottled drinking water and tap water, marketers of the bottled drinking waters brands and researcher observations. These approaches assessed the social issues related to water and explained them. Due to these, the researcher decided to make use of qualitative and quantitative approaches. These gave the researcher a better opportunity to analyze and narrate the main purpose of the research.

3.4. Sampling Methods

The total population which participated in the study of bottled drinking water brands, the managements of the products and its associated plastic bottles or plastic materials disposal were different groups of people, organizations and institutions. All of them were heterogeneous groups and dealt with the different aspects or processes of the water bottling, handling and management conditions including the public tap water handlings. Therefore, as to the research definition of population, it is heterogeneous group of population. For such heterogeneous and varied or bigger groups of population, the researcher had to find means of sampling, in order to ease the work of the research. That is to use sampling method that fits the existing nature of the population. So, the possibility for the researcher was, taking the purposive selection of the population samples as the population groups are not arranged in some orders to follow the simple random sampling or systematic random sampling methods. Therefore, based on the above explanations, the heterogeneous samples/groups were purposively selected as follows.

3.4.1. The Tap or the Bottled Drinking Water Brands End-Users Groups

These individual groups were asked about their perceptions on drinking waters, both bottled drinking and publicly or municipally supplied water through providing them the well prepared questionnaires or questions. The groups were both male and female and believed to be well educated among the communities. The questionnaires were distributed to them and their perceptions about potable waters were collected. These groups of male and female individuals constituted about 70 of all the participants in the survey. The type of information collected from these groups were, the quantitative type ones. The questionnaires prepared for these groups are annexed at the end of this report.

3.4.2. Bottled drinking water marketers or sellers

These groups also included both male and female individuals who sell the bottled drinking water in their shops, groceries and supermarkets through receiving the bottled drinking waters from the

bottlers or manufacturers. The groups were asked about their perceptions on managements of plastic bottled waters and associated plastic materials disposal and impacts on human health and the natural environments. The information collected from these groups were of the quantitative types and they were also inquired for their recommendations and suggestions on how to manage the productions, handle and manage the bottled drinking waters and the disposal and the managements of the associated plastic materials or trashes in the areas.

3.4.3. Regulatory and Bottled Drinking Water Brands Controlling Governmental Bodies

The federal, regional and zonal and woreda level offices were included in these groups. Some of them have prepared guidelines and standards and periodically enforce them. Others provide operational agreements to the factories manufacturing the water products. Some grant water wells or lands to the water bottling and marketing companies in the areas. These governmental organizations include, Ethiopian Standards Agency (ESA), Ethiopian Conformity Assessment Enterprise (ECAE), Ethiopian Food, Medicines and Health Care Administration and Control Authority (EFMHACA), and Oromia Regional Water Resources and Minerals Development Bureau (ORWRaMDB). Most of them have been interviewed about their tasks and responsibilities regarding the bottled drinking water brands administrations and control aspects.

3.4.4. Bottled Drinking Waters Company Owners, Managers or Workers.

This group comprised the water bottling companies operating in Sabbata Hawas Woreda and the villages surroundings in it. These companies were engaged in producing bottled drinking water brands and marketing them.

3.4.5. The Woreda Level Governmental Offices

The lower level Woreda level authorities were put under these categories. These were Sabbata Town Water Supply and Sanitation, Sabbata Town Investment Office, Finance and Economic Development, Woreda Administration Offices and others were the sources of information at the project area level.

Constraints encountered during data collection from all the participants

Yet, there were some problems encountered the researcher to deal with all the purposively selected Key Informants and Water Manufacturing Companies to get and interview them in their respective offices, because, some of them for being busy as regards the governmental offices and for the water bottling companies, for not being willing to give information on their companies' operations. The act of not giving information to the researchers by many companies is the common practice in Ethiopia. To solve the problems of meeting the above groups and collecting an adequate information from the Water Bottling Companies and governmental offices, the researcher visited the areas and respective offices several times, that is the governmental offices and the bottled drinking water company offices to get concerned people or officials for discussion. Yet, the researcher failed to get people in needed numbers as required. The above indicated issues created some inconveniences on the way to go with smoother and faster procedures. There were other challenges faced by the researcher during data collection with the bottled drinking water end-users and bottled drinking water sellers or marketers. a) The number of samples being high in number to have contacts. b) Time consuming and costly c) When questionnaires were distributed to be filled, most of the respondents did not return the filled questionnaires on time and for they have their own tasks.

Therefore, the researcher decided to go with some of the key informants willingly available as purposively selected. After this decision, information collections from all the willing and available groups as well as discussion and interviews were held, by visiting and distributing questionnaires to population or individuals available in all groups.

3.5. Instruments

The researcher utilized open-ended interview questions, prepared questionnaires, archival references, web-sites and researcher observations. The reason for using open-ended interview questions were that the questions allow the interviewer to freely discuss the facts related with the current topic and collect relevant information pertinent to the topic without frustrations.

The reason why researcher utilized prepared questionnaires was that it involved many people in the data and information collection. This is an opportunity to have people with different views, backgrounds and experiences in a group and gather information with a better depth. Archival and web-sites references and researcher observations were utilized to collect the secondary and primary data.

The interview checklists and the survey questionnaires and questions were drafted, prepared and submitted to the supervisor for approval before being used for data collection.

3.6. Data Collection

3.6.1. Primary Data Collection

Primary data were gathered from bottled drinking water end-users, retailers or marketers, bottled water company owners or managers, some governmental offices and researcher observations, with the help of interviews, questionnaires distributions and researcher observations.

3.6.2. Secondary Data Collection

Secondary data were gathered from archival, documentary references and web-sites in different sources and offices.

3.7. Data Analysis

To analyze the data, the following steps were followed.

First, the data were, polished and described in the way they are clear for analysis. Second, the data were categorized in terms of the research question. Thereafter, the data were analyzed in relevant software like Epi Info Software, Version 3.5.3 and interpreted accordingly. By doing this, finally the results and discussions were drawn.

CHAPTER FOUR: RESULT AND DISCUSSION

This chapter deals with analysis, interpretation and presentation of the results and data collected or obtained through open-ended questions, structured questionnaires and interviews as well as researcher's observations. The researcher has analyzed the data collected. The results have been discussed and presented under the groups from where the information or data were collected.

4.1. Results & Discussions on Bottled Drinking Water Brands End-Users Group

4.1.1. A. Demographic Characteristics of the Respondents.

Utilizing the questionnaires survey, for collecting the data from bottled and tap water end users group, a total of 70 purposively sampled individuals were selected from the study areas. Of selected respondents, 77.5 percent were male while 22.5 percent were female. Regarding the ages of respondents, 70.0 percent were between 30 and 65, 25.7 percent between 20 and 30 and the remaining 4.3 percent were less than 20 years of age. Regarding the level of the education of the respondents, 91.3, 4.4 and 4.3 percent were Bachelors' Degree and above, Diploma as well as Grade 9-12 respectively. Also, when the marital statuses of the respondents were seen, the majorities (63.8%) were married, 34.8 percent were single, and 1.4 percent were divorced. Among the respondents who gave their perceptions on bottled drinking water, municipal tap water and plastic bottles or material disposal issues, the majorities were male respondents. In general one can say that most of the respondents were educated male having first degree and married. The detail was given by Table 4.1 below

Table: 4.1A Demographic characteristic of the end-user respondents.

Variables	Categories	frequency	Percent	Cumulative Percentage
1. Sex of the respondents	Male	55	77.5	77.5
	Female	16	22.5	100
2. Age of the respondents	less than 20 years of age	3	4.3	4.3
	Between 20 and 30	18	25.7	30
	Between 30 & 65	49	70	100
3. Level of Education	Grade 9-12	3	4.3	4.3
	Diploma	3	4.3	8.7
	Bachelor's Degree & above	63	91.3	100.0
4. Marital Status	Single	24	34.8	34.8
	Married	44	63.8	98.6
	Divorced	1	1.4%	100

4.1.1 B. Discussion on perceptions by End-Users regarding the Bottled Drinking Water Brands

The responses given by the bottled drinking water end-user groups in relation to questions related to their perception on bottled drinking water brands presented to them were as follows.

Related to the sustainability of the water products, the responses given were 41.4% as neutral, 37.1% as good, 12.9% as poor 7.1% and 1.4% as very good and very poor. The responses given were indicating that the sustainability of water bottling is not well known and perceived by the respondents or the communities and the knowledge of these products by the users is unsatisfactory and poor. Regarding, the statement on the cleanliness or purity of the bottled water brands 45.7% of the respondents rated it as good, 34.3% of them rated as neutral, 10% of them

rated as poor, 8.6% and 1.4% rated the cleanness as very good and very poor respectively. This shows that a very low perception on the cleanliness or purity of bottled drinking water products by the respondents.

The other point related to these products that were asked the respondents to reply were packing and handling conditions of the bottled water products. Among the respondents 38.6% rated it as good, 24.3% as neutral, 21.4% as poor, 11.4% as very good and 4.3% as very poor. Still the perceptions on these products were taken by almost half of the community as good and about one fourth was neutral in indicating that the perceptions of these products are almost low. The question on the environmental friendliness of the bottled drinking water productions and the associated plastic bottles or materials were also rated by the respondents as very poor by 35.7%, as poor by 21.4 % and as neutral by 21.4%, as good by 17.1% and as very good by 4.3% of the respondents. This has indicated that more than half of the respondents replied the bottled drinking water productions and associated plastic bottles or materials had very bad impact on environment as well as on communities found around the areas.

The handling conditions of the products by the marketers or sellers, end-users or the communities were rated as follows. Based on the respondents' perceptions, 35.7% of them rated handling conditions as poor, 30.0% as very poor, 14.3% as good, 11.4% as neutral, and 8.6% as very good indicating that the ratings given by the respondents have shown the extremely poor handling and management conditions of the products by all groups of those who benefited from the products. For the detailed rating see table: 4.1B given below

Generally, it seems that the people or the communities did not have adequate knowledge in relation to the water bottling activities and its merits and demerits in the country. The issue of being neutral by many respondents is a good evidence of the lack of knowledge about these products by the community in this country.

Table 4.1B: - Results Table for Bottled Drinking Water Brands Only (Variables 1 to 5)

Variables	Categories	Frequency	Percent	Cumulative Percentage
1.Sustainability of the product or bottled drinking water product brands	Very poor	1	1.4	1.4
	Poor	9	12.9	14.3
	Neutral	29	41.4	55.7
	Good	26	37.1	92.9
	Very good	5	7.1	100.0
2. Cleanliness or purity of the bottled water product brands	Very poor	1	1.4	1.4
	Poor	7	10.0	11.4
	Neutral	24	34.3	45.7
	Good	32	45.7	91.4
	Very good	6	8.6	100.0
3. Packing and handling conditions of the products	Very poor	3	4.3	4.3
	Poor	15	21.4	25.7
	Neutral	17	24.3	50.0
	Good	27	38.6	88.6
	Very good	8	11.4	100.0
4. Environmental friendliness of water productions and the associated plastic bottles or materials	Very poor	25	35.7	35.7
	Poor	15	21.4	57.1
	Neutral	15	21.4	78.6
	Good	12	17.1	95.7
	Very good	3	4.3	100.0
5. Handling conditions of the products by the marketers/sellers and the end-users.	Very poor	21	30.0	30.0
	Poor	25	35.7	65.7
	Neutral	8	11.4	77.1
	Good	10	14.3	91.4
	Very good	6	8.6	100.0

4.1.1C Discussion on perceptions by End-Users regarding the Bottled Drinking Water Brands and associated plastic bottles or plastic materials management (variables listed from number 6-12).

The statement on use of empty plastic bottles by the community or individuals after being thrown here and there in relation to the human health was responded as bad by 47.1%, very bad by 40.0%, good by 8.6% and very good by 4.3% respondents. The responses given as bad when summed up became 87.1% which strongly indicated that this activity is totally bad and harmful to the human health.

On the phrases regarding whether the water bottling activities are well organized, coordinated and controlled by the law enforcing or regulating governmental bodies or agencies in the country, 45.7% responded as disagree, 24.3% as strongly disagree, 21.4% as agree and 8.6% strongly agree. The ratings for non-coordination and no organization or no controlling of the water bottling activities has been totaled up to 70%, showing that the management of these products was extremely uncoordinated, unorganized and uncontrolled by the concerned parties in the country.

The respondents' responses for *the general public or the communities including myself are well aware about the negative or positive impacts of the bottled drinking water productions and the management of associated plastic bottles or materials* showed that 44.3% disagree , 28.6% strongly disagree , 14.3% strongly agree and 12.9% agree with the issues raised as concern. The higher ratings were 72.9% (44.3% disagree and 28.6% strongly disagree) showing that the awareness or the perception and the knowledge of the community for the negative or positive impacts of these products are extremely poor. That is the general public is not well aware about the negative or positive impacts of the bottled drinking water productions and associated plastic bottles or plastic materials in the country.

Regarding the statement like “the manufacturers of bottled drinking water brands, marketers or sellers and end-users are well informed about the requirements for the productions and management of bottled drinking water brands as stated in **Ethiopian Compulsory Standards** for regulating and controlling the productions and management activities of the bottled drinking waters products in the country”, the rating or the responses given for this were disagree as 51.4%, strongly disagree as 27.1% totaling to 78.5%, as well as agree 12.9% and 8.6% showing that the perception

and the knowledge of these requirements are poor among all stakeholders of the bottled drinking water requirements..

Likewise, issues that dealt with the bottled drinking water products are well protected from environmental influences like heat, moisture, high temperatures and exposures to direct sun light, it means that at the productions, storage or supply sites were raised for respondents. The alternatives given for the responses to be rated were as true and false. The respondents' responses showed that 95.7% were rated as false. This clearly indicated that the protection of the bottled drinking water products from environmental influences and the managements of these products are extremely poor and non-existent.

Figure 4.1 Bottled Drinking Water Brands Seen Exposed to Direct Sunlight



Source: - Current or Own Survey

A series of question were also asked about the empty plastic bottles after drinking or using the bottled drinking water for most of the time. About half (52.9%) of the respondents replied that they disposed them anywhere while 24.3% of them responded that they put it in the rubbish bin. The remaining 18.6% and 4.3% Re-use it and gave it to the recyclers respectively. In general, the result indicated that there

were no a system of disposing the plastic materials in the country and the plastic materials are being disposed anywhere.

Regarding the type of water the respondents consume or prefer when he/she is at home, 47.1% of the respondents responded that they preferred filtered Tap Water but about one fifth (27.1%) uses untreated Tap Water. On the other hand, 14.3% uses Bottled Water 4.3% used boiled and filtered tap water and 7.1% uses boiled tap water. The responses given indicated that the majority's preference was Tap Water in any form be it managed in good manner or not. For the detail results, please see the below table 4.1C.

Table: 4.1C Results Table for the managements of Bottled Drinking Water Brands and Associated Plastic Bottles or Materials responded by the End Users (Variables 6-12)

Variables	Categories	Frequency	Percent	Cumulative Percentage
6.The use of empty bottles by the community or individuals after being thrown here and there in relation to the human health	Bad	33	47.1	47.1
	Very Bad	28	40.0	87.1
	Good	6	8.6	95.7
	Very Good	3	4.3	100.0
7. Water bottling activities are well organized, coordinated and controlled by the law enforcing or regulating governmental bodies or agencies.	Agree	15	21.4	21.4
	Strongly Agree	6	8.6	30.0
	Disagree	32	45.7	75.7
	Strongly Disagree	17	24.3	100.0
8 The general public or the communities including myself are well aware about the negative or positive impacts of the bottled drinking water productions and the management of associated plastic bottles or materials.	Agree	9	12.9	12.9
	Strongly Agree	10	14.3	27.1
	Disagree	31	44.3	71.4
	Strongly Disagree	20	28.6	100.0

9. The manufacturers of bottled drinking waters, marketers or sellers and end-users are well informed about the REQUIREMENTS FOR THE PRODUCTIONS AND MANAGEMENT OF BOTTLED DRINKING WATERS as stated in <i>Ethiopian Compulsory Standards</i> for regulating and controlling the productions and management activities of the bottled drinking waters products in the country.	Agree	9	12.9	12.9
	Strongly Agree	6	8.6	21.4
	Disagree	36	51.4	72.9
	Strongly Disagree	19	27.1	100.0
10. Everywhere, the bottled drinking water products are well protected from environmental influences like heat, moisture, high temperatures and exposures to direct sun light. It means at production, storage or supply sites.	True	3	4.3	4.3
	False	67	95.7	100.0
11. After drinking the bottled water, how would you deal with the empty plastic bottles for most of the time?	Give it to the recyclers	3	4.3	4.3
	Re-use it	13	18.6	22.9
	Put it in the rubbish bin	17	24.3	47.1
	Dispose it anywhere	37	52.9	100.0
12. What type of water do you prefer to drink when you are at home?	Boiled Tap Water	5	7.1	7.1
	Untreated	19	27.1	34.3

	Tap Water			
	Filtered Tap Water	33	47.1	81.4
	Boiled and Filtered Tap Water	3	4.3	85.7
	Bottled Water	10	14.3	100.0

4.1.ID. The importance of bottled drinking water brands and municipally treated and supplied tap water

This part mainly discusses a sort of comparison based on the perceptions of the respondents between publicly treated and supplied tap water and commercialized bottled drinking water brands. The responses given by the respondents were presented as follows.

Table 4.ID given below dealt with the perceptions and awareness of the respondents about municipally supplied tap water and commercially marketed bottled water. As it has been observed from the responses, the perceptions and awareness is very much low and minimal. The responses obtained revealed that the individual users of tap water and bottled drinking water did not have much knowledge about both water supply sources.

Respondents were asked whether “tap water is better for their health” or not. The responses obtained showed that 28.6% said disagree, 21.4% neutral, 21.4% agree with statement, 18.6% strongly disagree and 10.0% strongly agree. This showed that how the knowledge of the community or individuals did not go with what they frequently use and benefit from. In the same manner, respondents asked that whether “Tap Water is better to save for your pocketbook or money” or not, the replies given were summarized as follows, 42.9% strongly agree , 28.6% agree , 14.3% disagree, 11.4% strongly disagree and the remaining 2.9% neutral for the issue. These responses are indicative of the fact that municipality treated and supplied tap water is economically better and affordable than the bottled water brands. In the same manner, for the statement “Tap Water

productions are safer for the environment”, the responses given were 37.1% as agree, 24.3% as strongly agree, 17.1% as neutral, 14.3% as disagree and 7.1% as strongly disagree showing that at least the productions of tap water is safer for the environment compared to the other extremes of bottled drinking water productions that are notoriously feared to deplete the ground water and may induce water crisis.

When the responses given for “Tap water does not interfere with other water supply sources” was summarized, 30.0% of the respondents said disagree with the statement, 12.9% strongly disagree with the issues, and 28.6% neutral. However, 22.9% of the respondents agree with the statement and 5.7% strongly agree with the issues. This indicates that the perceptions or the knowledge of the respondents is limited on this regard and that the interference is higher on the side of bottled drinking water brands. Additionally, tap water being accessed by the majority of people was rated as follows, 31.4% as agree, 25.7% as strongly agree, 18.6% as disagree, 12.9% as strongly disagree and 11.4% as neutral indicating the true picture of the tap water accessibilities by the majority of people. In the same way, the statement “tap water is not profit driven” was rated as the following, as agree 35.7%, as strongly agree 21.4%, neutral 18.6%, disagree 12.9%, and strongly disagree 11.4%, indicating that tap water is not profit driven. To the contrary, the bottled drinking water brands are profit making enterprises and highly profit driven.

The cleanliness, purity and dependability of bottled drinking water product was also rated by the respondents as neutral by 32.9%, as agree with by 21.4%, disagree with by 18.6%, as strongly agree with by 15.7%, as strongly disagree by 11.4%. According to this rating, the purity, cleanliness and dependability of this product for health is under question since the neutrality rating was the highest in the rating categories. The portability of bottled drinking waters encouragement for users was also rated 34.8% as agree, 23.2% as strongly agree, 17.0% as neutral, 13.0% as disagree and 11.6% as strongly disagree. This showed that the bottled drinking water products are encouraging for transportation.

The last variable responded by the survey respondents was, the phrase entitled “*the general public is well aware about the economic and health benefits of the bottled drinking water brands and the negative impacts of the plastic bottles or materials in Ethiopia*”, the responses given were 44.3% as disagree, 42.9% as strongly disagree, 5.7% as strongly agree and 7.1% as agree. This is what generalizes the

perceptions and the awareness of the people about economic and health benefits of the bottled drinking water brands and the negative impacts of the plastic bottles or plastic materials in Ethiopia.

Table 4.1D. Results Table for Municipally Supplied Tap Water and Commercially Marketed Bottled Water Brands.

Variables	Categories	Frequency	Percent	Cumulative Percentage
13. Tap Water is better for Your Health	Disagree	20	28.6	28.6
	Strongly Disagree	13	18.6	47.1
	Neutral	15	21.4	68.6
	Agree	15	21.4	90.0
	Strongly Agree	7	10.0	100.0
14. Tap Water is better for Your Pocketbook/Money	Disagree	10	14.3	14.3
	Strongly Disagree	8	11.4	25.7
	Neutral	2	2.9	28.6
	Agree	20	28.6	57.1
	Strongly Agree	30	42.9	100.0
15. Tap Water productions are safer for the Environment	Disagree	10	14.3	14.3
	Strongly Disagree	5	7.1	21.4
	Neutral	12	17.1	38.6
	Agree	26	37.1	75.7
	Strongly Agree	17	24.3	100.0
16. Tap Water does not interfere with other water supply sources	Disagree	21	30.0	30.0
	Strongly Disagree	9	12.9	42.9
	Neutral	20	28.6	71.4
	Agree	16	22.9	94.3
	Strongly Agree	4	5.7	100.0
17. Tap Water can be accessed by the majority of people	Disagree	13	18.6	18.6
	Strongly Disagree	9	12.9	31.4
	Neutral	8	11.4	42.9

	Agree	22	31.4	74.3
	Strongly Agree	18	25.7	100.0
18. Tap Water is not profit driven	Disagree	9	12.9	12.9
	Strongly Disagree	8	11.4	24.3
	Neutral	13	18.6	42.9
	Agree	25	35.7	78.6
	Strongly Agree	15	21.4	100.0
19. Bottled Drinking Water is clean, pure and dependable for health	Disagree	13	18.6	18.6
	Strongly Disagree	8	11.4	30.0
	Neutral	23	32.9	62.9
	Agree	15	21.4	84.3
	Strongly Agree	11	15.7	100.0
20. Portability of bottled (plastic) waters is encouraging for users	Disagree	9	13.0	13.0
	Strongly Disagree	8	11.6	24.6
	Neutral	12	17.4	42.0
	Agree	24	34.8	76.8
	Strongly Agree	16	23.2	100.0
21. The general public is well aware about the economic and health benefits of the bottled drinking waters and the negative impacts of the plastic bottles or materials in Ethiopia	Agree	5	7.1	7.1
	Strongly Agree	4	5.7	12.9
	Disagree	31	44.3	57.1
	Strongly Disagree	30	42.9	100.0

4.2 Key Findings/Results from Bottled Drinking Water Sellers or Marketers

4.2.1 A. Demographic Characteristics of the Respondents.

Based on the differently prepared survey questionnaires for the water sellers or marketers group, in order to collect their perceptions and practices about the bottled drinking water products and associated plastic bottles or materials disposal and management for this group, a total of 29 purposively sampled individuals sellers or marketers were selected during the survey from study areas of the woreda. These group included shops or supermarket owners or employees. Among selected individuals, 58.6 percent were male whilst 41.4 percent were females. Regarding, the ages of the respondents, 48.3 percent were between 20 and 30, 30.0 percent between 30 and 65 years of age and the remaining 20.7 percent were less than 20 years of age. As to the level of the education among the respondents, 13.8, 17.2, 41.4, 17.2, and 10.3 percent were, Grade 1-5, Grade 6-8, Grade 9-12, Diploma, Bachelors' Degree and above respectively. Also, when the marital statuses of the respondents were reviewed, more than half (58.6%) were single and 41.4 percent were married. Those respondents also asked whether they have other occupation rather than the current and 96.6% have no second line jobs while 3.4 % have additional jobs.

Table: 4.1E Demographic characteristics for the bottled water sellers or marketers' respondents

Variables	Categories	Frequen cy	Percent	Cumulative Percentage
1.Sex of the respondents	Male	17	58.6	58.6
	Female	12	41.4	100
2. Age of the respondents	Less than 20 years of age	6	20.7	20.7
	Between 20 and 30	14	48.3	69.0
	Between 30 & 65	9	31.0	100
3. Level of Education	Grade 1-5	4	13.8	13.8
	Grade 6-8	5	17.2	31.0
	Grade 9-12	12	41.4	72.4

	Diploma	5	17.2	89.7
	Bachelor's Degree & above	3	10.3	100
4. Marital Status	Single	17	58.6	58.6
	Married	12	41.4	100.0
5. Do you have another occupation other than this?	Yes	1	3.4	3.4
	No	28	96.6	100.0

4.2.1B) Perceptions and Practices on Bottled Drinking Water Brands and associated plastic bottles or materials by Sellers or Marketers

The overall responses of the respondents about perceptions and practices of the respondents on the management and handling issues of the commercialized bottled drinking water brands and associated plastic bottles or materials disposal or management was given by table 4.1F.

There were no any orientations or trainings given to them on how to store, handle and sell bottled drinking waters in their shops as all respondents (100%) responded no. The huge numbers of beneficiaries of these products are the bottled drinking water marketers or sellers groups and these groups were responding that none of the concerned bodies have given them any type of orientations or trainings on the managements or handling of these differently branded bottled drinking water and associated plastic bottles/materials. Additionally, they told the researcher that they simply received the bottled drinking water products from the manufacturers' transportation vehicles and store and manage them in their own ways.

In addition to this, the researcher also asked who supplies them or the marketers or sellers with the bottled drinking water products to their shops. The responses given by the respondents showed that the producers or the manufacturers themselves supplied or distributed the products to the shops of the marketers or sellers of the water products by the bottled drinking water brands producers own transport vehicles. The responses given to this question were the producers

or the manufacturers 96.6%, other retailers 3.4%. Also their reply to other question followed on the acts of managing or handling or dealing with the empty plastic bottles or any plastic trashes or materials after use for most of the time, were rated as a) Gave them to the rubbish collectors 86.2%, b) Put them in the rubbish bin 6.9%, c) Re-use them 3.4 % and d) Dispose them anywhere 3.4%. This group responded to the question, as most of the plastic materials including empty bottles were given to the rubbish collectors by almost all of the respondents with 86.2% of the group responding.

The respondents also were asked about their perception on *the plastic bottles/materials or trashes thrown here and there whether they are good to the human health and the natural environment, and result showed that 96.6% of them assumed that it is not good to the human health and the environment while 3.4% responded that having plastic materials everywhere has no negative impact on the human health and the natural environment. From this reply, it is crystal clear that the plastic trashes of any type are hazardous to the human health and the natural environments.*

Though the respondents did not receive any orientations or trainings on mechanisms of managing and handling the bottled drinking water products, they have responded to the following question, *“Do you think that exposing the bottled drinking water products to direct sunlight good to its quality and the human health?”* The group’s response was 100% no. It was well understood by the users that, exposing bottled water products to direct sun light is not good to its quality and harmful to the human health.

Respondents also were asked whether *everywhere, the bottled drinking water products were well protected from environmental influences like heat, moisture, high temperatures and exposures to direct sun light or not.* The group’s response was 100% false. From this response one can understand that, there were no good management and protection practices of the bottled drinking water products and their protection from the direct sun light.

Figure 4.2: - Bottled Drinking Water Brands & Other Food Items Seen Exposed To Direct Sun Light



Source: - Current or Own Survey

For the recommendations or comments the respondents were requested on the productions and management of bottled drinking water products and disposal of its associated plastic bottles or plastic materials, the responses given were

- A) Awareness creation & training to all the stakeholders or the whole community or people as rated by 41.4%
- B) Monitoring & Control of productions by concerned parties or by the regulating and controlling governmental bodies as rated by 48.3% of them
- C) Prepare substitutes for plastic materials 10.3%. For the detailed results, please see the below table.

Table: 4.1F Results Table for Bottled Drinking Water Brands and Associated Plastic Bottles or Materials by the Bottled Drinking Water Sellers or Marketers Respondents

Variables	Categories	Frequency	Percent	Cumulative Frequency
I. Have you ever received any	Yes	0	0.0	0.0

orientation or training on how to store, handle and sell bottled drinking waters products in your shop?	No	29	100.0	100.0
2. If yes to question number one above, who gave you that orientation or training?	A) None	29	100.0	100.0
	B) ESA			
	C)PQAD			
	D)ECAE			
	E)MoH			
	F)MoWRD			
3. Who supplies you with the bottled drinking water products in your shop?	The Producers or the Manufacturers	28	96.6	96.6
	The Whole Sellers			
	Other Retailers	1	3.4	100.0
	Individuals			
4. After drinking or using the bottled waters, how would you deal with the empty bottles or any plastic materials after use for most of the time?	Give it to the recyclers			
	Re-use it	1	3.4	3.4
	Put it in the rubbish bin	2	6.9	10.3
	Dispose it anywhere	1	3.4	13.8
	Give it to the rubbish collectors	25	86.2	100.0
5. Do you think that the plastic materials or trashes thrown	Yes	1	3.4	3.4
	No	28	96.6	100.0

here and there are good to the human health and the natural environments?				
6. Do you think that, exposing the bottled drinking water products to direct sunlight, good to its quality and the human health?	Yes	0	0.0	0.0
	No	29	100.0	100.0
7. Everywhere, the bottled drinking water products are well protected from environmental influences like heat, moisture, high temperatures and exposures to direct sun light.	True	1	3.4	3.4
	False	28	96.6	100.0
8. Do you have any recommendations or comments for the production and management of bottled drinking water products and disposal of its associated plastic bottles or plastic materials?	Awareness creation % training to the stakeholders	12	41.4	41.4
	Monitoring & Control of productions by concerned parties	14	48.3	89.7
	Prepare substitutes for plastic materials	3	10.3	100.0

4.3. Regulatory Governmental Bodies Regarding *Bottled Drinking Water Brands* Productions

The Oromia Regional Water Resources Development Bureau was the responsible organization that provided the water wells to the water bottling companies based on the companies' own surveys or studies made or the surveys conducted earlier by the government.

The governmental organizations involved in guiding and regulating the bottled water productions activities were found to be Ethiopian Standard Agency (ESA), Ethiopian Food, Medicine, Health Care Administration and Control Authority (EFMHACA), Ethiopian Conformity Assessment Enterprise (ECAE)

The governmental organizations mentioned above have the standards of their own to monitor and control the activities of the water bottling except the Regional Water Resources Development Bureau

They told the researcher that they test and help testing of the water products based on their time table and conditions

They didn't have guidelines for the plastic bottles or materials management, disposal issues and their hazards mitigation efforts.

4.4. "Bottled Drinking Waters" Company Owners, Managers and Workers.

Though some of the water bottling companies were not willing to answer the questions or questionnaires presented to them and the requests made by the researcher to observe the operations of the plants that were rejected for unknown reasons, the replies given by some of them were as presented below.

It was confirmed that the water bottling factories have secured water sources or water wells from the Oromia Regional Water Resources Development Bureau depending on their own studies or practically by the Geo hydrological Surveys done by the government and licensed by different

governmental organizations like Ethiopian Conformity Assessment Enterprise (ECAE) and Ethiopian Food, Medicine, Health Care Administration and Control Authority (EFMHACA).

The Company representatives replied that they have Ethiopian Standards for their water bottling operations and the protection of the bottled water products everywhere from the environmental influences like heat, moisture, high temperatures and exposures to direct sunlight. As to the protections of bottled drinking water products from environmental influences like heat, moisture, high temperatures and exposures to direct sunlight, some said these products were not well protected and others replied that the products were being protected from the environmental influences.

Regarding the sort of training or orientations on how to manage, store and handle the bottled drinking water products and associated plastic bottles or trashes from the concerned governmental bodies, the replies were still incomplete saying yes or simply jumping/skipping the questions.

For the question, on the productions or importations of water bottles into the country, the responses were that, the plastic bottles were imported from abroad. Also the visited companies replied that, the plastic bottles were not recycled or re-used in their companies any time.

The drinking water bottling companies replied that they did not or did give training to their costumers (bottled drinking water retailers or whole sellers on management and handling of the water products and plastic bottles or materials. Additionally, the water bottling companies replied that they test the bottled water regularly for its quality from time to time. The tests were aimed at bacteriological or toxic materials presence in the bottled water and its quality. The companies also responded to the questions on employment of workers as the workers being employed as professionals externally and daily laborers as from the local communities in different categories.

Woreda is the fourth lowest administrative unit in Ethiopia next to the zonal administration divisions. In some regions, the zonal divisions are literally weak or totally absent. According to the current Ethiopian Administration Power shares, woreda or district is the most empowered and legally enforced administrative segments in the country.

Here in Sabbata Hawas Woreda, Sabbata is the capital of this woreda. Nowadays, Sabbata Hawas Town has incorporated the formerly Alem Gena Town into its unit and both are one and being

administered as one separate and independent woredain the Oromia Special Zone surrounding Finfinne or Addis Ababa City. When it comes to the massive Drinking Water Bottling Factories, all are located and concentrated in and around Sabbata Town. According to the information collected from the woreda or Sabbata Town Level Authorities or Experts. They did not have chances to involve in water bottling activities, but, are capable of collecting only taxes or revenues of the government. They did not involve in the provision of land or water wells to the companies and even not consulted about the potential of the ground water levels in their areas and distributions of the water bottling factories or companies in and around their town.

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter deals with the final summary findings of the study, where the discussions and results on the previous chapters were incorporated and summarized as conclusions and recommendations.

5.1. Summary

Analyses of the gathered information indicated the following findings.

Sustainability of the bottled water production was rated as poor and the cleanliness of the water products somewhat were termed as good or acceptable by the respondents. The packaging and handling conditions of the water products at the factory levels by the producers or manufacturers were rated as good by the majority of the respondents and also verified by the visits or observations of the researcher made to the water bottling factories or sites for the visited factories.

Environmental friendliness of the bottled water productions and the associated plastic bottles or materials were responded as extremely poor by the majority of the respondents. Also, the use of empty bottles by the community or individuals after being thrown here and there in relation to the human health was rated as bad & very bad together by 87.1% of the respondents which has indicated that these activities are totally harmful to the human health.

Water bottling activities were not well organized, coordinated and controlled by the law enforcing or regulatory governmental bodies or agencies according to the responses of the respondent giving their ratings as disagree 45.7% and strongly disagree as 24.3% totaling to 70%. In addition to the above information, the woreda level authorities were not involved and well informed about the water bottling activities in their localities except revenue collection and receiving some benefits for the woreda level enterprises.

The general public or the communities including the survey respondents were not well aware about the negative or positive impacts of the bottled drinking water productions as well as the management of the bottled drinking water brands and the disposal issues of the associated plastic bottles or materials. These situations have shown that the perceptions and the knowledge of these products are very poor and the awareness of the manufacturers of bottled drinking water, marketers or sellers and end-users were also poor. Additionally, the awareness about the Requirements for the Productions and Management of Bottled Drinking Water Brands as stated in **Ethiopian Compulsory Standards** for regulating and controlling the productions and

management activities of the bottled drinking water products in the country were also very much poor as rated by the survey respondents by the ratings like disagree 51.4% & strongly disagree 27.1% summing up to 78.5%. In these regards, the bottled drinking water activities or operations guidelines and directives prepared for monitoring and controlling every aspects of water bottling operations or activities were not known by all concerned stakeholders.

The responses to the phrase “Everywhere, the bottled drinking water products are well protected from environmental influences like heat, moisture, high temperatures and exposures to direct sun light”, that means at production, storage or supply sites. The rating or the responses for this point was replied 95.7% false, showing that the managements of these products were extremely poor and non-existent. The other question asked was like “after drinking or using the bottled drinking water, how the respondents dealt with the empty bottles” , the users or the survey respondents replied that they disposed the empty bottles off anywhere as 52.9%, put them in the rubbish bin as 24.3%, re-use them as 18.5% and give it to the recyclers as 4.3% . Re-use of empty bottles is dangerous to health and the recycling process is absent in Ethiopia. The disposal mechanisms of the empty bottles according to the respondents were in a harmful and bad manner.

Preferences for drinking water when at home for the respondents were rated as 47.1% for filtered tap water, 27.1% for untreated tap water, 7.1% for boiled tap water, 4.3% for boiled and treated tap water, whereas the preference for the bottled drinking water was only 14.3%. The majority of respondents replied that they prefer tap water as majority responded, even if the distinctions and the knowledge of the public between both bottled and tap water was poor.

The awareness of the general public about the economic and health benefits of the bottled drinking waters and the negative impacts of the associated plastic bottles or materials in the study areas were responded 44.3% as disagree and 42.9% as strongly disagree by the majority of the respondents. This was what generalized the perceptions and the awareness of the people about economic and health benefits of the bottled drinking waters and the negative impacts of the plastic bottles or plastic materials in the country.

The groups that have responded to the following issues were the core ones to the study of the problems of management related to bottled drinking water brands and associated plastic bottles or plastic trashes in the study area or elsewhere. They are also the ones who benefited better from

the bottled water operations in the area. At least, these groups know better about the contributions of water bottling to them and other community members as well as the impacts of plastic bottles or trashes in the area. These groups were the Bottled Drinking Water Marketers or Sellers.

As to these group responses, no any type of orientation or training on how to store, handle and sell bottled drinking water brands was given to them. The bottled drinking water products were supplied or distributed to bottled drinking water marketers or sellers shops by the bottled drinking water brands producers or manufacturers own vehicles. Also the reply for the acts of managing or handling or dealing with the empty bottles or any plastic materials or trashes after use for most of the time, was responded as being supplied to the rubbish collectors by bottled drinking water marketers or sellers.

The plastic bottles/materials or trashes thrown here and there were responded as extremely bad to human health and the natural environments as well as exposing the bottled drinking water products to direct sunlight was responded as not good to its quality and the human health as well. Strict follow up and control of water bottling activities and public awareness creation among all concerned stakeholders were recommended to be in place by this group. The general public and all users/beneficiaries of bottled drinking water need to have knowledge about the merits and demerits of water bottling operations.

Bottled water is considered as food and has been categorized with countless food items and medicines in the country. These items are massively produced in the country as well as being imported into the country with their unpleasant characteristics like forgery and adulterations. As to these research findings, the responsibilities of monitoring, administering, and controlling these huge items fall on the shoulders of EFMHACA (Ethiopian Food, Medicine and Health Care Administration and Control Authority). The Ethiopian Standards Agency (ESA) also has the guidelines entitled “**Ethiopian Compulsory Standards**“ containing the “Requirements for the Productions and Managements of Bottled Drinking Water” As to the information obtained from FMHACA, the organization is not responsible for the management, control and administrations of associated plastic bottles or trashes/materials. The responsibility of managing the plastic materials goes to the Federal Ministry of Forest and Climate Change, City Administration of Addis Ababa

Environmental Protection Authority (EPA) and The Oromia Regional State Environmental Protection Authority, all of them did not have any implementation guidelines except the general proclamations of the country regarding the dry waste disposal and management issues.

The Oromia Regional Water Resources Development and Minerals Bureau was the major authority providing water wells to the Water Bottling or Manufacturing Companies with inadequate and insufficient studies on the ground water potentials that may lead to the unwise depletion of the ground water by turning it into easy profit. The Oromia Regional Water Resources Development Bureau was the responsible organization that provided the water wells to the companies based on the previously done surveys or the companies' own surveys or other studies conducted earlier.

The governmental organizations involved in the guidance and control of water bottling operations are Ethiopian Standard Agency (ESA), Ethiopian Food, Medicine, Health Care Administration and Control Authority (EFMHACA), The Regional Water Resources Development Bureau and Ethiopian Conformity Assessment Enterprise (ECAE)

Some of the above mentioned governmental organizations have the standards of their own to monitor and control the operations of the water bottling except the Regional Water Resources Development Bureau

They told the researcher that they test the water products based on their time table and conditions. This refers to EFMHACA and ECAE

The governmental organizations that are designated or authorized to monitor and control the bottled drinking water activities in the country did not have a plan or plans to deal with the massive plastic bottles or materials brought into the country in relation to water bottling and dumped here and there after use.

The mechanisms of securing water sources or water wells from the Oromia Regional Water Resources Development Bureau was depended on their own studies or practically by the geo hydrological surveys done by the government and were licensed by different governmental organizations like Ethiopian Conformity Assessment Enterprise (ECAE) and Ethiopian Food, Medicine, Health Care Administration and Control Authority (EFMHACA).

The water bottling company representatives replied that they have Ethiopian Standards and guidelines for their water bottling operations and the protection of the bottled water products everywhere from the environmental influences like heat, moisture, high temperatures and exposures to direct sunlight. As to the protections of bottled drinking water products from environmental influences like heat, moisture, high temperatures and exposures to direct sunlight, some said these products are not well protected and others replying that the products are being protected from the environmental influences where the former information is holding true for the protection issues mention by the companies.

Regarding the sort of training or orientations on how to produce, manage and handle the bottled drinking water products and associated plastic bottles or trashes from the concerned governmental bodies, their replies were still incomplete saying yes or simply jumping/skipping the questions. They did not answer the questions baldly enough.

For questions on the productions or importations of water bottles in the country, the water manufacturing companies responded that, the plastic bottles were imported from abroad. Also the visited companies replied that, the plastic bottles were not recycled or re-used in their companies any time.

The drinking water bottling companies replied that they did not give training to their customers (bottled drinking water retailers or whole sellers on management and handling of the water products and plastic bottles or materials). Additionally, the water bottling companies replied that they test the bottled water regularly for its quality from time to time. The tests were aimed at bacteriological or toxic materials presence in the water and its quality. The companies also responded to the questions on employment of workers as workers being employed as professionals by ways of external advertisements and daily laborers from the local communities internally in different categories.

The manufacturers of bottled drinking water also did not say anything about the proper management or disposal mechanisms of the plastic bottles or plastic trashes they brought into the country and threaten the natural environment or severely pollute Ethiopian Ecosystems.

The woreda level authorities did not have much involvement in the water bottling operations and only capable of collecting taxes or revenues of the government

They also did not involve in the provision of land or water wells to the companies and even not consulted about the potential of the ground water levels in their locality as to help them conserve the scarce water resources and distributions of the water bottling factories or companies in and around the woreda town.

The woreda local authorities even did not involve in control and management of water bottling operations in their localities.

5.2 Conclusions

There were no trainings or orientations related to the mechanisms of handling, selling bottled drinking water brands and the proper disposals of plastic bottles or trashes to the bottled drinking water marketers or sellers, since these groups additionally deal with any type of plastic materials including those used for packaging the soft drinks of any sort. As to these groups, no one from the regulatory governmental bodies or water bottling company related organs have given them any types of trainings or orientations on the ways of managing bottled drinking water brands and associated plastic materials to date.

Different from other bottled drinking water respondent groups, the bottled drinking water marketers or sellers are well aware about the collections of empty plastic bottles or materials and at least giving this garbage to the rubbish collectors as they responded (86.2% of them) and responded also that the plastic materials thrown here and there are bad to the human health and the natural environments.

They also reacted to the questions “exposing the bottled drinking water products to direct sunlight” as being bad to its quality and the human health and everywhere the bottled drinking water products are not totally protected from environmental influences like **heat, moisture, high temperatures and direct sunlight**. The concerns of these group is that all concerned groups should uphold the idea of protecting the bottled drinking water brands from environmental influences, because they degrade the quality of the water and has negative health implications.

Recommendations from the group were A) Do awareness creations and give trainings to the communities B) Monitor and control the productions of the bottled drinking water brands anywhere. C) Prepare substitute items for plastic materials/trashes being used now.

The Ethiopian Food, Medicine, Health Care Administration and Control Authority (EFMHACA) is very much overwhelmed by the tiresome activities of both food and medicine administrating and controlling activities. The authority is also trying its best to monitor and control the quality of the bottled water brands through testing and inspecting the samples of bottled water where and when possible, but the authority seem overstretched by the enormous activities given to it.

The woreda level government offices were not involved in the managements of water bottling operations in their respective woreda. Due to the lack of participation and involvement in the water bottling activities they are cautious about the pressure created on the existing underground water in their areas. The woreda officials also have expressed their concerns or feelings that additional water bottling companies should not be allowed to come into their localities, thus, putting additional pressures on existing underground water potentials.

None of the above governmental organizations have expressing their concerns on the environmental friendliness of water bottling activities and have no plan on the modalities of disposing the detrimental plastic products massively produced in the country and imported into Ethiopia.

From the discussions conducted with this governmental groups, the researcher was informed that no trainings or any type of orientations were given to all stakeholders of the water bottling in order to raise their awareness about the benefits of these activities.

The water bottling companies have been conducting their own water testing activities based on their water testing schedules

In Sabbata Woreda Town and its surroundings, the concentrations of water bottling factories are very high and this concentration has been feared to put greater pressure on the availability of groundwater assets.

The plastic bottles used for water bottling reported to have been imported from abroad and the bottled drinking water products everywhere were not well protected from environmental influences like heat, moisture, high temperatures and exposure to direct sun light.

As confirmed by the water bottling companies themselves and supplemented by the direct beneficiaries of bottled drinking water marketers or sellers, there have not been given any type of training or orientations to the customers or retailers of these products regarding the management and handling of the bottled drinking water products and associated plastic bottles or materials.

Regarding the companies plan for used empty plastic bottles or plastic materials/trashes they used to import into the country, some say we are considering the Reverse Logistics or Recycling processes and others say, they are planning to put them into the rubbish bins in their factory sites to be thrown into the landfills. In conclusion, this implies that, the companies bringing these pollutants into the country are not thinking about the ill-effects of the plastic materials they brought into the country.

According to the information obtained from the companies themselves, they recruited the employees based on the levels of manpower required. That is, some skill dependent positions being based on external announcements and others locally employed from the local people.

All the water bottling activities were not monitored or controlled at the lower level or woreda level authorities in the area and these actions were not welcomed by the woreda level officials as to the information gathered from the woreda or town level officials

The woreda level authorities did not have much involvement in the water bottling operations and only capable of collecting taxes or revenues of the government

The woreda level authorities also did not involve in the provision of land or water wells to the companies and even not consulted about the potential of the ground water levels in their locality as to help them conserve the scarce water resources and distributions of the water bottling factories or companies in and around the Woreda Town.

5.3 Recommendations

This research exercise has examined and considered the management aspects of the bottled drinking water products and perceptions of bottled drinking water brands by all stakeholders as well as the managements and disposal issues of the plastic bottles or materials in the study areas. Therefore, based on the study made, the following recommendations were drawn in light of the research findings.

A) Recommendations to the End-Users of Bottled Drinking Water Brands

- Make sure that you consume the bottled drinking water brands which are well protected from environmental factors like heat, high temperatures and exposures to direct sunlight (Reference was made to the *Requirements for Bottled Drinking Water Productions Guidelines, ESA*).
- Combat the negative impacts of plastic bottles or trashes by giving any plastic bottle or plastic trashes including the plastic grocery bags to the rubbish collectors or recyclers (if available).
- Avoid using excessive plastic materials in your homes, work places, recreation centers etc. Remember, plastics are severe pollutants and unfriendly materials to the environment you are living in.
- Also, try to avoid bringing plastic bags at home and purchasing items with too much of packaging. This way you can help in contributing towards the environment in the form of reducing plastic pollution whose ill effects are irreversible.
- Teach the same to others to save nature and our ecosystem from ill effects of plastic materials.

B) Recommendations to the Marketers or Sellers of Bottled Drinking Water Brands .

- As has been your previous practices, please continue with giving the empty bottles and any plastic trashes to the rubbish collectors in order to be disposed in a safer manner.
- This group has best practices like only receiving bottled drinking water brands from the distribution vehicles of the water bottling and marketing companies. This practice should be upheld and continued in the future too.

- Regarding the practices of this water marketers or sellers, some unpleasant conditions were observed around some water selling shops, where some bottled drinking water bottles were seen exposed to the direct sunlight particularly of 20 liter jars. So, please protect any bottled drinking water products from exposure to the direct sunlight.

C) Recommendations to the Regional Water Resources Development Bureau or the Federal Ministry of Water Resources Development

- As the major organ of the regional government responsible for providing water wells or sources to the water bottling companies, the provision of the water wells or sources to the companies engaged in water bottling should be based on timely or fresh studies of the levels of the ground water potentials and the concentrations of the water bottling and marketing companies in that particular area. If not based on latest studies, the natural recharging of the groundwater cannot be made balanced with the amounts being exploited or taken out. If this does not happen, there will appear to be the lowering level of the groundwater and the ultimate depletion of the groundwater leading to water scarcity in that area.
- The local concerned woreda governmental officials are not comfortable with the high concentrations of the water bottling factories in these limited areas around Sabbata Town. They recommended that, the water bottling factories coming into their locality in the future should be sent or assigned to other unexploited areas in the region, for the purpose of equitable distribution of development projects in the region.
- The woreda governmental offices should be permitted to participate in operations of water bottling in their localities and provisions of water wells, so that they can contribute to a balanced water bottling activities in their localities.

D) Recommendations to the Regulatory or Law Enforcing Governmental Organizations

- Water Bottling Companies are mushrooming in every corners of the country and as to the researcher's experiences and observations, their speed of expansions are

overwhelming the capacities of the controlling and regulating governmental organizations. Also, the products they produce and their activities are sensitive to the lives and livelihoods of human beings in many aspects. Therefore, it seems obligatory and mandatory that the managements and regulatory activities of these products should be shared with the concerned lower level governmental organs like Health and Water Development Offices etc.

- Devise the mechanisms of providing trainings or orientations to create awareness at least at the primary end users, the marketers or sellers, other governmental offices as well as the manufacturers/producers themselves at all levels about the water bottling products, so, that it can help them to manage the products and associated issues in a desired and healthy manner.
- Unplanned or unwise use of the available natural resources including fresh water resources can lead into a sudden depletion of these resources, particularly the underground fresh water or springs resulting in water crisis or scarcities in the country. Therefore, avoiding being driven by the easy profits of any types or the market forces, the provisions of water sources or water wells to the Water Bottling Companies or Factories should be based on a fresh or current studies or surveys of the existing water potentials and geo hydrological studies in that specific location and the prevailing concentrations about water using or may be water depleting forces in that particular area or locality.
- As to the knowledge or the experiences of the researcher, there are some water bottling factories that are not known or recognized by the regulatory or law enforcing governmental bodies in some corners of the country. Therefore, to avoid any undesirable consequences and results of their operations, the concerned bodies of the government should hunt and bring these water bottling groups into light and put them under the regulatory and controlling forces of the existing directives.
- At least to minimize the ill effects of plastic materials on human lives and the natural environments, the water bottling companies should be advised to import biodegradable water bottling plastics into the country.

E) Recommendations to Bottled Drinking Water Brands Manufacturing or Marketing Companies.

- The water bottling companies are using naturally available resource which is water from that particular locality and highly expected to involve the local governmental offices in the development of area and contributing in opening more employment opportunities for local communities in their factories.
- The water bottling and marketing companies are the groups who are most benefited from their water bottling operations in the water marketing activities. But the plastic bottles or trashes they are bringing into the country are negatively impacting many things in the country including the natural environments. Therefore, the companies being benefited from this resource should plan for the mitigation of the hazards or problems being created by the plastic bottles or materials in the country.
- To enhance the quality of bottled drinking water and maximize the management efforts of bottled water brands in the hands of their customers, the water bottling companies should give all the necessary notes like *“Store in a Clean, Cool & Dry Places away from Direct Sunlight”*, etc on water bottles bodies in order to remind the users about protecting the products.
- As the water bottling companies are distributing their bottled water products to their primary customers like supermarkets, shops and other areas using their own vehicles, the water bottling companies are extremely expected to give trainings or orientation on how to manage, handle and protect the products from the damaging effects of the environment.
- For your water bottling activities, please plan and make practical to import a biodegradable or easily decomposable plastic bottles into the country.

F) Recommendations to Woreda Level Governmental Offices regarding the Bottled Drinking Water Brands Operation

- The water bottling operations in Sabbata area can easily affect the functions of these lower level organs of the government in several ways. During the coordination of development activities in their localities, these water bottling organizations should not be foreign or alien

to the development activities being carried out there. Therefore, some sort of mechanisms should be devised to link these development partners with the local development endeavors in order to get tangible development cooperation in that woreda or area.

- The woreda level authorities should be allowed to participate in the water bottling activities, at least in the local level personnel recruitments and water well provisions to the water bottling companies there.
- The participation of lower level authorities can help the water bottling operations to continue in a sustainable and harmonious manner. Therefore, the collaborations and participation of these groups is must.

6. References

(Awulachew et al. 2007), International Water Management Institute/ IWMI, Water Resources and Irrigation Development in Ethiopia- (Working Paper 123)

(BOFED, 2015), Oromia Bureau of Finance and Economic Development

(EFMHACA, June 2003 E.C), Food Manufacturing and Licensing Guidelines

(EFMHACA, June 2006 E.C), Food Exporters, Importers and Whole sellers Licensing Guidelines

(Ethiopian Standards Agency, 2013). Compulsory Ethiopian Standard, Bottled Drinking Water Specifications.

(FDRE-MoWR, 2002 E.C), Ethiopian Guidelines Specification for Drinking Water Quality

(CODEX STAN 227-2001), General Standard for Bottled/ Packaged Drinking Waters

(Brittany Turner & Jessica Sutton, March 2012), Plastic Bags: Hazards and Mitigation

(UDI, 2010), Urban Development Indicators, Finance & Economic Development Bureau of Addis Ababa City Administration

UN-WATER/WWAR2006/7, World Water Assessment Program, National Water Report for Ethiopia, Addis Ababa, December 2004

(MoWR, 2001), National Water Strategy

Water-related diseases. WHO (2014) or Guidelines for Drinking-Water Quality WHO (1993)

(Matiwos Ensermu, 2014), *Trends in Bottled Water Use Survey in Addis Ababa: Implication on Reverse Logistics of Bottled Water Manufacturing in Ethiopia*

GREEN NINJA. 2015 .Bottled Water vs. Tap Water (<http://greenninja.org>)

(FDRE-EPA, 2000), *Environmental Impact Assessment Guideline Document*

Food and Water Watch, 2007, www.foodandwaterwatch.org. Take Back the Tap.

International Bottled Water Association, “Beverage Marketing’s 2006 Market Report Findings,” (2007), http://www.bottledwater.org/public/Stats_2005.doc,

Drinking Water Research Foundation (DWRF), Revised March 2014, Bottled Water and Tap Water, Just the Facts.

World Resources Institute (WRI 1994-95), People and the Environment

City Government of Addis Ababa EPA 2012, Environmental Impact Assessment Technical Guidelines on Plastic Industries.

UNEP, Dec.2002, Technical Guidelines for the Identifications and Environmentally Sound Management of Plastic Wastes and their Disposal

Brian Mamoni, March 2009, Assessment of the Impacts of Bio plastics: Energy Usage: Fossil Fuel Usage: Health Effects: Effects on the Food Supply, and Economic Effects Compared to Petroleum Based Plastics.

7. Annex: Questionnaires

A) Bottled Water End-Users Survey Questionnaire ("Are Bottled Drinking Waters Brands and associated plastic materials production properly regulated and managed in the country?")

Part One: - Demographic characteristics of the Respondents

1. Sex of the respondent
 - a) Male b) Female
2. Age of the respondent
 - a) Less than 20 years b) between 20 and 30 years c) between 30 and 65 years d) Above 65 years
3. Level of Education
 - a) Illiterate b) Grade 1-5 c) Grade 6-8 d) Grade 9-12 e) Diploma f) Bachelor's Degree and above
4. Marital Status
 - a) Single b) Married c) Divorced d) Widowed e) Separated

Part Two

Questionnaires/Questions Regarding, Bottled Drinking Waters and Associated Plastic Materials Regulations, Handling and Management issues.

I am going to ask you some questions with regard to production and management issues related to bottled drinking water produced and marketed around Addis Ababa City Administration and the localities close by. I also want to inquire about issues of associated plastic bottles or materials used for packaging, storing and transporting the product. Therefore, you are kindly requested to rate the features of the bottled drinking water brands and associated plastic bottles being produced and marketed in Sabbata Hawas Woreda of Oromia Region and the surrounding areas of Addis Ababa City Administration based on the following features: 1= very poor; 2= poor, 3= neutral, 4=good, and 5= very good

S.No	Description/Features	1	2	3	4	5
1	Sustainability of the product or bottled drinking water product brands					
2	Cleanliness or purity of the bottled water product brands					
3	Packing and handling conditions of the products					
4	Environmental friendliness of water productions and the associated plastic bottles or materials					

5	Handling conditions of the products by the marketers/sellers and the end-users.						
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6	The use of empty bottles by the community or individuals' after being thrown here and there in relation to the human health	A) Bad B) Very Bad C)Good D) Very Good
7	Water bottling activities are well organized, coordinated and controlled by the law enforcing governmental bodies or agencies.	A) Agree B) Strongly Agree C) Disagree D) Strongly Disagree
8	The general public or the communities including myself are well aware about the negative or positive impacts of the bottled drinking water productions and the management of associated plastic bottles or materials.	A) Agree B) Strongly Agree C) Disagree D) Strongly Disagree
9	The manufacturers of bottled drinking waters, marketers or sellers and end-users are well informed about the REQUIREMENTS FOR THE PRODUCTIONS AND MANAGEMENT OF BOTTLED DRINKING WATERS as stated in Ethiopian Compulsory Standards for regulating and controlling the productions and management activities of the bottled drinking waters products in the country.	A) Agree B) Strongly Agree C) Disagree D) Strongly Disagree
10	Everywhere, the bottled drinking water products are well protected from environmental influences like heat, moisture, high temperatures and exposures to direct sun light. It means at production, storage or supply sites.	A) True B) False
11	After drinking the bottled water, how would you deal with the empty bottles for most of the time?	A) Give it to the recyclers B) Re-use it

		C) Put it in the rubbish bin D) Dispose it anywhere
12	What type of water do you prefer to drink when you are at home?	A) Boiled Tap Water B) Untreated Tap Water C) Filtered Tap Water D) Boiled and Filtered Tap Water E) Bottled Water

Give your perception regarding municipally treated and supplied Tap Water and commercialized Bottled Drinking Waters in Ethiopia. Please Rank the following statements as 1= Disagree; 2= Strongly Disagree, 3= Neutral, 4= Agree, and 5= Strongly Agree

S.No	Description/Items	1	2	3	4	5
13.	Tap Water is better for Your Health					
14.	Tap Water is better for Your Pocketbook/Money					
15	Tap Water productions are safe for the Environment					
16	Tap Water does not interfere with other water supply sources					
17	Tap Water can be accessed by the majority of people					
18	Tap Water is not profit driven					
19	Bottled Drinking Water is clean, pure and dependable for health					
20	Portability of bottled (plastic) waters is encouraging for users					

21	The general public is well aware about the economic and health benefits of the bottled drinking waters and the negative impacts of the plastic bottles or materials in Ethiopia	A) Agree B) Strongly Agree C) Disagree D) Strongly Disagree
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B) Bottled Water Marketers or Sellers Survey Questionnaire ("Are Bottled Drinking Waters and Associated Plastic Materials Production properly regulated and managed in the country?"

Part One

Demographic characteristics of the respondents

1. Sex of the respondent
 - a) Male b) Female
2. Age of the respondent
 - a) Less than 20 years b) between 20 and 30 years c) between 30 and 65 years d) Above 65 years
3. Level of Education
 - a) Illiterate b) Grade 1-5 c) Grade 6-8 d) Grade 9-12 e) Diploma f) Bachelor Degrees and above
4. Do you have another occupation other than this? a) Yes b) No
5. Marital Status
 - a) Single b) Married c) Divorced d) Widowed e) Separated

Part Two

Questionnaires/questions regarding, Bottled Drinking Waters and Associated Plastic Materials Regulations, Handling and Management Issues.

1	Have you ever received any orientation or training on how to store, handle and sell bottled drinking waters in your shop?	A) Yes B) No
2	If yes to question number one above, who gave you that orientation or training?	A) ESA B) Product Quality Assessment Directorate(PQAD) of Ethiopia Food, Medicines & Health Care

		Administration and Control Authority (FMHACA) C) MOH D) MO Water Resources Development E) Others (specify----- -----)
3	Who supplies you with the bottled drinking water products in your shop?	A) The Producers or Manufacturers B) Whole sellers C) Other retailers D) Individuals
4	After drinking or using the bottled waters, how would you deal with the empty bottles or any plastic materials after use for most of the time?	A) Give it to the recyclers B) Re-use it C) Put it in the rubbish bin D) Dispose it anywhere
5	Do you think that the plastic materials or trashes thrown here and there are good to human health and the natural environment?	A) Yes B) No
6	Do you think exposing the bottled drinking water products to direct sunlight good to its quality and the human health?	A) Yes B) No
7	Everywhere, the bottled drinking water products are well protected from environmental influences like heat, moisture, high temperatures and exposures to direct sun light. Where?	C) True B) False
8	Do you have any recommendations or comments for the production and management of bottled drinking water products and disposal of its associated plastic bottles or plastic materials?	A) Awareness creation & training B) Monitoring & Control of productions by

		concerned parties C) Prepare substitutes for plastic materials
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C) Questionnaires/Questions for the Regulatory Governmental Bodies Regarding Bottled Drinking Water Brands

Name of the Governmental Office: -----

Name of the responding Officer: -----

Telephone Address: Office -----Mobile-----

1	Do you have any Compulsory Official Standards for regulating and managing the quality of Bottled Drinking Waters and Plastic Bottles or Trashes for Environmental Concerns?	A)Yes B) No
2	If yes to question number 1 above would you give me the copies for reference issues?	A) Yes B) No, I cannot give you unless officially permitted C) My office does not have
3	At how many levels are the Bottled Drinking Waters and the plastic bottles or trashes being regulated by your good office in the country?	A) At Federal level only B) At Regional level C) At Woreda/District level D) At all levels

4	For providing the water wells to the Bottled Drinking Water Manufacturing Companies, who is the responsible governmental office/s?	A) Federal Office B) Regional Office C) Woreda Office, D) Others (specify----- --
5	Which institutions or agencies provide water wells? Please give me their names.	A) Regional and Zonal Water Resources Development Offices B) Regional and Zonal Investment Offices C) Woreda Water Resources and Investment Offices
6	Doesn't the water well your good office provided to the Water Bottling Companies interfere with other community water supply systems?	A) No B)Yes C) My office does not provide water wells D)I Don't Know
7	If yes, to question number 6 above, how?	
8	Do you have similar or different standards for regulating the Bottled Drinking Waters manufacturing as well as distribution and the Impacts of Plastic Trashes on Ethiopian soils?	A) Yes B) No C) C) My office does not have standards D) We have different standards.
9	If you have different standards, how do you enforce them?	A) Through trainings and seminars B) Through writing letters and passing guidelines and instructions C) Through regular visits and inspections

10	As the government body and decision making wing and technical office as well, which water sources you recommend for the people to use both economically, health wise and environmental friendliness and concerns? This should not link with commercial interest!!	A)Bottled Drinking Waters from plastic materials B) Municipally treated and supplied or Tap Waters C) Both
11	Does your office have water testing programs/ Safe Drinking Water Act to ensure the quality and safety of water from private wells as well as municipal water supply systems?	A) Yes B) No C) It is not the responsibility of my office
12	If yes for question no.11 above, what are the tests for?	A) For the amount or presence of micro-organisms/bacterial growth B) For the presence of chemical elements that cause diseases.
13	What are the frequency of testing and why?	
14	Water or bottled water is considered as a food.	A) Agree B) Highly Agree C) Disagree D) Highly Disagree
15	Who certifies Bottled Drinking Waters in Ethiopia?	A) Ethiopian Quality and Standards Agency B) Environmental Protection Authority/ Ministry of Environment, Forest and Climate Change C)Product Quality Assessment Directorate(PQAD) of Ethiopia Food, Medicines & Health Care Administration and Control Authority (FMHACA) D)Ministry of Health

		<p>E) Ministry of Water Resources and Energy</p> <p>F) Other Independent Bodies (Specify please----- -----)</p>
16	<p>If your good office is not currently having Compulsory Ethiopian Standards for bottled drinking waters and plastic trashes in the country, what are its future plans?</p>	
17	<p>Does your good office provide trainings or orientation on the modalities of productions, management, handling and care of bottled drinking waters and plastic materials to the whole community or to the manufacturers of the products?</p>	<p>A) Yes B) No</p>
18	<p>Who is the lead organization for enforcing the laws regarding the production and management of bottled water and associated plastic bottles or trashes in the country?</p>	
19	<p>We see people are re-using the plastic bottles or plastic materials repeatedly for longer periods in the country. What do you think the impact of the re-using of plastic materials on human health or the natural environment?</p>	<p>A) There is no health impact B) There is health impact on humans C) Don't know D) Negative Impact on the Environment</p>
20	<p>What benefits does water bottling offer to the local communities?</p>	<p>A) Provision of potable drinking water B) Rural Health Services C) Educational services D) Power supply E) Access roads E) Others (Specify-----)</p>

21	How can the end-users of bottled drinking water conclude that, the bottled drinking water brands are properly regulated, monitored and their qualities assured?	
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D) Questionnaires/Questions for “Bottled Drinking Waters” Company Owners, Managers and Workers.

Name of the Company: -----

Name of the responding Officer: -----

Position of the Officer-----

1	How do you secure/get sources of water/water wells?	
2	Who licenses you to start water bottling operations in your localities?	A)EQSA B) FMHACA of Ethiopia C) Regional Water Bureaus
3A	Do you have Ethiopian Standards at hand to guide you in production, management and handling of bottled drinking waters and associated plastic materials?	A) Yes B) No
3B	If yes for question 3A above, who has/ have legally enforced the standards?	A) EQSA B) FMHACA of Ethiopia C) MOH D) MOWRD E) others (specify) -----

4	The bottled drinking water products everywhere are well protected from environmental influences like heat, moisture, high temperatures and exposure to direct sun light.	D) True B) False
5	How do you deal with the empty bottles or plastic materials after use by your company and consumers?	A) Give it to the recyclers B) Re-use it C) Put it in the rubbish bin D) Dispose it anywhere
6	Have you received any type of trainings or orientations from any regulatory or law enforcing bodies in Ethiopia or abroad on the productions, management and handling of Bottled Drinking Waters and associated plastic materials so far?	A)Yes B) No
7	Where do you get plastic bottles or plastic materials used for bottling and packaging processes in the country?	A) We produce them here in the country B) We import them from abroad
8	Do you re-use empty bottles for bottling water again?	A) Yes B) No
9	What are your plans for used empty bottles and plastic materials/trashes that contaminate the environment impacting on the human health in the country?	A) Re-use it B) Consider the Reverse-logistics or recycle process C) Put it in the rubbish bin D) Dispose it anywhere as usual.
10	Do you give trainings or lessons to your customers or retailers regarding the management and handling of your bottled water products and plastic materials?	A) Yes B) No.
11A	If yes to question no. 10, when and where was that?	

IIB	If no, why not? ----- _____	
12	Do you test your products frequently to check for quality?	A) Yes B) No
13	Test for what?	A) Bacteriological/Micro-Organismal growth B) Toxic Elements or chemicals C) For Quality Issues
14	Frequency of testing?	A) Daily B) Weekly C) Biweekly D) Monthly E) Yearly
15	Can I observe some processes in your Plant?	A)Yes B)No
16	If yes to question No.15, can I observe the following parts?	A) Sanitary situations in the plant (Observations) B)Water wells locations (Observations) C)Capping and bottling processes (Observations)

17. Lists of manpower to ensure the employment opportunities and the proper running of the plant

S.No	Type of personnel	Position	Qualifications	Quantity	Number of locally recruited persons

18. Contributions to the development of the local community

Contributions	Type	Amount	Year Started		
Water supply to the village					
Health facility					
Education					
Roads accesses					
Rural electric supply					
Fuel supply					

19. Lists of Technical Manpower to ensure the employment opportunities and the proper running of the plant

S.no	Type of personnel	Position	Qualifications	Quantity	Number of locally recruited persons

20. Please give any significant contributions you made to the communities you are working in.

E) For the Woreda or District Level Offices only

Name of the Governmental Office: -----

Name of the responding Officer: -----

Telephone Address: Office -----Mobile-----

1. What are the contributions of water bottling activities to the local communities?
(Developmental contributions and others)

2. Employment opportunities opened to the local communities? List them please)

3. Any positive or negative impacts or pressures due to the operations of the water bottling activities in the locality?

4. Suggestions or Recommendations from the Regulatory Government Offices at Woreda Levels to the researcher?

5. Have you participated in the processes of providing water wells to the company's manufacturing Bottled Drinking Water in your Woreda/District please?