

# Assessing Environmental Management System: The Case of Dukem Town, Oromia Special Zone Surrounding Finfinne, Ethiopia

Megersa Tolera

PhD Candidate in Peace and Development Studies, Haramaya University

Author address: magarsatolera@gmail.com

Cell phone +251-11015869

## Abstract

The article discusses the problem of industrial pollution in Ethiopia, a newly industrializing country. The federal, state, and local governments have implemented various laws, policies, and initiatives to address the issue, and environmental organizations have been established. The study focuses on evaluating the environmental management system in Dukem Town using both qualitative and quantitative approaches, including questionnaires, interviews, focus group discussions, and observational data. The study finds that industrial pollution in Dukem Town, particularly at Di Yuan Ceramic and Habesha Steel Mills Plc in the Eastern Industrial Zone, is rapidly expanding. Most functioning industries in the town lack waste treatment plants, and even where they exist, they are not properly used. Many industries discharge untreated effluent into the adjacent community or nearby communities' drainage facilities without proper treatment, violating the specified requirements. Even in cases where industries have waste treatment plants, most of them do not function properly due to financial and political challenges. As a result, the environment and communities around them are vulnerable to pollution and its adverse effects.

**Keywords:** Environmental protection; Environmental management system; Industrial pollution control; Sustainable development policy; Oromia Special Zone (Ethiopia)

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## Introduction and background of the study

With the emergence of industrialization, there is a growing concern about environmental protection and sustainable development. Every business has an impact on the environment. Environmental sensitivity and progress are no longer simply of interest to students and environmentalists; governments, corporations, and individuals are also recognizing the benefits of environmental sensitivity and progress (Dahlmann, et al., 2008). Only a few years ago, the formation of international legislation on environmental protection in order to preserve human health from disaster occurred in our planet. Despite the fact that the development has only been going on for a few years, there are a number of Declarations, Conventions, and Agreements that contain various provisions on the values and modalities for achieving a clean and healthy environment. As a resource, the environment is the source of all human civilizations, hence environmental sustainability is essential.

The United Nations General Assembly, for example, reaffirmed the Stockholm Declaration in the Resolution 45/94 (1990), stating that "all individuals have the right to live in an environment that is adequate for their health and well-being" and calling for increased efforts to ensure a "better and healthier environment" Braunig, W.A., (2005). An additional argument would be that "all persons have the right to a clean and healthy environment," as stated in the Ethiopian Constitution (FDRE Constitution, 1995, p.47). The Constitution also states that the government has a responsibility to fight for a 'clean and healthy' environment for all Ethiopians. Some of the articles in Ethiopia's Environmental Policy address concerns of urban environment management directly or indirectly. Human Settlement, Urban Environment and Environmental Health, Hazardous Material Control, and Pollution from Industrial Waste are all addressed in Articles 3(7) and 3(8) of the environmental policy (Environmental Policy of Ethiopia, 1997). At least in theory, the legal environmental regulatory structure appears to be promising. Environmental management is, nevertheless, a policy duty of Ethiopia's Environmental Protection Authority and its partners, as evidenced by practices (Mekonnen, A. (2008). There is a lack of information on whether corporations are responsibly managing the natural environment or, worse, depleting it.

Capacity building and technology transfer to developing nations, such as Ethiopia, remain critical development priorities. Manufacturing industries are primarily located near watercourses and coastal wetlands in Ethiopia, and the discharge of untreated wastes into these bodies of water and the surrounding area has resulted in severe contamination of these areas. As a result, pollution and the prospect of more pollution from industry are still present (Gedion, (2001). According to a number of environmental studies, Ethiopia's past development has been heavily criticized due to a failure to incorporate environmental considerations into development goals. Nonetheless, it is critical to incorporate environmental considerations into development operations, programs, and

regulations in order to promote long-term growth (Beckerman W., (1992)

According to the literature reviewed, pollution induced by industrialization has a significant impact on the urban environment (Langeweg et al., 2000; Douglass, 1999). This is due to the fact that modern industrialization is the cradle of the urbanization process (Junni et al, 2013). The urban environment is significantly polluted and degraded because most industries are located within and/or near urban populations. Given the life-threatening nature of environmental problems around the world, global organizations and individual states are developing a variety of ways to address environmental issues. As cities become more industrialized, their populations grow, and the volume and nature of trash generated equally grow and change as well. This is especially true in cities in developing countries, where populations and economies are fast growing and infrastructures to deal with the resulting challenges are generally lacking. The variations in environmental sustainability can mostly be attributed to natural factors. However, in recent years, human-caused natural resource deterioration, pollution, and biodiversity loss have been reported, diminishing the environment's resilience (ECA, 2005).

Small and large industry wastes are released into the environment in various ways. Liquid industrial waste is typically discharged into neighboring ditches and into streams. The majority of solid trash, on the other hand, is dumped in factory grounds or any nearby open area (EPA, 2003). Without any treatment, gaseous emissions are simply released into the atmosphere. This type of pollution has had a negative impact on human health, life, and the environment. As a result, this widespread pollution requires immediate notice as well as focused action. Governments, international organizations, and non-governmental groups are all increasingly focusing on regulating human activities that have negative impacts on the natural environment (Akuffo, 1998).

The current Ethiopian five-year second strategic plan, the 2015/2016-2019/2020 Growth and Transformation Plan (GTP II) clearly stresses the need of environmental conservation and pollution management in ensuring the country's long-term growth. As a result, the federal and regional governments, as well as local government authorities, share responsibility for environmental pollution control. Despite the ratification of international and regional agreements, as well as the legislation of proclamations and environmental policy measures aimed at protecting the natural environment and bringing about sustainable development, they have encountered difficulties in implementation at all levels. Environmental regulations, both international and national, face challenges in execution. Furthermore, EIA laws and guidelines are not rigorously reviewed or followed to projects in the area. Despite commendable efforts, there are practical difficulties in implementing EMS legislation and ensuring the right to a clean and healthy environment in the country, as well as in the Dukem town government in the Oromia Regional state. A large number of manufacturers and industries operate in this Dukem Town; and regrettably, their rise and expansion have had a harmful impact on the host environment.

According to Zemelak (2011), one of the functional competences of municipal government is pollution control. Local government is the most accessible institution to citizens, and it is responsible for protecting the environment from pollution and making it livable. The local environmental protection authority is mandated to: (i) regulate and monitor whether any development activity is planned and implemented without harming the environment; (ii) regulate and monitor whether development activities conduct environmental impact assessments prior to project implementation; and (iii) regulate the disposal of various pollutants and waste materials from factories and industries. Despite these statutory functions, there is an apparent gap in controlling industrial pollution in Dukem Town.

### **Study design and methodology**

The study used a mixed method of qualitative and quantitative approaches to attain the research objectives and answer the core research issue. According to Creswell et al., (2003), utilizing mixed approaches helps to overcome the drawbacks of using single methods and improves the study's trustworthiness and reliability. The purpose of employing a qualitative research approach is to investigate the sample population's in-depth and complete perceptions, attitudes, practices, and reactions to environmental resources in their surroundings. It is also backed up with a quantitative approach for locating substantial measurable and countable empirical evidence on the topic at hand.

### **Sampling Design**

Purposive sampling and simple random sampling were used in the investigation. First, people of Dukem Town, who live close to the industries, were the first to be harmed by industrial pollution, and were purposefully chosen as the study's sample respondents. In this investigation, sample sizes were determined using both probability and non-probability sampling approaches. The appropriate sample size necessary to deliver the study sample size was determined using probability sampling. The following stages and procedures were used to determine representative sample sizes. The simple formula developed by Kothari (2004) to find proportionate sample sizes required. In this formula, the following assumptions were made: a 95% confidence level and  $P = 0.5$ . The equation is presented as follows:

$$n = \frac{z^2 \frac{a}{2} * p (1 - p)}{(e)^2}$$

Where, n = sample size

Z = Values of standard variant at 95% confidence interval, (Z = 1.96).

P = Estimated proportion of households affected because of rapid industrialization.

In this case, as the proportion is not known, therefore 0.5 will be used at a P values to obtain maximum number of sample size:

e = Standard error (acceptable error) which is 0.05

Thus, actual sample size will be calculated as follows:

$$n = \frac{(1.96)^2 * 0.5 (1 - 0.5)}{(0.05)^2}$$
$$= \underline{384}$$

The sample size calculated using the general formula above was obtained regardless of the size of the total study population. Therefore, in order to find out the actual sample size for this study, an additional step was taken based on the formula developed by Yamane, (1967) to further refine the proportionate sample sizes suggested for finite study population and is as follows:

$$n = \frac{no}{1 + \frac{(no - 1)}{N}}$$
$$n = \frac{384}{1 + \frac{(384 - 1)}{452}}$$
$$n = \frac{452}{3.0525} + 10\%$$
$$n = 148 + 10\%$$

Accordingly, sample size will consist of 148 respondents out of 452 household heads would be fixed for household surveys. Furthermore, an additional 10% of the total population will also reserve for replacements in order to overcome unexpected uncertainties during the actual fieldwork. So that the total sample size was 148+10%=162.

### Method of Data Collection

Various sorts of data collection equipment were employed in the investigation. For example, primary and secondary data was gathered through interviews, questionnaires, observations, focus group discussions, and document reviews.

### Data Analysis Technique

The data analysis strategy employed in this study was descriptive statistics with contemporaneous triangulation. Quantitative data acquired via survey questionnaires was structured and entered into the statistical package for social sciences (SPSS version 21) software to generate descriptive statistics and investigate the subject under investigation. In addition, qualitative data acquired through focus group discussions and key informant interviews was qualitatively reported to support the questionnaire results.

### Finding and discussions

Dukem is a town in central Ethiopia, in the Oromia Regional State, 37 kilometers south of Finfine (Addis Ababa). The settlement had the maximum altitude of 2,100m above sea level and the lowest altitude of 1,800m below sea level, with a total area of 3,586 hectares. The average temperature in the town is 25.50°C, with an annual rainfall of 95 mm. From mid-June to mid-September, the area sees uni-modal rainfall patterns. Dukem has 114,027 residents in 2015, according to the town's official statistics. Males account for 58,017, while females account for 56,010. Oromia's towns and cities are divided into four levels depending on their population counts, according to Oromia Proclamation No. 65/1995. Dukem Town has received a 2nd-A rating based on this classification of cities and towns.

### Eastern Industrial Zone (EIZ)

Eastern Industrial Zone (EIZ) is one of the first six Chinese Special Economic Zones (SEZs) to be developed in Africa under the auspices of the Forum on China-Africa Cooperation (FOCAC). The Ethiopian Eastern Industry Zone is 37 kilometers southeast of Finfine and 900 kilometers from the port of Djibouti, with 200 hectares of land in Dukem. EIZ's original development plan included USD 146 million in investments over more than 5 square kilometers of land, with 233 hectares built in the first and second phases.

The EIZ is Ethiopia's first and largest-scale industrial park, and the Ethiopian government has made it a priority in its "Sustainable Development and Poverty Reduction Program" to foster the development of the country's industrial sector. The Ministry of Industry has mandated that the EIZ focus on Chinese enterprises in the textile, garment, building materials, mechanical manufacturing, and agricultural processing industries (Fantahun, 2013). The EIZ was created as a consequence of a Memorandum of Understanding (MoU) between the Ethiopian government and the Chinese consortium, which appears to have concentrated solely on designating tasks and obligations for both parties to assume. According to the memorandum of understanding, the Chinese Consortium will be in charge of management and operations. Nonetheless, the Ministry of Industry has set up a steering group and a technical committee to help with the EIZ project's implementation (Ministry of Trade and Industry (MoTI), 2002). According to the official report of the Dukem Town Labour and Social Affairs Agency, the EIZ has around 129 firms and employs 17,496 persons as of 2020.

### **EIZ communal waste treatment**

It has been in place since 2018 and is designed to process industrial and sanitary waste collected from each of the constituting businesses. The treatment plant in the zone consists of preliminary treatment (which includes dehydrative separation sieve, primary sedimentation, neutralization, precipitation, and flocculation by each firm in their own way) and secondary treatment (which includes dehydrative separation sieve, primary sedimentation, neutralization, precipitation, and flocculation by each firm in their own way). The communal treatment plant is the tertiary and last one (treats at the final level and discharge the treated water for reuse by nearby farmers for irrigation purposes).

### **DI YUAN Ceramics Plc.**

DIYUAN Ceramics Plc. (public limited company), a three-stakeholder company with a paid-up capital of 4.2 million Ethiopian *birr* (please provide the US Dollar equivalent), was founded in March 2016 within the EIZ compound. The company's objective is to be the leading manufacturer of high-quality ceramic products. Integrity, quality, customers, agility, performance, and partners are also part of this company's corporate value. The company also aims to contribute to the country's ceramics needs for the construction industry, work in an environmentally sustainable manner, transfer technology, and provide job opportunities for the country's residents. In order to achieve this goal, the business began producing floor and entire ceramic tiles using kaolin, lime stone, quartz stone, and packing material.

### **Habesha Steel Mills Plc.**

Habesha Steel Mills PLC is a company that produces grade 60 rubbers and is based in Dukem. Since its inception in 2006, the facility has been producing grade 60 rebar in sizes ranging from 8mm to 32mm and supplying it to large government and commercial projects. The company began operations with permissible proposed actual capitals; today, its capital exceeds 500 million birr, and it employs over 1000 people on a permanent and temporary basis.

### **How effective is the policy enforcement on EMS in Dukem town?**

In this study, ten of the total 27 semi-structure interviewees responded that they do not have a legally confirmed policy dealing with the treatment of hazardous waste. Companies that do not have a waste treatment plant and are actually highly polluting claimed to have an official environmental policy. Despite the fact that the policy exists, the vast majority of these businesses are not moving through with its implementation.

### **Waste Generation and Waste management practices**

Ethiopia has no national guidelines governing industrial wastewater releases. Ethiopia, on the other hand, has had draft legislation governing the quality of wastewater released to public sewers and surface water quality criteria for trade effluent since 2003. Regulation for Industrial Pollution Control (Regulation No. 159/2008) is developed to assist the execution of the Industrial Pollution Control standards and to prevent future industrial pollution from existing and newly established industries. The legislation requires factories to avoid or reduce the generation of all pollutants in accordance with applicable environmental standards, as well as to protect the environment and human health.

EIZ Communal Treatment Plant, for example, has an environmental policy and claims to be working to protect the environment. Since 2018, the company has been treating garbage from several businesses at the tertiary level. Despite this, the corporation lacks the capability to clean wastewater from all businesses. The industrial waste is dumped into the adjacent community without being treated first. The researcher went to the EIZ downstream site and firsthand witnessed the level of untreated waste water pollution. The liquid waste is collected and discharged through the outflow of the communal wastewater treatment facility. Finally, it flows through the compound's center and into the Awash River.



Figure 1: EIZ untreated waste water discharged to the downstream communities in Dukem Town, Ethiopia December,2022.

When we look at the three sample companies, we can see that they produce liquid and gaseous hazardous pollutants that end up in adjacent towns (see Figure 1). Field observation, key informant interviews, and focus group discussions with various social groups were conducted regarding waste water management in the Eastern Industry Zone (EIZ). The researcher questioned a former EIZ company environment management unit expert about the firm's waste water management, and he explained that the firm has a waste treatment plant that will treat wastes in three ways, with the primary and secondary treatment processes taking place at the firm level. The third (tertiary stage of treatment) is gathered in one location and treated by the EIZ communal treatment plant; however the businesses are not seen treating their waste water in a similar manner.

The firms' reluctance to tell could be due to the fact that they operate within the EIZ, where waste water discharged from each firm is directed to the communal treatment plant for tertiary treatment. The capability of the communal treatment plan, on the other hand, was restricted to some and did not successfully treat the waste water. The EIZ discharged partially treated and untreated waste water to the downstream population as a result of this. According to him, the zone is currently attempting to prepare alternate and extra treatment plants within the zone compound, based on the EIZ's primary claim.

According to Dukem Town's Environmental Protection, Forest, and Climate Change Authority (DEPFCCA), the EIZ Communal Treatment Plant was responsible for collecting and treating waste water generated by all of the zone's businesses (such as textiles, garments, leaser products, plastic products, packaging, construction, food and wood products, soap detergent, medicine, and so on) to the highest possible standard before being discharged. However, according to an environmental audit undertaken by the authorities from October 20 to October 30, 2019, the company discharged untreated waste water in excess of the legal standard, which was validated by a laboratory. The environmental auditing undertaken by Dukem Town DEPFCCA against the plant detailed below demonstrates that EIZ's current environmental impact is severe and worrying.

Table 1: EIZ Waste Water Discharges to water sources in Dukem Town Areas, December,2022

Parameter	Standards (permissible limits)	Field number or code sample	
		Sample 1	Sample 2
Chemical oxygen demand, COD, mg/l	250 mg/l	183	283
Ammonia, NH <sub>3</sub> , mg/l	20 mg/l	15	7
Nitrite, NH <sub>3</sub> , mg/l	40 mg/l	1.9	0.2
Total- Nitrogen, mg/l	30 mg/l	27	26
Total-Phosphorus, mg/l	10 mg/l	146	186
Total- Alkalinity, mg/l		0.0001	0.0001
Total-hardness, mg/l		174	202
Copper, uh/l	2 mg/l	2.1716	2.011
Nickel ,Ni, ug/l	1mg/l	36.49	31.72
Zinc, Zn, ug/l	1mg/l	1.776	1.890
Manganese, Mn, ug/l	5mg/l	22.44	20.09
Silver,Ag, ug/l	1mg/l	2.090	2.406
Lead, pb,ug/l	0.1mg/l	2.1716	2.011
Cobalt, Co ug/l	1mg/l	79.12	80.18

Source: Laboratory analysis, December, 2022

According to table above, when compared to Ethiopia's quality of effluent limitations regulation, the laboratory result of west water created by EIZ was above the acceptable level. The discharge of EIZ waste water to downstream rivers, sewers, and surface water has been proven. As a result, the effluent produced from EIZ has had a significant impact on the community's health, as well as the health of their livestock and agricultural production in the downstream areas. As a result, the chemical discharged with untreated waste water effluent from EIZ may pose a risk to people's health, including respiratory issues, backbone pain, blood cancer, sinus and asthma, and so on. As a result of the discharge of partially treated or untreated waste water, the surroundings have become

polluted.

According to DEPFCCA, the EIZ management group in 2020 pays little attention,



Figure 2: EIZ untreated waste water used for irrigation in Koticha Kebele, Dukem Town, and December, 2022

The quality of the wastewater and combined wastewater with river water is found to be above the allowed limit value for irrigation, according to an FAO (Food and Agricultural Organization) standard from 1989. The combined water and wastewaters were deemed unfit for irrigation. As a result, the laboratory test of EIZ wastewater reveals a non-acceptable range norm, indicating that it is unfit for irrigation. In order to corroborate the findings, the researcher contacted 16 households in the Koticha area about the effluent the factory discharges, and they responded with a variety of environmental problems that were previously unknown due to this contaminated waste water. High unpleasant odor, development of skin problems when children wash from the toilet are some of the environmental disadvantages that people face. "When our crops were devastated, we reported to Dukem town government," said one of my primary interviewees.

Even if the Administrator stated that he will discuss the situation with all relevant parties, there is still no solution." According to her, the entire community in the vicinity of EIZ has expressed their dissatisfaction. She further claims that when someone comes into contact with this waste water, it burns their skin and causes them to break. Currently, we put ash and animal feces to our soil under the plants to reduce damage, and then we use waste water. This allows us to grow onions and tomatoes.

#### Gaseous waste

Ethiopia has no national legislation on air quality, but the MEFCC has approved World Bank guidelines, which will be used for benchmarking alongside the draft national air pollution regulations that are now being produced. Normally, because monitoring gaseous waste in the atmosphere necessitates advanced technology, this thesis relied on secondary data to conduct its investigation.

### **DI YUAN Ceramics Waste Generation & Waste management practices**

The presence of contaminants in the air in proportions that can harm humans, animals, and plants is referred to as air pollution. Local inhabitants and manufacturing workers are affected by air pollution, which also contributes to global climate change. Particulate particles (dust and soot) as well as gases such as carbon monoxide (CO), sulphur dioxides (SO<sub>2</sub>), and nitrogen oxides (NO<sub>x</sub>) have major health consequences. According to Mekuria (2019) Dyuan Ceramic's consultancy report, the company is lacking in EIA/EMP implementation (in terms of preparation and function of the document) PPE is not provided to low-paid risk assessors (confounded, unpleasant odor, noisy machinery, and heated workplace). Low act to perform on the community's air pollution complaint. Various harmful gaseous contents, such as volatile organic cpds (VOCs), CO<sub>2</sub>, NO<sub>2</sub>, Nox, and CO, have been released into the environment in excess of permissible levels. In addition to polluting the air, the corporation discharged dining and toilet waste water into an open area due to a lack of safety. According to official statistics received from Dukem Town.

Many people in the Koticha Kebele have experienced asthma and bronchitis as a result of the company's effluent emissions. The bulk of these were children and pregnant women. On the 14th of October 2018, the Dukem Town DEPFCCA sent a letter to Di Yuan ceramics with the reference number ATENBJQ/73/2021, requesting that they stop harming the environment. The Authority stated in its letter that Di Yuan Ceramics plc had received multiple warnings from the EPA but had failed to take corrective action.

I found a letter written to one industry from Oromia Regional State reading "during the course of ceramic production, your company committed substantial air pollution with dust particles and a foul odor," the letter reads. The community has complained about this on multiple occasions, and we have investigated and confirmed the issues. As a result, you must take action on the following environmental concerns within a specific time frame." In short, the letter requests that a course of action be taken, such as creating an environmental unit within the company structure, responding to environmental complaints by reducing pollution in any way possible, conducting an environmental audit, and delivering an EMP within a specified time frame. Finally, the letter said unequivocally that if the plant did not address the aforementioned environmental issues and find a way to manage its trash, it

would be compelled to pursue legal action.

The letter also warns DYUAN Ceramics Plc to stop polluting the environment in a letter dated 28/2018. The Authority stated in its letter that Di Yuan Ceramics plc had received multiple warnings from the EPA but had failed to take corrective action. Di Yuan Ceramics was also admonished by the Dukem town administration office to stop harming the environment and compensate the farmers. Following the dismissal of nearly one hectare of farm land, a farmer filed a complaint with the administration. The facility's administrators also demanded that the factory compensate farmers whose farm fields were harmed as a result of the factory's untreated liquid waste discharge.



Figure 3: Fruitless crops due to Di Yuan ceramic air pollution, Photo captured on December, 2022

Farmers and citizens' continued complaints at various levels prompted the corporation to make minor improvements while this study was being done. So far, the company has taken some corrective action, as demonstrated in the images below. However, due to a lack of oversight and review by the relevant government environmental protection agencies, this firm's pollution continues.



Figure 4: Habesha Steel Mills Plc. Waste generation and management practices, Photo captured on December, 2022

Habesha steel mills plc, for example, produces poisonous harmful smoke and pollutants throughout its manufacturing process since it uses old model steel production machinery. Hazardous gas emissions from this company were discharged directly into the environment in all directions. The afflicted community in Tedecha Kebele has complained to the Dukem town EPCCA several times. Based on these complaints, DEPFCCA investigated the issue and directed the company to use current steel technology to reduce emissions. As a result, from April 8, 2019 to April 9, 2021, Dukem town EPFCCA conducted an environmental audit in partnership with EEPFCCC and OEPFCCA. According to this discovery, Habesha Steel Mills plc was one of the factories contaminating the air by emitting dangerous gaseous particles into the environment in excess of the national allowed standard.

Table 2: Habesha Steel Mills Plc hazardous gas emission beyond permissible limits.

Polluter	Measurement	Standard	Difference	Remark
Habesha Steel Mills Plc.				
Particulate mass 2.5	382 $\mu\text{g}/\text{Nm}^3$	65 $\mu\text{g}/\text{Nm}^3$	317 $\mu\text{g}/\text{Nm}^3$	Hazardous
Particulate mass 10	424 $\mu\text{g}/\text{Nm}^3$	150 $\mu\text{g}/\text{Nm}^3$	274 $\mu\text{g}/\text{Nm}^3$	Hazardous
So <sub>2</sub>	3260 $\mu\text{g}/\text{Nm}^3$	500 $\mu\text{g}/\text{Nm}^3$		Hazardous
No <sub>2</sub>	2900 $\mu\text{g}/\text{Nm}^3$	200 $\mu\text{g}/\text{Nm}^3$	2700 $\mu\text{g}/\text{Nm}^3$	Hazardous

Source: Dukam Health Environment Protection hazardous gas emission beyond permissible limits report,

### November,2022

When compared to Ethiopia's quality of effluent limitations regulation, the laboratory measurement of gaseous pollutants from Habesha Steel Mills was found to be above the acceptable level. It was proven that the gaseous particles emitted by the company were discharged into the environment, causing dangerous air pollution. As a result, the chemical released with untreated gaseous particle effluent from the firm could pose a health risk to individuals, such as respiratory difficulties, sinus problems and Asthma.



Figure 4: Dukam Town Environmental Protection report on Habesha Steel Mills plc effluent discharged to the surrounding environment, November, 2022.

Habesha Steel Mills Plc further stated that contemporary technologies should be installed across the company to neutralize toxins discharged into the air. In response to homeowners' and the EPA's complaints, Habesha Steel Mills plc wrote to DEPCCA on July 20, 2019, stating that, in order to address these issues, the company developed a pollution control action plan and submitted it to the appropriate government agency. Finally, the latter stated that the installation procedure had begun and that the system will be operational until November of 2018. Despite the corporation's promise of improvement in this letter, the study found that the company does not adequately reduce air pollution.

### Effects of EIZ, Di Yuan Ceramics and Habesha Steel Mills Plc.

EIZ, Di Yuan Ceramics, and Habesha Steel Mills Plc., all of which are located in Dukem Town, have all created hazardous wastes, according to all (100%) of questioner responses. They have also had a negative impact on them during the manufacturing and disposal processes. Even if the Ethiopian government declares its commitment to Ecologically Sustainable Industrial Development (ESID), the main argument in this chapter is that it is not committed to enforcing the relevant pollution control laws required to integrate this value into its industrial pollution control and management practices in the case study industries. In actuality, as these case study industries demonstrate, there is a disconnect, if not outright conflict, between stated priorities and aspirations.

It also contends that the case study industries clearly demonstrate the presence of a powerful taboo against criticizing the three case study businesses' inadequate pollution control and management systems. Because local governments view these industries solely as sources of employment, environmental hazards are left unaddressed. Any objection leveled against them is interpreted as egotistical and unconcerned about the poor. According to the researcher, this is precisely why the impacted communities' complaints about the three case study industries' poor waste management have gone unanswered.

The vast majority of respondents (100%) believe that the industries have a detrimental impact on their health. According to the respondents, the three industries had a negative impact on their health during production and disposal.



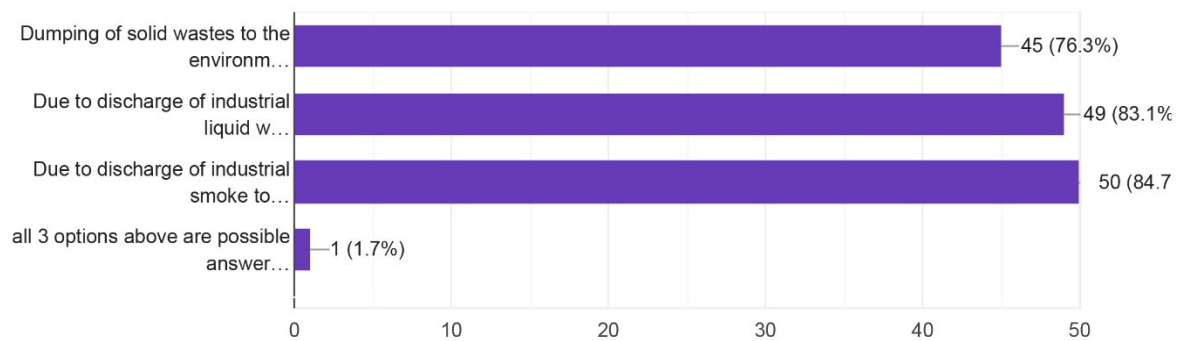


Figure 5: Effects of EIZ Communal Treatment Plant, Di Yuan Ceramics and Habesha Steel Plc. survey result, December, 2022

According to the data gathered from the locals, the most common health condition that impacts the respondents' health is unpleasant odor or stench from the two manufacturing enterprises. About 84.7 percent of nearby residents responded that the foul smell of industries during the manufacturing process or the discharge of industrial smoke has adverse impacts on their health. Residents living near EIZ have complained about these foul odors, claiming that it has caused respiratory problems, cough, asthma, sinus problems, skin problems, and eye problems. Based on the researcher's personal observation, the said foul odors emanating from the EIZ could be sensed up to 50 meters away from the factory's grounds. Furthermore, data collected from residents suggests that discharge of industrial liquid wastes into water bodies and the associated foul odors are the most common problem cause detriments to residents' health. The industries are hurting their lives and health, according to 83.1 percent of the respondents, by releasing their liquid wastes into the adjacent community. While the remaining 16.9 percent said that solid waste dumping by these industries was a problem.

The release of industrial waste and the resulting unpleasant odors, according to the respondents, is another widespread problem in the area that is impacting the people's comfort and wellbeing. Another issue that the respondents allege is impacting their health is vegetable and soil contamination, as the vegetables given to city residents are primarily produced by the polluted waste water used for irrigation. Even though they used waste water for irrigation most of the time, the chemical in the waste water destroyed their tomato and onion productions, according to one of the surrounding rural area inhabitants. As a result of the preceding debate, it can be concluded that all types of industrial pollution have an impact on the wellbeing of people as well as the environment.

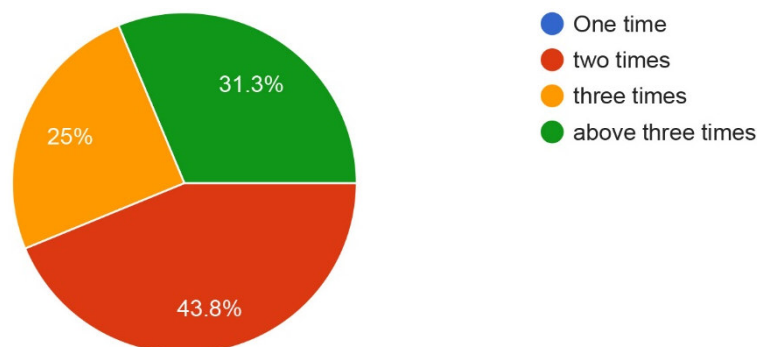


Figure 6: Frequencies that the environmental officer visit health institution per year

According to Figure 6 (derived from an online Google survey), the majority of respondents (43.8%) visited health facilities two times per year, while the rest 31.3 percent and 25% visited health institutions more than three times and three times respectively. This demonstrates that industrial wastes or pollution from EIZ, Di Yuan Ceramics, and Habesha Steel Mills Plc are commonly hurting locals' health. The frequency of time, on the other hand, fluctuates. Regarding this, the Environmental Health Regulator at Dukem Town Health Office responded that, even if there is no evidence for the cause of the patient examined with various air and water-related diseases, it is clear that disposing of liquid waste into water bodies and the resulting bad odor is the most serious public health problem.

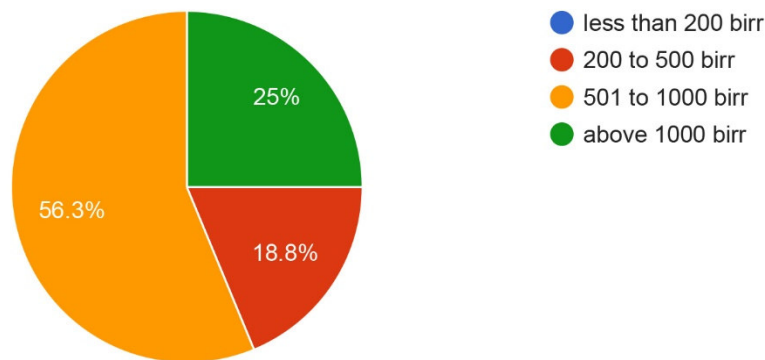


Figure 7: Cost ranges for health care service

As shown in Figure 7 the majority of respondents (56.3%) spend between \$500 and \$1,000 per year on health services, while 25% of respondents (25%) spend more than \$1,000 per year on health services, and the least expensive health service is between \$200 and \$500, accounting for 18.8% of the total. From the foregoing explanation, it is clear that industrial pollution is the primary cause of health-care costs. Pollution from EIZ, Di Yuan Ceramics, and Habesha Steel Mills Plc. is harming citizens' health, costing them more money and causing economic loss.

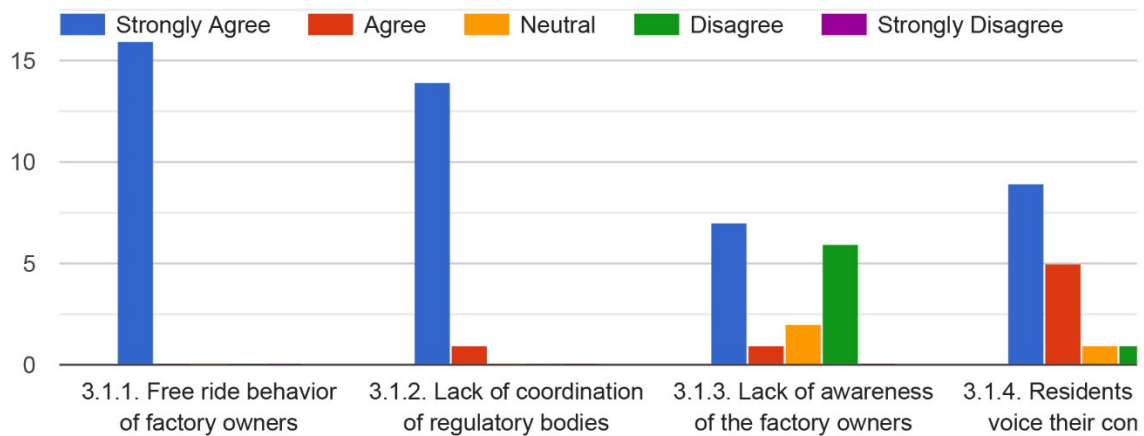


Figure 8: The Causes of Industrial Waste Problems

As shown in Figure 8, the majority of respondents strongly agree that factory owners' free ride behavior is the root of EIZ, Di Yuan Ceramics, and Habesha Steel Mills Plc's waste problem. While the remainder of them feels that factory owners and locals are unaware of the situation. The free ride behavior of factory owners, the lack of coordination with regulatory organizations, and residents' quiet are the key causes of the EIZ, Di Yuan Ceramics, and Habesha Steel Mills Plc industries waste problem that is visible in the town, according to this set of respondents. In other words, factory owners are not responsible for the environment or the well-being of citizens, and regulatory authorities and local governments have done nothing to help.

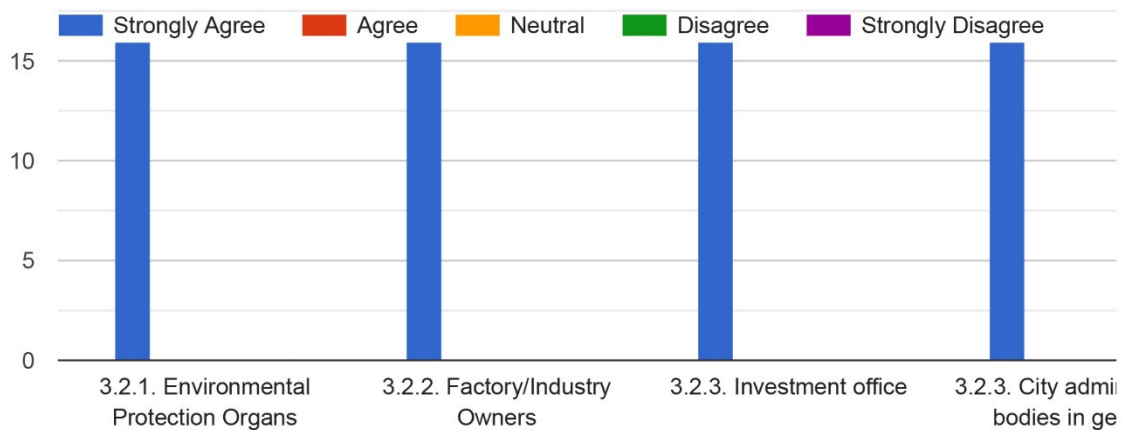


Figure 9: Ranges of responsibility for the causes of problems.

When asked which bodies are responsible for the present problem, 100% of the respondents strongly agreed that most agencies are equally responsible: the environmental protection agency, the plant owner, the investment office, and the town administration bodies in general. We can deduce from this response that the city population understands that the first accountable body for the problem is the city administrative bodies in general, because they are the ones who are responsible for caring for the city people's well-being. Factory owners are also accountable, as they must treat their waste and avoid polluting the municipal environment.

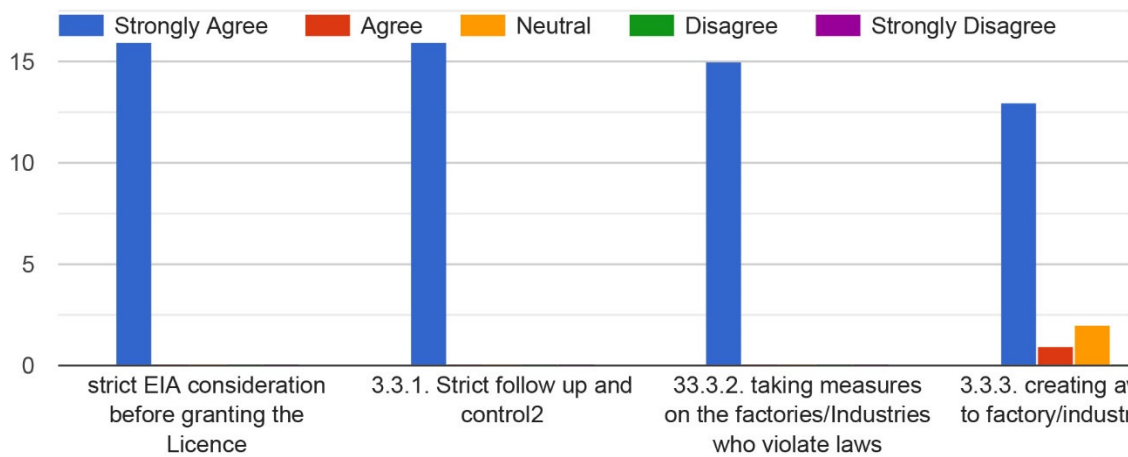


Figure 10: Regulatory bodies to minimize the problem

This clearly demonstrates that the respondents understand the importance of investments for both the town and the country's growth. In that case, the first action of the regulatory body in question should be to conduct a thorough EIA before granting a license for a new development project, as well as to conduct a thorough follow-up and create awareness to ensure that the investment's results are sustained and that the community's well-being is protected. However, if it does not work, they believe that the last option will be to take action against factories that break the law.

### The Role of local government in controlling industrial pollution

The DEPFCCA was established in accordance with Proclamation No. 199/2008. It is responsible for the regulation and control of industrial waste in the city, as well as the town's environmental protection. The institution's mission is to regulate a variety of industrial wastes in order to promote a cleaner and healthier environment. In terms of waste management in the area, evidence acquired from an interview with the Authority's head indicates that the area's industries are having difficulty controlling their wastes. Such industries' waste management issues are hurting the environment, notably the area's water bodies, air, and soil. In that situation, the city's population is afflicted with various diseases and is uneasy due to the harsh weather.

As the authority's head remarked, the institution strives to embrace public complaints while also striving to resolve the issue through various policies and procedures. The first of the authority's responsibilities is to monitor and control pollution in the environment. This entails monitoring, expert assistance, and remedial actions or measures to mitigate the negative effects of any project or development activity. There are several stages: pre-

construction, building, operation, and demolition. According to the authority's head, the monitoring procedure is mostly focused on whether the company has EIA documents, and for those that do not, the authority assists them in preparing EMPs (Environmental Management Plan).

The Authority collects samples of waste from enterprises that discharge pollutants into rivers without treatment as part of its Monitoring and Controlling Environmental Pollution program. The authority provides input to the enterprises based on the results of their waste tests. Companies also have a duty to notify the authority of their waste management status via a report. Following the monitoring and controlling process, the authorities take remedial steps against polluting firms that release their wastes into the neighboring community in violation of the law, based on gathered records of laboratory results on the companies waste management problem. It's possible that the measures will lead to the closure of industries. As a result, Di Yuan Ceramics Plc has ceased operations prior to the completion of this study.

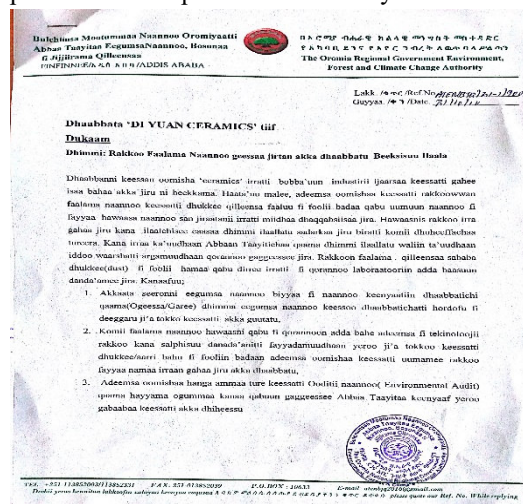


Figure 11: Warning letter up to closing by the town administration, a photo captured from the gate of one industry, December, 2022

The researcher also enquired as to why this occurred. The head of the authority responded that the federal government intervened as the industry has an accreditation from federal government. As a result, when a company was closed by the city administration after receiving multiple warning letters, the federal government might overrule that decision by ordering that the said corporation be reopened.”

As a result, the town administration appears that they are avoiding their responsibilities by doing little to manage industrial pollution. The Authority believes that stopping the plant is not the best solution for the town's industrial pollution problem; instead, concentrating on raising awareness and giving technical help, as well as cooperating for long-term sustainability, is a better option at this time. As a result, the authority chief proposed that factory owners be made aware of the situation.

Finally, as the institution has grown, there are numerous obstacles to their ability to exercise authority, which makes them hesitant to control industrial pollution. The first stumbling block is a lack of clearly defined jobs and responsibilities. As the authority's head stated, they have a broad mandate, but it is not explicitly supported by specific proclamation or law, and institutional capability is further hampered by lack of requisite staff. As she stated, due of the Authority's poor wage, no one wants to work there because there are so many organizations in the city that offer better wages and conditions of service”. In terms of lack of manpower, data acquired from the authorities revealed that there are around 468 industries in the Dukem Town administrative area.

### The Role of Dukem Town Health Office

Environmental health is a department of the Dukem Town Health Office (DTHO) that inspects and controls disease caused by environmental contamination. This department collaborates closely with environmental protection agencies to protect people's health from pollution. Even if there is no evidence for patients who have sickness caused by industrial pollution, according to data gathered from DTHO's environmental health regulatory department, it is evident that the cause is pollution of water and air caused by industries in the vicinity.

The researcher inquired as to what the institution have done to address the health problem caused by industrial pollution. The environmental health regulators responded that they had established a coordinated strategy with the appropriate bodies to address this public health issue. However, the fundamental issue with their functioning is the apparent gross negligence of the concerned body. According to the environmental health regulators, the municipal government pays little attention to the problem of industrial pollution and is hesitant to address it; however, it must be highlighted as a political issue since industrial pollution in the town will become a major concern. Unlike

environmental protection organizations, health care institutions have a greater responsibility to preserve public health because of its primary goal to protect and care for the people.

### The Role of Dukem Town Administration

According to information gathered from the Dukem Town Municipality Office Manager, environmental contamination, particularly discharges from various enterprises, is one of the town's most serious and difficult concerns. The majority of the companies in the area lack treatment systems and simply discharge their waste into adjacent water bodies, posing a variety of health risks to humans and animals in the surrounding rural areas.



Figure 12: Livestock drinking effluents in Koticha Kebele, Ethiopia (Date?)

"These three industries have been causing different difficulties on the area, including impacting the health of the citizens and animals, as well as soil contamination, both in the town administration and the adjacent rural area, "an interview response of EIZ, Di Yuan Ceramics, and Habesha Steel Mills Plc, 25, November 2022. This clearly demonstrates that industrial wastes, particularly those from the aforementioned three industries, pose a serious environmental threat due to high levels of organic chemicals, inorganic matter, dissolved, suspended solids, and specific pollutants such as chromium and heavy metals, which are released into the surrounding community without treatment.

In regards to the execution of EIA and investment approval based on this law, the manager interviewed showed that the way the city government or the region has previously accepted investors has played a part in the current challenges. Because the major goal was to create jobs, increase the national income and generate hard currency, and improve the economy, the implementation of pre-environmental impact assessments in Dukem Town, like other Ethiopian municipalities, remained quite weak, despite initial efforts in pollution control. Despite the fact that most industries pollute the host environment; the town administration is inept at enforcing disciplinary actions. For the past few years, residents of the nearby rural region, as well as some of the exposed Kebele, have been complaining. Due to public outcry, the responsible environmental protection authority, in collaboration with other competent agencies, issued a short-down order to Di Yuan Ceramics.

Because the majority of running industries do not adhere to specified criteria, administrative action will be taken against those that do not improve their waste management system in the future. This is because, on the one hand, residents have a right to live in a clean environment, and on the other hand, the difficulties put pressure on the town and regional administrative bodies to make decisions. In addition to the aforementioned decisions, the town administration has begun to take positive steps to address the problems that have been identified, ensuring the successful implementation of the Pollution Control Proclamations.

In general, despite best efforts, the local government is unable to regulate industrial pollution due to lack of enforcement of powers. The information received from citizens via questionnaire survey also suggests that regulatory agencies have not successfully carried out their duties. The main problem, according to the majority of respondents, is caused by factory irresponsibility and general lack of oversight and control duties by environmental regulatory organizations. In addition, the industrial pollution prevention regulation 159/2008 allows any citizen to file a complaint with relevant environmental organs about polluting enterprises. However, due to weak institutional capacity and other related issues, no immediate solutions have been taken to address the complaints.

To summarize, industrial pollution regulation in Ethiopia is a difficult undertaking. This is especially true in Dukem; where the three industries under investigation are located and where industrial pollution management caused by these sectors has become a major issue. The adoption of an inadequate sustainable development policy is the main cause of Ethiopia's industrial pollution problem in general, and in Dukem Town in particular. Economic and social development (especially poverty eradication) frequently takes precedence over industrial pollution

prevention. The many failings of government include, but are not necessarily restricted to: lack of political commitment to address industrial pollution; failure to enforce industrial pollution control laws; difficulties allocating resources and personnel and facilitating coordination within environmental protection, regulation, and monitoring bodies; failure to create awareness and enhance organizational capacity of affected communities with regard to their constitutional rights.

It is vital to note that while the government has approved industrial pollution control legislation, it does not however implement them, delaying industrial pollution control in the name of economic development and poverty alleviation. Ethiopia, in some ways, is a textbook example of the difficulties that emerging countries experience in balancing development with environmental concerns. Even while Ethiopia has backed green economic growth at the policy level, in practice it intends to follow in China's footsteps, prioritizing economic expansion over environmental damage. The principal focus of government, as shown by Ethiopian investment regulations, is on attracting foreign money, promoting industrial growth, and establishing a modern industrial nation. This is a classic example of a less effective version of sustainable development. Ethiopia, on the other hand, has had major industrial pollution problems as a result of its strong development tendency.

Finally, the close inter-relationship between the ruling party, the government, and numerous institutions tasked to promote environmental protection and take anti-pollution measures appears to continue to weaken environmental protection and effective anti-pollution procedures. In short, one of the biggest issues is the lack of separation of powers in practically all industrial pollution regulatory institutions. As a result, Ethiopia presents a severe test for policies or programs aimed at reducing industrial pollution and promoting long-term development.

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