

# Socio-Economic Impact Assessment of Textile Wastes in Arba Minch and Hawassa Textile Factories

Tessema Bashaye Tafesse and Adane Kassa Yetemegne  
Department of Chemistry, Arba Minch University, Arba Minch, Ethiopia.

## Abstract

The untreated effluents discharged by the industries leads to serious pollution of surface water, ground water, soils and ultimately affect the livelihood of the poor. With these respect assessment of socio-economic impacts of these textile industries is one of the crucial issues. Theoretical data were collected through questionnaires, interviews and observations of workers and Peoples resided near textiles. In addition to the theoretical data indicators of physicochemical pollutants such as color, temperature, conductivity, pH, TDS, TSS, BOD and COD of nearby water bodies were studied.

The values of COD (mg/L) for six sample sites were 328, 264, 68, 60,190, and 160 and the value of BOD(mg/L) 120, 90.5, 24, 27, 40.8, and 27.5 respectively. Some are found to be higher than the limits set by WHO (COD 250mg/L) and (BOD 30 mg/L) for the discharged of textile effluents into river. The ratio of BOD:COD was less than 0.5 indicates that effluent contains large proportion of non-biodegradable matter.

Total of workers employed in both textiles are 1584 with monthly salary ranging from 500 to 6000. The worker use glove, aprons and safety shoes are about 15.9%, the rest use one of the safety materials mentioned above. The residences suffered from bad odor of the textile wastes, they have got asthma, frequent headache, sneezing, and influenza. Animals of the residences that drank waste water and ate the nearby grass become thin and got long lasting sick. It was therefore, concluded that textile effluents were highly polluted hence negatively affect the socio-economic development. Appropriate treatment of must be made to render the wastewater suitable for residences and the receiving water bodies.

**Key Words:** Socioeconomic impact, Textile waste, socio-economic.

## 1. Introduction

Environmental pollution due to different types of industries is one of the vital problem presently facing Ethiopia and all over the world. Textile industries are major sources of Environmental pollution.<sup>[1]</sup> Moreover dyes used in textile industry are important sources of environmental pollution which poses serious problems because of its strong color, high COD, BOD and low biodegradability.<sup>[2]</sup> The water consumption and waste water generation from textile industry depends upon the processing operations employed during the conversion of fiber to textile fabric.<sup>[3]</sup>

Textile industry is one of the important and largest industrial sector in Ethiopia and important for the economical growth also. The climatic condition is suitable for production of raw cotton. This is typically suitable for the textile processing and ultimately for the growth of textile industries. The growth of textile industry is also due to availability of cheap labor from nearby area, due these government gives great attention for the expansion of textile industry. The industries discharges huge amount of effluent directly into public drain and on open space.<sup>[4]</sup>

Main pollution in textile wastewater comes from dyeing and finishing processes. These processes require the input of a wide range of chemicals and dyestuffs, which generally are organic compounds of complex structure. Because all of them are not consumed in the final product they became waste and caused disposal problems. Major pollutants in textile wastewaters are high suspended solids, chemical oxygen demand, heat, color, acidity, and other soluble substances.<sup>[5,6]</sup>

These wastes have historically been discharged in to the rivers, land fill waste sites and some others released in to the air. There are textiles that are using primary effluent treatment plants or secondary effluent treatment plants that could help for proper discharge of wastes. Even applying such treatment plants, because textile use different harmful chemicals (dyes, Sulfuric Acid etc.) in their processing, they could have a number of impacts on the ecology as well as the society.

During the past decades urban areas of developing countries have undergone rapid changes that have transformed the urban landscape as well as the lives of millions of peoples. Like other developing nations, Ethiopia, particularly urban centers of the country, which are the areas of industrial expansion, are experiencing socio-economic and environmental problems related to industries. One of the various industries that are causing such environmental and social impacts is the textile industry.

## 1.1 Socio-Economic Impacts of Textiles

Industrial promotion is a major priority for the governments of many developing countries. Industrial development can make significant beneficial contributions to a country's overall economic development.<sup>[8]</sup> As to the report textile industries have significance in generating employment opportunity; economic gain through export market and local market opportunity from the sale of cotton.<sup>[4]</sup> Textile is the most employment generating industry, accounting for more than 27% of the total manufacturing employment. The overall contribution of Ethiopian Industrial Manufacturing to the national GDP is about 7%, which is seven times less than the share of agriculture and is 12% that of total industry to GDP.<sup>[9]</sup>

## 1.2 Adverse Impacts of Textiles

Wastes divide in four different types<sup>[12]</sup> Hard-to-treat, highly dispersible, hazardous and toxic, and large volume wastes. Each of these four waste types can be found in the textile industry, and they all have their specific characteristics. Treatment is easiest if each waste is considered separately before being combined.

Difficult-to-treat wastes may include dyes, metals, phenols, toxic compounds and/or phosphates. This type of waste is resistant to conventional biological treatment, can pass through the treatment system and end up in the receiving stream where it sometimes causes toxic effects. It is therefore important to minimize through chemical substitution the use of chemicals which result in difficult-to-treat wastes. If no useful substitute can be found for the problem chemicals, the chemicals should be reused, recycled or segregated from the main waste stream and treated separately. Examples of highly dispersible wastes are lint, print paste and solvents. Lint and print pastes can clog up pipes and pumps. Lint is easily removed by screens and/or filters. Binders present in the print paste form gels and clog up drains. Normally, print paste does not cause toxicity problems, but it does put a high organic load on the treatment system. Problems associated with print paste can be reduced by making paste in quantity only sufficient for a given job. Excess print paste can be recovered in the concentrated form for recycle or reuse. For example, the water used to clean the rotary print screens can be collected and used as makeup water for a water-based print of the same color. The excess print paste can be treated with the solids removed from the biological treatment system. Other highly dispersible wastes, like solvents, have value and can be recovered through distillation, which reduces the costs of disposal and purchasing new solvent.

Generally textiles using different chemicals can be source of considerable negative environmental impacts. The impacts include air, water and land pollution; human health and occupational safety; loss of economic benefits and damages the ecological processes.<sup>[8]</sup>

### 1.2.1 Impacts on Water

The major polluting industries like textile and dyeing, paints, tanneries, oil refineries, chemical complexes, fish processing units, fertilizer factories, cement factories and soap and detergent factories discharge directly or indirectly toxic effluents in the rivers.

Ground water is the primary source of drinking water in urban and rural areas of many countries. The groundwater in industrial areas across the country has undergone severe contamination by industrial waste, effluents and emissions which are discharged indiscriminately without any regulatory system. Compared with other kinds of water, groundwater is normally preferred because it tends to be less contaminated directly by wastes and organisms. Most of the hazards coming to human and ecosystem are mostly due to ground water pollution. The untreated sewage, industrial effluents and agriculture wastes are often discharged into the water bodies. This contaminated water spread wide range of water borne diseases. The agricultural fields around these water bodies are also affected.<sup>[10]</sup>

Drinking water may be contaminated by various toxic metals. The impact of the effluents is so stupendous that the water has become unfit for drinking and irrigation.<sup>[11]</sup>

In Ethiopia, the distinction between surface and underground water is not as such visible in the existing legal regime that is Water Resources Utilization Proclamation No. 92 of 1994. This proclamation introduced water permits for all users except peasants, artisanal miners, traditional fishermen and traditional water transport providers. Although the water Proclamation No. 92 of 1994 was not fully implemented because of inherent weakness a more comprehensive Federal Water Resources Management Policy was issued in January 1998.

With regard to water pollution, the Policy stipulates for the need to establish and institutionalize environmental conservation and protection requirements as integral part of water resources planning and projects development. More importantly, it provides for the need to ensure that all water resources schemes and projects have EIA where known negative impacts could be minimized or prevented. This holds true for all ground and surface water development projects. The Ethiopian Standards and Quality Authority is the appropriate government body which

should set quality standards for various uses of water. However the 1990 Ethiopian Standards Regulation No. 12 only provides for desirable and permissible levels that are required for the physical and chemical properties as well as safety of drinking water and the testing methods to be used. To a large extent, the water quality standards incorporated in the said Regulation are based on the international standards set by WHO and do not necessarily reflect the particular conditions of Ethiopia.<sup>[13]</sup>

### 1.2.2 Impacts on Soil and Plant

Heavy metals emitted from the textile industry can disperse in environment and may ultimately get deposited in the soil. Plants growing in such areas may absorb heavy metals in their body. Although heavy metals like iron, molybdenum, manganese, zinc, copper, magnesium, selenium and nickel have a major role for growth and development of plants, but may be toxic beyond certain level. Industrial effluents like, textile effluent, not only contain nutrients that enhance the growth of crop plants but also have other toxic materials. Repeated metal exposures of plants affect its physiological processes such as photosynthesis, water relations and mineral nutrition. The impact of toxicity was evident as visible symptoms of chlorosis, yellowing and immature fall of leaves, poor growth and retarded flower, fruit and green yields. Therefore it is essential that the implications of the use of industrial effluents in the crop field and their effect on soil characteristics should be assessed before they are recommended for use in irrigation.<sup>[10]</sup>

### 1.2.3 Impacts on Human Health

During the past 20 years, a number of studies have examined the possibility that occupational exposure to hazardous chemical substances increases the risk for various diseases.<sup>[14]</sup> The incidence of environmental exposures on the general status of health has been increasingly acknowledged for numerous diseases.<sup>[19]</sup> The industrious hazardous waste may show effects in terms of death and morbidity. This may manifest as respiratory diseases, skin reactions, allergies, diminution of vision, corneal opacity, abortion, malformation of pregnancy, stunted growth, neurological disorders, mental depression, psychiatric changes, altered immune response, chromosomal aberrations and cancer.<sup>[16]</sup>

The chances of contact with chemicals occurs during loading, unloading and handling of chemical containers in the chemical store, transfer of chemicals from containers in the chemical store, transfer of chemicals from chemical store to workplace, handling of chemicals in the workplace, during mixing of dyes, loading of chemicals to machine for printing, removal of the remaining chemicals after printing and effluent from the workplace, disposal of chemicals or effluent and washing and disposing of chemical containers.<sup>[10]</sup>

As chemicals emit fumes, mist, vapors or dust during storage and handling any worker may be exposed to these airborne pollutants in any part of the workplace. Chemicals in liquid and gaseous form also affect the immediate neighborhoods, when released into drains or removed from the workplace by exhaust blowers and chimneys.<sup>[17]</sup>

Unhealthy workers may be less productive, miss work too often and make potentially costly mistakes. Textile effluent often contains odorous waste. Strong smells can damage the quality of life around the textile site and may reduce or destroy community support for further production or expansion. Controlling odor through improved waste treatment techniques, or even recycling, can improve community relations and may reduce costs.<sup>[18]</sup>

In Ethiopia several research works and attempts have been made by the NGOs, individuals and voluntary sectors to address the impacts related to textile industries. The present research work is aimed to assess the pollution potential due to effluent discharged by Arba Minch and Hawassa textile industries by characterization of waste water with the help of important pollution indicator parameters like pH, BOD, COD, TDS, combined with theoretical data to provide a better understanding of the socio-economic impacts of these textile industries. Both the textile industries under study area are raw cotton based. Even if textiles are blamed for their negative impacts it is important to have a general consensus on the extent of the positive and negative socio-economic impacts which requires detailed studies.

## 2. Methods

### 2.1 Research Design

This study is conducted to explore the impact of Arba Minch and Hawassa textile factories on the social and economic environment of the surrounding population. Use of quantitative and qualitative information provides a better understanding of research problems than either approach alone.<sup>[25]</sup> Hence, mixed approach was used for

collecting qualitative and quantitative data either simultaneously or sequentially for best understanding of the research problem under investigation.

## **2.2 Data Source**

### **2.2.1 Theoretical data sources**

The relevant theoretical data was gathered from manager, employees, people who reside around the textiles and concerned government officials. In an effort to augment the primary data and to make the research work more valid and worthy, all relevant secondary sources pertinent to the study were reviewed. Accordingly, different written documents both published and unpublished- books, journals, research works etc, in relation to the issue under consideration; government policy and strategy were referred.

### **2.2.2 Experimental Data Sources**

The sampling points were designated as sample one (S1) to sample six (S6). Waste water samples were collected from where the effluent released openly using clean plastic container. Collected samples were brought to laboratory and stored to the refrigerator at 4°C. Selected parameters such as temperature, pH, conductivity, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Biological Oxygen Demand (BOD) and Chemical Oxygen demand (COD) were analyzed according to APHA.<sup>[20]</sup>

## **2.3 Sampling**

The main targets of this study were workers of the textiles and peoples who resided around the textile factories. From the total of 961 employees of Hawassa textile factory randomly 74 workers and purposely 1 manager were taken and from total of 623 employees of Arba Minch textile factory 25 workers were taken in the same way as for Hawassa. Total of 60 residences, male 38% and female 22 were also taken.

## **2.4 Method of Data Collection**

The general principle in research work is that, the research strategies and the methods or techniques employed to collect data must be appropriate for the questions to be answered.<sup>[19]</sup> Accordingly, to meet the intended objectives of the study questionnaires, observation, interviews were the instruments used to collect the primary data from workers, concerned offices and stakeholders.

Open and close ended questionnaire was employed to collect primary data from the employees about social and economic impact of Arba Minch and Hawassa textile factories. These questionnaires were used to gather both qualitative and quantitative data. Interviews were also employed to collect information from the employer, people who are living near and around the textile factories, concerned officials of the regional environmental protection agency and investment bureau. More over waste water samples from the textiles, and the surrounding water body (Hawassa Lake and Abaya Lake) were taken and analyzed to support the theoretical date.

## **2.5 Method of Data Analyses**

The information which was collected through questionnaires was analyzed and processes in tabular form of percentage methods to derive specific conclusion. The information gathered through interview was reviewed and summarized qualitatively to develop a general understanding of the data. Then, through narrative description the entire qualitative data is analyzed and interpreted. Generally the experimental data was correlated with theoretical studies (questionnaires, interviews and observation) in order assess the socioeconomic impacts of the textile factories.

## **3. Results and Discussion**

Based on the research findings more than 30% of the workers are youth of age 15-24 and more than half of them are adult of age 24-60 (The age category is based on Ministry of Youth, Sport and Culture, FDRE). Regarding the sex profile of the respondents, male workers are dominant and account for 62% compared to the female counterpart that accounts for 38%. The marital status composition of the majority of them (78%) whether

married, widowed or divorced. Out of the total respondents, 58% of the respondents are married, 22% single, 15% divorced, while the remaining 5% are widowed.

Educational background of the workers was also one area of inquiry. The level of education is an important component in the livelihood of a community. In the first place, an educated individual would have a relatively greater opportunity of employment and earn more income, though not always the case. Moreover, there is a chance to be appointed in knowledge demanding posts and thereby diversifying the livelihood. Among the study subjects literacy level was found to be high. Can only read and write 7%, between Grade 1-8 are 51%, Grade 9-12 are 21%, Diploma holder are 12%, Degree holder 8% and Masters holder 1%.

In examining income of workers, of all the study subjects, those who claimed to earn a monthly income of Birr 600 or less than 600 are accounted for 40%, where as 44% of the total respondents earn 600-1500 birr per month and 16% respondent earn above 1500. Most of the respondents 82%, reported as in their house they comprise dependents, either children or other, who are economically as well as socially depend on them parents for protection and care. As per the reply of the respondents the minimum family size is 1 member and the maximum is 9 members, the average being four. The majority, about 47.6%, of the respondents categorized in the household (family) size of 1-3.

The age and sex profile of the study sample revealed that a great number of them 70% are adults between the age of 25 and 60, and male accounts 63.3%. Regarding the marital status 55% of the respondents are married, the remaining account for widowed, divorced and single. Examining the literacy status 18.3% of respondents cannot read and write whereas 81.7% of the respondents are literate which is within the range of the lowest being that can read and write to the highest being diploma.

Moreover, the respondents were asked about the monthly income for their households. Those who claimed to earn a monthly income of birr 500 or earn less are 43.3%. Those who earn between 501 and 1000 birr accounts for 35.0%; while those whose monthly household income is above 1001 are 21.7% of the total. With regard to the household size most of the respondents 75%, reported as they do have dependents, either their children or others who are economically as well as socially needs protection and care. According to the reply of the respondents the minimum family size is 1 member and the maximum is 9 members, the average being 3. Of those who have dependents, more than half of the respondents, 62.2% have household size of 1-3.

### 3.1 Benefits of Textile Industries

Despite considerable adverse impacts on the health of workers, local community or the biosphere in general, textile industries have significances in generating employment opportunity; develops economy of the country through export market and local market opportunity from the sales of cotton and finished fabrics. In such dimensions Arba Minch and Hawassa textile industries have also great contributions. By now Hawassa textile industries have created job opportunity for 961 individuals, 617 permanent 302 temporary and the rest 42 are daily labor from this 263 are females and Arba Minch textile industries have created job opportunity for 623 individuals, 430 permanent 106 temporary and the rest 87 are daily labor from this 228 are females. Hence total 1584 individual are currently working in these textiles. In examining the finding of workers' income from the textiles, of all the study subjects those who claimed to earn monthly income of Birr 600 or less accounted for 40%, where as 44% out of the total earn 601-1500 Birr per month, 15% respondents earn more than 1500-6000 Birr per month and 1% earn above 6000 birr per month.

Respondents Monthly Income from the Textile.		
Monthly Income (Birr)	Number	Percent
600 and less	40	40.0
601-1500	44	44.0
1501-6000	15	15.0
6000 and above	1	1.0
Total	100	100.0

Source: Computed from the primary data collected for the study.

As the finding illustrates 40% workers earn monthly salary from the textile is less than or equal to 600 birr. Despite this fact, as the respondents (workers) quite a large number (82%) of them support their large family from the income they only obtained from textiles. They stated that they do not have any other type of job to support their life. These workers also reported the income from the textile is not only used in supporting employees' life but also of those who depend on them (father, mother, sisters, brothers, children or others).

The workers and residents opinion about overall benefit the textile industries contributing for the surrounding community and the country at large were asked. Accordingly, the study subjects (the workers and the residents) stated that besides creating job opportunity the textile industries had great benefits for worker. The industry also collects cotton from sellers for example Hawassa textile buy large amount of cotton from Gonder region in the Northwest of the country, Awash region in the East and sometimes from Ersha Limat of Arba Minch and Brayle of South Omo in the south region. Moreover, the textile gets its chemical locally from Addis Ababa and imports from Switzerland Company, Europe (Germany, Spain and Italy) and Asian Countries (China and India).

With regard to market destination the products of textile, like bed sheets, shirts, carpets and processed cotton which are used for local market and treads which are exported to the international market specifically to European countries and Asian countries (China) which contribute for the development of economy of the country. Hence the textile generates foreign currency through export market.

### 3.2 Negative Impacts of Textile Industries

#### Impacts on Workers

As textile can be an extremely risky workplace, involving multiple hazards, the employer or the textile manager is responsible for his workers' safety. The employer has the obligation to communicate potential hazard information to the workers in such a way that they can understand and are able to avoid the hazards in question. The employer also has the obligation to provide safety equipments to works so that they can be protected from the likely impact in the production process. It is necessary that all workers in the textile operation have adequate awareness and knowledge about the different kinds of chemicals, their hazardous status etc.<sup>[18]</sup>

The most commonly needed personal protective equipment in textile and effluent treatment plants are protective clothing (gloves, safety shoes, aprons/protective garment tied over the cloth), hearing protection, protective goggles/eyeglasses and respirators/protective mask through which to breathe. If workers lack such devices, they could be unhealthy, less productive, miss work too often and make potentially costly mistakes.<sup>[20]</sup>

In assessing the potential adverse impacts of Arba Minch, and Hawassa textile industries the workers were asked whether or not they are using protective device at time while working in the textile. Accordingly, 60% of them reported that they are using protective materials.

The great proportion of the workers (30 %) reported as they are currently using only Aprons, those who use safety shoes (13 %), glove and safety shoes (12 %), glove, apron and safety shoes (10%), and apron and safety shoes (8%). The remaining (27 %) reported as they are not using protective materials.

Protective Devices the Workers Use.		
Protective Devices	Number	Percent
Aprons	30	30
Safety shoes	13	13
Glove and safety shoes	12	12
Aprons and safety shoes	8	8
Glove, aprons and safety shoes	10	10
Not using any protective devices	27	27
Total	100	100.0

Source: Computed from the primary data collected for the study.

From the finding one can conclude that even though it is the obligation of the textile to provide safety equipments to workers so that they can be protected from likely impact in the textile process but the employer did not apply it well. As result the workers are facing different potential hazards. The result of the questionnaire revealed that the proportion of workers who is in a critical exposure to hazard while working in the textile is about 27 %, this does not mean the rest are safe but the rest are at least used one or more protective device.

It was made an effort to investigate the measures that the textile takes when workers exposed to hazards or accidents while working. A few workers had reported that they had got medical treatment (a worker who has got accident on his hand). But as the response of the majority even though they frequently faced such hazards, either they did not get any medical treatment or the treatment they have got is not satisfactory.

The workers have also mentioned that because they are not using respiratory/protective mask through which they breathe to protect the bad odor, they encountered health problems like asthma, frequent headache and cold. Besides, those workers who reside near the textile also reported that bad odor is not the only problem in their working place but also around their living sites because of the presence of biological lagoon.



Workers who live near lagoon reported the textile industries were created health problems on the family members due to odor of the waste liquid of the textile collected at lagoon. Moreover, the domestic animals of the surrounding peoples' have been facing health problems because the animals eat the grass that grown near lagoon, drink water from it, and some time they sink in lagoon. Due such interaction; these domestic animals became sick and they couldn't going to be fat enough.

The most threatening problem is the waste over flow from lagoon released to "Chefe Wet Land"; this wet land is directly connected to "Tikur Wuha Water" (black water) that enters to Hawassa lake. This lake is primarily used as recreational center for whole Ethiopians and foreign tourists and particularly to Hawassa City which serve as a source of income. It also used for fishery and boat rent purposes which created job opportunity for large number of micro and small scale associations. This lake is being contaminated by the effluent of the textile at minimum concentration in which no doubt it would result health related problems in human life directly (used for cleaning and drinking purposes) and indirectly from fish consumption. The consequences of contamination also have an adverse effect on the aquatic lives which damage biodiversities in the lake.

### Impacts on the Residents

Textile industry contributes significantly towards exports, employment generation and occupies an important role in promoting economy of the country. However, during the process textile factory uses considerably large amounts of fresh water and after processing the water released with various chemicals and wastes which cause highest pollution unless they are treated well.

Hawassa textile industry which lacks the appropriate waste treatment and disposal system is now affecting workers and the surrounding community in a number of ways. But regarding the waste disposal, the technical manger of the textile reported that wastes are released after treating it using primary effluent treatment plant inside the compound that only separate solid wastes from liquid wastes and liquid wastes treated by using sulfuric acid manually hanged on small plastic jar. It was confirmed that the treatment plant is not working for long year ago. As shown below the there is no significant difference between before and after treatment.

	
<p>Disposed waste of Hawassa Textile after printing and dying.</p>	<p>Appearance of waste after treatment.</p>

On the basis of report of residences, 100% of the sampled respondents replied that the effluent/liquid waste of the textile reach their resident with its disgusting color and from the total 38.3% of the respondents reported that they did not yet faced any health problem related to the effluent. But the remaining 61.7% replied they faced health hazards. Family members especially their children suffered from water related diseases like typhoid etc. Even though detailed studies is requires, the respondents who reside on the side of the textile around lagoon faced many health hazards on their domestic animals like extreme weight loss, removal of their hair, loss of appetite, diarrhea and sometimes they died.

Moreover, the sampled residents are suffering from the bad odor from the textile. The textile effluent often contains highly odorous waste. As to the report of USAID (2009), strong smells can damage the quality of life around the textile site and may reduce or destroy community support for further production or expansion. Likewise the 96% of the sampled respondents did not denied the existence of bad smell. Around 10% of the respondents reported that they are not sure whether or not the problem they faced is related to the bad smell from textile waste, 30% reported as they did not faced any health problem related to the bad smell but larger percent, around 60% of the respondents replied that the common problem due to the bad odor of the textile wastes are: asthma, frequent headache, sneezing, and influenza.



Disposed waste of Hawassa Textile in front of the residences (Lagoon).



Tikur huwa river (left) and the bridge where the river join Hawassa lake (right).



### 3.4 Efforts of the Textiles to Implement EIA Recommended Mitigation Measures

Waste generation and disposal of waste forms part of everyday life problems which is more for industries especially textile because of the tremendous volume of wastes and chemicals used.<sup>[12]</sup> Pollution remediation of these textile wastes is of great need since they damage the normal functioning of the ecosystem. To reduce the toxicity of soil, water, air and the atmosphere as a whole caused due to the discharge of heavy metals and contaminants from textile, hence various treatment procedures should be followed. The methods should aim at reducing the toxicity of the metals before letting into the land or rivers.

In Ethiopia past experience has shown that programs and projects undertaken in different sectors of the country have caused damage to the environment and to public health. This is because traditional project preparations and decisions were mainly based on short term economic and technical feasibilities and neglected environmental and social as well as the long term economic dimensions.

Concern for environmental degradation in Ethiopia has been growing in recent years. The most important step in setting up the legal framework for the environment in Ethiopia has been the establishment of the Environmental Protection Authority (EPA) by proclamation No. 9/1995.

The proclamation EPA has amongst its powers and duties:-

- To prepare environmental protection policy and laws; and, upon approval, follow up their implementation.
- To prepare directives and systems necessary for evaluating the impact of social and economic development projects on the environment; follow up and supervise their implementation.

Contribution of Hawassa textile industry for the economy of the country is by processing raw cotton to finished products and Arba Minch is by processing raw cotton but not finish their products. However, unless appropriate environmental monitoring and protection activities are carried out, the development efforts of this project could damage the environment and make development unsustainable. The textiles were established before the EIA proclamation (Proclamation number 299/2002) hence the textiles are expected to adjust themselves to make activities environmentally friendly.

Environmental protection agency of SNNP region has responsibility and obligation to undertake monitoring and auditing of the waste management system of Hawassa and Arba Minch textile industries. However, an improvement has not been observed about the waste disposal mechanisms of the textiles; even the treatment system is not working due to the lack of sulfuric acid and non-functioning of waste treatment plant that monitor neutralization reaction. So it was examined and identified the following major weaknesses:-

- The textiles solid waste collection, treatment and disposal mechanism is very poor.
- The effluents from washing, finishing rooms and dyeing room pass through non-functional waste refining ponds and then released to lagoon.
- The volume and amount of textiles effluent are not known.
- Unavailability of laboratory room and equipments.
- The carelessness on the way of handling during mixing of dyes and lacks of neatness.
- Lack of discussion with residences on the impact of lagoon.



Physical appearance of dye mixing room (left) and the way dyes washed from the floor and enter the drainage system (right).



Sludge and algae resulted from waste water on lagoon.

Generally, the textiles solid and liquid waste management and disposal system is contaminating the surrounding environment this shows specially Hawassa textile industry is not implemented the EIA recommended mitigation measures. Officials from the regional environmental agency to some extent tried to discuss this threatening issue with textile managements on the issue the textiles handled environmentally friendly by improving the waste management and disposal mechanism but still the textile industries could not improve their practices. The regional EPA has no any written (research) document on the socio-economic impact of textile wastes to prohibit and control these textiles. Also the textiles have no any written document on the socio-economic impacts of textile wastes to improve their waste management system. Hence this research work may help in providing both theoretical and experimental evidence regarding the socio-economic impact of the textile wastes as a written document for SNNPR and the textiles.

### Experimental Evidences

Black colored liquid effluents were observed and the pH of the effluents is varied from 7.8 to 9.21 showing that the effluents from textile industries are alkaline in nature. The pH variation is primarily caused by different kinds of basic chemicals used during processing steps in textile industries like NaOCl, NaOH, surfactants and sodium phosphate. The values of S1, S2, S3 and S5 are observed to be higher than the standard prescribed by Central Pollution Control Board (CPCB) and WHO limit of effluent discharge (6.5-8.5). All the samples contain BOD value between 24 to 120 mg/L, the value S1, S2 and S5 are higher than

prescribed standards stipulated by WHO (30 mg/l). The value of COD of ranging from 60 to 328 mg/L, the value for S1 and S2 is higher than WHO standards. The higher value of COD is due to dyeing section of textile processing industry because of nature of chemicals employed and Arba Minch textile waste COD value is lower because textile did not have dyeing and finishing section. The ratio of BOD: COD was ranging from 0.2 to 0.45 and which is less than 0.5 that indicate the effluent contains large proportion of non-biodegradable matter.

The temperature values observed were 35 °C at S1, at S2 was 30 °C, while at S3 and S4 was 28 °C S5 was 26 and S6 was 15.8. The values were in the permissible limit of the WHO standards (<35). Higher pH values were recorded at S1 9.21, S4 9.08 and S5 8.7, this value is higher than prescribed standards stipulated by WHO (6.5-8.5). The conductivity values were 46.3 $\mu\text{scm}^{-1}$  for S1; 31.4 $\mu\text{scm}^{-1}$  for S2; 33.5 $\mu\text{scm}^{-1}$  for S3; 16.7  $\mu\text{scm}^{-1}$  for S4; 17.5  $\mu\text{scm}^{-1}$  for S5 and 16.4  $\mu\text{scm}^{-1}$  for S6. The values were in the permissible limit of the WHO standards (200 $\mu\text{scm}^{-1}$ ).

The TDS values observed were 891.1 mg/l at S1, at S2 was 483 mg/l, while at S3 and S4 was 183 mg/l and 582 mg/l S5 was 298 mg/l and S6 was 285 mg/l. The values were in the permissible limit of the WHO (1500 mg/l). In present study, suspended solids of untreated effluent were 110 mg/L and treated effluent 100 mg/L, S3 22 mg/L, S4 26 mg/L, S5 35 mg/L and S6 20 mg/L. The value of untreated effluent was higher than prescribed standards stipulated by WHO (100 mg/L).

#### 4. Conclusion

Development programs and projects undertaken in different sectors of the country have been causing damage to the environment and public health. The fast increase in the prevalence of the problem requires a timely measure. Research used as a major tool for indicating the appropriate action to be taken, to diagnose policy development, improvement and program execution or intervention which must be given priority.

Textiles are generally pollution-intensive industrial complexes generating large volumes and high concentration of liquid and solid wastes. These wastes have historically been discharged in to the rivers, land fill waste sites and some others were released in to the air which could cause damage to the environment and to public health. The negative and the positive socio-economic impacts of the textiles on workers and the surrounding community; the contribution of textiles to the economy of country; the efforts of the textile to implement EIA recommended measures to make the activities of textiles environmentally friendly were assessed.

The findings reveal that the textiles are contributing a lot for the local community as well the nation at large by creating job opportunity; bringing foreign currency through exporting their product to European and Asian countries; increase market choice for local customers and create opportunity for the community through collecting raw cotton. On contrary textiles have many negative impacts due to disposal of large amount of untreated wastes. The Due to lack of safety/protective device workers are exposed to different hazard (replied by worker). Due to untreated effluents the residences are facing different potential hazards (replied by residences). The workers and the residents near the textiles are suffering from different diseases due to the waste that is accumulated and disposed from the textiles without any treatment. Especially People who reside Hawassa textile near lagoon seriously affected both themselves and their domestic animals through direct contact and unpleasant odors of textile wastes. In contrast Arba Minch textile factory the effect is less due to the absence of finishing processes in which dyes did not used.

The ratio of BOD: COD was ranging from 0.2 to 0.45 and which is less than 0.5 that indicate the effluent contains large proportion of non-biodegradable matter. COD of ranging from 60 to 328 mg/L, the value for S1 and S2 is higher than WHO standards. Higher pH values were recorded at S1 9.21, S4 9.08 and S5 8.7, this value is higher than prescribed standards stipulated by WHO (6.5-8.5). These experimental evidences show that effluent wastes of textiles caused pollution and will cause a serious problem which agree with theoretical information obtained from workers and residences.

In general, textiles have undeniable advantage for the country like Ethiopia, where there is cheap human labor; sufficient water and abundant raw cotton, providing opportunity of employment for the citizens; the overall effect contribute for GDP of the country through. However the waste management of the textiles is not environmentally friendly. Due to the improper waste disposal mechanisms of the textiles, most workers and people who are living around the textiles are facing a serious health problem.

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