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Environmental and Social Impact Assessment (ESIA) of Magic Gel Production on Cockroaches Killer in Ethiopia (from September 2014- to January, 2015), Ethiopia

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Abstract

Abdul hafiz Shifa Import Trade in Pesticides and Agro Chemicals Project is aimed to produce Natural insecticide which is non volatile, easily applicable and highly environmental friendly, and supply the product (Magic Gel) to national and international markets with affordable price. As a business entity shall sought to draw modest profit and indeed creates job opportunities to professional, technical and semi-skilled personnel, and more definitely enhances the revenue to be collected through tax. A promising method under development for improving the environmental quality of product is life cycle assessment look at all the environmental impacts of a product and its package. One advantage of life cycle assessment is that it can determine whether reducing an environmental impact in one area. Such as manufacturing, shifts the impact to another, such as disposal. It also helps to identity where environmental improvement efforts should be focused. In carrying the Environmental and social Impact Assessment (ESIA) study of the project, emphasis was given to ensure that the project should not only be technically feasible and economically viable but also be socially acceptable and environmentally sustainable. Based on the EIA guideline of Ethiopia, Abdul hafiz Shifa-Import Trade in Pesticides and Agro-Chemicals Project has incorporated environmental impact assessment as an integral part of the project and conducted the study on the project area. The objectives of the study are to identify significant, positive and negative bio-physical and social impacts, which are likely to be caused due to execution of the project, enhancement of the positive impact and advantages of the project undertakings, measures for mitigating the adverse impacts. To attain the objectives, the main approaches and methodologies followed were project screening, review of relevant previous studies, polices and legal frameworks, project area field observations, consultations with Kebele and Woreda level, relevant stakeholders, describing the physical, biological and socio-economic baseline environmental conditions, collecting primary and secondary data, evaluation of collected data and the EIA report writing. Oral consultations were made with Kebele and Woreda level stakeholders and the project area community representatives. The consultative meetings helped in identifying stakeholders' fears and expectations from the project. The major adverse environmental impacts expected as a result of the Magic Gel project were; problems on solid waste noise and air pollution, and the likes. Mitigation measures were proposed to control the possible adverse impacts of the project. Among others, these problems can be managed through proper waste management, chemical application, technological designing, workers' protection from being exposed, etc. The major environmental monitoring parameters to ensure the effectiveness of the recommended environmental management plans were proposed and mainly focus on monitoring of essential corrective and preventive measures. The total investment of the project is estimated to 1,350,000. The estimated total environmental budget for the implementations of the environmental management and monitoring plan is estimated at Birr 4500 for 3 years and Birr1500 for the first year project period. Finally, it is concluded that implementation of the Magic Gel project will bring significant beneficial impacts in socio-economic development of the project area and the country as a whole. Therefore, no significant environmental problems will be expected if the proposed measures are properly implemented.

Introduction

Cockroaches are brown most common insects with antenna and are about one and a half inches (four centimeters) long when fully grown [1]. Cockroaches feed on garbage, fruit, crumbs and a variety of other items. They are considered one of the most successful groups of animals. Because cockroaches are so adaptable, they have successfully adjusted to living with humans. Cockroaches may carry hazardous bacteria and viruses that cause human illnesses. However cockroaches do not directly transmit these diseases to humans. Cockroaches

may trigger asthma attacks in response to irritants from body parts and droppings [1]. They live for only short period of time at least one year. In one year of their life span, a single cockroach can lay nearly 150 eggs. An adult female cockroach produces an egg capsule, called an ootheca, which it carries around protruding from the tip of the abdomen. Cockroaches can live up to one month without food. It is important to constantly keep food sources away from them. Fossil evidence indicates that cockroaches have been on earth for over 300 million years.. About 3,500 species of cockroaches exist worldwide, with 55 species found in the United States. Only four species are common pests in Pennsylvania structures. These are the German, brown-banded, Oriental, and American cockroaches.

A fifth species, the Pennsylvania wood cockroach is an occasional nuisance pest in some locations like Ethiopia [1,2]. Managing cockroaches is not easy. You must first determine where the roaches are located. The more hiding places you locate and manage, the more successful your control program will be. Integrated Pest Management (IPM) is the most effective means of controlling a cockroach infestation and preventing its reoccurrence. In other words, change the situation that promotes cockroaches! All aspects of the situation must be evaluated: Reduce food and water sources, eliminate hiding places, consider using baits, Avoid sprays if possible, Use traps to monitor the population [1]. Since the 1960s, EIA has evolved as a comprehensive important management tool in giving decisions regarding ecological, social, economic and technical impacts of projects on their environments [3]. Currently, in both developed and developing countries, [4]. Health and sanitation are the important need and necessary of humankind as far as socio economic development directives are concerned.

The productivity of the citizens and the betterment of living standard shall not be anticipated without enhancing the accessibility of the sanitation and healthy environment service facilities. Articles 40, 43, 44 and 90 of the constitution were especially reviewed as these articles are among others, especially state the right to development, the right to live in a clean and healthy environment and also address environmental objectives respectively. In addition, the Environmental Policy, Health Policy, Environmental Protection Organs Establishment Proclamation, EIA Proclamation; Environmental Pollution Control Proclamation, Public Health Proclamation, Environmental Impact Assessment Guidelines, Administrative Structure and Environmental Institutions of the country were evaluated. Article 44 states about provisions of "Environmental Rights" for all Ethiopians. The article indicates that all persons of the country are entitled to "live in a clean and healthy environment" and have to meet their basic needs in sustainable manner. The demand of natural insecticide in the desired quality, its better effectiveness, easily applicable ,less toxicity to human and other domestic animals, non volatile to environment, and affordable price by the national and international market has the revealed unsatisfactory in the context of our country [5].

The national polices and strategy encourages the development such chemical industries particularly cottage industries that engaged in production of daily consumables items. Most manufacturing/production projects were carried out without due considerations of the effects on the social and environmental safe guards. The planning and implementation of any development of these projects shall incorporate the environment management practices so as to keep the balance of the natural environment and live hood of communities. In recent years the environmental protection authorities at different levels are requesting techno-economic feasibility and EIA studies for various existing and new projects. This has led, a Magic gel natural insecticide processing factory, hereafter the prospective proponent of the Magic Gel processing small plant(mixer) located in Addis Ababa Kolfe Keranio sub city Kebele 01/02/14. In order to carry out EIA study, the factory owner contacted a trustworthy consulting firm-Wanza International Consulting (WIC) [6]. The overall goal of the firm is to contribute to the safeguarding of the Ethiopian Environment and sustainable utilization of the country's bio-resources for its economic, health and social development as well as to provide practical training. WIC is licensed by the Addis Ababa City Administration Trade and Industrial Development Bureau. The Managing Director, Assoc. Prof. Mengistu Woube is also certified by the Ethiopian Management Institute and Environment Protection Authority. He (the consultant) and the factory owner (Ato Abdul hafiz Shifa) signed an official working agreement in February, 2014. The team of experts, led by Dr. Mengistu made a working visit to the project site. The team observed the whole activities, collected pertinent data and technical and professional discussions have been made with the owners, experts and workers of the project.

Research Methodology (Figure 1)

Research Approaches

We recognize and follow two kinds of research approaches, the deductive approach and inductive approach [7]. Based on these considerations, the inductive approach was reversed in connection between theory and empirical findings; the researcher constructs theoretical frameworks upon the data studied in practice [8]. In other hand, in deductive research were presented when the theories reviewed in the literature are tested by the results of the empirical information that might be accordingly supported. The deductive approach is also the commonest relationship between theory, practical of the project and research [9]. Based on this thesis purposes, it is thought as more appropriate the use of the inductive approach, and more acceptability the practical data collected from the Environmental and Social Impact Assessment in the research area, will help constructing the framework for sustainable decision making in the process of project selection and the project area was also meet environmentally friendship. Moreover, these business research recognizes were two main research strategies; those qualitative and quantitative. As described by many authors, the

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qualitative research is more common in social sciences where opinions, perceptions and more in-depth knowledge is required, while quantitative finds application in exacts sciences, in form of a quantified evidence, indicators etc [10]. The research design of this study will follow a qualitative approach and will have the form of a case study by using data collection methods such as interviews, examination of reports and useful information from secondary sources [10].

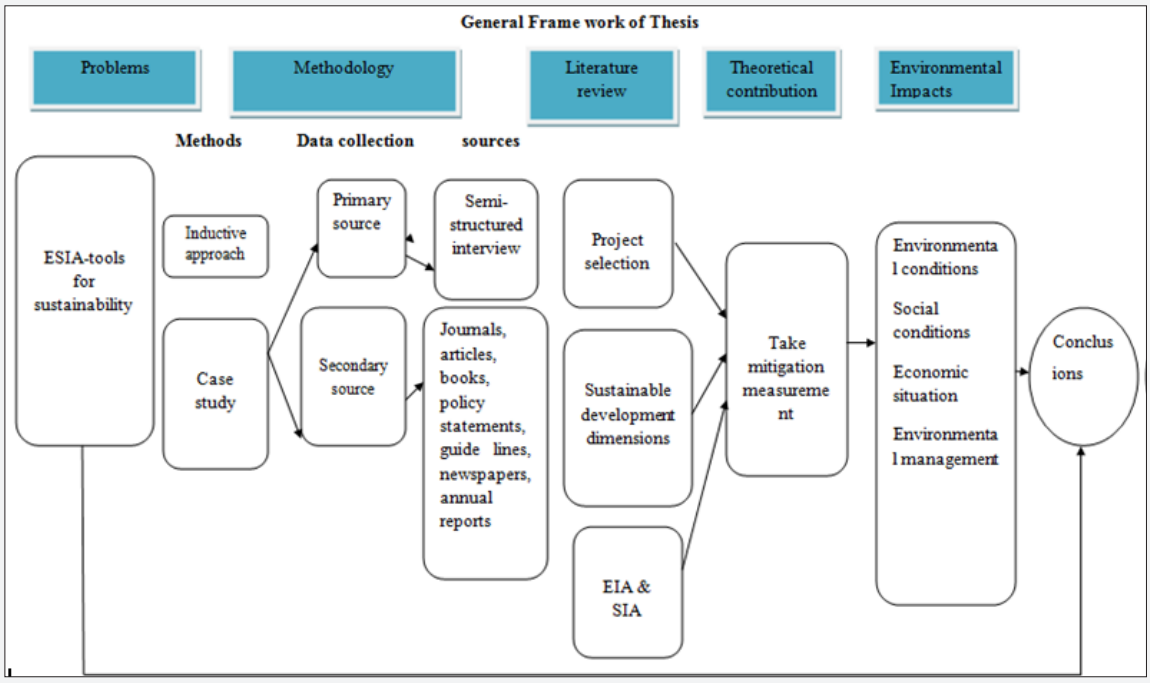

Figure 1: The five main pillars of the research methodology, which is developed by the author.

a) Time horizon: Time horizon was covered in this research, because it is another methodological characteristic of research. By time horizon was understood the period taken is consideration while conducting the research, which can be either longitudinal or cross-sectional methodology [11]. However, this study was considered cross-sectional methods due to the limited time available as well as the nature of the problem. The qualitative approached followed during this research makes the cross-sectional horizon of the problem more appropriate to be analyzed [12].

b) Data collection: Data collections were really an abundant in which can give to a researcher more space and options to choose the most appropriate one. Primary and secondary sources data were collected.

c) Primary data sources: Observations, field visit, surveys, interviews, and workers engaged in operational activities and nearby residents and experiments are some of essential primary sources of information [13]. Semi structured interviews will constitute the main primary source of information for a deeper understating and examination of the situation and more specifically the company's perception and attitude toward sustainability as part of strategy.

d) Secondary data sources: The relevance of secondary data sources was not limited only in solving and giving answer to the project research questions but in particular understanding the problem itself. Review of relevant polices, regulations, guidelines and annual reports of the companies, articles or literature reviews and local newspapers are an essential secondary sources and were collected.

e) Literature, study and legal documents review: Feasibility study of the project literatures on chemical and insecticide, pollution control proclamation, the procedural EIA guidelines [14], EIA Review guidelines [14] and Environmental Policy of Ethiopia were thoroughly studied in order to design the structure of the report [15]. Checklists to collect data and design of successive phases of studies were designed based on the information obtained from the desktop review and the knowledge obtained from prior engagement in similar projects. These include important features of the project that would have direct impact on the environment i.e., base line data collection. Some of the major information are manufacturing process setup & legality, material inputs, the location of the project area, the liquid and solid waste generation ,existence of environmentally sensitive environs in the project area, benefits of the project infrastructure, technologies to be used, and occupational safety and hygiene [16]. This project have already start its production, has got license of its patent right for its owner, conducted new investigation of this natural insecticide chemical, obtained certificates from the Ethiopian Science

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and Technology Minister; Ethiopia Food, Medicine and Health Care Administration and Control Authority. Based on the samples, these authorities checked the toxic and approved that the product was not toxic for human being [10].

Research Description

a) Major Activities of the project: This insecticide chemical processing small plant is found in a warehouse of a total area 200 m2 with enough height that is only platform for the mixing kettle and syringe filling space, there is enough space and air in the room. Around twenty six employee has been performing their duties in good conditions. Different activities have been done in the room such as mixing the ingredients properly by using digital mixer machine, filling the syringe with the homogenous mixture of Magic Gel, and Packing the product with label package cartoon at the same time. There are two different stores, total area of 20 m2 of each. The first store used for raw material stock pile that packed with 20 liter capacity plastic barrels of vegetable oil and 50 kg polypropylene sacks wheat flour, and 20 liters plastic of chemicals. Packing material that well labeled easily identifiable. The second room is used for the packed products where stored, packing products (Magic Gel) arranged properly. Both the ware house and stores are net, well ventilated, have enough space with sufficient air and with sufficient light comfortable to undertake the design process activities under it. There is a laboratory with important equipments. In the laboratory, the quality and quantity of each and every ingredient has been checked. There is first aid kit box in front of the working room, which contain important chemicals. The raw materials, chemical purchases from any chemical supplier, and the wheat flour and vegetable oil also purchases from any flour supplier or local super markets.

Methodology for production process

a) Raw material Inputs: The wheat flour, oil, tap water, and boric acid were mixed in the digital mixer (homogenizer) very well. In this insecticide chemical production process there was no chemical reaction is take place, no new substance is formed, but it is only a formation of a homogenous mixture of these ingredients. Using the wheat flour is used as food of the insect or cockroaches, the oil is used for soften and remain wet and tasty the insecticide to attract the cockroaches in order to eat the insecticide. This product is remaining wet and jelly for more than one year. The rest acetic acid and secret chemical has toxicity properties which kills cockroaches or insects with 48 to 72 hours by infecting their muscles.

b) The major ingredient of products: The chemical formulas of the major ingredient are Carbohydrate (flour) ($C_6H_{12}O_6$) n where n is number of carbon, Vegetable oil ($C_9H_{17}O_2$), Boric Acid (HBO_3) and water (H_2O), and this raw materials are important

c) Wheat Flour: The purpose of using wheat flour has been a source of food, for insects in the mixture of Magic Gel.

d) Vegetable Oil: Vegetable oil is needed for testing purpose or to attract cockroaches and kept the Gel wet for long period of time.

e) Tap Water: The water mixing up other ingredients, used as a formation of dough.

f) Boric acid: it is organic acid, which is used toxic to cockroaches in Magic Gel.

This product (Magic Gel) is non-volatile, odorless, and no need of spray, it is not in the form of gas but it is gel semi-solid. It only attack or kill insects in the digestion process. It is non volatile easily applicable which is environmentally friendly.

Production process

In the production item the factory follows the standard recipe so as to mix the measured proportion of the ingredients unit and the desired homogeneity is achieved. The ingredients are allowed to be mixed (homogenized) in to the final output in the mixing kettle. As shown in the following chart, the four production components function in a healthy manner, and the company has a long/term strategy to recycle used packed materials and syringes. Our argument is illustrated using the following simplified Magic Gel processing model. The model will help us to describe and conceptualize our ideas through a holistic approach (Figure 2).

Figure 2 : Processing Room.

Material Handling and Storage

All the chemical inputs are well packed and safe to handle for both processing and storage. The major inputs are chemical boric acid and the vegetable oil has liquid form that contained in polyethylene vinyl chloride (hard plastic) container. It is suitable to put a leveled floor so that easy to pick up for processing. The major activities as a whole are mixing the ingredients properly; filling the syringe with product and packaging which have been take place at the same times. The company shall also reuse plastic bags and plastic chemical container repeatedly; and finally deliver for market with a fair price to recycle for further use. In both stores, all items are arranged in such a manner that could not create inconvenience, harm or to draw in risks on the workers and to the surrounding area.

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By Products and Waste Generation

During the process of production and the specified and illustrated process flow, byproducts or wastes are generated. No waste or byproducts are generated unless the products or the starting materials are caused to flow off as a result of being reluctant or the appropriate precautionary steps are ignored. The only possible waste can be considered are the packing polypropylene bags of the raw materials and cartoons for the products packing, which are safe to use for any purpose, and even recently recycling become familiar.

Description of the Project Area

The Geographical Location, Flora and Settlement

a) Location: The factory is located at Kolfe-Keranio, along Addis Ababa-Jimma road, 300-400 m from the main road at the back of Natran Company to south west (Figure 2). It is adjacent to Jemo River, 300 m from the river. The total area size of the compound is 12000 m2 and the topography of the area is characterized as valley, and the gradient is decreasing from the main road to the river.

b) The Flora: The factory is located in mixed land-use for both residential and industrial areas of the sub-city. The natural vegetation type of the project area comprises of Acacia tortoise and Acacia mellifera, Juniperus procera-Allophylus abyssynicus type, olea europaea, bush and different grass species along Jemo River Bank (Figure 3). The project team also observed that the project area is conducive to grow highland and lowland fruit trees and vegetables. Furthermore, there is a good opportunity for the project to use the indigenous once and adopted trees and other vegetation species for conservation measures, wind breaks and shades in the project command areas.

Figure 3 : Production Store.

c) Infrastructure: The site is accessible with the common use of rock block plate road. Since the site is situated in center of the city the water energy and communication infrastructure facilities are unquestionable.

d) Settlement: Scattered settlements include five factories (e.g. Natran Company) and few individual houses are located along the project site. Stores, processing houses, office and others are located within the project site. These settlements are made of tin roof and wall. The factory owner and his immediate family members live within the compound (Figures 4 & 5). Photo showing the physical and human environments, flour and animal farm, and is mostly surrounded with five factories which produce plastic, flour and animal farm.

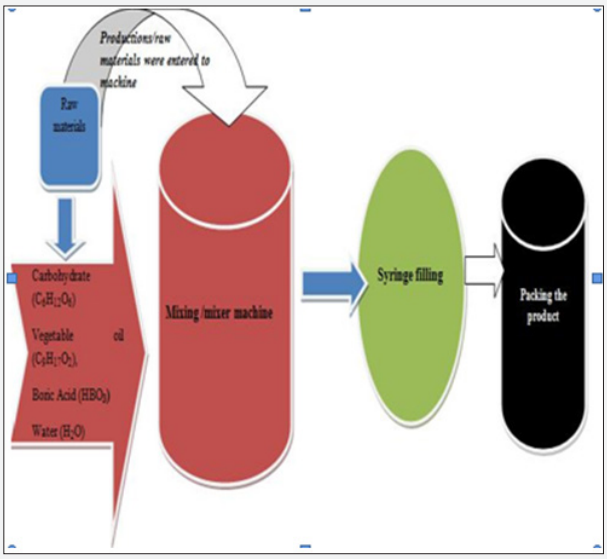

Figure 4 : Process Flowchart of the necessary inputs of production, the project has a prospective capacity of packed syringe production up to 3800/day, 100,000/month and 1,200,000/year. Workers perform their duties on a shift basis and eight hour/day and six working days/ week.

Figure 5 : Overview of the project area.

Policy, Legislative and Administrative Requirements

A) Environmental policy of Ethiopia

The overall goal of the policy is to enhance the living condition of the people of Ethiopia by promoting sustainable development through sound environmental management. This implies that the need of the present generation should be fulfilled

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without compromising to the ability of the future generation to meet their needs. There should be compromise between short-term economic growth and long-term environmental protection. As much as possible, development activities should minimize degradation and pollution of the environment because rehabilitating a degraded environment is very expensive. The policy also states that natural resource and environmental management activities should be integrated laterally across all sectors and vertically among all levels of organizations (Figures 6 & 7). To respect this policy and realize its goal (i.e. promoting sustainable development through sound environmental management), detailed environment rehabilitation and management plan of the project has been developed based on the anticipated impacts and the mentioned policy concept and requirements [17].

Figure 6

Figure 7 : Settlement.

B) Some environmental policies are:

a. Every person has the right to live in a healthy environment

b. Sustainable environmental conditions and economic production systems are impossible in the absence of peace and personal security. This shall be assured through the acquisition of power by communities to make their own decisions on matters that affect their life and environment

c. The development, use and management of renewable resources shall be based on sustainability

d. Natural resource and environmental management activities shall be integrated laterally across all sectors and vertically among all levels of organization

e. The integrated implementation of cross-sectoral and sectoral federal, regional and local policies and strategies shall be seen as a prerequisite to achieving the objectives of this Policy on the Environment

Applicable National Legal Instruments

The following is the highlight of some of the National Legal Instruments that are considered to deal with the utilization and management of natural resources, with the utilization and management of natural resources.

A) Proclamation of the Constitution of the Federal Democratic Republic of Ethiopia (Proclamation No 1/1995)

In the constitution, Ethiopia has captured the most important aspects of sustainable development. This has been sufficiently reflected in the provisions govern the right to development (art.43), where people's right to:

a) Have the right to improved living standards and to sustainable development.

Nationals have the right to participate in national development and, in particular, to be consulted with respect to policies and projects affecting their community.

b) Enhanced capacity for development and meet their basic need provided for; as well. Environmental right (article 44) where peoples tight to: clean and healthy environment as well as proper compensation is recognized.

B) Environmental Impact Assessment Proclamation (Proclamation No299/2002)

This proclamation requires that major development programs [18], plans and projects of the private and sectors are subject to EIA before their approval. This proclamation also provides a legal base to harmonize and integrate environmental economic, cultural and social considerations into the planning and decision making process and there by promotes sustainable development. The primary purpose of EIA is to ensure the impacts of projects, policy and programs, etc are adequately and appropriately considered and mitigation measures for adverse significant impacts incorporated when decision are taken. So, where the people right to:

a) undertaking the assessment by neutral consultant (third party)

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b) Consideration of the guiding principle and operating principles of EIA- focus on the major issue of significant impact.

c) Identification of measures for monitoring and managing impact.

d) Provision of this information/study report to EPA for sound review and decision…..etc can be taken as indicators which show the implication of EIA proclamation in the study process.

C) Environmental Pollution Control Proclamation (No 300/2002)

The license should provide the required personal protective customs [19], health &medical facilities and should immediately notify any act of occurrences which has resulted in loss of life or serious injury to the licensing authority. This proclamation aims at eliminating or when not possible, to mitigate pollution as undesirable consequence of social and economic development activities. Among the environmental pollution control proclamations are control of pollution, management of hazardous waste, chemical and radioactive substances, respect of environmental standards, punitive and incentive measures etc are listed.

D) Labor Proclamation (42/93)

The labor proclamation obliges that an employer shall take the necessary measures to adequately safeguard the health and safety of the workers. To ensure workers safety and job security the need to respect this proclamation has been clearly stated in this document. Under this proclamation the following specific issues have been found relevant and important to be recognized and ne implemented accordingly. Under labour proclamations freedom of association and collective bargaining, equality of workers, waged and benefits paid for standard working week should meet at least or industry minimum standards and always be sufficient to meet basic needs of workers and their families and to provide some discretionary income are the basic one.

E) Public Health Proclamation (200/2000)

This proclamation prohibits discharging of untreated liquid waste generated from septic tanks, seepage pits and industries into water bodies, or water convergences [20], it also prohibits the disposal of solid or liquid or any other waste in a manner which contaminates the environmental of affect the health of the society.

In general, the Consultant has as much as possible considered the above-mentioned-policies and legal issues by following the review and procedural EIA Guidelines developed by EPA. Accordingly, it is recommended to recognize and respects the mentioned administrative, legal and policy requirements by the proponent.

F) Applicable Institutional legal instrument

a) Institutional and Administrative Frameworks

The Proclamation for the establishment of Environmental Protection Organ, No 295/2002 issued a series of institutional mandates that extend powers and duties of the Federal EPA , the EPC (The environmental Protection Council), Regional Environmental Agencies(REA) and the Sectoral Environmental Units.

b) National Level Institutional Arrangements

The administrative structure of the country is based on a Federal System that has nine Regional States and two special city administrations. As a national level, environmental protection activities are directed through three levels of institutional arrangements:

a) The environmental Protection Council (EPC);

b) The EPA; and

c) The Inter-Ministerial Commission coordinating mechanisms.

Environmental Protection Council: The Proclamation establishes EPC that ensures integration of environmental concerns with development policies. Environmental Protection Authority: Article 5 indicating that the authority is established

d) "To ensure that all matters pertaining to the country's social and economic activities are carried out……."

e) Inter-Ministerial Commission coordinating mechanisms: Besides EPC and EPA, there are a number of Inter-Ministerial Commission coordinating mechanisms that were established in the form of standing national committees and boards to deliberate upon issues relevant to their functional areas.

Regional Environmental Protection Agencies

EPA Proclamation No. 295/2002 [21] states that each National Regional States shall establish an independent regional environmental agency based on the Ethiopian Environmental Policy and conservation strategy to ensure public participating in regulating and follow up that any development activity is planned and implemented without damaging the environment and disordering its balance.

A) Environmental Impacts of the Project

a) Potential Positive Environmental Impacts

Among other benefits, the project

a. Creates job opportunity for 34 people which generate income. Based on the owner's long-term plan, the factory will creates more opportunity to inhabitants of the area in building strong relationships with other sectors and brings strong economic and social integrations with other sectors.

b. Can create opportunity for the community to expose to modern gardening, recreation activities and dairy farm development practices.

c. Enhances cultural transformation through which women of the area who are under cultural pressure can

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be benefited by encouraging them through employments opportunities.

d. Contributes to the realization of the development strategy particularly in the area of life-standard facilities improvements.

e. Earns considerable profit to the proponent as well as to the city administration through tax.

f. Supplies 3200 syringe of Magic gel/day to Addis Ababa and other regional towns.

g. Contributes to the growth of chemical sector specifically to the enhancement of sanitation and facilities.

Impact Analysis

Environmental impact analysis involves three steps; impact identification, prediction and evaluation. The most possible potential impacts associated with each phases; design, construction and operation phases of the Magic Gel project were identified using checklist and professional judgments as indicated in Tables 1-3.

Table 1: Environment management plan, the table showed that the effects projects and how to adapted and mitigated the impacts of Magic Gel production factory by investor and institutional responsibility.

No	Potential Environment Impact Physical Environment	Proposed Mitigation Measure	Project Phase	Institutional Responsibility for Implementation
1	Deterioration of downstream	Proposed mitigation measure	Operational Phase	Investor environmentalist
2	Noise and sound pollution	Proper design and construction of the system not to result for noise and sound pollution	Design Operational Phase	Investor
3	Impacts on social, Cultural and Natural sites	Promote and strengthening Community Awareness	Operational Phase	Investor and line sector
4	Handing proper using of the product	Making awareness properly labeling the product	Operational Phase	The project

Impacts prediction was done using professional judgments depending upon the project area environmental conditions. Predictions and decision- making of the identified impacts involved projecting of the baseline environmental settings into the future. The parameters used in evaluating the magnitude and likelihood of the impacts are briefly addressed below. Spatial and temporal extent, the natural resources carrying capacity and possible potential environmental sustainability as a result of the impacts of the identified parameters were done. Based on these factors; the most possible impacts of the project on the environmental resources and the socio-economic conditions of the project area were evaluated. Forecasting of the main identified impacts was done to assume the impacts with and without the Magic Gel project.

Negative Impacts of the project

A) Potential Adverse Impacts on the Physical Environment and Mitigation Measures: Depending on the EIA general principles, project type, specific conditions of the project area and project needs, proper environmental mitigation measures were recommended for each identified adverse significant environmental impacts as the result of the Magic Gel project. The investigation team found out that the project has no direct negative impacts on the biophysical and human environments that possibly could created in the process of natural insecticide production (such as decanting and mixing up the ingredients, homogenizing, packing, raw material and product handling/storage/), application of the products for the desired purposes, packing materials destination after the items in used up, generation of wastes, maintenance, repair & overhauling of the processing units, utilities etc are identified and presented as follow. For the summary of the identified adverse impacts and proposed mitigation measures (Table 1).

B) Water pollution: There is not directly or indirectly liquid waste generation in the manufacturing process, there is no leakage could result in the pollution of water since the flow possibly is directed to the nearby septic tank then to the sewerage system.

C) Solid Waste: the polypropylene bags contain the wheat flour and hard plastics which container oil could be a potential source of solid waste. The cartoons that used to pack the Magic Gel and also some broken syringes are also the potential source of solid waste in the market cycle of the product.

D) Air pollution / localized air pollution/: There is no formation of gases or air pollution in any steps of the formation of this Magic Gel. Because no more chemical reaction is take place, as well as no heat energy is needed, except electric energy is needed for the dynamo of a mixer.

E) Noise pollution: The mixing machines could not have that much noise pollution, and the mixing process is takes

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place once a day for a maximum of forty minutes. The machine could generate their own characteristic operation noise it is not that much serious problems.

Mitigation measures to minimize the negative impacts

After identifying the specific negative impact, it is sensory and applies the mitigation measures. In order to put into operation run the business and secure the sustainability of the project, the proponent and its technical personnel should work on the following recommended mitigation measures to minimize the negative impacts. Decanting, pouring out the mixed chemical has done manually but for the future the project has plan to buy the filler machine that prevent the contamination of chemicals.

a) The polypropylene bag shall be reused until the salvage value is exhausted and afterwards conveyed to the recyclers till the origin of the producers in the local. The packing box made of hard paper are also reused by others and finally conveyed to the recyclers.

b) In the production section the inputs ready for use also be queued in convenient manner.

c) Recognized the main store house so as to categorize with type and sensitivity making use precautionary measure shall be posted before entering in to the pile or engaging to use for.

d) The machines do not have that much noise generates even if as a result the permissible limit that may not harm the workers health so far nor is the people in the surrounding area.

e) Always inform the workers in order to use hand gaunt and glove to prevent the possible contamination of the chemicals, especially who are working on syringe fillers.

Improper Chemicals Application

Improper use of chemicals in Magic Gel process can disturb ecological balance of an area. It can result in downstream damage of aquatic biological resources due to washed off chemicals from the factory site. To control the impacts on downstream resources due to these chemicals improper uses, the following measure shall be undertaken:

a) Ensure appropriate chemicals applications that demands to process the Magic Gel in the command area into considerations,

b) Select appropriate method of chemicals applications, and

c) Use integrated processing management and seeks professional advice.

Community consultation

Since an EIA is a participatory monitoring and evaluation approach, the members of the surrounding community are involved .The selected community representatives were interviewed on individual bases. Group discussions were also held on the project site. This face-to-face interview and group discussions were administered mostly by the consultant and team members. Respondents of this study were asked to assess and reflect on the overall strengths and weaknesses as well as the positive and negative impacts of the factory/ the project on the natural and human environments.

The respondents stated that the factory:

a) has never imposed any impacts on any components so far;

b) has been involved in the construction of infrastructure,

c) supports the communities financially;

d) provides job opportunity particularly to the youths;

e) contributes to the security of the area; and

f) Gives natural insecticide with affordable price.

For the whole testimonies, please see the attached document, Appendix xx.

Environmental management plan (Emp)

In due course, the company shall establish an environmental management system to enhance the positive impacts and to mitigate the identified measures activities in its plan and formulate the monitoring system. Planning and conducting periodical investigation such as annual environmental audit shall verify the management practices and improve the system).

Environment Management Unit (EMU)

Impacts of any development depend on its activities, inputs, products and stresses of the development activity. The project management body is needed to harmonize such activities through implementation of the proposed mitigation measures during and after commissioning of the project. The body is expected to run the Magic Gel project environmental management, monitoring and conduct self-internal environmental audit regarding the implementation of the planned environmental management activities/ As a result, proper environmental management is necessitated with accountability (Table 1).

Institutional Capacity Building and Training

The strength institutional capacity of the environmental management unit of the project implementer, environmental awareness, seminars and workshops are essentials. They create assesses for assigned environmental personnel of the project and stakeholders to get an opportunity to forward views and concern (Table 1).

Proposed Mitigation Measures, Summary and Estimated Cost

After all possible impacts of the project on the proposed Magic Gel area were evaluated based on the existing environmental conditions and impacts severity, mitigation measures were

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summarized for the potential identified impacts. The measures and activities for mitigation the impacts are indicated in Table 2.

Table 2 : Environmental management plan estimated cost.

N o	Mitigation measures summary	Estimated cost(annual)	Remarks(3 years)
1	Proper chemicals uses		
2	Surrounding community awareness creation	1000	3,000
3	Project environmental personnel capacity building	2000	6,000
4	Project environmental monitoring	1500	4,500
5	Gardening and recreational development	500	1,500
	Total cost		15,000

Environment Monitoring and Auditing Plan

Environment monitoring is an important tool for environmental management. The project owner and the staff must monitor the implementation and achievement of the planned environmental mitigation measures and investigate implementation of essential corrective and preventive measures as per the management plan [22-27].

The recommended monitoring plan was list on Table 3.

a) Monitoring during construction: The monitoring activities during the construction comprise visual observation during the first year of the project.

b) Monitoring during operation: Major environmental aspects to be monitored during first operation period of the project.

c) Environmental audits: Systematic environmental audit will be made in two or three years period to evaluate the environmental and social performances of the project (Table 3).

Table 3: Environmental monitoring plan.

No	Parameters to be Monitored	Activity	Frequency	Institutional Responsibility	Cost for 3
1	Upper stream and downstream environmental conditions	Assess any change in Magic Gel quality and other environmental conditions on the project	Once in a year		100,0
2	Magic Gel productivity	Assess trends of Magic Gel Productivity			1,00,0
3	Environmental Audit	Assess achievements of the projects environmental plans	Once in a year		300,00
4	Quality control and standard formation, Inspection	Assess the products and methods of Production and Materials	Once in a year		1,00,000
5	Periodic reports on Environmental assessment to the regulatory agency	Prepare Periodic reports	Once in a year		30,000
Total Cost					1,530

Conclusion and Recommendations

Conclusion

Implementation of the Magic Gel project will bring significant impacts in protecting the physical and social environments as well as socio-economic development of the project area and the country as a whole. It ensures employment opportunities livelihoods, health and also increases economic levels of the local community. The EIA study has shown that the benefits of the project outweigh by far the most expected possible socio-economic and socio-ecological impacts due to the project implementation. It was also concluded that the project is technically and economically viable, socially acceptable and environmentally sustainable.

Recommendations

a) It is our belief that this document fully replies the requirement of Ethiopian Environmental Impact Assessment, pollution control, labor, and public health proclamations by providing the required information. And the consultant confirms that the identified potential impacts could arise if any with negligence.

b) Optimistically, the company as an insecticide processing firm can handle the responsibilities knowing that no any segment of development endeavor sought advantages out of the other. The economic advantages shall be anticipated with interdependent component development that is environment.

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c) As deemed necessary we recommend that the proposed project could conduct an internal environmental performance audit as it well driven in the production process with the necessary technical assistance of the regulatory agency to follow and monitor the whole trend in the future.

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