ADDIS COLLEGE

FACULTY OF CONSTRUCTION TECHNOLOGY AND MANAGEMENT

POST GRADUATE STUDIES

Environmental and Socio-Cultural Effects of Humbo-Abela-Abaya Road Construction Project in Wolayta Zone, Southern Ethiopia

By

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Declaration

I, ***Eyasu Engida Bassa***, do hereby declare that this Thesis is my original work and that it has not been submitted partially; or in full, by any other persons for an award of a degree in any other university/institution.

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This Thesis has been submitted for examination with my approval as University supervisor.

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As members of the Examining Board of examiners, we certify that we have read and evaluated the thesis prepared by **EYASU ENGIDA BASSA** entitled "**Environmental and Socio-Cultural Effects of Humbo-Abela-Abaya Road Construction Project in Wolayta Zone, Southern Ethiopian"** and we recommend that this thesis is accepted as fulfilling the thesis requirement for the Masters of Science in Construction Technology Management.

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Abstract

Environmental issues are becoming a global agenda demanding integrative approach, while planning and implementing development projects regardless of their type, size and scope in any country. The purpose of this study was identifying the environmental and socio-cultural effects of Humbo-Abela-Abaya road construction activities in South Ethiopia, Wolayta Zone. To this end, the exploratory survey research design was employed. Samples of 286 households were selected representing residents around the project area for survey questionnaire. For interview purpose, top community elders, coordinators, environmental experts from woreda office, and public health professionals from health centers were selected purposively. Self-developed questionnaire was used for the collection of quantitative data which assesses the impacts and restoration practices. It includes five items designed to assess the impact on ecosystem, natural resource, and public health in the study area. The study used relative importance index as analytical tool. The results indicate that 88.1% of the respondents believe that deforestation is evidently observed as the major effect of the construction activities. The findings also identified three major priority areas with top importance indexes. Accordingly, ecosystem impact is the first top priority with overall relative importance index (RII=0.840) including soil erosion, waste water, deforestation and loss of biodiversity. The second most important item is impact on human health with overall relative importance index (RII=0.81) including drug addiction, HIV/AIDS & STI), and bad smell. The third most important item with overall relative importance index (RII=0.809) is natural resource impact comprising dangerous excavation, loss of aesthetic value, change of landscape, and over extraction of as sub categories. Thus, this study suggests that the project needs to set integrated plan prior to implementation of the project.

Key words: Environment, Socio-Cultural, Road construction, Public-Health

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CHAPTER ONE INRTODUCTION

1.1. Background of the study

Infrastructure development is a key driver for progress across the African continent and a critical enabler for productivity and sustainable economic growth. Road construction is one of the infrastructures paving the way for community livelihood development and economic growth across the continent. It contributes significantly to human development, poverty reduction, and the attainment of the Sustainable Development Goals (SDGs) (Banjo et al., 2012).

Public infrastructure projects such as road, promote economic welfare, social benefits, and facilitate accessibility and convenience to the societies. Infrastructure projects, such as road transportation networks, have been considered as critical policy instruments to promote growth and social development. Sustainable roadway construction can be defined as the optimal use of resources during the roadway life-cycle reducing the economic and social impacts (Quium, 2019).

Studies so far have confirmed that road construction projects in developing countries have been playing critical roles in socio-economic development. The road projects have contributed to enhance the standard of living and socio-economic welfare of the people living within the project areas, as well as the nations; increase access to, and delivery, of social services; provide access to remote areas in the country; facilitate immediate access to exports; and stimulate increased cultivation of cash crops (Fonchingong & Fonjong, 2002).

For most developing countries, roads are the predominant mode of transportation, as these countries have not been able to efficiently develop other modes such as rail, air, and water. This high dependency on road systems has resulted in major investments in the road sector, which have altered the economic and social landscape of many Sub-Saharan African countries, especially Ethiopia (Asomani-Boateng et al., 2015). To these ends, governments in developing countries' including Ethiopia investment in infrastructure accounts for over half of the recent improvement in economic growth (Salami et al., 2010).

In Ethiopia, the expansion and improvement of road networks have increased accessibility and mobility while reducing the distance to destinations, travel costs and travel time. The projects facilitated the movement of people and goods to and from the project woredas, zones, and regions. Reduced transport costs due to the road construction projects encourage people to engage in off-farm activities such as setting up small scale or agro-based industries which would ultimately contribute to achieving overall development of the local, as well as regional economy and contribute poverty reduction across the country. The benefits in the form of reduced travel time and increased speeds result in the more efficient transport of people and goods in a safe and reliable manner. The projects have been improving traffic conditions for both motorized and non-motorized traffic while reducing vehicle operating costs and travel time (Sieber & Allen, 2016).

Access to social and economic amenities such as health facilities, schools and markets have been enhanced. In this regard employment opportunities for both skilled and unskilled human power rises, some of which could be recruited from communities residing along the road. Small scale and micro ventures emerged as a result of the demand by workers and transient traffic, for accommodation, food, supply of provisions, etc (Stifel et al., 2012). Overall, the road construction projects in Ethiopia have been playing critical roles through enhancing the standard of living and socio-economic welfare of the people living across the country.

Despite these social and economic benefits, road construction projects are perceived to bring a number of adverse environmental and social impacts resulting from the construction activities and during operation of the rehabilitated road. Soil erosion, compaction and pollution could be the results from land clearing and grubbing, extraction of construction materials, and compaction by heavy equipment, use of detours and access roads, and spillage of hazardous substances like fuel and oils. Likewise, sediment loading and pollution of water sources may be the results from excavation and spillage of hazardous substances. Deforestation and damage to natural vegetation are considered to be significant effects due to general clearing of vegetation and visual intrusion caused by clearance during widening of the road, construction of detour roads, exploitation of material sources and contractor’s site establishments (Balcha & Oyda, 2021).

Wildlife may be impacted as a result of disturbance and fragmentation of habitats, and disruption of wildlife movements. Due to their mobility and access to cash, immigrant road construction workers and truck drivers are notorious for encouraging the spread of STIs/HIV/AIDS. Girls and the very poor are particularly vulnerable in this respect (Balcha & Oyda, 2021).

The project road is located within Southern Nations and Nationalities People's Region (SNNPR) in Wolaita Zone. The road traverses through Abela Abaya Woreda of Wolaita Zone in SNNPR and directly connects 8 Kebeles of the Woreda. It serves the highly fertile uncultivated areas and thus plays a strategic role in linking this area, which has high agricultural potential, to the rest of the country. The project road is accessible through the route Addis Ababa-Shashamene-Halaba-Sodo-Arbaminch and starts at around 404km from Addis Ababa (6.93km from Humbo town towards Arbaminch). The project start is also accessible through other routes and the shortest one is with the route Addis Ababa-Butajira-Halaba-Sodo-Arbaminch having length of around 336km from the capital Addis. On the Works Contract, the project road is indicated to have length of 26.287km with control points of start point (E 368365, N735664), Faricho town, Abaya town and end point (Ethiopian Road Administration Annual Progress report, 2023). Given the benefits of the road construction projects, there are economic and socio-cultural effects of the ongoing projects at the construction site. On top of that, the majority of road construction projects in Ethiopia is neither completed on time nor is its construction cost within the stipulated budgetary allocation (Kassa, 2020). However, the above mentioned facts regarding the effects of road construction projects are nationwide and haven't yet indicated the current conditions of specific project area. This implies that there is lack recent study in the specified area and this has created knowledge gap. Therefore, this study seeks to assess the environmental and socio-cultural effects of Road Construction Projects in Humbo-Abela-Abaya Area.

1.2. Statement of the problem

A development of a country is driven by the economic growth of a country itself. This can be seen through the rapid in the construction industry which normally plays a role in the development of a country. The rapid growth of the construction industry in Ethiopia

has made a positive impact on the achievement of the national economy. However, these positive effects were contaminated with a variety of unimpressive achievement, especially in terms of inefficient and poor management systems. The poor management problem in construction industry in Ethiopia is a common phenomenon happen and is increasing. This has resulted in environment and socio-cultural effects. The "Humbo-Abela-Abaya Road Construction Project" is not exceptional.

For instance, as a few studies indicated, due to a single road construction project a total of 654 households and institutions have been impacted. Out of these, 162 are female headed while 492 are male headed, and 16 of the affected buildings belong to public and government institutions. In the rural sections, 82.8 ha of farmland were permanently lost, while 243.87 ha were impacted temporarily (including land for deviations and the contractor's camp). In total, 102 structures were fully affected (94 urban and 8 rural) and 610 partially affected (566 urban and 41 rural). In addition, affected trees include eucalyptus (2,415), juniper (1,185), coffee plants (18,511), enset (37), banana (218), and various trees with medicinal and ceremonial value that are difficult to quantify (Impact & Summary, 2011).

The same study confirmed that, the loss of farmland by households forced them to be permanently dispossessed from their farmland in the project road corridor. The loss of strip of land by households also requires full resettlement because the impact was not minimal for each household. This has necessitated resettling those households who lost their plot of lands due to the expropriation by the project road construction works. The study suggested that the affected households who lost strip of their land and could continue their livelihood in the remaining plot of land need to be compensated as per the law for losing their crops, trees, and some other perennial crops (Bekelcha, 2019). However, some of the households complain the compensation system and also there was an inappropriate rehabilitation practice of degraded lands during post-construction period.

Nevertheless, studies conducted so far have focused on post-project phase and after the completion of the projects. These have brought lack of insight into the actual situations and problems which the communities encountered. Therefore, this study seeks to explore

the economic and socio-cultural effects of the ongoing projects at their construction phases in Humbo-Abela-Abaya Area.

1.3. Objectives of the study

1.3.1. General Objective

The general objective of the study is to assess the environmental and socio-cultural effects of Humbo-Abela-Abaya Road Construction Project in Wolayta Zone, Southern Ethiopian.

1.3.2. Specific Objectives

- To analyze the effects of road construction project activities on ecosystem in Humbo-Abela-Abaya Area.
- To assess the socio-cultural effects of road construction project activities in Humbo-Abela-Abaya Area.
- To develop strategic tools to minimize the impact of road construction projects on environment and sociocultural aspects in the study area.

1.4. Research Questions

- What are the ecosystem effects of road construction projects in Humbo-Abela-Abaya Area?
- What are the socio-cultural effects of road construction projects in Humbo-Abela-Abaya Area?
- What strategic tools are significant to minimize the environmental and socio-cultural effects of construction projects?

1.5. Significance of the Study

Beyond its importance as partial fulfillment for Masters of Science in Construction Management, the study is designed to fill the gaps by identifying the environmental and socio-cultural impacts due to the construction activities; and suggest the implementation strategies to mitigate the effects. By extension, the research findings and lessons will help policy makers to formulate appropriate policy and strategic measures on the basis of empirical evidences. It will also help implementers and supervisors of road construction

project in performing effective restoration interventions. Moreover, the study is believed to serve as a reference for further studies to be carried out in the future.

1.6. Scope of the Study

This study focused on identifying the environmental and socio-cultural effects of road construction activities in a specific project. It does not represent the road construction projects at national level.

Geographically, the study was restricted to a single ongoing project, namely in Humbo-Abela-Abaya road construction project.

Thematically, the study focused on four major issues such as ecosystem, natural resources, and public health.

1.7. Organization of the paper

This study paper is organized in five chapters. The first chapter sets background of the study, statement of the problem, objectives, and significance of the study. Chapter two presents the review of literature, empirical and theoretical frameworks. The third chapter deals with research design and methodology, sampling procedures, data collection instruments and procedure; and data analysis and presentation. The fourth chapter deals with results and discussions while the last chapter deals with summary, conclusions, and recommendations.

CHAPTER TWO LITRATURE REVIEW

2.1. Definitions of basic Terms

The definition of Environment adopted in this research is "The physical, biological, social, economic, cultural, historical and political factors that surround human beings. It includes both the natural and built environments. It also includes human health and welfare (Riggs et al., 2018). In the 1970s, environmental impacts were considered to be impacts on the natural, biophysical environment such as problems related with air and water quality, climate change, hydrological systems variability, flora and fauna and various stage of noise (Upadhyay, 2020).

In today's world, many of environmental impact indicators such as green-house gas, acidification potential, ozone depletion, and smog are linked to various stages of the road construction projects (Hammond & Institute, 1995). The general environmental impact indicators can be divided into direct, indirect, and operational emissions. Since the environment is very complex, indicators provide a more practical and economical way to track the state of the environment than if we attempted to record every possible variable in the environment (Collins et al., 2009).

On the other hand, as per the guideline social impacts are the cost of the human population by any public and private actions that change the people live, work, play, relate to one another, organize to meet their needs etc. Social impact focuses on the human dimension of environment, and seeks to identify the impact on people who benefited and loses (Smit & Wandel, 2006). The major types of social impacts are relates to lifestyle, cultural, community, quality of life and health related impacts. The assessment of the social impacts of road traffic is usually based on objective indicators or on expert judgment, without input from the affected communities (Gomes et al., 2020).

2.2. Impacts of road construction on the environment

The construction industry causes a detrimental effect on the environment both locally and globally. Local impacts of construction include air pollution, noise pollution, construction wastes, urban heat islands, and land clearance (Pero et al., 2017). Global impacts of the

building consist of global warming, resource usage, and ozone layer depletion. World is facing multiple environmental crises, especially from different types of pollution. Pollution from one country can affect a neighboring country, or even have a global impact. For example, untreated industrial waste discharged into rivers causes pollution at its source but can also affect people who live downstream of the discharge point. In large river systems this can create problems if the river crosses a border with another country and carries the pollution with it.

Air pollution from factories, vehicles and wood fires contributes to localized health problems in towns and cities but is also moved around by wind and air currents. These emissions may also contribute to global-level climate change (Salih, 2001; UN-Habitat, 2014). Exporting polluting materials such as hazardous waste from one country to another also raises a concern. There are other ecological crises, such as extinction of animals and plants from the Earth because of destruction of habitats and hunting. Humans' inability to respond to these various crises leads to a need for global policies to strengthen weak institutions and improve governance. If you could view the Earth from space you would see that we are all living on one planet and share one global environment. There is a great threat to our survival if humankind continues to damage the environment and if countries do not act together. We have shared responsibilities in caring for current and future generations. Protecting and managing our global shared resources requires institutions that support collective action (Ostrom, 1990). Such institutions include internationally agreed rules, laws and policies, as well as organizations. International agreements that become policies allow countries to work together in trade and investment and in addressing global concerns such as air pollution, water pollution, managing hazardous wastes, and climate change. All these issues are trans-boundary in nature, which means that the potential impacts from these events and developments cross national boundaries and affect more than one country.

2.3. Impacts of road construction on the society

Improved road infrastructure promotes economic development, enhances accessibility and connectivity, provides employment opportunities, improves transportation safety, and

has positive environmental impacts. On the negative side roads occupy land resources and form barriers to animals. They can also cause adverse impacts on natural water resources and discharge areas. The three most damaging effects of road construction and management are noise, dust and vibrations. Specifically, road construction and excavation lead to soil exposed and erosion caused by changes in ground runoff conditions; road engineering destroys surface vegetation, resulting in a decrease in plant species and ecosystem structure and function; road construction destroys wildlife habitat (MA & Eburukevwe, 2013).

Air pollution caused by road construction harms the environment, degrading the region's air quality. The degraded air resulting from road construction mainly contains silica, among other compounds. When inhaled into the human body, silica can lead to lung cancer and other respiratory tract infections such as silicosis, cough, cold, etc. These diseases impact human health greatly and can have even worsening effects on people with underlying health conditions such as asthma, which may lead to the loss of life (Manisalidis et al., 2020). On the other hand, road construction is linked to environmental pollution and risks, which impact people's health and well-being in urban and rural areas (Marzouk et al., 2017).

2.4. The Aspects of Sustainable Building Construction

As sustainable development hinges on three pillars, the same holds for sustainable construction. The three aspects of sustainable construction are environment, social and economic aspects respectively.

2.4.1. Environmental Aspect

The built environment should be environmentally friendly by reducing negative impacts on the environment. The construction industry causes a detrimental effect on the environment both locally and globally. Local impacts of construction include air pollution, noise pollution, construction wastes, urban heat islands, and land clearance (Pero et al., 2017). Global impacts of the building consist of Global warming, Resource usage, and Ozone layer depletion. To curb this harmful practices, environmentally sustainable practices involve minimizing resource consumption, use of renewable and

recyclable resources and materials, protection of agricultural lands, enhancing air quality by minimizing emissions of harmful gases, use of local construction materials, and energy efficiency (Dosumu & Aigbavboa, 2019; Pero et al, 2017).

2.4.2. Social Aspect

Though much emphasis is given for environmental and economic dimensions, little research is undertaken regarding social sustainability in construction. The concept of social sustainability depends on the perception of people, which makes it difficult to define (Farzanehrafat et al, 2017). A study was conducted on how various clients define and which social sustainability aspect is considered most crucial within the scope of construction (Miree, 2016). The result showed that the perception of one client differs from the other.

Respect for human rights, carrying out construction activities with different stakeholders based on ethics and moral obligations, and provision of safety and security were some of the definitions outlined by respondents (Miree, 2016). Hence, social sustainability within the realm of construction has a different meaning for different people. Despite the difficulty to define social sustainability, some attempts have been made to define social sustainability.

Social sustainability in construction refers to "the engagement among employees, local communities, clients, and the supply chain to ensure meeting the needs of current and future populations and communities" (Vasquez & Klotz, 2013). Social sustainability is also defined as full filling the necessity of present and future generations in a manner that protects the health of the community (Farzanehrafat et al., 2015).

Another issue about social sustainability is which indicators to use as a guideline. Studies have been conducted to establish a social sustainability framework. A framework was devised for integrating and evaluating social aspects in the planning and design phases of construction projects (Vasquez, 2011).

Based on the framework, the social sustainability framework consists of community involvement, corporate social responsibility, safety through design, and social design. However, the framework didn't encompass the whole construction cycle but focused on

the planning and design phases. In contrast, a comprehensive list of social sustainability indicators, for use in different phases of a construction project's life cycle which was evaluated by construction professionals and scholars was proposed (Farzanehrafat et al, 2017).

Despite different interpretations of social sustainability, generally social sustainability in construction focuses on the positive impact of construction on people (Dillard et al. 2009 cited in Vasquez, 2011). Giving equal opportunities to work, Provision of Education and Training for employees, protection of cultural heritages during construction, involving the community during the decision process, and satisfying the expectation of clients for the money spent are some features of social sustainability in the construction industry (Dosumu & Aigbavboa, 2019). It is suggested that to have a broad understanding of social sustainability, considering the effect of construction on people throughout the lifecycle is vital (Vasquez, 2011).

2.4.3. Economic Aspect

The construction industry has a huge potential to contribute to the development of a nation. Especially in developing countries since most work is done through manual labor, the industry creates job opportunities for a large number of people. Thus, creating an opportunity to improve the standard of living and minimize poverty. Moreover, the construction industry can be the backbone for socio-economic development by providing housing and infrastructure (Durdyev et al., 2012).

The performance of the construction industry is crucial in attaining economic development. Usually, Performance is measured based on quality, cost, schedule, and safety. For example, although it is difficult to finish construction projects within the exact timeframe, minimizing delay is necessary. Because delay results in additional cost, it reduces profit to be earned by companies (Tengan et al., 2016).

Similarly, inferior quality structures led to high maintenance cost since the built structures are unable to meet their service life. Hence, a sustainable economy can be achieved through minimizing construction costs, reducing completion time, improving

productivity, satisfying the needs of the client, ensuring job satisfaction, and proper distribution of resources (Goshime et al., 2019).

2.5. Global Environmental Policies and International Agreements

The United Nations (UN) is an intergovernmental global organization with 193 member states (including Ethiopia) that promotes and facilitates international cooperation in order to address global concerns such as maintaining international peace and security, solving international problems and encouraging respect for human rights (United Nations, 1945). UN summits and conferences bring together representatives of the member states to discuss trans-boundary issues.

A surge of literature have indicated the significance global environmental and international agreement (Penning-Rowsell et al., 2006; Streck, 2004). International agreements take various forms depending on their stage of negotiation and implementation and whether they are intended to detail aims and aspirations or legal rights and duties. In this section we will consider some international agreements developed by the United Nations that have formed global environmental policies.

As various literatures have indicated the air, water, weather and climate of the continents of the Earth are interconnected. Human activities across the globe that use natural resources or produce wastes have also become interconnected, particularly with improvements in communication and transport. Many of Ethiopia's activities both affect and are affected by those of other countries. International activities and our shared global environment mean that countries worldwide have common interests that need to be addressed through international or global agreements on our environment, trade and business. Such agreements can take place between different countries or more widely through the United Nations. Global environmental policies are internationally agreed goals, principles or procedures used to guide decisions and actions to address specific environmental issues (Cho & Jiang, 2022; Christmann, 2004; Penning-Rowsell et al., 2006; Ramalho Luz et al., 2018; Streck, 2004; M. Yang & Fry, 2018).

2.6. Empirical Studies

2.6.1. Social impacts

Road construction has its important impact on economic development of any Nation, therefore it cannot be evaded. Construction industry plays an essential role in the socioeconomic development and has a lot of significance to the achievement of national socioeconomic development goals of providing infrastructure, sanctuary and employment (Osei, 2013). Roads are one of the ways how human development expands as well as people increasingly rely on cars for transportation on a daily basis. Social impacts are the impacts of developmental interventions on human environment. The impacts of development interventions take different forms. While significant benefits flow in from different development actions, there is also a need to identify and evaluate the negative externalities associated with them.

The construction of roads influences the human activities and behavior both positively and negatively. For the positive influence, road construction facilitates traffic flow, human mobility, and the movements of products and services, while negative, implication include taking up valuable areas and distorting the ecosystem functions.

On the other hand, its negative consequences on groundwater and river flow cannot be over emphasized. Likewise, the road construction projects are acknowledged to have impacts on buildings within the area of construction. According to some studies, construction is responsible for up to 50% of climate change. It also impacts landfills and air, water, and noise pollution (Ahmed, et al., 2021). Following the same pattern of thoughts, Kaur and Arora (2012) confirmed that waste water is generated from construction activities, sewage, commercial activities, and other sources.

2.6.2. Environmental Impact

Environmental impact is defined as any impact caused by a proposed development activity on the environment including effects on human health and safety, fauna and flora, soil, air, water, climate, landscape and historical monuments, or other physical structure (Afzal & Farzana, 2002). The impact of construction activities generated during the construction process relates to a number of aspects. Ametepey and Ansah (2014)

states that even though, construction project development potentially contributes to the economic and social development, and enhancing both the standard of living and the quality of life, it is also associated with deterioration of the environment. According to a study conducted by Zolfagharian et al. (2012) in consideration of the size of mega projects, the ecosystem impact of construction activities has such adverse environmental impacts as solid wastes, soil erosion, and land use, operation with vegetation, water pollution, bad odor and climate change.

According to Morledge and Jackson (2001); Poon (2001) summarized these aspects as resource consumption, dust and gas emission, disruption of people through noise; and traffic diversion, consumption of renewable and nonrenewable resources, forest clearance, land-scape changes, and loss of biodiversity, soil erosion, and compaction. Road construction is inevitable for maintaining and improving transportation infrastructure, but it can also have negative effects on the environment, such as air pollution, noise, erosion, habitat loss, and greenhouse gas emissions (Omotehinse & Ako, 2019). The environment is threatened severely by so many problems, some of which are caused by the activities of construction projects (Ijigah et al., 2013).

Construction sector generate worldwide substantial environmental impacts. It contributes to about half of the total energy consumption of high-income countries and is responsible of a major share of greenhouse gas emissions also in developing nations (Stern et al., 2006; Asif et al., 2007; Cole, 1999; and Emmanuel, 2004). Some of the available statistics indicate that the construction and operation of the built environment accounts for: 12-16 % of fresh water consumption; 25% of wood harvested; 30-40 % of energy consumption; 40% of virgin materials extracted and 20-30% of greenhouse emissions (Macozoma, 2012).

A study by Dietz et al. (2001) showed that environmental impact can be gauged in the risk to human and ecological health as well as in the subtle but horrifying altering course of nature. This risks includes the dangers and changes to the quality of life that are determined by physical, chemical, biological and psycho-social factors which in turn shows how far the damage has been carried out.

Infrastructure projects can have significant impacts on the environment, such as deforestation, soil erosion, loss of biodiversity, and increased air and water pollution (Gupta, 2019). Few of the research finding showed that the limited length of the rod in every countries may causes landscape disfigurement and decreasing number of buildings (Kenworthy, 2006). For example, more than 20% of land in United States is impacted by the presence of roads, as a result, there is increasing the number of highway roads and over 40 million miles of roadways have covered by constructions (Rappuoli et al., 2014). Furthermore, many of adverse environmental impacts like waste, noise, dust, solid wastes, toxic generation, air pollution, water pollution, bad odor, climate change, land use, operation with vegetation and hazardous emissions by engines emissions are affected the communities during construction stages (Marmaya & Mahbub, 2018).

Similarly a study conducted by Abd Rahman and Asmawi (2016) indicated that the activities of land clearing, excavation of site and its associated works will totally change or alter the environmental settings that lead to many environmental problems like land degradation, soil erosion, loss of biodiversity and so forth. A number of studies reported that construction industry is the major source of adverse consequences on the ecosystem, natural resources, and public health.

Construction activities such as grading and filling drastically reduce soil quality on construction sites left unprotected sites and it could be further degraded by erosion and adversely affect the surrounding environment. A study conducted by Bribián et al. (2011), indicates that environmental impacts of the construction process cover resource use and waste generation, ecological loading and human health issues. Similarly, according to a study conducted by Cardoso Teixeira (2005), show that construction activities may cause soil compaction, substantial increase in the soil level, opening of ditches and trenches, removal of the superficial soil layer, loss or damage to the roots, and damaging of the trunk and leaves.

Indicating the magnitude of impact of construction on specific environments, a study result conducted by Hossain et al. (2022) also found that construction activities results in ecosystem damage form 65% of the total impact and resource depletion form 8% of the total impact. Feld et al. (2011) also indicated that the disturbance influence on

surrounding wildlife, vegetation, hydrology, and landscape spreads much wider than the area that is physically occupied and contributes far more to the overall loss and degradation of habitat.

At the same time, a study conducted by Wu et al. (2022) indicated that it is expected that construction damages the fragile environment because of adverse impacts of construction, those impacts include resource depletion, and biological diversity losses due to raw material extraction, land fill problems due to waste generation. Similarly a study by Bogardi et al. (2020) showed that environmental impact of construction can be measured in the risk to human and ecological health as well as in the alteration of the course of nature.

Roads can have both positive and negative influences on people and the environment. On the positive side roads provide the opportunity of mobility and transport for people and goods. On the negative side roads occupy land resources and form barriers to animals. They can also cause adverse impacts on natural water resources and discharge areas (Fahrig & Rytwinski, 2009).

The three most damaging effects of road construction and management are noise, dust and vibrations. Noise mainly occurs during road construction phases but it can also occur to a lesser degree during maintenance operations. Dust is created during the construction of gravel roads and unbound aggregate layers. Excess dust production can be treated by a range of means such as watering, the use of alternative materials, and by using dust binders near houses. Vibration can be caused by uneven road surfaces and can pose significant impacts and problems to houses close to the source (Newman et al., 2012). This lesson will focus on the environmental effects of noise, dust, vibrations, and other environmental concerns, and offer suggestions on how they can be mitigated.

2.6.3. Ecosystem impact

In light of a large number of ongoing construction projects, the ecosystems impact of construction has become an important issue (Zolfagharian et al., 2012). These adverse environmental impacts like waste, noise, dust, solid wastes, toxic generation, air

pollution, water pollution, bad odor, climate change, land use, operation with vegetation, and hazardous emissions.

Air emissions are generated from vehicular exhaust, and dust during construction. This emission includes Co2, No2, and So2. Noise emissions are generated as a result of various construction equipment's, air compressors, and vehicles. The construction equipment's and other sources will generate noise within the range of 70 to 120 DB within the vicinity of construction site (Giunta et al., 2019).

On the other hand, wastes are generated from construction activities, labors camps, sewage treatment plant, and other sources. The solid waste generated during operational phase is categorized as biodegradable, recyclable, inert/ recyclable and hazardous. Out of the total waste generated 50% of it would be biodegradable, 20% of the waste would be recyclable, 30% would be inert and it is assumed that a small quantity (0.3%) of it would be hazardous waste (Enshassi et al., 2014).

2.6.4. Impacts on natural resources

One of the adverse impacts of most construction activities is natural resource endowment. This is in terms of the consumption of renewable and non-renewable resources. According to Shen et al. (2005), various natural resources are used during any typical construction process; these resources include energy, land, materials, and water. In addition, construction equipment operations consume a lot of natural resources, such as electricity and/or diesel fuel. Construction sector is responsible for consuming a high volume of natural resources and generation a high amount of pollution as a result of energy consumption during extraction and transportation of raw materials (Li et al., 2010; and Morel et al., 2001).

As to the study conducted by Andreas (2001), construction activities results in, in most cases, imply a loss of wildlife habitat. The physical encroachment on the land causes disturbance and barrier effects that contribute to the overall habitat fragmentation due to construction activities. A clearly negative effect of the dam construction is the change in the landscape nature, surface depletion of the natural or semi natural landscape, including areas that are sensitive (wetlands, river valleys, and environmentally valuable (e.g.

protected areas), in weakening the links between natural areas that forms a national or regional system of protected areas and, finally, a series of processes of the landscape transformations. According to Lawrence et al. (2012), the direct, indirect, and cumulative impact of construction are land utilization and river and stream diversion as direct, land erosion, pollution and deforestation as indirect and change of wildlife habitat due to deforestation, increase in temperature due to forest and vegetation removal as well as landscape change as cumulative impact.

2.6.5. Public Health impact

Most construction projects are located in a densely populated area. Thus, people who live at or close to construction sites are prone to harmful effects on their health because of dust, vibration and noise due to certain construction activities such as excavation and pile driving (Li et al., 2010). During the construction phase of a project, construction dust and noise are regarded to be two major factors that affect human health (Tam et al., 2004). Li et al. (2010) and Zolfaghrian et al. (2012) conducted a research about environmental impacts of construction in United States of America; they categorized the environmental impact into three safeguard categories: ecosystems, natural resources, and public impacts.

Li et al. (2010) stated that health damage accounts for 27% of the total impact, which is less than the ecosystem damage (65%), but far beyond the resource depletion (8%), which justifies the necessity of performing health damage assessment. Zolfaghrian et al. (2012) confirmed that transportation resources, noise pollution, and dust generation with construction machinery are the most risky environmental impacts on construction sites.

Also a study undertaken by Li et al (2010) reveals that communities who live around construction sites are exposed to harmful health hazards due to wastes causing pollution from construction activities. The study finding of Tam et al (2004), similarly indicate that during the construction phase of the project, dust and noise are regarded to be the two major factors affecting human health. The same study also indicated that prevalence of communicable diseases and social disruption are among the adverse impact of both construction and post-construction phase of projects.

2.7. Strategies to Minimize Road Construction Effects

Road construction is inevitable for maintaining and improving transportation infrastructure, but it can also have negative effects on the environment, such as air pollution, noise, erosion, habitat loss, and greenhouse gas emissions (Winston, 2014). As literature indicated, there are some best practices to minimize these impacts and promote sustainable road development.

2.7.1. Plan ahead

Before starting any road construction project, project implementers should conduct a thorough environmental assessment to identify the potential impacts, risks, and mitigation measures. This will help avoid or reduce the damage to sensitive areas, such as wetlands, forests, wildlife corridors, and cultural sites. They should also consult with the relevant stakeholders, such as local communities, environmental agencies, and indigenous groups, to ensure their input and consent (Glasson & Therivel, 2013). While conducting an environmental assessment is crucial, it's essential to also consider the long-term maintenance needs of the road (Jha et al., 2014).

By designing the project with the future in mind, you can reduce the frequency of interventions and minimize the long-term environmental impact. This includes planning for climate change adaptation measures such as higher temperatures, increased precipitation, and flooding events. Additionally, consider integrating green infrastructure, such as vegetated swales or bios wales, to manage storm water runoff and improve water quality (Yang et al., 2015).

2.7.2. Choose eco-friendly materials

The materials you use for road construction can make a big difference in the environmental footprint of your project. You should opt for materials that are durable, recyclable, renewable, and low in carbon and energy consumption. For example, you can use recycled asphalt, concrete, or glass instead of virgin aggregates, or use bio-based binders instead of petroleum-based ones. You can also use permeable pavements, which allow water to infiltrate and reduce runoff and flooding (Ortiz et al., 2009).

When selecting eco-friendly materials, consider not only the environmental footprint but also the life cycle cost of the materials; Materials with low maintenance requirements and long service lives can lead to significant environmental savings over time. Furthermore, explore innovative materials, such as self-healing concrete or cold-in-place asphalt paving. This could be a challenging scenario for the construction contractor to bid on an engineered design and specs as provided by the owner. Exceptions to those designs can only be proposed as value engineering proposal after the contract is awarded (Senthil Kumaran et al., 2001).

2.7.3. Minimize disturbance

During the construction phase, you should try to minimize the disturbance to the natural environment and the surrounding communities. This means using the least invasive techniques, such as directional drilling or trenchless methods, to avoid cutting or digging too much. You should also limit the width of the construction zone, control the dust and noise levels, and prevent the spread of invasive species. You should also restore the disturbed areas as soon as possible, by replanting vegetation, stabilizing slopes, and creating wildlife passages (Baker, 1992).

Many construction projects do not clean up or keep the construction site clean of dust, excess materials at the end of each day work. These projects have bad transitions (gravel to pavement), potholes with-in projects and dust. If proper inspection and attention to details would be encouraged it would save or eliminate a lot of complaints and environmental disturbance (Zuo et al., 2017).

To further minimize disturbance, consider the timing of construction activities. Scheduling construction during periods of low ecological sensitivity or low human activity can reduce impacts on wildlife and surrounding communities. For instance, avoid construction during breeding seasons for local fauna or during school hours in residential areas. Additionally, implement a solid waste management plan to reduce waste generation, promote recycling, and ensure proper disposal of hazardous materials (Shekdar, 2009).

2.7.4. Optimize traffic flow

One of the main goals of road construction is to improve the traffic flow and reduce congestion, which can also benefit the environment by lowering fuel consumption and emissions. You can use various strategies to optimize the traffic flow, such as adding lanes, roundabouts, signals, or ramps, or using intelligent transportation systems, such as adaptive traffic control, real-time information, or smart tolling. You should also encourage alternative modes of transportation, such as walking, cycling, or public transit, by providing adequate facilities and incentives (Barth & Boriboonsomsin, 2009).

2.7.5. Monitor and evaluate

After completing the road construction project, you should monitor and evaluate its environmental performance and impacts. This will help you identify any issues or problems that need to be addressed, such as leaks, cracks, or erosion, and implement corrective actions. You should also measure the effectiveness of your mitigation measures, such as the survival rate of the planted vegetation, the water quality of the runoff, or the wildlife activity in the passages. You should also report your findings and lessons learned to the relevant authorities and stakeholders (Dahalan et al., 2024).

As part of the monitoring and evaluation process, establish a feedback loop that allows for continuous improvement in road construction practices. This can involve sharing lessons learned and best practices with other agencies, municipalities, and industry professionals. Vital to sustainable road construction is the continuous monitoring and evaluation of environmental impacts. Implement robust monitoring systems to track air and water quality, soil health, and wildlife habitats throughout construction. Regularly assess the effectiveness of erosion (Dahalan et al., 2024).

2.8. Summary and Research Gap

Any development project that plans to improve the quality of life has some built-in positive and negative impacts. A typical construction process involves the use of various construction equipment and natural resources and generates many pollutants (Li et al., 2010). Identification of possible impacts of building construction projects on the

environment is a task that needs to be accomplished for the realization of more effective environmental management (Ijigah et al., 2013).

Quantitative assessment of the environmental impact of construction activities can help decision makers identify major environmental impact factors and make environmentally friendly construction plans in the early stages of construction (Li et al., 2010). It is expected that construction damages the fragile environment because of adverse impacts of construction, those impacts include resource depletion, biological diversity losses due to raw material extraction, landfill problems due to waste generation, lower worker productivity, adverse human health due to poor indoor air quality, global warming, acid rain, and smog due to emissions generated by building product manufacture and transport that consumes energy (Lippiatt, 1999).

Environmental impacts are categorized into three safeguard subjects: ecosystems impacts, natural resources impacts and public impacts (Li et al., 2010; Chang et al., 2011; Zolfagharian et al., 2012). In light of a large number of ongoing construction projects, the ecosystems impact of construction has become an important issue (Zolfagharian et al., 2012). Those adverse environmental impacts include waste, noise, dust, solid wastes, toxic generation, air pollution, water pollution, bad odor, climate change, land use, operation with vegetation, and hazardous emissions. Air emissions are generated from vehicular exhaust and dust during construction (Kaur & Arors, 2012).

According to Macozoma (2012), statistics indicate that construction and operation of the built environment accounts for nearly12-17% of fresh water consumption, 26% of wood harvested, 30-45% of energy consumption, 40% of virgin materials extracted, and 25-30% of greenhouse gas emissions. As the study result of Zolfagharian et.al (2012) out of the many environmental impacts, ecosystem impact has the greatest impact with 67% of the overall impacts whereas natural resource impact accounts 21 % and public impact takes nearly 12% of the total impacts.

A study conducted by Gangolells et al. (2011) stated that determination of major environmental impacts will assist to consider a range of on-site measures in order to mitigate those impacts. However, researches show that creation of enabling environment

for restoration practice is minimal. A study conducted by Hostetler (2010), particularly with regards to open space conservation and restoration of damaged environment, most of the policy effort is concentrated on the design phase with only token attention for the construction and post-construction phases. Among the three environmental impacts, ecosystem impacts, has the greatest impact on the environment (67.5%) of total impacts. Natural resources impact' accounts for 21% of the total impacts, while 'public impact' consists of only 11.5% of the total impacts.

Prediction of the environmental impacts of construction in the early stages of projects, may lead to improvements in the environmental performance of construction projects and sites (Gangolells et al., 2011). According to Sabogal et al. (2015), there is, therefore, an urgent need to accelerate the recovery of degraded ecosystems for the benefit of humans and nature. The development project should, thus, be planned in such a manner that it has maximum positive impacts and minimum negative impacts on the environment (Kaur and Arora, 2012). Therefore, it can be concluded that environmental impacts of construction activities results in a serious issues. As a result, there is a need to develop a system to mitigate the construction impact on the environment to protect the ecosystem, natural resources and health of the community.

Table 2.1 Empirical study summary and Research Gaps

Authors	**Research title**	**Major findings**	**Research Gap**
Tariku Dessu Habte (2021)	Sustainable roadway construction: Economic and social impacts of roadways in the context of Ethiopia	Results show that the life- cycle costs of the Jointed Concrete Pavement have about 90% cost advantage over the Hot Mix Asphalt pavement. This is the result of the unique properties of cement concrete which give its durability and hence lower maintenance, social cost, and longer design life.	These results do not show the cultural aspects of the society
Nirali Shukla & Jani (2018)	SOCIAL IMPACT ASSESSMENT OF ROAD INFRASTRUCTURE PROJECTS	Among the three environmental impacts, 'ecosystem impacts' has the greatest impact on the environment (67.5%) of total impacts. 'Natural resources impact' accounts for 21% of the total impacts, while 'public impact' consists of only 11.5% of	The setting is different from the current study area

		the total impacts.	
ELLENE DEJENE DEMEREW (2022)	ASSESSEMENT ON THE CAUSES AND EFFECTS OF ROAD CONSTRUCTION PROJECT DELAY: CASE OF ADDIS ABABA CITY ROAD AUTHORITY	The study indicates that the top major causes of delay in road construction are Cost of materials, Shortage of foreign currency, Delay in approving documents by consultant, Delay due to Sub-contractors, Delay of payment by the client, Shortage of construction material, Improper planning and scheduling, Reworks, Lack of modern technology equipment and Low bid by contractor. The study further determines that the major effects of delay are Time Overrun, Cost Overrun, Poor quality, Compromised Quality	The results do not represent the socio-cultural aspects of the study area
Belew Dagnew Bogale(2016)	SOCIOECONOMIC IMPACTS OF ROAD DEVELOPMENT IN ETHIOPIA: CASE STUDIES OF GENDEWUHA - GELAGO, MILE – WELDIYA AND GINCHI - KACHISI ROADS	The findings show that there are more positive and less negative temporal and spatial socioeconomic impacts generated by the three corridors notwithstanding disparities among the different locations. Accordingly, the paved highway is found to have more powerful positive impacts than the gravel roads, which are of low standards and functioning poorly. The status of truck and bus terminals which should have been integrated in the highway development projects are still underdeveloped with obvious effects on the sustainability of their socioeconomic impacts in the study areas. Furthermore, certain natural and more importantly manmade factors are found to have pre-empted the realization of certain positive socioeconomic impacts to be obtained from road interventions	These findings cannot be representative of the other project in geographically different settings
AFRICAN DEVELOPMENT FUND: JIMMA-MIZAN ROAD UPGRADING PROJECT (2006)	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT SUMMARY	Road side erosion, landslide and gully formation; Destruction of natural forest and road side cultivation; Impact on cultural, religious and archeological resources	Temporal limitation is high

Akuto Musaeh BP Kamarkor1 , Dr. Paul K. Sang (PhD) (2020)	Social - Cultural Environment and Performance of Roads Projects Funded by Nairobi Metropolitan Services Kenya	The study established from the literature reviewed that the social - cultural environment aspects such as local community literacy levels, community support, language and corruption practices affects the performance of roads projects. The study concluded that the social - cultural environment significantly affects the performance of roads projects. The study recommends that policymakers should hold seminars on the effects of social - cultural environment factors on performance in order to develop reasonable and realistic regulations and laws aimed at performance evaluation and improvement. To achieve high performance in road construction, both macro and micro environmental elements ought to be included in strategic planning.	Contextual variation
Lyndon N. A. Sackey1 · Jeremiah Quartey1 · Augustus N. N. Nortey1 · Afa Tiwaa Obeng1 · Abigail Amoakoatta Okyere1 · Phebe Y. Kayoung1 (2023)	**Road construction and its socio-economic and health impact: a case study of Atonsu lake road**	The research indicated that road construction has adversely impacted the health of Atonsu lake road inhabitants but saw a decline in the number of cases recorded at the hospital due to restrictions associated with COVID-19 and its accompanying stigmatization, which prevented people from reporting to the hospital. There was also a significant impact on the income levels of the inhabitants, which has a significant correlation with the frequency of client patronage before and during the construction of the road. Findings reinforce the need to greatly consider including effective dust abatement practices and a phase-by-phase implementation of road construction projects to reduce the negative impacts associated with the process.	Contextual and the setting variations

Source: Compiled by the Author, 2024

To sum up, it is also evident from the above literature that for construction activities have been imposing both positive and negative challenges. In Ethiopian context the studies conducted by various researchers confirmed the direct relationship between construction interventions and socio-cultural as well as environmental effects. Nevertheless, the above studies done in different sites at different time and context and they have been concentrated on analyzing at post-construction practices and at national level and these studies have lacked specificity to set project specific strategies for mitigating the impacts.

This study clearly established dimensions such like context, time duration (lack of recent study) and methodology as research gaps. Therefore, to fill these gaps, this study sought to investigate the environmental and Socio-Cultural Effects of Humbo-Abela-Abaya Road Construction Project, in Wolayta Zone, Southern Ethiopia.

2.9. Conceptual Framework

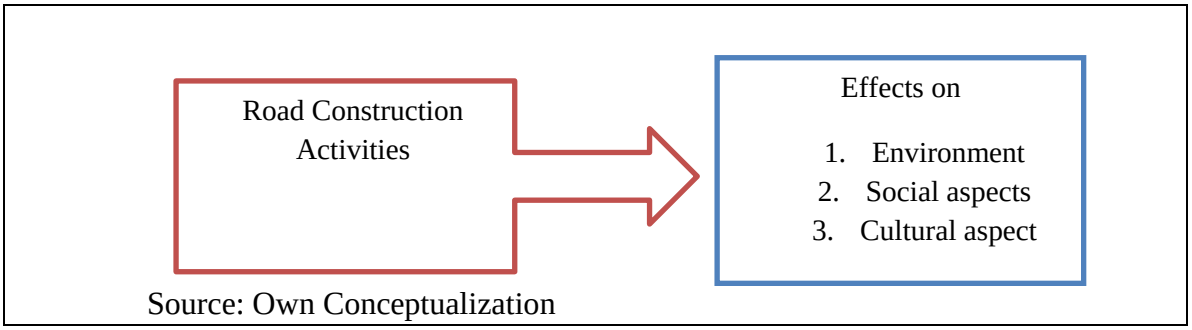

Figure 2.1Conceptual Framework

Source: Researcher's conceptualization, 2024

The above conceptual framework depicts the relationship between the dependent variable (Road construction activities) and dependent variable dimensions such as environment, social aspects, and cultural aspects.

CHAPTER THREE MATERIALS AND METHOD

3.1. Description of the study area

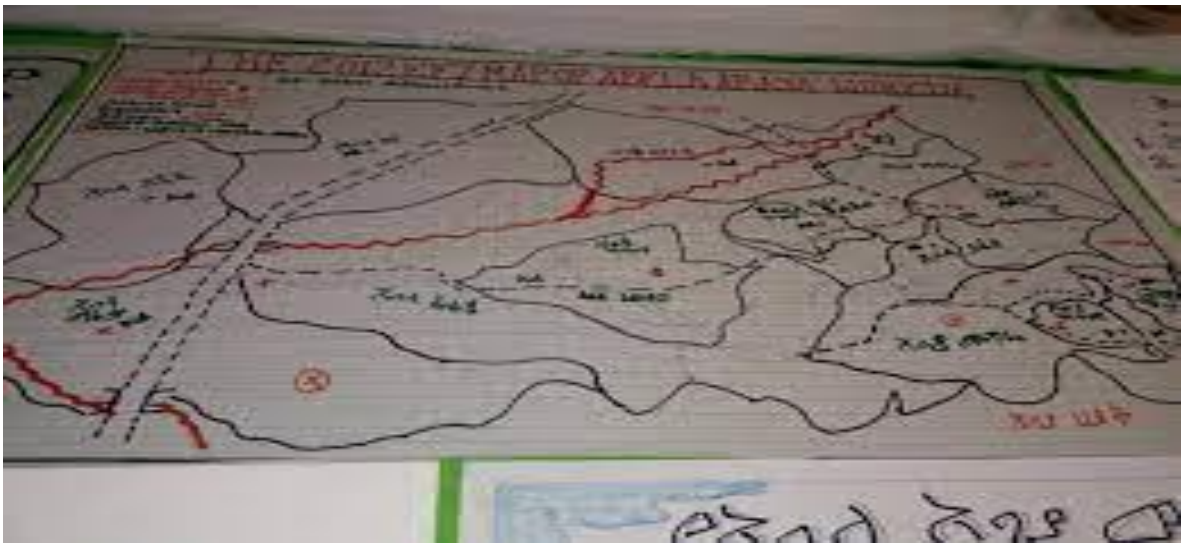

Fig. 3.1 Map of the study area
Source: Abela-Abaya Woreda Adminstration office, 2023

Abala Abaya woreda is located in Wolayta Zone of Southern Ethiopia. The woreda is established in 2019 from the surrounding woredas; and those surrounding woredas formed border to the Abala Abaya woreda. Abala Abaya is bordered on the south by Lake Abaya, on the west by the Offa woreda, on the north by the Humbo woreda, on the east by Hobicha woreda. The administrative center of this woreda is Faracho Town. The Humbo-Abela-Abaya Road Construction Project covers 26 Km (source: project office, 2022).

3.2. Research Design

This study was conducted by using both qualitative and quantitative research approaches. It will employ descriptive case study type of research since these methods help to describe the state of affairs, reality or event as it exists and to explore the challenges related to urban land lease policy implementation practices in the study area respectively. Obviously, the purpose of a descriptive research is to determine and report the way things are done and attempts to describe such things as possible behavior, attitudes, values and characteristics (Kim et al., 2017). As of the research type, selecting an appropriate

research technique is too much important. Therefore, the researcher will adopted a case study research strategy to assess the environmental and socio-cultural effects of road construction projects in Ethiopian Road Authority. From the point of view of time dimension, a cross-sectional study will be conducted since the study is conducted once over a period of time.

3.3. Sources of Data

In this study mainly primary data were used to fulfill the stated objectives of the research. Hence, both qualitative and quantitative types of data were taken from these primary sources. The primary data were collected using various tools such as questionnaire and interview.

3.4. Sampling Design

3.4.1. Sampling population

Target population is the universe that the sample frame, sampling unit and sample size are extracted from, and to which the result/findings of the research will be generalized (Zhao et al., 2013). Thus, all households found in the catchment areas of the construction project at the study area. Target population is said to be a specified group of people or object for which questions can be asked or observed to develop required data structures and information (Hair e t al. 2006). The main participants of this study will be local project affected communities since the study aimed to assess the effects of the ongoing construction road projects on their livelihoods. In particular, the study focuses on road corridor project affected households who had been influenced by the road construction project. The term “sample” refers to the portion of the population that enables us to draw inferences about the population. So, the sample size must be adequate to make meaningful inferences.

In other words, it is the minimum size needed to estimate the true population proportion with the required margin of error and confidence level. There are several approaches to determine the sample size, these include using a census for small population as the sample, imitating a sample size of similar studies, using published tables and applying formulas to calculate a sample size. The best approach to determine the sample size is the

application of one of several formulas. In addition, there are some factors that must be taken into consideration when determining the sample size; and knowing these factors and their effect helps the researcher to determine the appropriate the sample size of the study. These factors can be summarized as follows:

3.4.2. Sample size

The statistical methods of sample size determination depend on the type of data being collected. If the data are continuous, our concern will be about studying the means, but if the data are qualitative (categorical data), our concern will be about studying the proportions (Ralph et al, 2002). The level of precision refers to the survey error or the sampling error. It is defined to be the difference between the parameter of population and the sample statistic that associated with this parameter. The level of precision is inversely proportional with the sample size. It means, the lower the precision level, the more sample size will be needed to reach the goal. This level is often expressed in percentage (such as 5% or 7%). Note that, while determining the sample size, the level should be as low as possible without increasing the sample size to more than your resources will allow (Chadha 2006; Israel, 2009).

As Best and Kahn (1989) recommended, the sample size of each target population will be determined according to the ideal sample size of a target population which is large enough to serve as an adequate representative and small enough to be selected economically in terms of both time and complexity of analysis Therefore, the study sample size was determined by Yamane's Formula, ***n=N/1+N (e 2).*** Where: e = the level of precision with plus or minus 5%, n=sample, N=Total population, at 95% confidence level and P=0.05 for categorical level for an alpha level (Yamane, 1967).

For this study, residents in the catchment areas of the project were considered as the study population. The population in this study comprises households in the study area which is 1000 in number. The sample size is determined by .

$$n = N/1+Ne^2$$

Where,

n is sample size,

N is Population size

e is error tolerance at confidence level of 95%(giving a margin error of 0.05).

It is n = $N/1+Ne^2$= 1000/1+1000*0.0025=286; where n is sample size, N is population size, e is error tolerance at a confidence level of 95% (giving a margin error of 0.05). According to the above formula the sample size determined for quantitative study was 286. The sample size for this study was based on the assumption that the sample should be adequate in representing the study population.

3.4.3. Sampling technique

After getting the lists of the units under studied settings, the researcher employed simple random sampling technique. This is because it provides equal chance to be selected. For qualitative data, the researcher recruited 10- households purposively from the study population. Thus, the total sample for this study will be 296, which is 286+10=296).

3.5. Methods of Data Collection

Questionnaire: - The questionnaires embrace both closed and open-ended questions which allows for the collection of large amount of data from selected samples. The closed-ended questionnaires were prepared and standardized by using nominal type scales in a way that makes the respondents easy to understand. In order to assess the impact of environment and socio-cultural aspects self-developed questionnaire was used. It includes five items designed to assess the impact on environment, five items for social aspects and five items for cultural aspects in the study area. Each item is rated using five-point Likert scale ranging from 1 (highly sever) to 5 (low impact). The open-ended questions were used mostly for variables which could not be presented in a closed and coded manner.

Interview: - Interview questions were used for collecting data from the woreda health and social affairs office experts which is relevant in this study. Structured and semi-structured interview questions were prepared for them and then face to face interviews was conducted.

3.6. Methods of Data Analysis

The information collected through questionnaire and interview was analyzed and interpreted within the framework of the study objectives using different methods. The quantitative data was analyzed by using descriptive statistics such as frequency, percentage and standard deviation. Regarding the inferential statistics, index matrix was employed to identify the strength, and relative importance of the factors. Qualitative data gathered through interview was analyzed thematically by narration. Then, the findings from both quantitative and qualitative data analysis were triangulated and the integration was done at the interpretation phase of the study. Concerning the inferential statistics to calculate the relative importance Index, the following formula was applied as suggested by Tam et al (2000).

$$RII = \frac{\sum W}{A * N}$$

where w is the weighting given to each factor by the respondent, ranging from 1 to 5; '1' is the least strong impact and '5'' is the extremely strong impact for environmental impact and '1' is poorly restored and '5' is well restored for restoration practice; "A" is the highest weight; in this study it is 5; and N is the total number of samples.

The RII shall be a variable ranging from 0 to 1. Regarding data presentation, quantitative data will be presented using charts and tables while the qualitative data shall be presented in texts forms.

3.7. Methods of Data Presentations

Regarding data presentation, quantitative data were presented using charts and tables while the qualitative data was presented in texts forms.

3.8. Validation

3.8.1. Validity of the instrument

Validity is the degree to which a measure accurately represents what it is supposed to. It is concerned with how well the concept is defined by the measure(s). Therefore this study

made an attempt to addresses validity through the review of literature and adapting instruments used in previous research.

3.8.2. Data reliability test

Reliability testing was done in order to determine whether the questionnaire and the results obtained were true and realistic findings. Cronbach's alpha was also calculated as part of the reliability test to assess how valid the results were and whether the researchers would get similar results to generalize if the sample size increases. A value of 0.7 or higher is very good values that can lead us to conclude that the researchers would get the same results if they carry out the survey with a larger sample of respondents (Burns and Bush, 2000: 329). In this case all of the independent variables included in the analysis have reliability co-efficient of $\alpha \geq 0.7$ and over all reliability co-efficient value is 0.749. As a result, the reliability test indicates that there is high level of internal consistency and it allows proceeding towards data analysis.

Table 3.1 Result of Reliability Analysis for the Questionnaire

Independent variables	**No of Items**	**Cronbachs Alpha**
Environmental Ecosystem	4	0.761
Environmental Natural Resource	4	0.745
Public Health and Socio-Cultural	3	0.772
Overall Reliability Analysis	11	0.759

Source: SPSS output (2023)

Table 3.2 Descriptive of normality test

Items	**Sex of the respondents**			**Statistic**	**Std. Error**	**z-value for kurtosis and Skewness(statistics/ Std. Error)**
Construction Effects	Male	Mean		2.3	0.076	
		95% Confidence Interval for Mean	Lower Bound	2.15		
			Upper Bound	2.45		
		5% Trimmed Mean		2.28		
		Median		2		
		Variance		0.566		
		Std. Deviation		0.752		
		Minimum		1		
		Maximum		4		

		Range		3	
		Inter-quartile Range		1	
		Skewness		0.342	0.245	0.342/0.245=1.39
		Kurtosis		-0.024	0.485	-0.024/0.485=-0.049
	Mean			2.85	0.191	
	95% Confidence Interval for Mean		Lower Bound	2.43		
			Upper Bound	3.26		
	5% Trimmed Mean			2.83		
	Median			3		
	Variance			0.474		
	Std. Deviation			0.689		
	Minimum			2		
	Maximum			4		
	Range			2		
	Inter-quartile Range			1		
	Skewness			0.203	0.616	0.203/0.616=0.329
	Kurtosis			-0.496	1.191	-0.496/1.191=-0.416

Source: SPSS output (2023)

Normality of data assumes that the Z values of Skewness and kurtosis should be somewhere in the span of -1.96 to +1.96. The Skewness and kurtosis measures should be as close to zero as possible. In reality, however, data are often skewed and kurtosis. A small departure from zero is therefore, no problem as long as the measures are not too large compare to their standard errors. As a consequence, the researcher divided the measure by its standard error. The calculated values: 1.39, =-0.049, 0.329; =-0.416 are neither below -1.96 nor above +1.96 which is what we want. All four z values are within -/+1.96. Regarding Skewness and kurtosis, our data are a little skewed and kurtosis for both males and females but it does not differ significantly from normality. We can assume that our data are approximately normally distributed in terms of Skewness and Kurtosis.

3.9. Ethical Considerations

In the process of conducting this research, care was taken so as to make the research ethically sound. Thus, in the process of data collection, first, the consent of respondents were asked and approved and then they were informed the purposes of the research and the anonymity and confidentiality of their information as well as their privacy to be

secured. Besides, proper data gathering procedures were followed to avoid faulty data gathering procedures. The works of other researchers were given great value so that they are to be acknowledged (cited) properly. All individuals and groups or organizations that play a significant role for the success of the study were also acknowledged.

CHAPTER FOUR RESULTS AND DISCUSSION OF FINDINGS

4.1. Introduction

This chapter provides a presentation, analysis and discussion of the empirical findings according to the purpose and objectives of the study. This section comprises the response rate of the respondents, which include sex, age group, marital status, level of education, family size, and means of livelihood using bars and charts and deals with empirical findings on the study objectives and research questions using descriptive statistics such as: - percentage, mean and standard deviation. In addition, Index-based analysis was done to compare the severity of each item.

4.2. Response Rate

The study targeted 286 respondents to provide the information of the study and 286 questionnaires were distributed to the respondents who composed the sample size of the study. All the distributed and usable questionnaires were returned giving a response rate of 100%.

4.3. Demographic Data of Respondents

This section of the study discusses the characteristics of the respondents such as sex, age group, and marital status, level of education, family size, and means of livelihood. The researcher adopted charts and bar graphs to present and discuss the results of the sample characteristics below. The rationale of using figures was to ascertain the categories of the different characteristics in relation to the responses of the respondents. In order to summarize the results, figures were used by the researcher because it was another way of presenting the results in a summarized manner.

4.3.1. Respondent Category by sex

In order to present the respondents category and sex distribution categories of the respondents, frequency tabulation was used by the researcher. Figure 4.1 below presents the results:

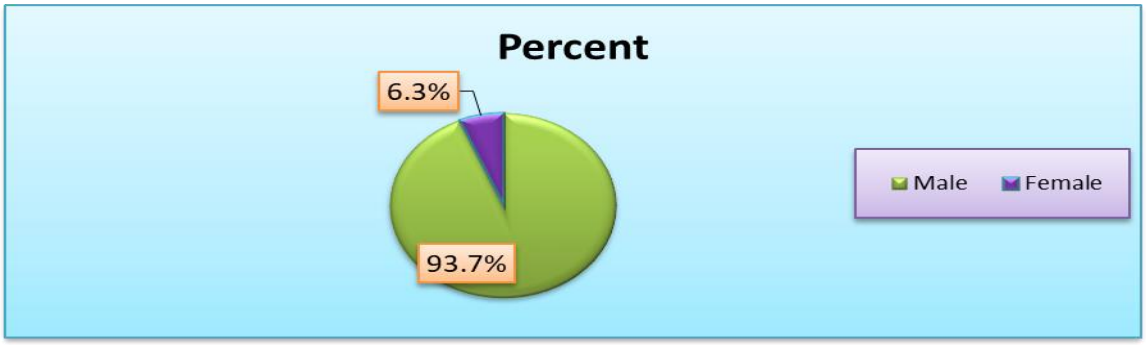

Fig.4.1 the respondent category and sex distribution
Source: Field survey, 2023

The results in the above pie-chart show that 93.7% (268) of the respondents were male whereas 6.3% (18) were female. From the findings, it can be said that the opinion of both sex is gathered.

4.3.2. Respondent Category by Age Group

Frequency tabulation was used by the researcher to present the age distribution of the respondents. Fig 4.2 below presents the results.

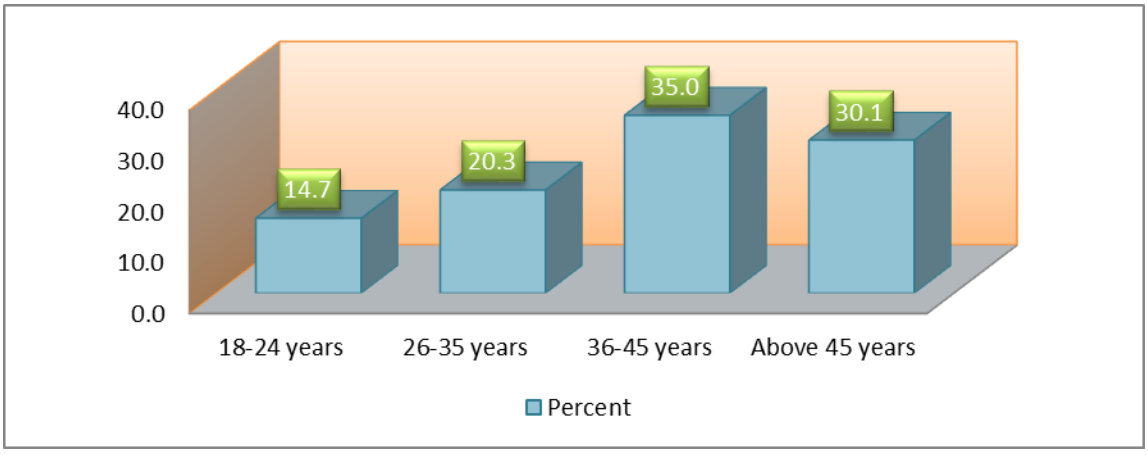

Fig.4.2 age category of the respondents
Source Field Survey 2023

The results in Figure 4.2 above indicates that 42 (14.7%) of the respondents fell in the age brackets of 18-24 years, 58 (20.3%) are in between 26-35 years, 100(35%) are in 36-45 years, and 86 (30.1%) are above 45 years. The results imply that the composition of the respondents was made up of respondents who are representative of all age category in the community and it enables the researcher to get the data representing aged and young residents.

4.3.3. Marital status of the respondents

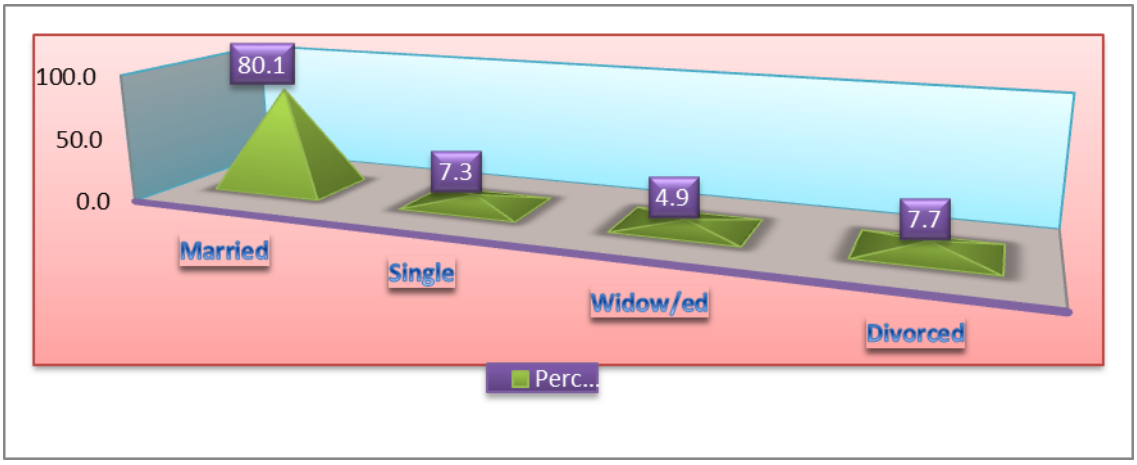

Fig 4.3 Marital status of the respondents
Source Field Survey, 2023

Regarding the marital states of the respondents, 229 (80.1%) are married, 21 (7.3%) are single, 22 (7.7%) are divorced, and 14 (4.9%) are widowed. This shows respondents from different marital status have been included in the study.

4.3.4. Respondent Category by Education level

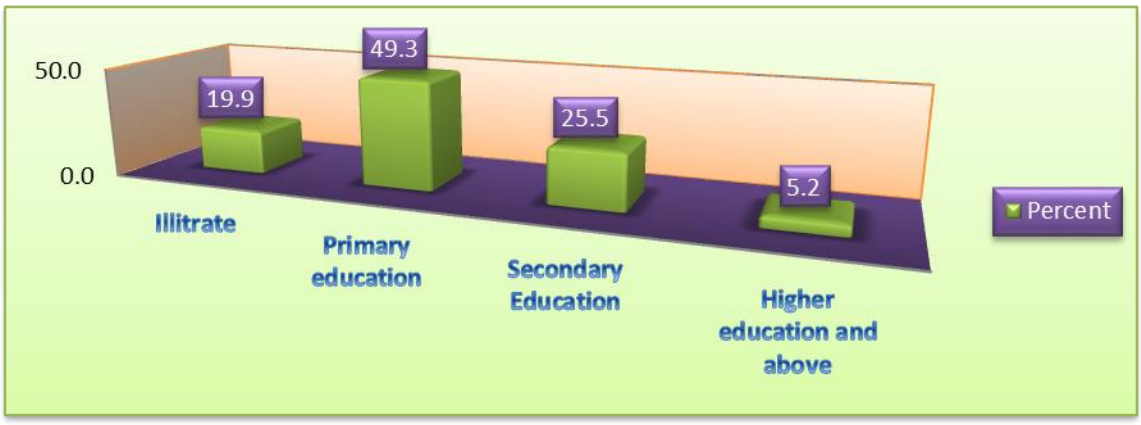

Fig 4.4 Education level of the respondents

Source: SPSS output (2023)

According to the results in Fig 4.4, 57(19.9%) of the respondents were illiterate, 141 (49.3%) completed primary education, 73 (25.5%) completed secondary education, and the remaining 15 (5.5%) were higher education and above. From the findings, the majority of the responses (80.1%) have primary education and above levels. This may indicate that the respondents possess the required qualifications to understand major

challenges posed by road construction project in their areas and respond to the questionnaire properly.

4.3.5. Respondents' Family Size

The bar-graph was used by the researcher to present the respondents family size. Figure 4.4 below presents the results:

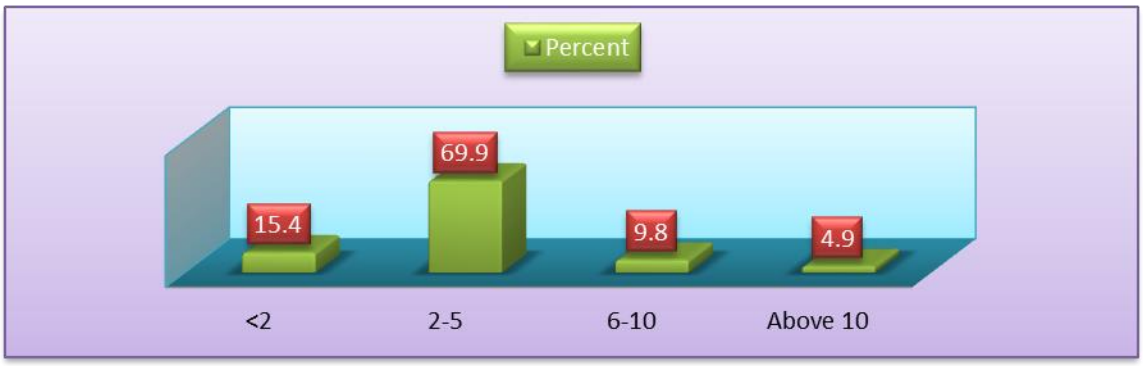

Fig.4.5 work experience of the respondents
Source: SPSS output (2023)

From the results in Figure 4.5 above, 44(15.4%) of the respondents have a family size less than two, 200(69.9%) have a family size of 2-5, 28(9.8%) have a family size of 6-10, and the remaining 14(4.9%) have a family size above 10. This could imply that the majority of the respondents (69.9%) have average level of family size. This shows that most household heads are leading stable family and the study area is not socially disrupted.

4.3.6. Means of Respondents Livelihood

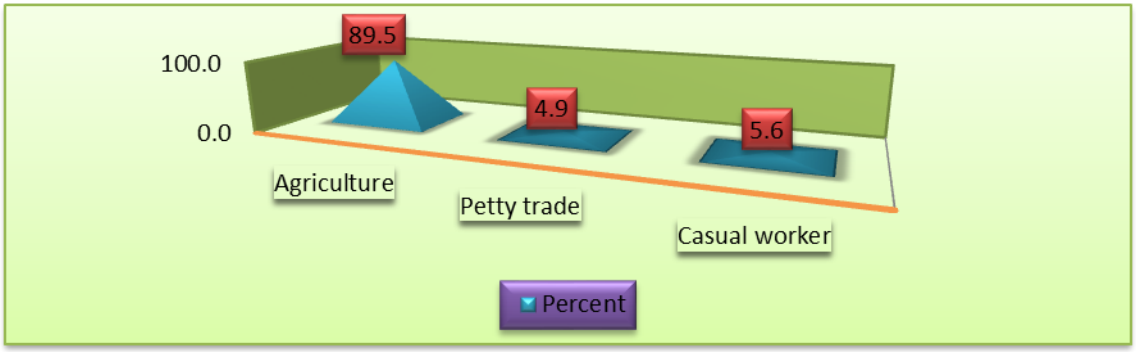

Fig 4.6 Livelihood Means of the respondents
Source SPSS output 2023

The other socioeconomic information of the respondents collected in the survey questionnaire is major means of livelihood. As indicated in table 4.6 above, majority of them or 89.5% relied on agriculture and some 11.5% depends on petty trading and casual work. This information shows that the population in the study area is highly dependent on the natural environment and has implication that environmental degradation of any kind severely affects their livelihood.

4.4. Results of Study Variables Based on the Study Objectives

The findings in this study are based on the study objectives which included the demographic variables. The variables are measured using a five-point Likert scale and the results are presented in descriptive tables, showing percentages, means and standard deviation of responses under each variable. Inferentially the index comparisons among the items have been done. The results from the quantitative source are compared with qualitative ones.

4.4.1. Study results of objective one

4.4.1.1. Descriptive of Environmental Effects, Ecosystem

Table 4.1 Severity of the ecosystem damage

Items	Response Scale											
	Highly severe (5)		Severe (4)		Medium (3)		Low (2)		No effect (1)		M	STD
	F	%	F	%	F	%	F	%	F	%		
Deforestation	56	19.6	197	68.9	29	10.1	0	0	4	1.4	4.052	0.649
Soil erosion	70	24.5	175	61.2	32	11.2	3	1	6	2.1	4.049	0.766
Loss of bio-diversity	55	19.2	197	68.9	30	10.5	0	0	4	1.4	4.045	0.649
Waste Water	64	22.4	185	64.7	31	10.8	2	0.7	4	1.4	4.059	0.695
Grand Mean=4.05; STD=0.69												

Source SPSS output 2023

The above table indicates that the severity of ecosystem damage due to the activities of road project in the study area. As indicated in table 4.1, 249 (87.1%) perceived that waste water was a problem at severe level; 253 (88.5%) perceived that deforestation is at

severe and above level; 252 (85.7%) perceived that soil erosion is at severe and above level; and 252 (85.7%) perceived that loss of bio-diversity is at severe and above level.

4.4.1.2. Descriptive of Environmental Effects, Natural Resource

Table 4.2 Severity of the natural resource damage

Items	Response Scale											
	Highly severe (5)		Severe (4)		Medium (3)		Low (2)		No effect (1)		M	STD
	F	%	F	%	F	%	F	%	F	%		
Raw Material Depletion	57	19.9	193	67.5	31	10.8	1	0.3	4	1.4	4.042	0.669
Dangerous Excavation	57	19.9	195	68.2	30	10.5	0	0	4	1.4	4.052	0.654
Landscape Change	61	21.3	186	65.0	32	11.2	2	0.7	5	1.7	4.035	0.714
Loss of Aesthetic Value	56	19.6	195	68.2	32	11.2	0	0	3	1.0	4.052	0.633
Grand Mean=4.04; STD=0.67												

Source SPSS output 2023

Table 4.2 indicates the response regarding the severity of natural resources in the study area due to the activities of road constructions. Under natural resource category, as shown in the above table, 252 (88.1%) responded that deforestation was the major damage caused by the construction activities (M=4.052); 251 (87.8%) responded that loss of aesthetic values was the major damage caused by the construction activities (M=4.052); 250 (87.4%) responded that raw material depletion was the major damage caused by the construction activities (M=4.042); and 247 (86.3%) responded as landscape change is the major damage due to the construction activities (M=4.035).

4.4.2. Results of objective two

Table 4.3 Severity of the public health and Socio-Cultural Effects

Items	Response Scale											
	Highly severe (5)		Severe (4)		Medium (3)		Low (2)		No effect (1)		M	STD
	F	%	F	%	F	%	F	%	F	%		
Drug Addiction	62	21.7	184	64.3	33	11.5	2	0.7	5	1.7	4.032	0.719
HIV/AIDS & STI	56	19.6	193	67.5	32	11.2	1	0.3	4	1.4	4.035	0.669
Bad Smell	63	22.0	184	64.3	31	10.8	3	1.0	5	1.7	4.038	0.726
Grand Mean=4.03; STD=0.70												

Source SPSS output 2023

As can be seen from the above table, 247 (86.3%) of the respondents believe that bad smell was at severe and above level in their areas due to the construction interventions (M=4.038); next to bad smell, 249 (87.1%) confirmed that HIV/AIDS and STI was at severe and above level (M=4.035); and drug addiction takes the third position on the basis of the mean value (M=4.032) and confirmed by 246 (86.0%) of the respondents who responded as it was at severe and above level.

4.4.3. Results of objective three

Table 4.4 Index Comparison

No	***Environmental Impact***	*Likert scale*						*Weight*	*RII*	*Rank*	*Overall rank*	*Average RII*
		5	*4*	*3*	*2*	*1*	*N*	S W	$\frac{\sum W}{A*N}$ (			
I	*Ecosystems Impact*											0.840
1.	*Deforestation*	*56*	*197*	*29*	*0*	*4*	*286*	1159	0.8103	*3*	*4*	
2.	*Soil erosion*	*70*	*175*	*32*	*3*	*6*	*286*	1333	0.932	*1*	*1*	
3.	*Loss of biodiversity*	*55*	*197*	*30*	*0*	*4*	*286*	1157	0.809	*4*	*7*	
4.	*Waste Water*	*64*	*185*	*31*	*2*	*4*	*286*	1161	0.8114	*2*	*3*	
II	*Natural Resource Impact*											0.809
6.	Raw Material Depletion	*57*	*193*	*31*	*1*	*4*	*286*	1156	0.805	*4*	*11*	
7.	Dangerous Excavation	*57*	*195*	*30*	*0*	*4*	*286*	1159	0.8115	*1*	*2*	
8.	Landscape Change	*61*	*186*	*32*	*2*	*5*	*286*	1154	0.806	*3*	*10*	
9.	*Loss of Aesthetic value*	*56*	*195*	*32*	*0*	*3*	*286*	1159	0.8104	*2*	*5*	
III	*Impact on Human Health*											0.81
10	*Drug Addiction*	*62*	*184*	*33*	*2*	*5*	*286*	1154	0.8102	*1*	*6*	
11	*HIV/AIDS &STI*	*56*	*193*	*32*	*1*	*4*	*286*	1154	0.809	*2*	*8*	

12	*Bad smell*	*63*	*184*	*31*	*3*	*5*	*286*	1155	0.808	*3*	*9*

Source SPSS output 2023

As shown in the above table, in the ecosystem impact category, the respondents ranked soil erosion" in the first position (RII=0.932) as the most important ecosystem impact due to the construction activities of the m project. Next to soil erosion, waste water and deforestation index value of RII= 0.8114 and 0.8103 respectively are the most important environmental impacts. When talking about the natural resource impact category, "dangerous excavation" is the most important impact caused due to the construction activities of the road as ranked above (RIII=0.8115). In this case, loss of aesthetic value is the second most important item with index (RIII=0.8104), followed by landscape change (RIII=0.806) and then raw material depletion (RIII=0.805). Among public health impacts, drug addiction take the first position with (RII=0.8102) while HIV/AIDS & Sexually transmitted Infections (STI) (RIII=0.809); and bad smell (RIII=0.808) take third and fourth positions respectively. In other words, drug addiction is considered as the most important public health related impact associated with the construction of the project under study settings. This indicates that either due to poor management of the project or due to lack of the interest to post-construction interventions in the area has posed adverse environmental impacts on ecosystem, natural resources and public health issues.

As the average index value in table 4.4 indicates, ecosystem impact is the first top priority with overall relative importance index (RII=0.840) including soil erosion, waste water, deforestation and loss of biodiversity. The second most important item is impact on human health with overall relative importance index (RII=0.81) including drug addiction, HIV/AIDS & STI), and bad smell. The third most important item with overall relative importance index (RII=0.809) is natural resource impact comprising dangerous excavation, loss of aesthetic value, change of landscape, and over extraction of as sub categories.

4.5. Interview Results

The researcher has made in-depth interviews with the employer and other stakeholders. Accordingly the interview result shows that they only know that the contractor has legal

obligation to restore the damaged environment. During the field work for data collection, key informants from Wolayta Zone Environmental Protection and Afforestation office, Abela-Abaya Woreda Health Center, Abela-Abaya Woreda Social Affairs Office were interviewed and replied that it was because of the requirement from project lending financial institutions. Therefore, based on the document review and interview result it can be said that due to lack of clearly stated legally binding conditions, it has made the project contractor to leave without implementing restoration activities after completion of the construction or in post-construction period. The researcher attempted to address a total of 16 key informants from the community and get the following findings.

Accordingly, asking to assess their knowledge about environmental degradation, all of the respondents interviewed replied that they have knowledge as to what environmental degradation. They further mentioned flooding, soil erosion, landslide, cutting of forests while asked to name some. This implies that communities have practically faced environmental damage in their locality. Regarding the question as to what ecosystem damage occurred as a result of the dam construction in their surroundings, out of 16 interviewee 9 of them replied clearance of trees, 5 of them said damage on soil and the remaining 2 replied that it was wild life loss and soil erosion increased occurred since the project came.

When asking which natural resource impact they have noticed due to the project, almost all of the interviewed informants replied bore hole here and there happened except 3 of them who have answered extraction of raw materials. Their response indicates that a dangerous excavation was severe damage due to operation of the construction mainly as a result of taking out materials for their construction need. In the quest what public health problem resulted since the commencement of the project, 12 of them replied HIV/ AIDS prevalence became health problem and 4 of them said addiction of "*Khat"* and smoking of cigarette as the most widely seen health problem among youths in their community.

Response from Health Professionals

> *"The individual said that the road construction project contributed much in terms of social and economic aspects. However, because of the construction activities the Malaria breeding sites increase and this resulted in an increase in the number of malaria patients; an increase in STI, HIV/AIDS, abortion, drug*

addiction (we suspect that this increase might be connected to the increase in new comers as daily laborer and technicians from across the country. In addition, Teenage pregnancy also increases and even school drop-out increase."

Response from Woreda Social Affairs experts

"As they said, currently (2019—2022) there increase crises manifested in terms of abduction, rape, drug abuse and criminals that are affecting the norms and values of the society. We attempted to address these challenges through community conversation and community policing practices and to some extent through trainings such as "Girls empowerment" and Behavioral Change Communication (BCC) for voluntary youths".

While asking the severity the environmental damage due to the construction of the project, out of 16 interviewed informants 13 of them replied it was severe. Only 3 of them said the damage was low. Key informants also were asked about the implemented restoration activities of the project after the completion of the project. The question was similarly categorized like that of the environmental impact. Accordingly questions framed as ecosystem restoration, natural resource restoration and public health related restoration. Regarding the question as to what ecosystem restoration was implemented, 10 informants out of 16 interviewed replied waste removals, 3 of them replied re-plantation and the remaining 3 said soil erosion control measure. Of the natural resource restoration, 9 of the informants replied reshaping of damaged land, 5 said soil tilling and scarifying and 2 informants replied back filling of bore holes.

Regarding the public health focused initiatives the project has implemented, majority of the key informants interviewed, 12 out of 16 respondents or 75% replied HIV/AIDS prevention related activities were most widely implemented activities by the project.

When asking how they evaluate the overall performance of the restoration activities implemented in and outside of the project construction site, almost all of the key informants replied that the performance of the restoration activities was poor and only one of them said it was good.

Questions to know about community participation was also forwarded to key informants; Accordingly, when asked whether they have been participated in the restoration activities, except 3 of them all interviewed informants replied that they have never been participated in restoration activities. As to the question how did they see the importance

of restoration with community participation in comparison to without community participation, all of the interviewee said restoration with community participation is important?

Interviewing the community (Some of the Field Notes & Images)

Image 1, some of environmental impacts left unrestored

4.6. Triangulation of Survey and Interview results

As indicated by Brewer and Hunter (1989), the researcher would develop confidence in the appropriateness of the scale, when parallel and comparable outcomes are obtained with two methods, i.e., using a questionnaire (survey research) and interview (qualitative research). Based on the concept of triangulation the finding from both sources are as follow:

- As to which ecosystem impact occurred due to the construction activities of the project some of the interviewed respondents and 88.7% of the survey respondents replied that deforestation or clearance of trees is the severe impact of the construction activities in and around the site.

- Regarding the factor of natural resource impact, nearly 88.1% of survey respondents and majority of the respondents of interview responded that dangerous excavation is the most highly impacted natural resource factor.
- Of the public health impact, while 87.1% respondents in survey questionnaire, majority of the interviewed informants replied that it was HIV/AIDS prevalence highly observed around the project communities.
- Regarding the environmental restoration activities, some of the interview respondents responded that waste removal as implemented restoration activities among other activities.
- Of natural resource restoration activities about half of the interview respondents replied that reshaping of damaged lands as restoration activities of the natural resource focused activities.
- As to the public health initiatives done by the project after completion of the project, majority of the interview respondents replied that HIV/AIDS prevention activities were public health focused initiative carried out by the project in the community.
- Regarding the overall evaluation of the restoration activities, great majority of the interview result show that the performance of the project in restoring the damaged environment was below expectation.
- Regarding the status of community participation, majority of the interview respondents replied that they have never participated in restoration activities.
- Regarding the knowledge about environmental degradation, all of the interviewed respondents replied that they have knowledge about environmental degradation.
- Regarding the importance of community participation in restoration activities against without community participation, all of interview and survey respondents replied that, restoration activities with community participation is important.

4.7. Discussions

This study tried to show as to what types of environmental and socio-cultural impacts occurred due to the construction activities of the road construction project which were observed in and around the project site. As well as the study also tried to identify the type and level of restoration practiced carried out by the project after the completion of the

construction activities and how effective its management system was. As can be seen from the study, the project construction activities resulted in various types of environmental impact up on the area. Moreover, those affected areas were not satisfactorily restored that commensurate with the level of the impact. This could be possible when legal issues are put in place.

The study further indicates that the community under study has knowledge as to what environmental degradation means and its effect. In addition, the communities were well aware of the benefit of participating in restoring the damaged environment. It can also be understood from this that community members around the project site were cooperative if they were mobilized.

The finding from this study also tried to indicate that the project was not emphasized in restoring the most severely affected environment except implementation of HIV/AIDS prevention activities. This is because the intervention started during the construction period and some activities continued after the project completion by already formed youth clubs and health centers. This means that these activities does not demand the project presence in the area implying that the lesson could have been taken and applied to other types of restoration activities as well.

While deforestation, soil erosion and dangerous excavations were highly impacted environmental factors (in survey result, index value and interview), restoration of these impacts were given less attention. The other point that can be seen from the study is that the employer was mainly focused on follow up and taking over of the dam and its operation only and its monitoring of the restoration of damaged environment is ignored.

CHAPTER FIVE CONCLUSION AND RECOMMENDATION

5.1. Introduction

This study was aimed at answering such research questions as what environmental and socio-cultural impacts occurred due to the construction activities of "Humbo-Abela-Abaya Road Construction Project", and what restoration activities were implemented. In view of answering these research questions the researcher employed both descriptive and exploratory methods and collected qualitative and quantitative data through interview and survey questionnaire. The data were analyzed using descriptive and inferential statistics and triangulated the interview result to descriptive survey result. It is evident from this study that the environmental impacts caused in and outside of the project site were severe and in contrast the implemented restoration activities were very limited. Moreover, the effectiveness of restoration management system was not found satisfactory.

5.2. Conclusions

This study tried to show as to what types of environmental and socio-cultural impacts occurred due to the construction activities of the road construction project which were observed in and around the project site. As well as the study also tried to identify the type and level of restoration practiced carried out by the project after the completion of the construction activities and how effective its management system was. As can be seen from the study, the project construction activities resulted in various types of environmental impact up on the area.

First, majority of the respondents believe that the environmental impact due to the construction activities of the project was various and severe (87.4% of survey result and 81% of interview result).

Second, respondents perception as to the restoration activities implemented indicate that such severely damaged environmental factors as deforestation, soil erosion and dangerous excavations occurred due to the construction activities of the project was very limited.

Third, HIV/AIDS & STI is the most severe public health impact (Likert scale value of RII=0.876) and at the same time its prevention is well implemented intervention/restoration (RII=0.910) activity done by the project contractor.

Fourth, there is no clearly indicated management system established to carry out the restoration activities and absence of legally binding statement in contract agreement document that made the contractor accountable (Document review and interview result).

Finally, this study shows that the environmental impact due to the construction activities seen during post-construction period of the project was various i,e. ecosystem, natural resource and public health impact and that the project site and its surrounding left without adequately restored due to lack of rooms for accountability on the part of the project contractor and well established follow up mechanism on the part of the project employer.

5.3. Recommendations

On the basis of findings of this study, the following recommendations for actors involved in construction projects and stakeholders are forwarded.

i. Recommendation for the employer

- The employer of the project has to specifically include legally binding statement regarding the issue of post-project environmental restoration activities.
- The employer has to also ensure that the takeover of the project includes the healthy functioning of the environment in to consideration.

ii. Recommendation for the contractors

- The contractor of the project is recommended to develop the environment management plans that specifically address not only environmental protection during the construction period but also restoration of the damaged environment due to its operation.

iii. Recommendation for Ethiopian Environmental Authority (EEA)

- The EEA need to establish strong monitoring and evaluation system so that the project it has approved after ESIA take care of the environment in post-construction period.

- The EEA is recommended to establish systems that enable the local governments to oversee and take part in issues regarding environmental protection.
- The EEA need to have a structure that it directly supervise and follow the environmental protection issues rather than delegating at least in such big projects.

iv. Recommendation for future research

- It is recommended that researches need to be carried out to assess the environmental impact of the road construction project activities up on specific factors of the environment

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Annexes

TITLE: ENVIRONMENTAL AND SOCIO-CULTURAL EFFECTS OF HUMBO-ABELA- ABAYA ROAD CONSTRUCTION PROJECT IN WOLAYTA ZONE, SOUTHERN ETHIOPIAN

A Questionnaire to be filled by households in the catchment area of "Teblela – Abela-Abaya Road Construction Project" in Wolayta Zone, South Ethiopia

Dear respondents,

I, **Eyasu Engida Bassa**, am a student of **Construction Technology and Management** in Addis College, Addis Ababa. The main purpose of this questionnaire is to collect the appropriate data that will help to assess the Environmental and Socio-Cultural Effects of Road Construction Projects in Ethiopia: the case of "Teblela –Abela - Abaya" road construction project in Wolayta Zone. This study will be conducted only for academic purpose, and hence it will not affect any one by any means. Thus, the data collected through this questionnaire is kept confidential and only used for academic purpose. Therefore your genuine and timely response is important.

Thank you in advance.

Overall Directions

You are not expected to write your name

Put an "X" mark in the space provided for all close-ended questions and write your opinion for all open ended questions on the space provided for them. It is possible to use English or Amharic language to write.

I. PERSONAL BACKGROUND

1.1. Sex: Male. ----------Female----------

1.2. Age in years----------

1.3. Education level----------

1.Illiterate------- 2. Primary-------- 3. Secondary------ 4. Higher Education---------

1.4. Marital Status 1. Married--------- 2. Single------- 3. Divorced------ 4. Widow/ed---

-------- 1.5. Family size in number----------

1.6. Major means of livelihood of respondents----------

1.Agriculture---------- 2. Petty trade----------3. Casual work----------

A Questionnaire to be filled by households in the catchment area of "Teblela Abela-Abaya Road Construction Project" in Wolayta Zone, South Ethiopia

I.	Environmental effect, Ecosystem

S/N	Items	Measurement Scale				
		Highly severe (5)	Sever e (4)		Low (2)	N e (
1	Deforestation					
2	Soil erosion					
3	Loss of biodiversity					
4	Waste water					

II.	**Environmental effect, Natural resource QUESTIONNAIRE**

S/N	Items	Measurement Scale				
		Highly severe (5)	Severe (4)	Mediu m (3)	Low (2)	No effect (1)
1	Raw material depletion					
2	Dangerous excavation					
3	Landscape change					
4	Loss of aesthetic value					

III. Effect on Public Health and Socio-cultural Effect

S/N	Items	Measurement Scale				
		Highl y sever	Severe (4)	Mediu m (3)	Low (2)	N o ef
1	Drug Addiction					

2	HIV/AIDS &STI					
3	Bad smell					

If you have any comments please write----------

For Environment protection Experts

Interview questions

Q1. How do you see the impact of Road Construction Projects in general?----------

---

Q2. How about the impact of "Humbo-Abela_Abaya Road Construction" Project?----------

---

Q3. What effects are manifested during the implementation of this project in terms of environment aspects such as

a) Ecosystem (deforestation, soil erosion, biodiversity waste water etc.)----------

---

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b) Natural resource (raw material depletion, dangerous excavation, land scape change, loss of aesthetic value etc.)----------

---

Q4. What strategies do you suggest to mitigate the impact of the construction projects:-

a) For contractors----------

---

b) For project owners----------

-

c) For supervisors----------

---

d) For communities----------

---

e) For Local Administrators----------

---

f) For Policy designers----------

Thank you

For Health and Social Workers

Interview questions

Q1. How do you see the impact of Road Construction Projects in general?----------
---

Q2. How about the impact of "Humbo-Abela_Abaya Road Construction" Project?----------
---

-

Q3. What effects are manifested during the implementation of this project in terms of Health and health-related issues?

c) Communicable diseases----------

---

d) Non- communicable diseases----------

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e) Reproductive Health issues----------

---

f) HIV/STI prevalence----------

---

g) Others----------

Q3. What do you suggest to prevent the transmission of Health and Health related diseases?

a. For Community Health Workers----------

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b. For communities----------

---

c. For Local Administrators (Health Institutions)----------

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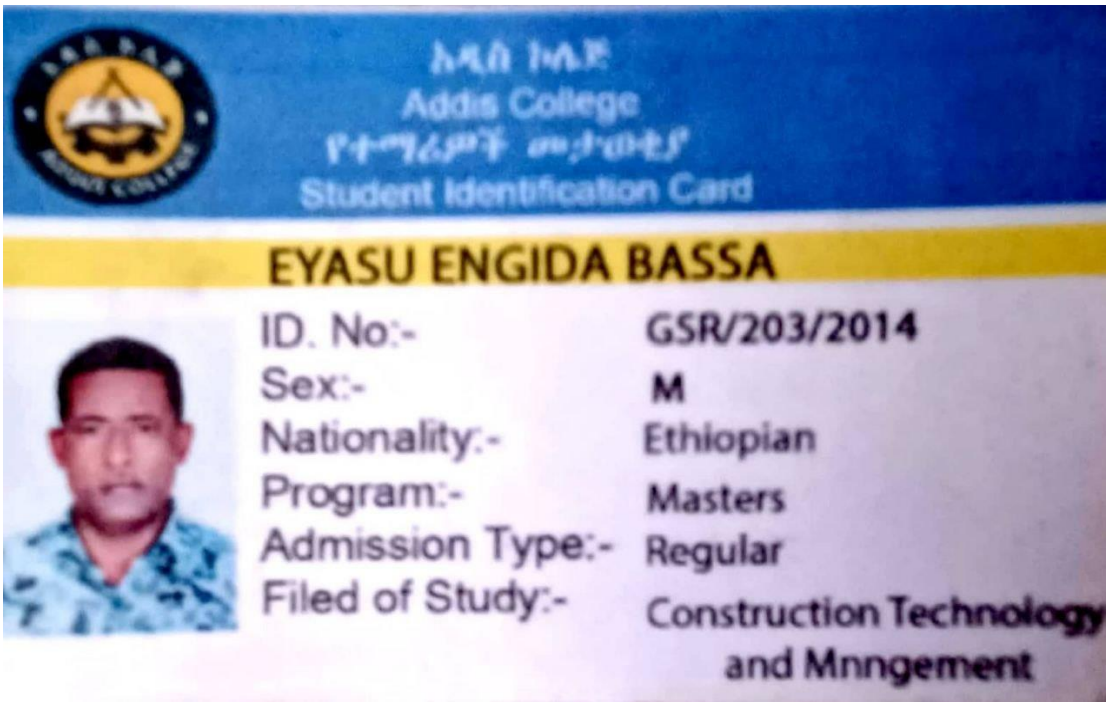
d. For Policy designers----------

Thank you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Student Identification Card
EYASU ENGIDA BASSA
ID. No:- GSR/203/2014
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Program:- Masters
Admission Type:- Regular
Filed of Study:- Construction Technology and Mnngement

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SCHOOL OF GRADUATE STUDIES

THESIS TITLE APPROVAL FORM

This is to certify that the thesis entitled

Study On Environmental and Socio-Cultural effects of Road Construction project in Ethiopia: the Case of Tebla-Abela-Abaya Road project.

has

been carried out by EYASU ENGIDA ID NO GSR/203/2014 E.C

Advisor Name — Signature — 18/09/2015 E.C Date

School Dean — Signature — Date

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በርዕሱ እንደተገለፀው በኮንስትራክሽን ቴክኖሎጂ እና ማኔጅመንት የድህረ ምረቃ ትምህርት ክፍል ተማሪ የሆኑት ኢያሱ እንግዳ የኮሌጁ ተማሪ መሆናቸው እንዲገፍላቸው በ02/12/2015 ዓ.ም በጻፉት ደብዳቤ ጠይቀዋል። በዚህ መሰረት ስማቸው የተጠቀሰው ተማሪ የአዲስ ኮሌጅ የማስተርስ ፕሮግራም ተማሪ እና የመመረቂያ ወረቀት (Thesis) በመስራት ላይ በመሆናቸው በእናንተ በኩል አስፈላጊው ትብብር እንዲደረግላቸው እየጠየቅን ለሚደረግላቸው ትብብር በቅድሚያ እናመሰግናለን።

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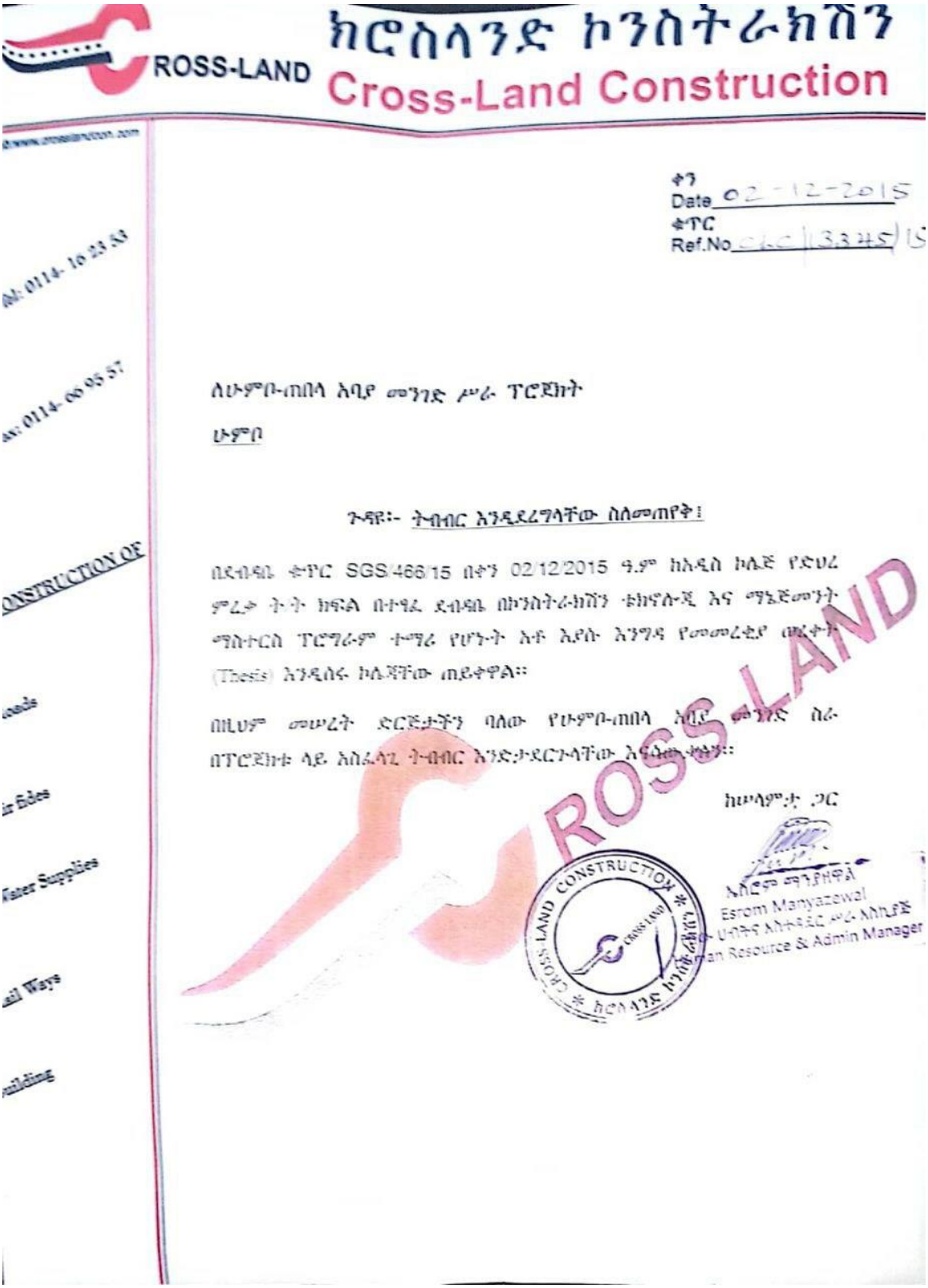
ብሩክ ጥበቡ
የድህረ ምረቃ ዲን
Biruk Tibebu
Dean, School of Graduate Studies

አድራሻ 1. አለ ምስራቅ ቴ.መ.ት ሥልጠና ኮሌጅ ፊት ለፊት E-mail addis_college@ethionet.et Fax 251-11-663 12 74

መልስ ሲፅፉልን የኛን የደብዳቤ ቁጥር ይጥቀሱ / In replying please quote our Ref. No.



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በደብዳቤ ቁጥር SGS/466/15 በቀን 02/12/2015 ዓ.ም ከአዲስ አበባ የድህረ ምረቃ ትምህርት ክፍል በተሰጠ ደብዳቤ በኮንስትራክሽን ቴክኖሎጂ እና ማኔጅመንት ማስተርስ ፕሮግራም ተማሪ የሆኑት አቶ ኢየሱ እንግዳ የመመረቂያ ጽሑፍ (Thesis) እንዲሰሩ ክሊኝቸው ጠይቀዋል።

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Man Resource & Admin Manager

CROSS-LAND CONSTRUCTION * ክሮስላንድ ኮንስትራክሽን

Thank you for your valuable contribution to the success of my research

……. THE END ……