Responsible Land Governance: Towards an Evidence Based Approach

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# Land for Food or Power? The Interface between Hydropower Production and Family Farming in Southwest Ethiopia

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**Abstract**

Gilgel Gibe-I hydroelectricity dam is one of the mega hydropower projects of Ethiopia found in the southwestern part of the country. This project was designed to produce 183 MW energy for 70 years, but is currently at risk of being silted up within 24 years. This study identifies the prospects and challenges to find a long-term balance between hydropower production, livelihoods of family farmers and sustainable land use. We used mixed methods approach to collect quantitative and qualitative data and applied a 'riskscapes' framework. The project displaced about 2,476 households out of which 560 moved to resettlement sites. The remaining households became landless, food insecure and are living in the surroundings of the project area farming inside the buffer zone. The community is also energy insecure because of lost access to source of biomass energy as a result of destruction of the riparian forest. In order to achieve a balance between the riskscapes of siltation, food and energy insecurity and national hydropower production, we recommend holistic approaches to community needs and project sustainability. In particular we recommend proper land use and buffer zone management, provision of electricity to the local communities and compensation for lost properties in the project area.

**Key Words: Hydropower, `Riskscapes, Food Insecurity, Energy Insecurity, Siltation**

## 1. Introduction

Ethiopia is a country located in East Africa occupying an area between geographic coordinates of 800 North and 3800 East. With a landmass of 1.1 million square kilometer and a total projected population of 90 million in 2015 (CSA, 2016), it is the second most populous country in Africa. Agriculture, more than 95 Percent of which is based on family farming, is the principal source of livelihood for over 81 percent of the county's population (CIA, World Fact Book, 2012, CSA 2016). A food security report published by CSA and WFP (2014) revealed that, over 40 percent of the family farming households is food energy deficient and 46 percent of rural children under five years are stunted. These family farmers are living not only under extreme conditions of food insecurity but also under serious conditions of energy insecurity. While over 80 percent of the total population of the country is living in rural areas, electricity distribution networks are concentrated mainly in urban centers. As a result, 80 percent of the urban population and only two percent of the rural population have got the privilege to get access to the grid electricity (Yewhalaw et al., 2014). The rural population relies mainly on biomass energy (Guta, 2012) . According to the International Energy Agency, in 2014, biomass energy accounted for 92 percent of the total national energy consumption of the country while hydroelectricity and oil products accounted respectively for one and seven percent.

In the last two decades, Ethiopia had massively increased its hydropower generation capacities as part of its plans to satisfy the domestic consumption demands, to boost its industrialization, and become a top regional electricity exporter (World Bank, 1997a). Most large hydropower dams in Ethiopia have been built in the Southwestern parts of the country, an area dominated by traditional smallholder-based agriculture. This study focuses on the Gilgel Gibe-I (GG-I) hydroelectricity dam in Jimma zone, Oromia Region, Southwestern Ethiopia, one of the largest dam projects in Ethiopia in the last decades.

Generation of hydroelectric power demands construction of dams and creation of artificial lakes which in turn require displacement of people out of the reservoir and dam area and change of the landscape (Bahiru, 2010; Tefera & Sterk, 2008). Displacement of a certain number of households to achieve bigger national objectives is becoming a normal practice in development projects. For instance, the construction of large dams has led to displacement of 40 to 80 million people word wide and many of these people have not been compensated (WCD, 2007). About 57 percent of the world's dam was built by China and India where the two countries respectively displaced over 10 million and over 16 million people. According to the World Bank's project completion report on GG-I hydropower, the project displaced about 706 households and the Ethiopian government has compensated all the project affected people and moved them to resettlement sites (World Bank, 2007). The Bank's feasibility study document (World

Bank, 1997a) shows the delineation of buffer zone to protect the dam from siltation. Moreover, reports of the Ethiopian Electric and Power Corporation show that the buffer zone has been planted with trees of different species to compensate the riparian forest that has been lost in the reservoir area and protect the reservoir from erosion (EEPCO, 2011). However, studies conducted by Devi et al. (2008) revealed that GG-I dam will be completely filled with sediments within 24 years at the current rate of siltation. Despite the fact that all project affected people were reported to be compensated before they were moved to resettlement sites, there are reports showing the food insecurity situation of the project affected people (Hathaway, 2008).

This study analyzes the overlapping risks in the study area affecting the generation of hydropower for the nation and the livelihood of the local community living nearby the Gilgel Gibe-I hydroelectricity dam and reservoir. Based on in-depth empirical field research carried out in the area in 2015/16, this study tries to identify prospects and challenges to find a long-term balance between hydropower production, local livelihoods of smallholder family farming households, food security and sustainable land use.

The rest of the paper is organized in six sections. The second section provides description of the study areas and section three describes the methodologies followed. The fourth section deals with the conceptual framework used for analysis of the data and section five presents the results and discussions. Section six provides conclusions and recommendations derived from the findings of the study.

## 2. The Study Area

This paper is based on data collected from Kersa and Omonada districts (*woredas*), Jimma zone, Southwest Ethiopia (Fig. 1). These districts are hosting the reservoir for the Gilgel Gibe-I hydroelectricity project. Family farming households were displaced from the reservoir site of Gilgel Gibe-I and resettled in Kersa and Omonada districts in 2000/2001. Seven out of the nine resettlement villages are now located in Kersa district while the remaining two villages are found in Omonada district.

<<Figure 1: Map of the study area about here>>

Agro-ecological zones in Ethiopia are traditionally classified into five categories with traditional names assigned to each of the zone based on altitude, temperature and rainfall amount and distribution. These agro-ecological zones are named as *berha*[1], *Kola*[2], *weinadega*[3], *dega* [4]and *wurch*[5] (Hurni, 1998). The

[1] Berha is a dry hot area found in within altitude ranges of 500-1500 m.a.s. receiving mean annual rainfall of less than 900 mm and average temperature of over 22 C$^{o}$.

study sites fall under three out of the five agro-ecological zones. Kersa is located between 1,740 and 2,660 meters above sea level (m.a.s.l.) and consists of 10 percent *dega*, and 90 percent *woinadega,* agro-ecologies. Omonada located between 880 and 3344 m.a.s.l. and consists of 24 percent *dega*, 63 percent *woinadega* and 13 percent *kola*. The main rainy season in Kersa and Omonada areas stretches from March to September and the area receives an average annual rainfall of 900-1300 mm. Temperatures are moderate ranking from 20-28 °C with variations across specific agro-ecologies.

The main language spoken in the study areas is *Afan Oromo*. Some people also speak Amharic in addition to *Afan Oromo*. Almost 99 percent of the sample households in the study area are Muslims. The average family size in the study areas is 7 persons per household. However, family farmers often face labor shortages, especially during weeding and harvesting seasons.

The important sources of energy for family farmers in the study areas are fuel wood and kerosene for light. Fuel wood is collected either from the nearby forests (if available) or crop residues (maize and sorghum Stover) are used as a substitute. The dependence on biomass as source of energy is similar to other parts of the country (Negash & Kelboro, 2014). Access to electricity is limited to urban areas in both Kersa and Omonada districts.

Maize is the dominant crop produced in the study areas. Results of the household survey show that maize is the most dominant crop in Kersa and Omonada districts covering respectively 74, 68 percent of the total cultivated land of these areas in the 2014/15 cropping season. The second dominant crop is *Tef* (*Eragrostis tef)*, followed by sorghum, pepper, *khat (Catha edulis*) and coffee. Livestock such as cattle, sheep, goats, donkey, horses and mules as well as poultry and honey bee are reared in the study areas. The average livestock holding in the study areas is 5.7 TLU. Ownership of at least a pair of oxen is a necessary condition for farm traction. However over 16 percent of the households in the study areas did not have any ox and they need to look for other options for seedbed preparation and planting.

## 3. Methodology

This paper is based on qualitative and quantitative data collected during a one year (May 2015 to April 2016) fieldwork in Kersa and Omonada districts, in Ethiopia. A mixed methods approach was employed

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[2] Kola is a sub-moist area found within altitude ranges of 500-1500 m.a.s.l. receiving mean annual rainfall of 900-1000 mm and average temperature of 18-24 C$^{o}$.

[3] Weinadega is a moist-cool area found within altitude ranges from 1500-2300 m.a.s.l. receiving mean annual rainfall of over 1000 mm and average temperature of 18-20 C$^{o}$.

[4] Dega is a cold area found at altitude ranges from 2300-3200 m.a.s.l. receiving mean annual rainfall of over 1000 mm and average temperature of 10-14 C$^{o}$.

[5] Wurch is a very cold or alpine area found at altitude of over 3200 m.a.s.l. receiving mean annual rainfall of above 1000 mm and average temperature below 10 C$^{o}$.

to conduct in-depth interaction with the subjects of the study in the form of informal individual and group discussions, observations of community practices, focus group discussions and household surveys. These interviews and discussions were held with households living in the area where the Gilgel Gibe-I project is located and the area where the project affected people were resettled in Kersa district. We met people who were displaced from their original site and resettled in Kersa district, the host community in Kersa district, the non-project affected people both in Kersa and Omonada districts and the households living in the surroundings of the buffer zone. Discussions were made with households who lost their lands and living on the boundaries of the buffer zone of GG-I hydropower dam, the people who lost their farmlands partially in the project area and the leadership of the *kebele[6]s* in the project and resettlement areas. We also made intensive discussions with relevant officials in the district and zonal offices and tried to triangulate some of the information and data obtained from the community in different ways. We also made repeated visits to the project office at Deneba and made discussions with the project management team. We had several opportunities to observe the community practices especially in soil and water conservation works and the ongoing initiatives to rehabilitate vegetation in the buffer zone. In addition to the discussions we made with local community and government offices, we made extensive discussions with scientists at Jimma University who are actively engaged in researches related to Gilgel Gibe watershed management and members of the taskforce established to handle the problem of siltation in GG-I dam reservoir.  In total, we made in depth individual discussions with more than 60 people and 12 informal groups formed of five members on average. We also made 22 focus group discussions with 150 farmers and household survey with 230 sample farmers. There were over five times of repeated meetings with some of the community members and this has enabled us to get the trust of key informants that were suspicious at the initial stage of our meetings. Secondary data and relevant documents were also collected from different sources. Use of combination of the different methods helped use to make triangulations in order to verify information and data generated using different techniques

## 4. The Conceptual Framework (Theory of Analysis)

Conceptually, the study applies the riskscapes framework (Müller-Mahen & Everts, 2013) focusing on the analysis of sources of risks (that can simultaneously happen and collectively shape life and space) to different actors, on how these sources of risks are perceived by different actors and translated into response strategies. Riskscapes show the overlapping risks in a given space with different levels of influence on different actors in that space. Riskscapes is also about the perception of the different dimensions of risks in a given space by different actors and it varies with spaces. The theory of riskscapes asserts that, while many risks appear global by their very definition, they are still embedded in particular

[6] Kebele is the least level of government administration.

landscapes and produce locally perceptible effects. The riskscapes theory suggests using common frameworks to analyze risks that simultaneously happen in one location in order to better understand how they collectively shape life and space. Müller-Mahn and Everts (2013) argue that different actors with different perspectives can view riskscapes differently from others and there could be a multitude of riskscapes. They explain the fact that riskscapes viewed by different actors from their own perspectives could partially overlap and these riskscapes are intrinsically interrelated. These riskscapes could also be conflicting and may create controversial socio-spatial images of risk.

## 5. The Rskscapes of Siltation, Landlessness, Food and Energy Insecurity

The riskscapes in the study areas are shaped by different actors and their different risk perspectives and practices. The study areas are affected by numerous overlapping risks whose resultant outcome affects the livelihood of the local population in one or the other way and service life of the hydropower dam. Accordingly, this case study highlights the three constituents of riskscakpes that have been outlined by Müller-Mahen and Everts (2013). First, any riskscape is a combination of material aspects that can be located in a physical landscape, and the ways in which individuals or communities make sense of them in and through everyday practices. Second, although different actors are dealing with the same thing, different riskscapes happen depending on the diverse ways in which people make sense of the different sources of risks and their manifestations(Müller-Mahen & Everts, 2013). Third, different risk management interventions need to take into account the existence of the different riskscapes to understand the different agencies and dependencies.

In this study we can distinguish three sets of actors with respect to the riskscapes of siltation, landlessness and food insecurity that are related to Gilgel Gibe-I (GG-I) hydroelectricity dam. The first set of actors is composed of experts including GG-I project management team, researchers, non-governmental organizations, local and national administration officials. The second set of actors is family farming households that lost their crop and grazing lands in the project area and are living around the reservoir of the GG-I hydroelectricity dam without being compensated for their land and properties. The third set of actors is composed of project affected households who were compensated for their perennial crops and immovable properties and relocated to the resettlement sites. For simplicity of discussion, we call the first set of actors as experts and the second and third set of actors as local community. The general scenario is that experts consider the local community as sources of risk of siltation to the hydropower dam while the local community considers GG-I hydropower project as source of risks of landlessness food and energy insecurity to them. While the risks of siltation, landlessness and food insecurity are overlapping and inter-related risks, the different actors perceive only one of them from their own perspectives. The different actors also try to develop management strategies for their riskscapes (risks perceived from their own perspectives). However, since the different riskscapes are inter-connected, it might be impossible to get lasting solution for one without addressing other riskscapes. Therefore, resolving the overlapping riskscapes in the project area need holistic approach in which all the riskscapes will be mitigated or addressed in a way that brings about mutual gain to the different actors.

### 5.1. Gilgel Gibe-I Hydroelectricity Dam Project

The plan for construction of Gilgel Gibe-I hydroelectricity dam was conceived in 1960s during the Imperial regime after which the Yugoslav Elecroproject company conducted the first hydroelectricity study on Gilgel Gibe river in 1963. Different companies were involved in the study of this dam including the Chinese technical mission and the Electric Power Development Corporation of Japan in 1974. The Dergue military government continued with the effort to build GG-I dam and involved the Canadian firm known as ACRES International Ltd in power planning in 1982, the team of experts from the Democratic People's Republic of Korea and the Italian company, Ente Nazionale Per IÉnergia Electrica Italy (ENEL) in preparation of the feasibility report in 1984 (World Bank, 1997a). The initial activities for the construction of GG-I dam were started in 1988 through a cooperation agreement established between the Government of Ethiopia and the Democratic Republic of Korea. This cooperation and the project work were interrupted in 1994 until it was re-initiated in 1996 with the cooperation agreement that was maintained between the Ethiopian Government and the Italian company ENEL/Elc consortium (Ethiopia Electric Light and Power Authority (EELPA, 1997; Kebede, 2001).

GG-I hydroelectric dam is located in the Jimma Zone of Oromia Regional State, South West Ethiopia at the latitude 7°50´ north and longitude 37°20´ east near the Addis Ababa-Jimma highway road about 260 km south west of Addis Ababa and 70 km Northeast of Jimma town. The project site is located in the boundary area between four districts: Kersa, Omonada, Tiro Afeta and sokoru districts (Fig. 2).

<<Figure 2: Map of Gilgel Gibe site about here>>

GG-I hydroelectric dam is a 40 meters curved rock filled dam whose reservoir has a capacity to store 917 million cubic meters of water (World Bank, 1997b, 1999, 2007). The reservoir of the dam occupies about 48 sq. Km. and an area surrounding the reservoir, the buffer zone occupies an area of about 2,600 ha

(World Bank, 1997b, 1999). The buffer zone is an area found within 500 to 1000 meters from the upper most limit of the water in the reservoir in all directions. Gilgel Gibe-I project was commissioned in 2004 and it injected 184 MW dependable capacity and total production of 722 GWH/year in 2005 to the interconnected national grid system (World Bank, 2007). This project increased the power supply of the nation by 45 percent and enabled to reach additional 380 towns and 164 districts (*woredas*) and contributed energy to the country's domestic industries and export to neighboring countries (Devi et al., 2008). With further investment on Gilgel Gibe-II power plant that was commissioned in 2010, the water from the same reservoir is used to generate another 420 MW of energy and the total annual production of 1,650 GWH energy a year. This means GG-I hydropower dam and its reservoir are currently used to generate over 600MW of electrical energy to the benefit of the nation.

### 5.2. The Riskscapes of Siltation

GG-I hydropower dam was designed to serve at least for 70 years. However, Devi et al. (2008) estimated that volume of the dam will be reduced by half within 12 years and would completely be filled with sediments within 24 years under the current rate of siltation. According to this study, the total sediment load to the dam was 45 million ton/year out of which the contribution of Gilgel Gibe River that carries sediments from upstream watershed was only 277,437 tons/year (less than 1% of the total sediment load). The remaining balance of the sediment load is the one contributed by the sheet erosion from the catchment of the dam which was estimated to be about 44.7 million tons/year that is 2,210 tone per square kilometer. This means the major source of sediments shortening the service life of GG-I dam is the catchment of the dam. The important causes for this sheet erosion are intensive traditional agricultural practices, overgrazing and poorly managed or non-existence of the buffer zone to protect the reservoir.

Gilgel Gibe-I hydroelectricity dam project is surrounded by communities of smallholder family farming households whose livelihood is based on mixed crop livestock farming activities. The buffer zone was intended to be covered with trees of different species and grasses to serve as a filter in order to protect the reservoir from siltation. Accordingly, the project implementation reports show that about 775,000 trees of various species were planted in erosion prone areas of the buffer zone during the construction phase of the project (EEPCO, 2011). However, these trees covered only small spots within the vast area of the buffer zone. Though it is demarcated as a buffer zone, the vast area of land is not protected and managed as per its initial plan (Devi et al., 2008). According to the discussions we made with the project management team at Deneba office and our observations in the field, the buffer zone is being used for livestock grazing and crop cultivation (up to the bank of the reservoir) (Picture 1).

<< Figure 3: Cultivation of the buffer zone of GG-I buffer zone about here>>

It is also believed that some of the households that have been moved to resettlement sites are coming back to cultivate in the buffer zone (Teklu & Kassa, 2011). In a nutshell, failure to enforce the buffer zone is contributing to damages on the service life of the reservoir by intensifying the amount of soil that is carried to the reservoir through the sheet erosion.

The risk of siltation to the GG-I dam affects the cascade hydropower plant to GG-I, Gilgel Gibe-II that relies on water held in the reservoir of GG-I dam. The fate of the two power generation plants is tied up with the service life of GG-I dam which is being threatened by the fast siltation process.

### 5.3. Expected Benefits of the Project to the Local Community

The community living around the reservoir of GG-I dam was expecting to benefit from the electric power generated by the dam and better fish harvest from the new artificial lake. The expectations were based on promises made by the project at the beginning of its operation in the study areas. As expected, the community is benefitting from fishing on the reservoir of the dam. This is because the reservoir has created favorable condition for the fishery (EEPCO, 2011). Fishing is carried out both on individual and group basis. Groups of young farmers in the four neighboring districts have formed independent fishing groups and cooperatives. These cooperatives obtained some grants from Global Environmental Fund (GEF) to procure fishing equipment including the boats and different items. However, we learned that fishing groups formed in any part of the districts were able to access the fish and the permission given by the district offices to the fishing groups did not consider the capacity of the fishing stock in the reservoir. The consequence was unfavorable fierce conflicts erupted among the different fishing groups that have gone to the level of loss of life. Because of these conflicts, the fishing activities have been halted by the time we conducted this study. On the other hand, individual farmers explain that they have benefitted from fishing on the reservoir. Some farmers indicated that they have been able to build their household assets using income from the fishery. However supply of electricity remained a mare promise and could not be realized over the last 13 years. None of the project affected community has got access to electricity. Realization of this promise could have played a significant positive role in creating sense of ownership of the project by the local people. It could have also played an important role in reducing destruction of trees around the buffer zone thereby it could have contributed to reduction of soil erosion from areas surrounding the buffer zone and siltation in the reservoir.

## 5.4. New Risks to the Local Community

### 5.4.1. The Riskscapes of Landlessness and Food Insecurity

The major objective of GG-I hydroelectricity dam is to generate dependable electric energy for the nation and to contribute to the export of energy to neighboring countries and beyond. As indicated earlier, the project has achieved these targets. However, the reservoir of the dam and the buffer zone had to be free from human settlement, grazing and cultivated agriculture. This means implementation of the project required acquisition of land that involved partial or complete displacement of family farmers residing in 18 *kebeles* found in four neighboring districts (Kersa, Omo Nada, Sokoru and Tiro Afeta districts) of Jimma Zone (EELPA, 1997; Kebede, 2001). This area was occupied with over 300 hectares of riparian forest, human settlement, agricultural lands and grazing fields (World Bank, 2007). The new risk came to the livelihood of the community since the project had to displace all the residences in the project area, clear the riparian forests and deny access to crop-lands and grazing fields in the area delineated for the project. According to the resettlement implementation plan developed by Ethiopian Electric Light and Power Authority (EELPA), the project affected 2,476 households out of which 706 households were residing and farming in the reservoir area and buffer zone and the remaining households were residing outside the land area occupied by the project but farming and grazing in the project area (EELPA, 1997). According to the resettlement action plan, the project completion reports (World Bank, 2007) and an ethnographic study conducted immediately after the displacement of people from the project site by Kassa (2001), out of the total households affected by the project, households that were living and farming in the project area (706 in number) were forced to move out of the area. These households were offered the opportunity to be given 2.5 hectars of land, a house with roof of corrugated iron sheet, Provision of agricultural inputs for one year and cultivation of the land by the project if they move to the resettlement site. These households were compensated for their trees and perennial crops before moving to resettlement sites. Out of 706 households 562 households accepted the offer and moved to resettlement sites. About 144 households wanted to resettle themselves nearby their relatives and the remained around the project area. The rest of the affected households (1770 households) are still residing around the buffer zone without being compensated for the land and immobile properties they lost because of the project.

According to information obtained from individual and focus group discussions, the project has denied them access to their crop and communal grazing lands. Some of the residents lost almost all their crop and pasture lands in the reservoir area and buffer zone and are left with their residence and home garden. For instance, one of the female farmers we interviewed in Burka Asendabo *kebele* of Omonada district indicated that her residence is found at the boundary of the buffer zone and she does not have any land left for cultivation or grazing. She has been left behind because she did not qualify for resettlement since her house is located outside the reservoir and the buffer zone. The livelihood of this farmer and her household depends on faming of the protected buffer zone. She has five sons that are already married after the displacement of the household by the project. There is no intergenerational transfer of land to these young farmers. But they all are cultivating the buffer zone until they will be forced to stop. According to the discussions we made with the leaders of Burka Asendabo *Kebele*, about 300 such households out of the total 1,000 households residing in their *kebele* have lost their lands in the project area. The *kebele* administration also described the challenge they are facing since these households are not compensated for the lands they have lost in the project area. They need to get access to land in order to produce their food and this is their right enshrined in the constitution of the country.

According to the discussions we made with some farmers, they are still expecting resettlement since the government is becoming more serious in enforcing exclusion of residents from grazing and cultivated agriculture in the buffer zone. Results of the household survey reveal that residents of the study area ranked involuntary resettlement and eviction of farmland as highest among sources of risk of food insecurity. This shows how the community is uncertain about its future prospects depending on its past experience mainly because of issues of landlessness emanating from the GG-I hydroelectricity dam project. Accordingly, results of this study reveal that about 80 percent of households in the dam area have shortage of land to produce enough food for their family and 55 percent of these households perceive that their families are food insecure.

While discussing the sources of risk of food insecurity, one of the farmers in Burka Asendabo reiterated that "shrinkage of our grazing land area because of GG-I dam reservoir has forced us to limit the number of our livestock. Because of this, we could not get access to milk and meat. We (men) can eat meat at least once in two weeks when we go to the town. However, our women and children rarely get meat and milk." This farmer and other family farmers that we met during focus group discussion, individual in-depth interviews and household survey revealed that, the community has lost access to its communal grazing land. This has forced members of the community residing nearby the reservoir to downsize their livestock number and give up sources of household nutrition and income.

Apart from landlessness, residents in the study areas attribute recurrence of the disease known as head smut of *tef* (*Eragrotis tef*) to the artificial lake created due to the dam. Almost all farmers we met during the in-depth interviews and focus group discussions indicated that the head smut disease became intensified following the accumulation of water in the reservoir. They emphasized that *tef* is almost getting out of production because the disease has become prevalent damaging the crop every year. Since *tef* is one of the staple food crops in the area, farmers consider this challenge as a threat to their food security. Results of the household survey also revealed that, about 98 percent of the famers in the study areas perceived head smut of *tef* as a source of risk contributing to their food insecurity. Moreover, results of focus group and individual assessment of the different sources of risk of food insecurity revealed that head smut disease of *tef* has a very high impact on household food security. The disease is highly predictable and has a very high likelihood of occurrence but it is non-recoverable and non-avoidable. Agricultural experts working in the area also witnessed the association of recurrent occurrence of head smut disease with the dam and they associated it with increased humidity of the area because of the artificial lake. According to experts, the humid environment creates a favorable condition for the disease causing agents to flourish.

### 5.4.2. The Riskscape of Energy Insecurity

Apart from access to agricultural lands, the project affected community have lost the riparian forest to the reservoir water. This forest was the major source of biomass energy that a local community has been using since time immemorial. It was also source of wood for construction and farm implements. The forest was also source of households' income during stress times of the year. Since the surrounding farmers used to sell fuel wood collected from this forest to the nearby urban centers, it was source of biomass energy not only for the project affected community in the dam area but also to the nearby urban dwellers. However, following the destruction of the riparian forest, the community switched to using small tree stands in their surroundings. As a result, the tree stands around the residential areas and farmlands were wiped out within a very short period of time. One of the farmers in Burka Asendabo *kebele* said: "the forest along the Gibe River used to be our major source of wood for construction and fuel. However, it was cleared by the project and we remained using the trees in our area. Now we have finished all the trees and we are left with bare land. This has exposed us to run-off." The run-off carrying the top soil from the catchment in turn contribute to the fast siltation of the reservoir. This shows how far the coping mechanisms of the community for problems associated to energy insecurity mainly triggered by the project are back-firing on the safety of the project itself. If these problems continue unsolved, their repercussions on the service life of the project continues to be disastrous.

### 5.5. Risk Management Strategies at the Community and Government Levels

#### 5.5.1. Risk Management Strategies of the Actors Associated with GG-I Project

The consequences of soil erosion on the service life of dam reservoirs have been well understood by the policy makers and the professionals associated with hydropower generation and others supporting these efforts. The project environmental feasibility study (World Bank, 1997a) has also indicated the potential siltation and underlined the need to do integrated watershed management to protect the dam throughout its service life. Studies conducted on the impact of siltation over the service life of other dams such as Koka, Aba Samuel and Gilgel Gibe I dam itself (Devi et al., 2008; Gizaw et al., 2004) also called for measures to save the dam from a high rate of siltation. Moreover, Ethiopian Electric and Power Corporation; Ministry of Water, Irrigation and Electricity; Jimma University; PHE (Population, Health and Environment Cosortium); relevant regional and zonal administrative offices and other relevant stakeholders including non-governmental organizations have created a task force that works on reducing the siltation problem in the GG-I hydroelectricity dam in 2010 and the task force have been working since then. The collaborative research project between Flemish Universities and Jimma University is also conducting tremendous studies in the GG-I watershed.

At the national level, based on professional recommendations, the government of Ethiopia has initiated national watershed management schemes under the Sustainable Land Management Program (SLM) focusing on soil and water conservation practices being implemented through community mobilization. The Gilgel Gibe-I watershed has got due emphasis because of the damages that are inflicted on the service life of the reservoir of the dam because of the high rate of sedimentation due to soil erosion from the surround areas and the upper catchment. In addition to the SLM program, the federal government through the Ministry of Water, Irrigation and Electricity has allocated additional resources to overcome different forms of soil erosion, gullies, and landslides that contribute for fast sedimentation in the GG-I dam reservoir (Figure 4).

<<Figure 4: Gully rehabilitation work and rehabilitated gully around the buffer zone about here>>

As part of initiatives to promote integrated watershed management activities, some projects funded, for e.g., by the Global Environment Fund, have come up with dual purpose income diversification activities such as apiculture, zero grazing fattening and fishery development. The project has established a revolving fund to be used by groups of farmers in the watershed for these income diversification activities. This helps efforts of integrated watershed management in that that the community will buy-in the idea of conserving the watershed including the buffer zone while being benefited from their conservation activities. However, the activity of these projects is not strongly focusing on project affected households living near the buffer zone of the dam whose livelihood depends mainly on cultivation and grazing in the buffer zone. On the other hand, these projects are not implemented following a clearly defined land use plan in the buffer zone and specific responsibilities are not assigned to specific groups or individuals to care for specific plots in the buffer zone. For-example, though the beneficiaries of the Global Environmental Fund projects are supposed to use cut and carry system to fatten cattle, the actual practice on the ground is still far from the intended cut and carry method. Farmers still use grazing in the buffer zone to fatten oxen and there is no functioning monitoring and enforcing mechanism on the ground. The innovative idea we came up from group and individual discussions with farmers that are using the income diversification activities and the community leaders is assigning the responsibility to protect specific plots of land in the buffer zone to specific individuals that have been affected by the project. The existing approach is giving access to the grass grown in the buffer zone to any farmer that is organized in the fattening group, which is not limited to project affected family farmers. However, unless priority is given to project affected individuals, this might be a source of conflict in the community. In order to overcome this, it was suggested to develop well-articulated land use plan that shows what should be grown where and assigning the responsibility to protect specific plots according to its land-use plan. Individuals or groups assigned to specific plots will be benefiting from the grass and trees grown on the plot she/he is protecting. We have tried to share this idea with relevant district and zonal officers and their feedback was positive. This might help a step towards sustainable management of the buffer zone and as it ensures mutual benefit of the project by protecting the reservoir from siltation and the project affected people residing around the buffer zone.

As per the discussions we made with the management of GG-I hydroelectricity dam project at Deneba, the buffer zone in all directions is being cultivated and grazed by several farmers. The project office works in coordination with the local administration including the district and zonal offices to exclude farmers from the buffer zone. Among the approaches is use of police force to scare farmers cultivating and grazing animals in the buffer zone as temporary measure. But this did not help whatever the imprisonment and penalty is applied to enforce the buffer zone protection measure. We also learnt that there were attempts to damage the matured maize crop in the buffer zone to discourage farmers. But this was not also a solution since some of these farmers do not have any other source of livelihood as their land has already been taken by the buffer zone and they did not get any replacement for their land. According to the discussions we made with the district and zonal offices responsible for land management, they were also trying to resolve the issue by forcing the farmers not to enter the buffer zone.

The leaders of the grass-root government administration (the *kebele*) are the one doing the real enforcement of the land tenure related issues. As per the discussions we made with some of the members of the *kebele* administration in one of the affected project areas, it is difficult to enforce the buffer zone unless the uncompensated victims who lost their lands in the buffer zone get sufficient compensation. So far, despite a huge pressure from the district, zonal and regional administrations, the local level administration did not prevent the victims of the project from farming or grazing in the buffer zone. This is mainly because it is a matter of survival for their families and they are the ones who understand the real story on the ground.

### 5.5.2. Risk Management Strategies of Project Affected Community

The major impact of GG-I hydroelectricity project on the livelihood of smallholder farmers in the project area was through evicting them from their farmlands. As indicated earlier, out of the total 2, 476 households that were affected by the project, only 706 households obtained compensation for their perennial crops and other immoveable properties (CRB, 2008; EELPA, 1998; Kebede, 2001; World Bank, 1997a, 1997a). About 144 households out of the 706 households were resettled on their own. They remained with their relatives mainly in communities that have remained nearby the buffer zone. These households are getting access to land through sharecropping and renting arrangements. Those households who partially or holly lost their grazing area and crop lands are still cultivating their lands that has been taken by the buffer zone. The local administration explains that, those farmers who lost their lands without any compensation do not have the certificate of land use right in the buffer zone since it is already taken by the project. However, the administration did not prevent these households from cultivating the buffer zone since they know that these farmers did not get anything and do not have other means of survival. This is an informal understanding within the community and its leadership since almost everybody is the victim of the problem. Since members of the *kebele* leadership and at least some of their relatives have lost their lands in the project area, it is difficult to enforce the buffer zone.

In order to overcome the challenges they are facing because of the head smut of *tef*, farmers have experimented on their own and come up with adaptation mechanisms of their own. This involves shifting the planting time and using the early maturing local variety of *tef* known as *saye*. Farmers call this technology as *Geniso*. They use short rains before the onset of the main rainy season and produce *tef* in two months' time. The mechanism is just to escape from high humidity at the crop maturity stage. The problem with *Geniso* is that farmers cannot produce it on large plats of land since harvesting will be a difficult task when the crop matures during the onset of the main rainy season.

The energy insecurity of the family farming households is being intensified with increasing population pressure. Currently, farmers are using crop residues, especially the maize stover as a coping mechanism for shortage of fuel wood. However, this might not cover the fuel needs of households throughout the year. Provision of electricity services at least to the community in the catchment of the dam might enable the community to cope with the energy insecurity problems, decrease pressure on the vegetation in the area and reduce soil erosion which contributes for siltation of the dam.

## 6. Conclusion and Recommendations

Ethiopia is at a booming age in its hydroelectricity development. Gilgel Gibe-I is one of the major hydroelectricity dam projects that have been successfully implemented to meet the country's ambition to generate electric power for its domestic consumption, to boost industrialization and export of power to the region. As it has been the case with other dam projects worldwide, Gilgel Gibe-I project has displaced several family farming households. Most of these people have been left uncompensated and they have become landless, food and energy insecure. Studies conducted by Devi et al. (2007) estimated that the reservoir of GG-I hydropower dam that was designed to serve 70 years is going to be completely filled with sediments within 24 years at the current rate of siltation. This means, both the GG-I hydropower project and the local community are confronting multiple layers of risks. These multiple and interdependent risks are affecting life and space in the study area. According to Müller-Mahen and Everts (2013), different actors perceive the same risk differently because of their different perspectives and this creates a condition in which we can have as many different riskscapes as the number of perspectives of actors. This leads to the situation in which the different actors will develop intervention measures for their important riskscapes without considering the perspective of others. What is observed in the study area is also a condition in which different actors understand risks from their perspectives and tend to develop intervention measures to tackle the immediate causes of their riskscapes. For example, according to experts associated with GG-I dam, the immediate causes for the riskscape of siltation are destruction of trees, intensive farming and overgrazing in the catchment of the reservoir, and unprotected buffer zone. Different interventions have been developed and are being implemented to overcome soil erosion problems in the watershed to reduce siltation in the GG-I reservoir. However, the immediate causes of risk of siltation are the survival strategies of local communities against the riskscapes of landlessness, food and energy insecurity. This means sustainable solution for the riskscapes of siltation need understanding and resolving the root causes of the riskscapes of landlessness, food and energy insecurity of the local community. The current efforts being made to overcome the risk of siltation are protracted efforts which failed to focus on the bigger perspective. However, interventions designed and implemented in such a protracted way without considering different perspectives of the relevant actors might not be able to achieve their intended objectives. In order to overcome such problems, the riskscapes theory suggests using holistic approaches in which common frameworks are used to analyze risks that simultaneously happen in a given space in order to better understand how they collectively shape life and space. Taking this into account, we recommended community consultation and resolving issues related to landlessness, food and energy insecurity of the community in order to sustainably resolve the risk of high rate of siltation in the reservoir. One of the ideas which emanate from discussion with the local community and different actors in the area is community management of the buffer zone after proper land use plan is developed on the available land area in the buffer zone. The land use plan is used to differentiate the buffer zone into strategic use zones that will enhance the purpose for which the buffer zone is delineated. It also helps specific individuals or groups of individuals that are given responsibility to manage specific plots to develop the necessary vegetation in a way that will maximize her/his personal benefits and the protection role of the buffer zone. Provision of electricity service to the community around the dam is a very important step that might respond for the energy insecurity of the community and enhance sense of ownership of the project among the local community. Reconsidering the possibility of compensating the project affected people living around the buffer zone and designing alternative employment generating mechanisms that will help to improve their livelihood is also an important step in terms of responding to the risks of landlessness and food insecurity of the community. Revisiting the implementation modalities of the on-going income diversification credit schemes that have been developed to benefit smallholder farmers in the Gilgel Gibe watershed to focus on project affected households could be one of the measures in this regard.

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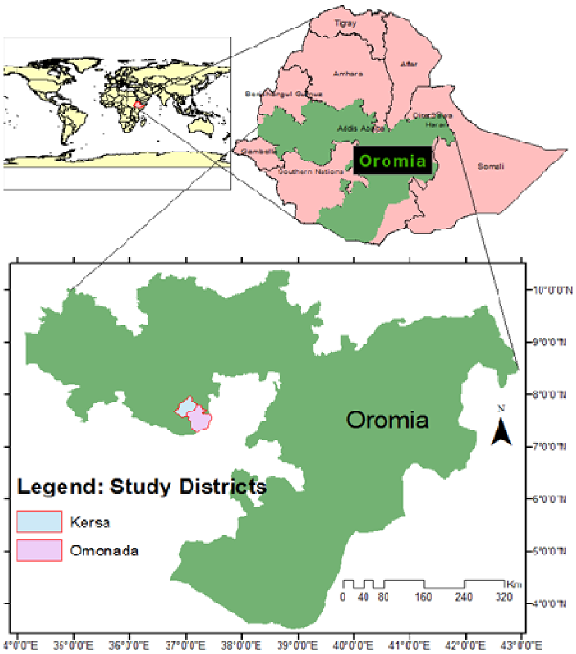
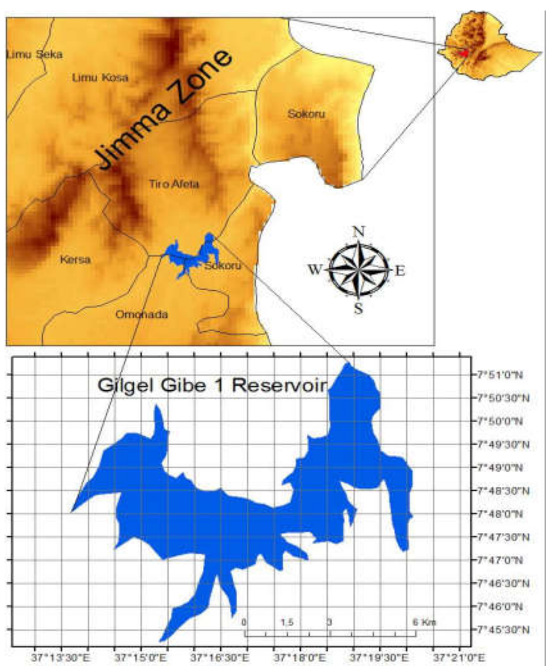
List of Figures




Source: Developed by Seboka

**Figure 1: Map of the study area**




Source: Developed by Seboka, 2016

**Figure 2: Map of the Gilgel Gibe-I site**

Source: Taken from proceedings of the workshop on IWM of Omo-Gibe basin (2010) (left) own (right)

**Figure 3: Cultivation of the buffer zone of GG-I buffer zone up to the bank of reservoir**

Source: Picture taken during the field work

**Figure 4: Gully rehabilitation work (left) and rehabilitated gully (right) around the buffer zone**