

Summary of Environmental and Social Consideration in Detailed Planning
Survey for the Project for Formulating Master Plan on Development of
Geothermal Energy in Ethiopia

1. Full title of the project

The project for formulating master plan on development of geothermal energy in Ethiopia

2. Type of the study: Mater plan

3. Categorization and its reason

3.1 Categorization: Category “B”

3.2 Reason

The project is not considered to be a large-scale geothermal power project, is not located in a sensitive area, and has none of the sensitive characteristics under the JICA guidelines for environmental and social considerations (April 2010), it is not likely to have a significant adverse impact on the environment. .

4. Agency or institution responsible for the implementation of the project

Geological Survey of Ethiopia (GSE)

5. Outline of the project

5.1 Objectives

Expected goals which will be attained after the Project Completion

(1) Goal of the Proposed Plan

The capacity of GSE will be developed and ready to commence geothermal development projects. The following outputs will be attained from the project.

- A database for geothermal sites
- A master plan for geothermal energy development, including evaluation of geothermal potentials and prioritization of geothermal development

(2) Goal which will be attained by utilizing the Proposed Plan

Geothermal power development in Ethiopia will be promoted

5.2 Justification

Ethiopia has relatively large scale geothermal sites among the rift valley countries in Africa. Thus far, 16 sites for geothermal power development have been identified and it is expected the total potential generating capacity would be nearly 5,000MW. GSE intends to rigorously promote geothermal development in order to achieve more stable energy mix and sustainable power supply.

Considering such government policy, JICA has already conducted “Data Collection Survey on Geothermal Development in Africa” in Ethiopia in 2010. However, the current situation is that the most of geothermal sites were not yet explored and even surveys already conducted were incoherent as they were conducted by various donor organizations in a different method and for different purposes. Therefore, these un-unified data sets are making difficult for GSE to evaluate geothermal resources and prioritize them in a scientifically coherent protocol. Consequently, GSE have been unable to formulate a geothermal development plan, and they managed to commence only one project in Aluto-Langano.

Therefore, GSE officially requested JICA to provide technical cooperation in formulating geothermal development master plan including geothermal reservoir evaluation and development prioritization as well as in developing GSE’s capacity in geothermal development.

Through the series of discussions between GSE and JICA, both sides agreed to conduct the project for formulating master plan on development of geothermal energy in Ethiopia to promote sustainable geothermal energy development in Ethiopia.

5.3 Location

The study includes the following 16 geothermal sites in Ethiopia.

Finkilo (Alito 2), Bobesa (Aluto 3), Allalo Beda (Tendaho 3), Abaya, Tulu Moye, Dofan, Gedemsa, Nazreth, Meteka, Teo, Danab, Damali, Boina, Dallol, Kone, Arabi

5.4 Proposed activities

The study includes the following contents.

- (1) Data Collection and Desk Review
- (2) Nation-wide survey of geothermal energy
- (3) Training in Japan
- (4) Database and master plan development

5.5 Scope of the Study

The geographical scope of the Study is the above mentioned 16 geothermal sites in Ethiopia. The study consists of the following works.

- (1) Data collection and desk reviews

This study includes data analysis of existing surface survey data, reviews on environmental issues and the existing power system and remote sensing to identify necessary additional surveys and prioritizing them.

- (2) Nationwide surveys

This survey includes geochemical survey, geological survey and environmental and social impact survey.

- (3) Training in Japan

This training focuses on reservoir evaluation.

- (4) Data base and master plan development

This survey includes the following works such as data analysis, pre-resource evaluation, identifying MT survey targets, conducting MT surveys, identifying drilling targets, database development and formulating the master plan. A workshop will be held to disseminate the outputs of the study.

6. Description of the project site

The geothermal sites mentioned in section 5.3 are located in the Great Rift Valley area in Ethiopia. It extends for more than 1000 km in a NE-SW to N-S direction from the Afar depression, at Red Sea-Gulf of Aden junction, southwards to the Turkana depression in Kenya. The numerous lakes of the Valley floor in central and southern area are extraordinarily rich in biodiversity, and support the livelihoods of various farmer and fisher communities. Most of the Valley lakes do not have an outlet. The Afar Depression is located in the northern part of the Valley. The southern area of the Afar region consists of the valley of the Awash River, which empties into a string of lakes along the Ethiopian-Djibouti border.

7. Legal framework of environmental and social considerations

(1) Constitution of the Federal Democratic Republic of Ethiopia, Proclamation No. 1/1995:

The Constitution dictates important provisions relevant to the country's environmental policy: Article 44 states that all persons have the right to live in a clean and healthy environment, Article 92 oblige the government to make all efforts to provide every Ethiopian with clean and healthy environment. Articles 91 and 92 also hold the government and the people of Ethiopia responsible for the preservation of natural resources and maintenance of ecological balance.

Article 40 states that ownership of both urban and rural land is a common property which is not subjected to sale or other means of exchange.

Peasants have the right to obtain land without payment and are protected against eviction from their land. Article 44.2 states that "All persons who have been affected or whose livelihoods have been adversely affected as a result of state programmes have the right to a commensurate monetary or alternative means of compensation, including relocation with adequate state assistance."

(2) Environmental Policy

The Environmental Policy of Ethiopia (EPE) was approved by the council of ministers in April 1997. EPE's main policy goals can be summarized in terms of improvement and enhancement of the health and quality of life of all Ethiopians and of promotions of sustainable social and economic development through the adoption of sound environmental management principles.

(3) Environmental Impact Assessment Proclamation, No. 299/2002

The primary aim of the proclamation on EIA, No.99/2002 is to make EIA mandatory for specified categories of activities undertaken by the public or private sectors and to define the extension of EIA for policies, plans and programmes in addition to projects.

This law does not include any requirement on specific to strategic environmental impact assessment. However this law is enacted whereas the implementation of the environmental rights and objectives enshrined in the Constitution would be fostered by the prediction and management of likely adverse environmental impacts, and the maximization of their socioeconomic benefits. Article 44 of the Constitution declares that all persons have the right to a clean and healthy environment and Article 92.2 of the Constitution declares that the design and implementation of the programs and projects of

development shall not damage or destroy the environment. Thus this law considers conducting strategic environmental impact assessment in designing any development program for protecting environmental right of the people of Ethiopia.

(4) Environmental Protection organs Establishment proclamation No. 295/2002

The Proclamation for the Establishment of Environmental protection organs, No. 295/2002 was issued to establish a system which separates and in the meanwhile coordinates the coordinated but differentiated responsibilities among environmental protection agencies at Federal and Regional levels. The Proclamation recognizes assigned responsibilities to different organizations for environmental development and management activities on one hand, and environmental protection, regulations and monitoring on the other.

(5) Environmental Pollution Control Proclamation No.300/2002

The primary objective of the proclamation is to provide the basis from which the relevant environmental standards applicable in Ethiopia can be developed, and to punish the violation of these standards.

8. Provisional scoping

The purpose of environmental and social consideration study in this study is to conduct strategic environmental impact assessment to avoid and/or to minimize significant environmental and social impact caused by geothermal energy development. Exact location, layout and specification of geothermal power plant and high voltage transmission line are not decided by this study.

The following table shows provisional general scoping of geothermal energy development and construction of high voltage transmission line between geothermal power plant and existing electricity network.

Table 1. Provisional scoping

Impact		Rating		Description
		Exploration/ construction	Operation	
Social Environment	Involuntary resettlement	C	C	Location of communities and households is unknown in the geothermal sites and associated transmission route.
	Local economy such as employment and livelihood, etc.	B+	B+ (P) D (T)	Opportunity of employment may increase and local procurement of goods and foods may be increased during exploration, construction and operation of geothermal power plant and the associated transmission route
	Land use and utilization of local resources	C	C	Land use and utilization of local resources are unknown in the geothermal sites and the associated transmission line.
	Social institutions such as social infrastructure and local decision making institutions	C	C	Social institutions and local decision making institutions are unknown in the geothermal sites and the associated transmission route.
	Existing social infrastructure and services	C	C	Existing social infrastructures and services are unknown in the geothermal sites and the associated transmission route.
	The poor, indigenous and ethnic people	C	C	The poor, indigenous and ethnic people are unknown in the geothermal sites and the associated transmission route.
	Misdistribution of benefit and damage	C	C	Local community, land use and local industry etc. are unknown in the geothermal sites and the associated transmission route.
	Cultural heritage	C	C	Cultural heritage is unknown in the geothermal sites and the associated transmission route.

Impact	Rating		Description
	Exploration/ construction	Operation	
Local conflict of interest	C	C	Land use and local industry etc. are unknown in the geothermal sites and the associated transmission route.
Water usage or water rights and communal rights	B-	B-(P) D (T)	Well drilling, power plant and transmission line construction and power plant operation need some amount of fresh water.
Sanitation	B-	D	During exploration drilling and construction of geothermal power plant, human waste of workers is treated by temporary simple treatment facility and may cause some negative sanitation impact near the facility. After commissioning, human waste of workers of power plant will be treated by permanent treatment facility, which does not cause any leakage of human waste. Health impact caused by electro-magnetic field of transmission line will not be happened, since building of residential houses, schools and clinics etc. under the transmission line is prohibited by the regulation of the Electricity law.
Hazards (risks), Infectious diseases such as HIV/AIDS	B-	D	There is no large scale earth work during exploration drilling, construction of power plant and transmission line. During drilling and construction stages, workers may be migrated from other places with infectious diseases. After commissioning, there is no migrant worker.

Impact		Rating		Description
		Exploration/ construction	Operation	
Natural Environment	Topography and geographical features	B-	D	Some impact may be occurred during construction. After commissioning, there is no significant earth work.
	Soil erosion	B-	B-	Land cover may be removed by exploration drilling and construction of power plant and transmission line. Without appropriate mitigation measures, soil erosion may continue even after commissioning.
	Groundwater	C	C (P) D (T)	Water supply plan for exploration drilling, construction and operation of power plant, construction of transmission line is not decided. Operation of transmission line does not need any water.
	Lakes and rivers	C	C(P) D(T)	ditto
	Flora, fauna and biodiversity	C	C(P) D(T)	Flora, fauna and biodiversity are unknown in the geothermal sites and the associated transmission route. Operation of transmission line does not cause any impact to them.
	National park	DP) C(T)	D(P) C(T)	Geothermal sites in the National park are excluded from the 16 geothermal sites. National park on the associated transmission route is unknown.
	Other protected areas	C	C	Other protected areas are unknown in the geothermal sites and the associated transmission route.
	Landscape	B-	B-	Some impact may be occurred by exploration drilling, construction of power plant and transmission line.
	Global warning	B-	A+	Exploration drilling and construction of power plant and transmission line emit CO ₂ by operation of machines and trucks.

	Impact	Rating		Description
		Exploration/ construction	Operation	
				Geothermal energy is renewable energy and can replace fossil fuel consumption after commissioning.
Pollution	Air pollution	B-	A-(P) D(T)	Exploration drilling, construction of power plant and transmission line emit exhaust gas from machines and trucks. Emission of H ₂ S from geothermal steam discharging testing and power plant operation may cause air pollution.
	Water pollution	B-	B-(P) D(T)	Some impact may be occurred by effluent of waste water from offices and worker's houses during exploration drilling, construction of power plant and operation of power plant.
	Soil contamination	B-	D	Some impact may be occurred during well drilling. After commissioning, geothermal hot water is re-injected to deep underground area.
	Waste	B-	B-(P) D(T)	Some impact may be occurred during well drilling, construction and operation of power plant.
	Noise and vibration	B-	B-(P) D(T)	Some impact may be occurred during exploration drilling, construction and operation of power plant.
	Ground subsidence	D	A-(P) D(T)	Discharging of geothermal fluid by exploration drilling, testing of geothermal potentials is temporary and amount of the discharge is limited. After commissioning, geothermal fluid is continuously discharged and may cause ground subsidence.
	Offensive odor	B-(P) D(T)	B-(P) D(T)	Emission of H ₂ S from geothermal steam discharging testing and power plant operation may cause offensive odor. Construction and operation of transmission line do

Impact	Rating		Description
	Exploration/ construction	Operation	
			not use any chemical to cause offensive odor.
Accidents	C	D	Exploration drilling, construction of power plant and transmission line may cause accidents. According to previous experiences, there is very little possibility to cause accidents.

Rating:

A: Serious impact is expected

B: Some impact is expected

C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses)

D: No impact is expected. IEE/EIA is not necessary.

+: Positive impact, -: Negative impact

P: Geothermal power plant

T: Transmission line

9. Alternatives to the project activities including “without project” option

Electricity supply in Ethiopia is heavily depended on hydro power plants. Therefore electricity supply is depended on rain falls and is not stable. Without the development alternative power plants to hydro power plants such as geothermal power plants and thermal power plants, power supply in Ethiopia continues to be not stable. Geothermal power development will contribute to secure stable power supply in Ethiopia. Thermal power plant is not feasible, since there is no local fossil fuel resource in Ethiopia and Ethiopia is a landlocked country Import of expensive fossil fuel may cause significant negative impact to Ethiopian economy, because of shortage of foreign currency.

The study identifies the priority of development among 16 geothermal sites taking into consideration of geothermal energy potential, economics of power supply and environmental and social impacts of geothermal energy development etc.

10. Result of the consultation with recipient government on environmental and social consideration including roles and responsibilities

GSE agreed to abide by “JICA Guidelines for Environmental and Social Considerations” in order to ensure that appropriate considerations will be made for the environmental and social impacts of the Project.

11. Terms of reference for environmental and social consideration study

(1) Conducting the following baseline surveys on environmental and social consideration

- Federal and regional laws and regulations on environmental and social consideration, such as environmental impact assessment, pollution control, resettlement, public participation, provision of information to public. Gap analysis between these legal frameworks and JICA Environmental and Social Consideration Guideline will be conducted.
- Federal and regional institutions which are in charge of environmental and social consideration.
- Designated national parks, other protected areas, habitats of wildlife and plants, cultural heritages by federal or regional government in and near the geothermal sites and the associated transmission line routes
- Social environment such as land use, rural communities, poor, ethnic minorities and indigenous peoples, economic and industrial activities in and near the geothermal sites and the associated transmission line routes

- (2) Analysis on alternatives including zero-option scenario, based on the concept of Strategic Environmental Assessment
- (3) Scoping on possible environmental and social impacts, focusing on Air Quality, Water Quality, Wastes, Noise and Vibration, Subsidence, Odor, Protected Areas, Ecosystem, Resettlement, Living and Livelihood, Heritage, Landscape, Ethnic Minorities and Indigenous Peoples, Working Conditions, Impacts during Construction and Accident Prevention Measures.
- (4) Initial environmental and social examinations in 16 geothermal sites
- (5) Evaluation of the impact of the project and the alternatives to the project
- (6) Identifying mitigation measures to minimize the negative impacts of the project
- (7) Making monitoring plans for the project
- (8) Making recommendations on environmental and social consideration for sustainable geothermal development
- (9) The draft scoping report and the draft environmental and social consideration report to be consulted with local stakeholders, when necessary. Comments submitted to the reports shall be taken into account in the final reports.