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FINAL REPORT

Ex-post evaluation of the Italian Development Cooperation initiative in Ethiopia, named "Gilgel Gibe II Hydro-electric Project"

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The opinions voiced in this report belong to the authors and do not necessarily reflect the official positions of the Ministry of Foreign Affairs/General Directorate for Development Cooperation. All mistakes and omissions are the exclusive responsibility of the authors.

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ABBREVIATIONS USED IN THE TEXT

AIDS	Acquired Immune Deficiency Syndrome
EC	European Commission
CSA	Central Statistical Agency
DAC	Development Assistance Committee (OCSE)
DGCS	General Directorate for Development Cooperation
EAPP	Eastern Africa Power Pool
EEA	Ethiopian Economics Association
EEPCo	Ethiopian Electric Power Corporation
EIB	European Investment Bank
EMU	Environmental Monitoring Unit (EEPCo)
ELC	Electroconsult spa
EPA	Environmental Protection Authority
EPC	Standard “Engineering, Procurement and Construction” Contract
ETB	Ethiopian Birr
EU	European Union
GGII	Gilgel Gibe II Hydro-electric Project
EthGov	Ethiopian Government
GTP	Growth and Transformation Plan 2010/11-2014/15
HDI	Human development index
HIPC	Heavily Indebted Poor Countries
IDA	International Development Association
ITA	Italian Government
MAE	Ministry of Foreign Affairs
MDG(s)	Millennium Development Goal(s)
MEANS	Quality Control for evaluation reports (EC)
MAE	Ministry for Foreign Affairs
MoFED	Ministry of Finance and Economic Development
OCSE	Organisation for Economic Co-operation and Development
ODA	Official Development Assistance
ONG	Non-governmental organisations
PASDEP	Plan for Accelerated and Sustained Development to End Poverty 2005/06-2009/10
RTA	Ethiopian Road Transport Authority
SDPRP	The Sustainable Development and Poverty Reduction Program 2002/3-2004-05
SLUF	Sustainable Land Use Forum
TBM	Tunnel Boring Machine
UNECA	United Nations Economic Commission for Africa
UNFPA	United Nations Population Fund
UNPD	United Nations Development Programme
TEE	Technical and Economical Evaluation (2004)
EIA	Environmental Impact Assessment
WB	World Bank

SUMMARY

The main objectives of the evaluation

The objectives of the ex-post evaluation of the Gilgel Gibe II project are:

- to provide the MAE with a consistent and objective evaluation of the results, the foreseen effects and the first impacts of the project;
- to verify whether the project's costs and benefits are influenced by the specific implementation methods used;
- to provide useful guidelines for future assessment of funding requests for major infrastructural projects.

Method

The methodological approach used for the evaluation has been based on the Logical Framework of the Gilgel Gibe II operation, already contained in the Economic and Technical Evaluation produced by MAE/DGCS in 2004 and duly updated by the Evaluator, at the beginning of 2012.

The evaluation process has been based on the 5 OCSE/DAC evaluation criteria (Relevance; Effectiveness; Efficiency; Social, Economic and Environmental Impact; Sustainability) and the 6 stages of the Project Cycle (Programming, Identification; Formulation; Funding; Implementation; Evaluation). A set of 44 evaluation questions were prepared and were then re-classified into 13 general questions.

From a methodological point of view the following documents were taken into consideration: the M&V (Monitoring and Evaluation) Guidelines and Operations Manual for Development Co-operation initiatives (MAE/DGCS), the Co-operation Principles of the European Union Treaty; the Millennium Development Objectives (UN); the aid effectiveness (Paris declaration), the general orientation of the international community (ODA).

The general economic context

Ethiopia is one of the most highly populated countries in Sub-Saharan Africa (76 million inhabitants in 2011), but also one of the poorest in the world and the country receiving the most Official Development Assistance and Official Aid support (2009), amounting to € 3,040 million. The ODA has amounted to € 36 per head.

The Ethiopian economy is among the fastest growing for African non-oil producing countries, posting high rates of expansion between 2004 and 2008 (approx. 11.4%). The per head GDP has grown from € 768 in 2008 to an estimated € 1,068 per head in 2012.

Ethiopian policy is focused on reaching energy self-sufficiency through a gradual and active exploitation and development of its considerable hydro-electrical potential.

In August of 2011 the EthGov disclosed the main contents of the *Growth and Transformation Plan* (GTP) for the 2011-2015 period. The GTP is designed to ensure that the country achieves food security and its Millennium objectives, particularly in the health and education sectors.

The economic and social context of the area of operations

The Gigel Gibe II hydro-electric plant is located in the South of Ethiopia, approximately 250 km from Addis Abeba. The site of the operation straddles the regions of Oromia (area managed by Jimma) and SNNRP (South Nation and Nationalities People Region; special district of Yem).

The population in the Sokoru and Fofa weredas (2012) amounts to 251,490 inhabitants, with a majority of men (50.2%). The surface area is of 1,652 sq. km. with a population density of 143.5 inhabitants/sq. km. The literacy level (Fofa) stands at 43%, with men posting a majority over women and an even more marked disparity between urban and rural areas. The child survival rate after birth is of 83%. The number of children born for each woman stands at 1.7 in urban areas and 2.8 in rural areas.

The Gilgel Gibe II Project

The project, featuring a hydraulic tunnel approx. 26 km. long, exploits a drop of 500 m, bypassing the one hundred kilometre long range of gorges along which the natural course of the river Gilgel Gibe flows into the river Omo. The plant has been conceived as a completion of the Gilgel Gibe I plant, up and running since 2004, seeing as it takes advantage of the same water accumulation basin without the need to create a new large size lake. The electrical power generation is achieved by means of 4 x 105 MW Pelton turbines which supply a total of 420 MW and a total annual production estimated at around 1,650 GWh/year.

For the construction of the these works the EEPCo has been granted assistance loans from the Italian Government amounting to 220 MEuro and 50MEuro from the European Investment Bank (EIB). The overall final cost of the entire project amounted to 493 MEuro, compared to a 2004 forecast of 422 MEuro. The additional funds for the completion of the works have guaranteed by national Ethiopian resources.

The main evaluation *findings*

Relevance and significance of the project for Ethiopian development

The Evaluator has verified the internal and external coherence of the operation relative to international co-operation policies and Ethiopia's development policies. The results of this analysis has enabled verification of the project's relevance relative to: Italian Co-operation policies; Ethiopian development policies *(Poverty Reduction Strategy Paper* and *Growth and Transformation Plan*); the co-operation policies reported in the official documents of the European Commission; international community policies, with particular reference to the Millennium Development Goals.

The project is very significant in terms of the exploitation of the national hydro-electric potential. The evaluation has been based on the meeting of internal energy requirements, the capacity to export the energy into bordering companies and thus on the degree of Ethiopia's energy self-sufficiency.

Energy production capacity

The analysis performed by the Evaluator has helped to established that the plant is operational and is achieving the performance levels foreseen by the project, with a

production capacity which in 2011 has reached expected values. The energy produced is distributed on a regular basis.

Efficient use of resources

The use of the available resources has been in line with foreseen operating objectives and expected results. The technical difficulties that arose during construction and after the works had been completed have affected the delivery times of the operating output.

All funding channels have been regular, ensuring a flow in line with project implementation schedules. The investment and operation cost management is in line with initial forecasts. The financial profitability of the investment shows an internal profit rate (5.72%) which is lower than estimated,. This is due to the application of tariffs much below those envisioned in the 2004 TEE (Technical and Economic Evaluation), with positive effects, however, on the population.

The assessment of the role played by the actors involved in terms of operational, management and decision making efficiency is positive. All involved have shown great thoroughness and a correct overall management of the project and an increasing level of co-ordination between them.

A significant impact at a local level

From the social and economic point of view the GGII project has had a significant impact on the areas of the two Weredas (Ethiopian districts) which border the plant, and in particular on the two villages of Fofa (Yem Special Wereda) and Soukoru (Soukoru Wereda).

The impact on employment has been significant, and continues to be evident, even under different guises, after the completion of the construction work. The local work force on average amounted to 2,410 workers (with a maximum of 3,552 workers in September of 2006). The *direct* impact on occupation during construction site operation concerned 0.7% of the total population of the area.

In terms of *directly connected activities*, the construction of the GGII has contributed to the development of professional expertise and craft know-how. These acquired skills have to many individual craft activities being set up. Where *indirectly linked activities* are concerned, the construction of the GGII has boosted the development of sectors such as tourism, trade and agriculture.

The factors that seem to ensure that the occupational impact *will be a lasting one* are: the level of skills acquired by certain professional segments and the competence acquired by local personnel are in line with national labour demands. A particularly significant aspect here is the knowledge transfer that has taken place in favour of younger segments of the population.

Environmental impact

The main construction work has involved a small reservoir and extensive tunnel work. All other major construction work has taken place in narrow uninhabited valleys. Consequently the general impact and even the visual one are limited and can be considered acceptable, given the benefits it should provide.

The boring of the 26 km hydraulic tunnel connecting the Gilgel Gibe to the Omo rivers was undoubtedly the most challenging operation of the entire project, due to its considerable length and the complex geological and hydrological structure of the volcanic ridge to be bypassed. However, the tunnel excavation does not seem to have interfered with the groundwater reserves and no complaints have been voiced both in relation to the availability or the quality of the water resources used by the local populations.

However, during the works, the management of all the procedures and many of the environmentally critical aspects could certainly have been undertaken with greater care, thoroughness and respect for the territory where the GGII plant now stands by introducing a few simple yet alternative operating and design solutions.

Finally what has to be pointed out is the total absence of any monitoring and control systems or activities over the structural, geo-technical and hydrological aspects affecting the works and the territory that houses the plant.

The sustainability of the effects over time

Most of the positive effects generated by the GGII operation will continue to produce beneficial effects for the local population even in the future. According to sustainability criteria, the social services and structures that have been set up, the technical know-how and the development of the local institutions represent a fly-wheel capable of promoting sustainable effects.

The satisfaction of the population was clear to see but it was backed by the awareness that the services and structures must continue to be managed in a sustainable fashion. The sustainability of the road network developments (outside the towns) may only be guaranteed so long as effective and regular maintenance is provided by the Ethiopian administration.

The EEPCo internal organisation seems capable of managing the plant and the personnel employed has the required competence to perform the jobs involved. The EEPCo seems less equipped to manage civil works. This shortfall could limit the readiness to forecast and/or manage exceptional events.

Conclusions and Recommendations

Consistent with the evaluation objectives, we have produced two clusters of results, one related to the project's objectives, results and effects (Cluster 1) and one related to project implementation methods (Cluster 2). Finally another cluster has been produced relative to "*the useful information gained for future assessments of funding requests for major infrastructural projects*", which essentially provides strategic and operating recommendations based on the evaluation's conclusions.

1 *The conclusions related to project objectives, results and effects* (Cluster 1)

C1.1 The overall objective, the specific objective and the project results have been fully achieved.

C1.2 The effects of the Project in relation to the first social and economic impacts are positive.

C1.3 Although the project was conceived with a low environmental impact, the management of some of the implementation processes during construction have raised a few questions regarding the future environmental impact of the project.

C 1.4 The impact for the future is seen as positive, despite concerns on the efficient maintenance of civil works over the medium-long term.

2. *The conclusions relating to the project's implementation methods (Cluster 2)*

C 2.1 The critical elements reported in the various stages of the project cycle have been adequately managed by the involved stakeholders.

C 2.2 Although the technical difficulties encountered certainly had a negative effect on the delivery time for full operating efficiency, they did not substantially affect the project benefits.

3. *Strategic and operating recommendations*

S 1 During the future management of similar co-operation projects it is strongly recommended that a comparison between a number of design solutions be made and the project should be validated by a third party and the ex-post evaluation should not place before the external project has been officially completed.

O1 It is recommended that a prompt official completion of the Project be solicited.

O2 It is recommended that the local authorities be aware of the need to make all the roads built as part of the project readily usable by the local populations.

O3 It is recommended that in depth studies be carried out to pin point the reasons behind the various tunnel collapse with a view to subjecting this structure to continuous monitoring.

O4 Despite the works having already been completed, the local authorities should be advised to arrange for an environmental management and monitoring plan.

INTRODUCTION

The Ministry of Foreign Affairs, the General Directorate for Development Cooperation has assigned Italsocotec Spa the task of carrying out the ex-post evaluation of the initiative promoted by the Development Co-operation in Ethiopia termed "Gilgel Gibe II Hydro-electric Project" according to the prescriptions of the MAE evaluation Guidelines and the principles of OCSE/DAC.

This evaluation is to be structured around four subsequent phases, which are:

- Inception phase
- Desk phase
- Field phase
- Synthesis phase

During the preliminary preparatory phase of the evaluation, the Evaluation Team collected the detailed documentation on the initiative from the MAE and had discussions with the DGCS personnel directly involved in the project in specific meetings and interviews. The Evaluator then presented the detailed evaluation approach to the *Reference Group,* the group of experts coming from different DGCS structures, on 27 January 2012 and obtained positive feedback. The first phase was thus completed with the presentation of the *Inception Report* on 7 February 2012 containing a brief outline of. the detailed evaluation questions, the indicators to be used to answer the questions, the basis to be used for making the judgements and the schedule for the subsequent evaluation phases. The *Inception Report* was approved on 28/02/2012.

During the second phase, a detailed desk analysis was performed of all the documentation provided by MAE and sourced by contacting the main operators involved in the Project. The 28 March 2012 saw the presentation of the *Desk Report* structured in such a way as to provide: the progress made in the analysis of the documentation, definitions for terms that were unclear, the first answers to the evaluation questions, the issues that required more in depth analysis and the conditions that needed to be verified during the field investigation, the project method, the evaluation tools to be used during the field investigation and the related schedule. The *Desk Report* was approved on 20/04/2012.

Between 10 and 19 May 2012, the Evaluation Team travelled to Ethiopia to perform the field investigation, which involved meetings with the main Project reference and contact persons (UTL contacts, EEPCo contacts, General Contractor supervisors, national and local authorities, contact persons for the main Government and Non-Governmental Organisations, Ethiopian academics), a *focus group* comprised of members of the local populations, technical inspections at the area of operations and of the plant structures and systems, inspections of the social civil works built by the General Contractor. During the mission the team met over 60 people involved in the project.

The field activity report was presented to the *Reference Group* on 25 May 2012.

This final ex-post Evaluation Report of the Development Cooperation initiative in Ethiopia, "*Gilgel Gibe II Hydro-electric Project"* therefore presents all the results obtained from all the activities performed. The Report is structured as follows:

- **PART I**: which details the objectives of this evaluation and the methodological approach used.
- **PART II:** provides a description of the social, political, economic and environmental context both at a national level and for the area of operations, as well as the plant itself and its importance in the context of the Italian Cooperation programs;
- **PART III:** provides the answers to the evaluation questions;
- **PART IV:** outlines the evaluation conclusions and the recommendations that they give rise to.

PART I:

THE OBJECTIVES AND THE METHODOLOGICAL APPROACH USED FOR THE EX POST EVALUATION

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1. THE OBJECTIVES OF THE GILGEL GIBE II PROJECT

The Gigel Gibe II hydro-electric plant (GGII) is located in the South of Ethiopia, approximately 250 km from Addis Abeba. The site of the operation straddles the regions of Oromia (area managed by Jimma) and SNNRP (South Nation and Nationalities People Region; special district of Yem).

The Gigel Gibe II hydro-electric plant is part of a broader series of infrastructural operations designed to exploit the water resources of the Omo basin for energy production purposes and has been conceived as a downstream completion of the Gilgel Gibe I plant seeing as it uses the same water accumulation basin and thus does not require the creation of another large size lake. It exploits the useful 500 m drop returning the waters of the Gilgel Gibe river to the Omo river bypassing the approximately 100 km of gorges that constitute the natural course of the confluence of the two rivers thanks to the building of a hydraulic tunnel approx. 26 km in length.

This project had been included with a top priority level in the Ethiopian Government's national electrical power development plan designed to satisfy the fast growing demand for electrical energy and the expected energy production deficiency of the national electrical system in coming years.

In order to embark on this project, the EEPCo, the Ethiopian State Electrical Energy Company had been granted assistance loans by the Italian Ministry of Foreign Affairs amounting to 220 MEUR. Further assistance loans amounting to 50 MEUR were received from EIB to cover electro-mechanical provisioning. The Ethiopian contribution amounts to approx. 45.2% of the entire investment (compared to an expected 28%) which in May of 2012 had been written up in the accounts as an approximate figure of 493 MEUR.

The **general objectives** of the GGII project, updated during the ex-post evaluation compared to those identified by the technical and economic evaluation of 13 September 2004 by the DGCS in order to disburse the loans, can be summed up as follows:

- **The promotion of the exploitation and development of the national hydro-electric potential within a sustainable environmental framework.**
- **The expansion of the national energy sector's export capability.**
- **Increasing Ethiopia's energy independence.**

2. THE OBJECTIVES OF THE EX-POST EVALUATION

In line with the indications provided by the Guideline document for the MAE evaluation and the OCSE/DAC principles (*know to decide, know to innovate, know to judge*), the objectives of the ex-post evaluation of the Gilgel Gibe II project are:

- provide the MAE with a consistent and objective evaluation of the results, the foreseen effects and the first impacts of the project;
- verify whether the project's costs and benefits are influenced by the specific implementation methods used;
- to provide useful guidelines for future assessment of funding requests for major infrastructural projects.

Our task was mainly focused on verifying the successful achievement of the objectives set by the technical and economic evaluation drafted by MAE in 2004 and duly reviewed based on the current situation and then presented to the *Reference Group* during the course of the Approach presentation on 27/01/2012. The evaluation has therefore attempted to verify the successful achievement of the expected results by analysing the effects of the initiative in terms of cost and direct and indirect benefits that the project is having and will provide in the near future as far as the development of Ethiopian society is concerned.

The overall evaluation process is based around the following considerations:

- By cross-referencing the quantitative and qualitative data and information, the methodological and operational approach used will enable a consistent and objective assessment of the results posted by the operation. It should in any case be underlined that the assessments on the initial impacts, and to an even greater extent of the future prospects are influenced by having had to rely almost exclusively on information and indicators of a qualitative nature, collected shortly after the completion of the operation and mainly referring to a short field mission.
- The technical and economic evaluations concerning the design methods and the operation's implementation, as well as those relative to the contractual framework used, are dealt with here for the sole purpose of identifying the lessons that can be learned from the experience, without attempting an in depth evaluation of the design details as this is beyond the scope of this evaluation. The Evaluator has therefore taken steps to ensure that it was not distracted by any highly technical project details which might have diverted attention from the main objective of the evaluation which are the results achieved, the future outlook and the initial impact of the project.
- One of the risks that can affect the field evaluation process is the actual readiness of the stakeholders and the local population to engage with the evaluator. During the course of the mission in Ethiopia however, the exchange was based on mutual trust and respect thus enabling the evaluator to collect valid and significant qualitative indications on the results and the effects of the operation from a social, economic and environmental standpoint. The evaluator selected the persons to be interviewed very carefully both at operations headquarters and at the site of the investigation, informing everyone in advance as to when the meetings would be held.

3. THE METHODOLOGICAL APPROACH

3.1. The reconstruction of the Project's Logical Framework

The Evaluation team produced an update and a review of the Logical framework compared to the one presented in the 2004 Technical and Economic Evaluation of the initiative.

A logical process must be followed in order for the initiative to be suitably evaluated. The Logical Framework is a method which enables the relationships between the essential elements (levels) of an operation to be processed in an integrated fashion: *General objectives, Specific objectives, Expected Results, Activities,* with the corresponding *Indicators*, the *Sources* and the *External conditions* (the corresponding *Costs* and *Resources* are assigned according to the same rationale as the *Activities*)[1].

The information collected and organised by the Logical Framework is shown in the following matrix of the GGII operation.

DESCRIPTION	INDICATOR	SOURCES	COND.
General objective – Promote the exploitation and development of the national hydroelectric potential in a sustainable environmental context. – Expand the export capacity of the national energy sector – Increase Ethiopian energy independence	– Exploitation of the national electrical potential on an estimated total of 4,057 Mw of hydroelectric power (TEE base line: 15%; 2010 Target: >40%) – Exported electrical energy (2009 baseline, GWh....; (2014 Target) GWh....; – Contribution to Ethiopian GDP.... % (2014 Target) – Reduction of fossil fuel imports (2009 baseline, GWh....; (2014 Target) GWh.....;	– GGII project evaluation report Sector Statistics EthGov – EEPCo Evaluation of the 'Energy Access project' funded by the World Bank – EEA Ethiopia Electric Agency – (Ethiopia Electricity Regulator). – Technical validation with selected stakeholders.	
Specific objective – Improce access to electrical energy and satisfy the demand of the population and the development requirements, in an economically sustainable way and with the least environmental impact	– Energy Access (TEE baseline 15% - 2013 Target: 20%) – Estimated 700,00 new grid connections (2014 Target) – Δ of electrical energy sales tariffs to local population and collectivity – Diesel produced installed electrical power – (TEE base line 11.7% - 2010 Target: 12%)	– GGII Project Evaluation Report; – Environmental impact study – EEPCo statistics; EEPCo quarterly reports with note by monitoring expert – Sector expert reports – Interviews with selected stakeholders	Hypothesis subject to verification
Expected Results – The Gigel Gibe II hydro-electric plant in full operation can provide additional supplementary power – Operating system capable of ensuring transmission from Gigel Gibe II to Addis Abeba.	– Electrical energy produced annually by GGII (2008 Target: 1,505 GWh/year) – i) GGII power installed (2008 Target: 4 x 105MW – ii) Transmission capacity from GGII to Addis Abeba (2008 Target: 230 + 45 km of 400KV power line)	– GGII Project Evaluation Report; – Final ELC/EEPCo test report – EIB evaluation report – Interviews with selected stakeholders	Hypothesis subject to verification
Activities/components **A) EPC contract** **B) Road Contract** **C) Consultancy Service** **D) Project Implementation Unit**	Component cost *A) € 445.806.920,00* *B) € 19.117.519.99* *C) € 10.235.670,60* *D) € 18.582.221,60* **TOTAL €. 493.742.332**	Resources EthGov 223.7 M€ ITA 220 M€ EIB 50 M€	

Figura I - 1: Matrix of the Logical Framework of the GGII operation
(based on: 2004 Technical and Economic Evaluation)

[1] MAE-DGCS, *Operating Manual for Monitoring and evaluation of Development Cooperation initiatives* (April 2002, pag. 20).

3.2. The Logical Framework and the evaluation criteria

On the basis of the Logical Framework, the evaluation activities have been focused on the five key OCSE-DAC evaluation criteria, consistently with the specific nature of the GGII operation, as specified below:

- **RELEVANCE** Compliance the GGII operation objectives with the policies of: Italian Cooperation, Ethiopian development, European Community and International Community cooperation. Compliance with the development expectations of the Ethiopian population and particularly its poorer sections.
- **EFFECTIVENESS** The extent to which the established objectives have been achieved. Any factors that have hindered the achievement of the foreseen objectives during the various phases of the Project Cycle.
- **EFFICIENCY** The appropriate use of the available resources in relation to the level of achievement of the foreseen objectives and the expected results, even taking into considerations possible operating procedures for comparative purposes. Any possible efficiency draining factors reported during the various phases of the Project Cycle.
- **IMPACT** The positive and negative effects in the short, medium and long term from a social, economic, cultural, environmental and institutional policy standpoint. The factors that have influenced these effects during the various phases of the Project Cycle. How these effects are perceived by the beneficiaries.
- **SUSTAINABILITY** The degree of sustainability of the GGII initiative. The factors that have played a favourable or unfavourable role in determining its sustainability, as detected during the various phases of the Project Cycle.

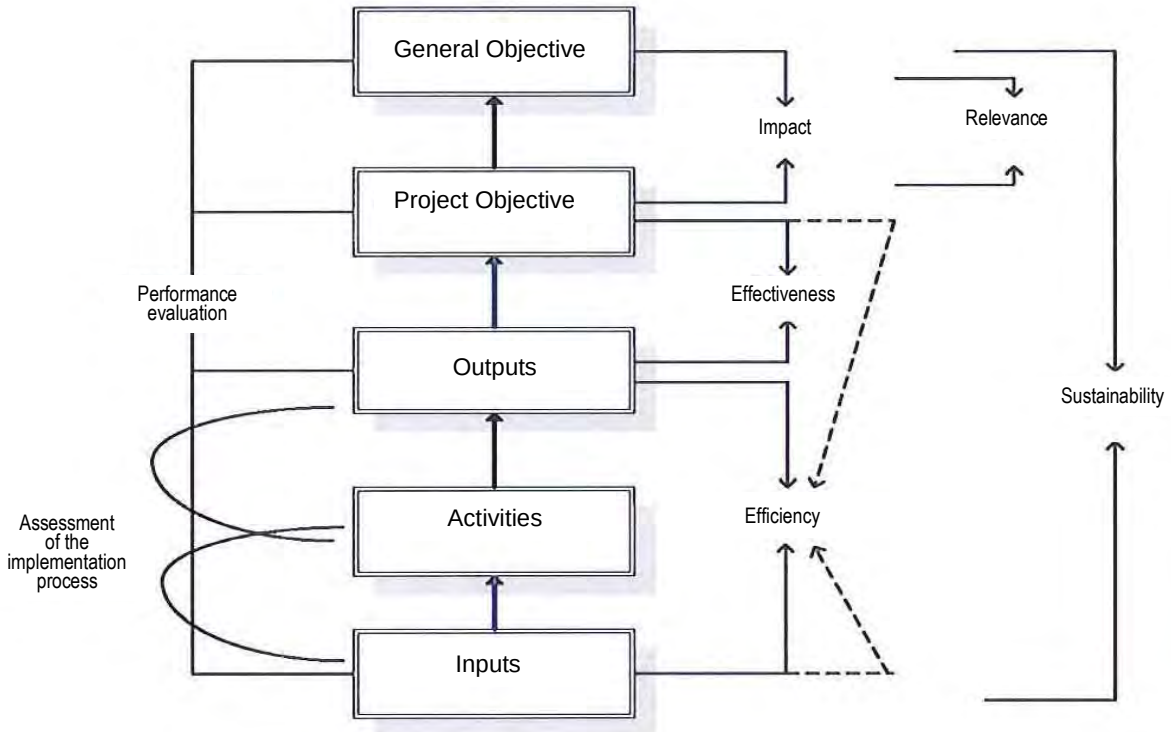


Figura I - 2: Logical Framework Diagram
Source: Verification Team reassessment

3.2.1. Evaluation questions and indicators

The preparation of the evaluation questions has been organised according to five evaluation criteria (*relevance, effectiveness, efficiency, impact* and *sustainability*) agreed by OCSE/DAC and adopted by the DGCS. The evaluation questions that the Evaluator was required to answer were:

- detailed in the Terms of Reference, relative to the evaluation criteria, and transformed into specific questions
- came up during the verification phase with the Client, on the basis of modification requests forwarded by RUP/DGCS, already during the Inception Report approval phase.
- reported by key stakeholders, in the desk and field documentary and interview phases
- noted directly by the evaluator during the field investigation phase

The *relevance* criterion will be used to assess compliance with principles, policies and commitments and consequently we have undertaken a critical analysis of the overall consistency applied to the various aspects of the operation.

- The principles established in the Maastricht Treaty concerning the co-ordination, the complementarity and the coherence of cooperation policies in EU countries including any changes introduced by the Lisbon Treaty.
- The commitments undertaken at UN level concerning the pursuit of the Millennium Development Goals.
- Principles established in the Paris declaration concerning the effectiveness of aid.
- General policy trends of the international community on issues such as assertion of democracy, respect for human rights, banning of inequalities, equity in general, protection of minors, safety and cleanliness of the work place and environmental protection.
- Indications provided by the DGCS Evaluation Guidelines.

In the evaluation tool-kit preparation procedure, the *Costs and technical specifications* document, detailed at point 5.2, contains eight items that should be included in the evaluation questions. From a functional point of view, five of these aspects are included in the evaluation questions seeing as they are pertinent to the following criteria:

- *Efficiency*, for all that is related to elements (4) *Main factors that have affected the successful / unsuccessful achievement of the objectives and results* and (6) *Role of the stakeholders involved: DGCS (Central and local offices), Local Authorities, General Contractor*
- *Impact*, for all that is related to elements (2) *Medium to long term results and effects on the affected population and on the environment* and (7) *Improvement of the impact and sustainability for the future*
- *Sustainability,* for all that is related to element (5) *Know-how and ability of local bodies to achieve the objectives related to the management of the hydro-electric plant and to handle structural issues in the future.*

The other three aspects that are taken into consideration in terms of *system actions* (design methods and technical implementation, contractual framework adopted) These elements do not directly concern the "core" of the evaluation, but enable the highlighting of possible lessons learned by the DGCS and the Ethiopian Government.

We here refer in particular to: (1) *Initiative design and implementation method: technical, economic and financial aspects;* (3) *External effects and technical initiative implementation methods;* (8) *Contractual framework adopted for initiative management and risk sharing between subcontracting organisation and general contractor with reference to international standards and initiative requirements.*

On the basis of the OCSE-DAC criteria and the specifications assigned by MAE to points 5.1 and 5.2 of the *Costs and Technical Specifications*, the Evaluator has prepared an investigation tool-kit comprised of **44** evaluation questions, subdivided as follows:

- relevance (8 questions)
- effectiveness (5 questions)
- efficiency (8 questions)
- social and economic impact (9) and environmental (8)
- sustainability (6)

The specific evaluation questions detailed above have been brought together into the following 13 general evaluation questions (header questions):

1. Does the internal and external coherence of the operation comply with international co-operation policies and Ethiopian development policies?
2. Is the co-operation investment designed to exploit Ethiopia's electrical potential?
3. Does the energy produced by GGII reach the expected capacity and has it contributed to satisfying the needs of the population?
4. Can the profitability of the investment over time be considered to be well-balanced?
5. What were the factors of success / failure and how they were managed by the actors involved?
6. What kind of assessment can be made of the cost/effectiveness of hydro-electric energy development in the Sub-Saharan scenario?
7. What effects have been generated in terms of occupation, downstream activities and know-how?
8. What effects have been generated at social, cultural and political-institutional level?
9. What kind of impact can be associated to GGII's interference with the water ecosystem and the hydro-geological equilibrium?
10. What kind of impact has GGII had on the local geomorphology and the landscape?
11. What impact is expected in terms of energy sustainability?
12. What is the perception at a local level of the project's medium and long term benefits?
13. Will the EEPCo and the local stakeholders be capable of running the plant?

Beside each evaluation question, the *Inception Report* also identified the reference indicators. The indicators have been established in terms of their unit measurement, TEE 2004 baseline, TEE 2004 target, current value established by the evaluation and consequently a performance rating. The relative values calculated have then been reported in annex 1, according to the structure shown in Table I- 1

XX *Evaluation question*		
	INDICATOR	**UNIT OF MEASUREMENT**
	Indicator definition	*Unit of measurement used by the indicator*
	BASE LINE	**TARGET**
	Value deduced from the Project's Technical and Economic Evaluation performed in 2004	*Target value indicated in the Project Technical and Economic Evaluation performed in 2004*
CURRENT FIGURE	*Current verified value*	
RATING	*Performance index obtained by comparison of the current figure with the conjectured target value*	

Table I- 1: Definition of project indicators

The rating scale set for all indicators is as follows:

- **A** Rating High
- **MA** Rating Average-High
- **MB** Rating Average-Low
- **B** Rating Low

Where by high rating we refer to a result that is positive even compared to expectations while vice versa a low rating refers to a negative result.

In Figure I - 3 a logical diagram of the specific and more general questions is shown consistent with the OCSE/DAC criteria, while Table I- 2 details all the evaluation questions prepared for this evaluation.

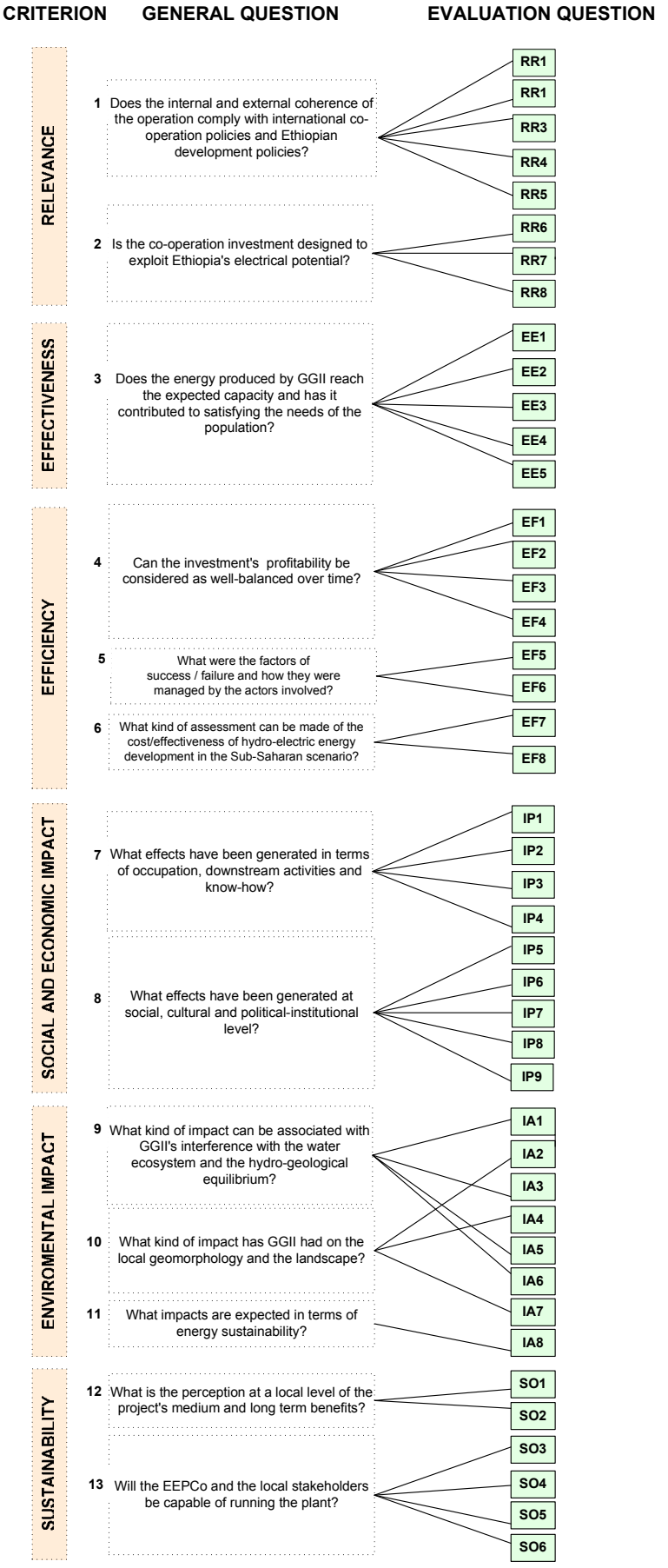


Figure I - 3: Evaluation Question Graph
Source: processed by Evaluation Team

Criterion	General Question		Evaluation Question
Relevance	1) Does the internal and external coherence of the operation comply with international co-operation policies and Ethiopian development policies?	RR1	Are the objectives pursued by the evaluated initiative in line with Italian Cooperation policies?
		RR2	Are the objectives pursued with this initiative and currently being evaluated in line with Ethiopian development policies and Ethiopia's *Poverty Reduction Strategy Paper* in particular?
		RR3	Are the objectives being pursued in line with the development expectations of the Ethiopian population, particularly the poorer sectors, as expressed by the more representative sections of the local society (*democratic ownership*)?
		RR4	Are the objectives pursued with this initiative and currently being evaluated in line with the cooperation policies detailed in the official documents of the European Commission?
		RR5	Are the development objectives pursued and undergoing this evaluation in line with the objectives agreed by the International Community and the Millennium Development Goals in particular?
	2) Is the co-operation investment designed to exploit Ethiopia's electrical potential?	RR6	To what extend is the exploitation and development of the national hydro-electric potential promoted within a sustainable environmental framework.
		RR7	To what extent does the objective pursued favour the expansion of the export capability of the national energy sector?
		RR8	To what extend does the objective pursued contribute to Ethiopia's energy independence.
Effectiveness	3) Does the energy produced by GGII reach the expected capacity and has it contributed to satisfying the needs of the population?	EE1	Is the GGII plant currently operational and does it reach the expected performance levels?
		EE2	Is the energy produced by GGII regularly distributed throughout the national electrical grid?
		EE3	Has the Ethiopian electricity user base been expanded (population/companies)?
		EE4	Has access to electrical energy been extended within the local Ethiopian population?
		EE5	Does the currently adopted fee policy enable access to be extended to a broad section of the population?

Criterion	General Question		Evaluation Question
Efficiency	4) Can the investment's profitability be considered as well-balanced over time?	EF1	Has the use of the available resources been in line with foreseen operating objectives and expected results?
		EF2	Is the management of investment costs, running costs, operating revenue, etc... still capable of guaranteeing the financial profitability of the investment?
		EF3	What effects have the delays accumulated had on investment profitability?
		EF4	Is it expected that the problems and geological contingencies encountered during the excavation may limit the efficiency of the works due to more frequent and costly tunnel maintenance operations?
	5) What were the factors of success / failure and how they were managed by the actors involved?	EF5	What are the main factors to have affected the successful / failed achievement of the objectives and results during the various phases of the project cycle?
		EF6	In terms of operating, management and decision making efficiency, what has been the role of the figures involved such as DGCS (Central and local offices), Local Authorities and General Contractor?
	6) What kind of assessment can be made of the cost/effectiveness of hydro-electric energy development in the Sub-Saharan scenario?	EF7.1	In cost/effectiveness terms, what is the ratio between total cost of the operation/additional population served?
		EF7.2	In cost / effectiveness terms, which similar operations, performed in developing countries, could be of reference for GGII, particularly in Sub-Saharan Africa?,
		EF8	In terms of benchmarking, which similar operations, performed in developing countries, could be a reference for GGII?
Social and Economic Impact	7) What effects have been generated in terms of occupation, downstream activities and know-how?	IP1	Did the works construction phase have an occupational impact on the local population and to what extent?
		IP2	Has there been an increase in downstream activities that can be directly linked to the works construction?
		IP3	Can a "lasting" occupational impact for the local population be established that will continue even during plant operation?
		IP4	What know-how has been transferred to the local population thanks to the construction of GGII?
	8) What effects have been generated at social, cultural and political-institutional level?	IP5	Have other economic sectors (agriculture, live stock farming, crafts, etc....) been affected in a positive/negative way by the construction and the subsequent operation of the GGII plant?
		IP6	Is it possible to detect specific positive or negative effects on the collectivity, safety and local social cohesion that stem directly from the GGII undertaking?
		IP7	What short, medium or long term positive or negative social, cultural or political - institutional effects can be identified?
		IP8	Has there been any increase in pandemics (HIV, malaria, etc.) among the local population that may be linked to the construction works?
		IP9	What is the beneficiary's perception of the project's results and effects in the medium to long term and of how future impacts may further improve these results?

Criterion	General Question		Evaluation Question
Environmental Impact	9) What kind of impact can be associated with GGII's interference with the water ecosystem and the hydro-geological equilibrium?	IA1	Has the deviation of a considerable water flow from its natural water course had any detectable effects? IA1.1 What changes in water flow rates have been recorded in the Gilgel Gibe river between the upstream and downstream plants? IA1.2 Have any problems been reported or observed regarding ground water height increases in specific areas due to the water deviation or the tunnel boring (i.e. partial flooding, inundations, new emergencies, slope instability due to rising ground water levels?
		IA3	Has the tunnel construction interfered with the hydrological equilibrium? IA3.1 Have there been any reports of springs disappearing or wells/small water reservoirs drying up that were previously used by or the local population? IA3.2 Have any assessments of the potential hydrological impact been carried out over a sufficiently extensive area, both upstream and downstream of the construction works? IA3.3 During the tunnel excavation phase was any high temperature ground water intercepted or water showing the kind of chemism typical of this highly volcanic region?
		IA5	Effects on the natural vegetation and fauna as a result of works construction (water uptake system, access roads, etc...) - Have check-lists for vegetation and fauna species been carried out during the works phase and system operation that can provide useful indications for the assessment of changes in ecosystem equilibriums?
		IA6	Have regular measurements been carried out upstream and downstream of the newly built plants on the physical and chemical properties of the superficial and underground waters? Has a monitoring procedure been foreseen during plant operation?
	10) What kind of impact has GGII had on the local geomorphology and the landscape?	IA2	What has been the effect on slope stability? IA2.1 Which surfaces affected by geological instability before and after the completion of the works and within the project boundaries (including excavation areas) have been subjected to refurbishing operations and safety precautions (sq. km.)? IA2.2 Percentage of roads built according to methods and criteria that will make them efficient in the long term and consequently of use 2 to the local population?
		IA4	Where and according to what procedure have the large masses of debris produced by tunnel excavation been disposed of? Have the foreseen excavation debris safe disposal measures been implemented?
		IA7	What landscape re qualification activities have been foreseen for the area of operations and excavation? To what extent have they already been undertaken?
	11) What impacts are expected in terms of energy sustainability?	IA8	Will the electrical energy production provided by the Gilgel Gibe II hydro-electric plant lead to a reduction in CO2

[2] By roads that may "used" in the long term by the local population we refer to roads with the following specifications:

- roads built or widened, whose kerbs and embankments have been stabilised and secured, so that they are practicable by both animal drawn vehicles and auto vehicles, even during the rainy season;
- roads whose management and maintenance is expected to be handed over to local institutions;

			emissions compared to conventional energy sources (fossil fuels)?
Sustainability	12) What is the perception at a local level of the project's medium and long term benefits?	**SO1**	In time, will the local population be able to continue benefiting from the effects generated by the construction of the plant (social services and infrastructures built during the construction site phase; occupational opportunities; energy distribution; technical know-how; institutional development)?
		SO2	How does the benefiting population perceive the medium to long term effects and the sustainability of the project?
	13) Will the EEPCo and the local stakeholders be capable of running the plant?	**SO3**	Does the EEPCo have a suitable organisation and know-how to manage the plant during the course of its useful working life in normal operating conditions?
		SO4	Will EEPCo be capable of facing up to exceptional events (such as tunnel collapses, damage caused by calamitous event, etc...) so that even in the future it can handle structural problems?
		SO5	Have the local institutions and stakeholders acquired the know-how and the abilities required for the servicing and maintenance of the hydro-electric plant?
		SO6	Is there a long term hydrological, geo-technical and structural monitoring plan in place covering all aspects of the works?

Table I- 2: Evaluation Questions

Part II

PROJECT FRAMEWORK

INDEX

INTRODUCTION

The second part of the ex-post evaluation Report of the Ethiopian Cooperation Development initiative in the Gilgel Gibe II hydroelectric project provides an overall project framework.

The literature analysed highlights a considerable growth rate for Ethiopia in recent years. The country is still poor, but the development trend is positive and the commitment of the EthGov seems consistent and focused on the Millennium Goals. To trace a brief outline of the context in which the GGII project took place we have here taken into consideration the *Joint Ethiopia Country Report* published by the Ministry of Foreign Affairs and the Ministry for Economic Development; the *International Financial Statistics of the* International Monetary Fund (IMF) and the *Africa Development Indicators* of the World Bank.

The analysis of the social and economic context for the area of operations is based on the statistics published by the Central Statistical Agency (CSA). The official references are the Statistical Abstract 2011/2012 and the Statistical Tables of the general 2007 census.

The environmental context of the area of operations is identified with the physical landscape of Ethiopia and its plateau, the Ethiopian Highlands, which are bordered by the broad Sudanese plains, the Danakil depression, known as the Afar Triangle to the East towards the Red Sea and the Somalian plateau that gradually slopes down towards the Indian Ocean. The complex of works that constitute the Gilgel Gibe II plant are set in the basin of the Omo River, South Western Ethiopian Plateau, which runs for over 700 km in a region of breathtaking beauty, still for the most part uncontaminated and rich in biodiversity.

The main players involved in the operation are the Ethiopian Government that has established a political framework focused on Ethiopia's energy development and the Italian Foreign Ministry DGCS (General Directorate for Development Cooperation) as main financial partner in the Gilgel Gibe II project. The leading players involved in the construction are the Ethiopian Electric Power Corporation, the Salini Costruttori company that has performed the *General Contractor* role and ELC Elettroconsult that has provided consultancy services.

From the first project concept of 2003, to the decision of the Steering Committee for the Development Cooperation (October 2004) the Gilgel Gibe II hydroelectric Project has been included in the Cooperation programs with a very fast preliminary assessment and start up.

A report with greater technical detail which offers various viewpoints of the GG II hydroelectric plant, which is included in a broader context of plant operations for the exploitation of the hydroelectric resources of the Omo basin for energy production purposes. The plant has been conceived as a follow-on completion of the Gilgel Gibe II plant, using the same water accumulation basin without the need to built a new major sized lake. In basic terms the water of the Gilgel Gibe, is released by the GG I plant and routed down a hydraulic tunnel 26 km long, exploiting a fall of approx. 500 m. The power station positioned at the base then releases the rerouted waters into the river Omo.

1. ASPECTS OF ETHIOPIAN STRUCTURE AND DEVELOPMENT

The literature analysed highlights a fair growth rate for Ethiopia in recent years. The country is still poor, but the development trend is positive and the commitment of the EthGov seems consistent and focused on the Millennium Goals.

To trace a brief outline of the context in which the GGII project took place we have here taken into consideration the *Joint Ethiopia Country Report* published by the Ministry of Foreign Affairs and the Ministry for Economic Development; the *International Financial Statistics of the* International Monetary Fund and the *Africa Development Indicators* of the World Bank.

The ***Joint MAE-MSE Country Report***[1] published during the second half of 2011 presents a very detailed analysis of current Ethiopian circumstances. The table below sums up some of the general figures and the main macro-economic indicators.

GENERAL DATA	
Form of State:	Federal Republic
Surface area:	1,221,900 sq. km
Language:	official language: Amharic, English very widespread
Religion:	Christian Orthodox, Muslim, Protestant, Catholic
Currency:	birr
SACE Country Risk	Seventh risk category

MIN ETHIOPIAN MACRO-ECONOMIC INDICATORS				
INDICATOR	**2010**	**2011**	**2012**	**2013**
Nominal GDP (USD bn)	26.60	31.10	36.90	37.20
Real GDP growth (%)	10.10	7.50	8.00	7.50
Population (millions)	75.10	76.20	77.30	78.40
GDP per head (USD)	1,145.00	1,232.00	1,342.00	1,451.00
Unemployment (%)	n.a	n.a	n.a	n.a
Public debt (% of GDP)	n.a	n.a	n.a	n.a
Local currency/USD exchange rate	14.41	16.90	17.80	20.10
Goods Exports	2,400.00	2,957.00	3,169.00	3,558.00
Goods Imports	7,365.00	9,670.00	10,823.00	10,992.00
Services Balance	-302.00	-39.00	14.00	74.00
Income Balance	-64.00	-33.00	-34.00	-5.00
Current Transfers Balance	4,905.00	5,115.00	5,326.00	5,369.00
TOT	n.a	n.a	n.a	n.a
International Reserves	2,766.00	2,665.00	2,994.00	3,246.00

Table II - 1: Main macro-economic indicators for Ethiopia

Source: EIU Country Report /Data and charts/Annual data and forecast; UNCTAD; Local Statistics Offices

A few elements of the joint report are reported or summed up below.

[1] See http://www.rapportipaesecongiunti.it/rapporto-congiunto.php?idpaese=96

- With approx. 76 million inhabitants in 2011[2], Ethiopia is one of the most populated countries of Sub-Saharan Africa.
- Ethiopia is still one of the world's poorest countries, but with a per head GDP climbing quickly (965$ in 2008; 1,044$ in 2009; 1,145$ in 2010; 1,232$ in 2011 (estimate); 1,342$ (estimate) in 2012).
- In recent years, Ethiopia has turned out to be *one of the fastest growing economies among African non-oil producing countries* with growth rates in double figures (approx. 11.4%) between 2004 and 2008.
- This growth however has been fuelled by public investments financed for a large part by the National Bank of Ethiopia. *The growth is primarily linked to the infrastructural sector and the energy sector.*
- As for the inflation rate, the results of the EthGov have been effective and have enabled the country to cut the rate drastically to about 8% on average in 2010. This value is the lowest recorded since 2004.
- Due to the heavy devaluation (16.7%) decided by the Authorities in September of 2010, an increase in the rate of inflation was recorded in January of 2011 of as much as 17.7%. From September 2011 to December 2011, *food inflation* dropped by 51.3% to 46.5% and non food inflation dropped by 24.7% to 21.8%.
- According to the data of the Economist Intelligence Unit, the growth of the GDP has been around 7.5% in 2011 and should show a constant upward trend in the coming years (8% in 2012 and 7.5% in 2013).
- In August of 2010 the EthGov presented the main contents of the *Growth and Transformation Plan* (GTP), a strategic plan for the country's growth over the 2011-2015 period. According to the EthGov, the GTP should enable the country to achieve security in terms of food and the Millennium goals, particularly in the health and education sectors. The GTP envisages a consistent growth for the industrial sector over the five year period.
- The EthGov's performance with regard to National budget has been consistently good, with an expected public deficit of between 2-3% of GDP for the 2012 - 2013 tax year . The strong presence of the State in the economy particularly through direct investments in the infrastructural sector will continue to put pressure on the risk of an increase in public spending[3].
- The Ethiopian economy is primarily based on the agricultural sector, including livestock, which represents approx. 45% of the GDP, approx. 85% of exports and involves 80% of the population. Coffee is the main commercial crop (35%), but it has been gradually becoming less significant (it used to be as much as 65%). Other important agricultural exports are hides and leather, pulses, oilseed crops and the traditional khat.
- The service sector, which represents a further 40% of the GDP, has shown a consistent growth in recent years and particularly since the end of the military dictatorship, driven mainly by tourism, telecommunications, transport and financial and insurance services.
- The manufacturing sector is mainly represented by small scale light industry and by farming and food supply companies that have witnessed a considerable growth in recent years.
- The mining sector only accounts for a meagre 0.5% of the GDP and is mainly centred on the extraction and sale of gold.

[2] See Economist Intelligence Unit

[3] See: Joint report "*In many cases the fight against tax evasion has been perceived by the private sector as harassment" by the Authorities involved. Hundreds of businessmen have been arrested, often for minor legal infringements*".

As far as the country's openness to international commerce and foreign investment we report the following quote from the Report:

- The Ethiopian economy is still sluggish as far as its readiness to embrace international commercial ventures.
- Ethiopia has a constant deficit in its current account budget seeing as the surplus in intangible entries, which represent the flow of development aid transfers made by donating countries and the remittances by emigrants, are not enough to balance the net deficit of the trade balance. This deficit amounted to approx. 5 million USD in 2010 and should hold steady around 6 - 7 million USD up until 2013 (figures from Economist Intelligence Unit).
- After having earned first place among Ethiopian export end markets in 2009, China has actually consolidated this position. According to the most recent figures available (IMF) for 2010 Italy is eleventh in the ranking among destination countries, second among European countries after Germany.
- Ethiopian imports mainly revolve around raw materials and intermediate products such as oil, iron, cement and aluminium, chemical products and fertilizers, machinery, industrial equipment and vehicles, medical and pharmaceutical products but also textiles, cereals and other major consumables.
- China maintains its leadership as Ethiopia's main goods supplier. Italy ranks sixth and has turned out to be the leading European goods supplier to the country (IMF figures for 2010).

In terms of the trade exchange with Italy and direct bilateral foreign investments the picture shows that:

- ISTAT (Italian Statistical Institute) figures on commercial trade between Italy and Ethiopia has been stable as far as commercial flow is concerned during 2009 and 2010. The comparison between the first 11 months of 2010 and the first 11 of 2011 (last available ISTAT figures) shows an increase in both imports and exports.
- Special purpose machinery represents the primary item of Italian exports to Ethiopia, followed by electrical equipment, non electric domestic appliances, metal construction elements and other metal products.
- Permanent crop products (coffee) are the main Italian import from Ethiopia (followed by leather and textiles).
- The Italian operators that reside in Ethiopia, working on small and medium sized Ethiopian right companies are over 200 and are mainly involved in sectors such as trade, construction, mechanical workshops, electromechanical and metal workshops, footwear, leather goods, tourism, vehicle components, printing, carpentry, catering, plastics, agriculture and livestock farming.
- The main Italian companies that operate in Ethiopia are: IVECO; SALINI Costruttorii; SIEMENS ITALIA; SELEX;GEOM. LUIGI VARNERO; the BONIFICA Group; DANIELI; DRILLMEC of the TREVI Group; GEOX; ENDECO ENGINEERING Spa; FRI-EL Green Power; PRORAS; Pert Engineering; Italy Consortium.
- In particular, where Salini Costruttori is concerned, the Joint Report specifies that *after having completed the building of the hydro-electric production plant in the South-West of the country (Gilgel Gibe) in 2008, it built a second hydroelectric plant in the same area, Gilgel Gibe II, and has been assigned the construction tender also for Gigel Gibe III and for a new dam known as "Great Renaissance Dam" or "Grand Millennium Dam" which at full capacity should produce 6000 MW (it would be the largest hydroelectric*

project of the African continent and valued around 3.3 billion Euros), where it has recently begun work[4].

IMPORT EXPORT ITALY - ETHIOPIA TRADE BALANCE	2008	2009	2010	2010 (Jan - Nov)	2011 (Jan - Nov)
Italian imports from Ethiopia	60.6	43.9	45.2	42.5	81.2
Exports from Italy towards Ethiopia	182.9	151.7	147.2	130.2	178.5
Balance	122.3	107.8	101.9	87.7	97.3

Table II - 2: Import Export: Italy - Ethiopia trade balance
Source: Istat - Values in Euro mlns

The ***International Financial Statistics* of the IMF International Monetary Fund** provide an outline of of the main balanced, current and future indicators for Ethiopia up to 2013.

INTERNATIONAL MONETARY FUND International Financial Statistics[5]	2007 [a]	2008 [a]	2009 [a]	2010 [a]	2011 [b]	2012 [b]	2013 [b]
GDP							
Nominal GDP (US$ bn)	19.2	25.9	28.5	26.6	31.1	36.9	37.2
Nominal GDP (Birr bn)	172	248	335	383	526	657	748
Real GDP growth (%)	11.5	10.8	8.8	10.1	7.5	8.0	7.5
Expenditure on GDP (% real change)							
Private consumption	17.1	18.1	7.9	15.2	10.0	7.6	6.7
Government consumption	-0.9	7.6	-10.7	31.7	5.3	9.8	8.9
Gross fixed investment	26.5	-1.6	35.2	-6.2	10.0	7.6	6.7
Exports of goods & services	10.4	-3.3	6.9	14.3	31.3	7.1	12.3
Imports of goods & services	31.4	12.6	16.4	15.9	21.3	7.1	7.3
Origin of GDP (% real change)							
Agriculture	9.5	7.5	6.4	5.6 [b]	5.0	8.0	9.0
Industry	10.2	10.4	8.9	9.5 [b]	9.0	9.2	9.0
Services	15.2	15.3	14.3	7.6 [b]	9.5	7.6	5.6
Population and income							
Population (mlns)	71.6	72.8	73.9	75.1	76.2	77.3	78.4
GDP per head (US$ at PPP)	866	965	1.044 [b]	1.145 [b]	1.232	1.342	1.451
Fiscal indicators (% of GDP)							
Central government revenue [d]	17.0	16.0	16.3	17.2 [b]	17.2	16.5	17.1
Central government expenditure [d]	20.7	18.9	17.2	18.8 [b]	19.2	19.6	20.6

[4] The joint MAE-MEF report on Ethiopia mentions the GGII operation managed by Salini, but does not refer to the Italian Cooperation for Development funding and the Assistance Loan worth 220 million Euros.
[5] References: *a Actual. b Economist Intelligence Unit estimates. c Economist Intelligence Unit forecasts. d Fiscal years ending July 7th.*

Central government balance [d]	-3.7	-2.9	-1.0	-1.6 [b]	-2.0	-3.1	-3.5
Net public debt	42.9	39.6	41.0	51.9 [b]	43.7	41.9	44.4
Prices and financial indicators							
Exchange rate Birr:US$ (av)	8.97	9.60	11.78	14.41	16.90 [a]	17.80	20.10
Exchange rate Birr:€ (av)	12.29	14.12	16.41	19.13	23.52 [a]	22.70	24.92
Consumer prices (av; %)	17.2	44.4	8.5	8.1	33.0	15.7	10.2
Stock of money M1 (% change)	21.4	26.2	31.0 [b]	20.5 [b]	48.8	26.6	22.0
Stock of money M2 (% change)	22.2	23.4	31.5 [b]	21.6 [b]	45.8	25.8	22.6
Lending interest rate (av; %)	7.5	8.0	14.2	14.5 [b]	16.0	14.5	12.0
Current account (US$ m)							
Trade balance	-3.871	-5.652	-5.281	-4.965	-6.713	-7.114	-7.434
Goods: exports fob	1.285	1.555	1.538	2.400	2.957	3.169	3.558
Goods: imports fob	-5.156	-7.206	-6.819	-7.365	-9.670	-10.283	-10.992
Services balance	-384	-451	-332	-302	-39	14	74
Income balance	40	2	-37	-64	-33	-34	-5
Current transfers balance	3.387	4.295	3.459	4.905	5.115	5.326	5.369
Current-account balance	-828	-1.806	-2.191	-425	-1.671	-1.807	-1.996
External debt (US$ m)							
Debt stock	2.620	2.879	5.030	7.147	7.989	8.207	8.906
Debt service paid	133	112	103	192 [b]	233	286	280
Principal repayments	88	72	62	130 [b]	185	235	230
Interest	45	40	42	62 [b]	48	50	51
International reserves (US$ m)							
Total international reserves	1.290	871	1.781	2.766 [b]	2.665	2.944	3.246

Table II - 3: International Financial Statistics of the FMI International Monetary Fund
Source: IMF, International Financial Statistics

It is worth noting that the IMF forecasts show growth of the real GDP of over 7.5% and, in sector terms, agriculture and industry show very favourable growth forecasts.

The ***Africa Development Indicators of the World Bank***[6] refer to 48 countries of Sub-Saharan Africa (*Factoids 2011*) and provide a few significant indicators which enable Ethiopia to be viewed within the context of the other Sub-Saharan nations.

[6] See http://data.worldbank.org/sites/default/files/adi-2011-africa-factoids.pdf

WB: Africa Development Indicators	Position ETHIOPIA	Indicator ETHIOPIA
Factoid n.1 *The poorest country*	6th place	**US$ 330**, per head income in 2009
Factoid n. 2. *From the least to the most population*	47th place	**82.8 million inhabitants** and an annual population growth of 2.6%
Factoid n.3. *Most number of cell phones per inhabitant*	46th place	**48.9 cell phone subscribers** per 1,000 inhabitants, 2009
Factoid n. 4. *Best access to hygienic and sanitary services*	41st place	**12 %** of the population with best access to hygienic and sanitary services, 2008
Factoid n. 5. *Life expectancy at birth*	21st place	**56 years** (Life Expectancy, 2009)
Factoid n. 6 *Least diversified exports*	36th place	**10 products** which represent over 75% of total exports, 2009
Factoid n. 7 *Most number of women in Parliament*	14th place	**21.9% women in national Parliament** , 2009 (percentage of total seats)
Factoid n. 8 *Country that most benefits from development aid*	1st place	**US$ 3,820 million**, with a per head ODA of **US$ 46.**
Factoid n. 9. *Country with the best progress in reducing child mortality*	7th place	**- 46.0%** decrease in child mortality per 1,000 births (percentage variation between 1990 and 2009)

Table II - 4: Africa Development Indicators of the World Bank
Source: http://data.worldbank.org/sites/default/files/adi-2011-africa-factoids.pdf

Ethiopia's position is highly differentiated compared to the overall system of indicators identified by the World Bank as representative of the socio-economic realities and situation of the 48 Sub-Saharan African countries.

The life expectancy, the female presence in Parliament and a significant decrease in child mortality are symptomatic of a significant social improvement.

Ethiopia is the country that receives the most Official Development Assistance[7] and Official Aid, for 2009 of US$ 3,820 million (€ 3,040 million), a per head ODA of US$ 46 (€ 36).

The graph and the table of the World Bank provide details on Factoid n.8 *Country benefiting from the most development aid* for 2009.

[7] The Official development assistance (ODA) is a definition introduced by the Development Assistance Committee (DAC) of OCSE to measure aid and development assistance (Aid). The Official Aid (OA) is calculated based on the aid flow that satisfies the conditions of eligibility for inclusion in the ODA: The beneficiary countries are indicated in Part II of the DAC list.

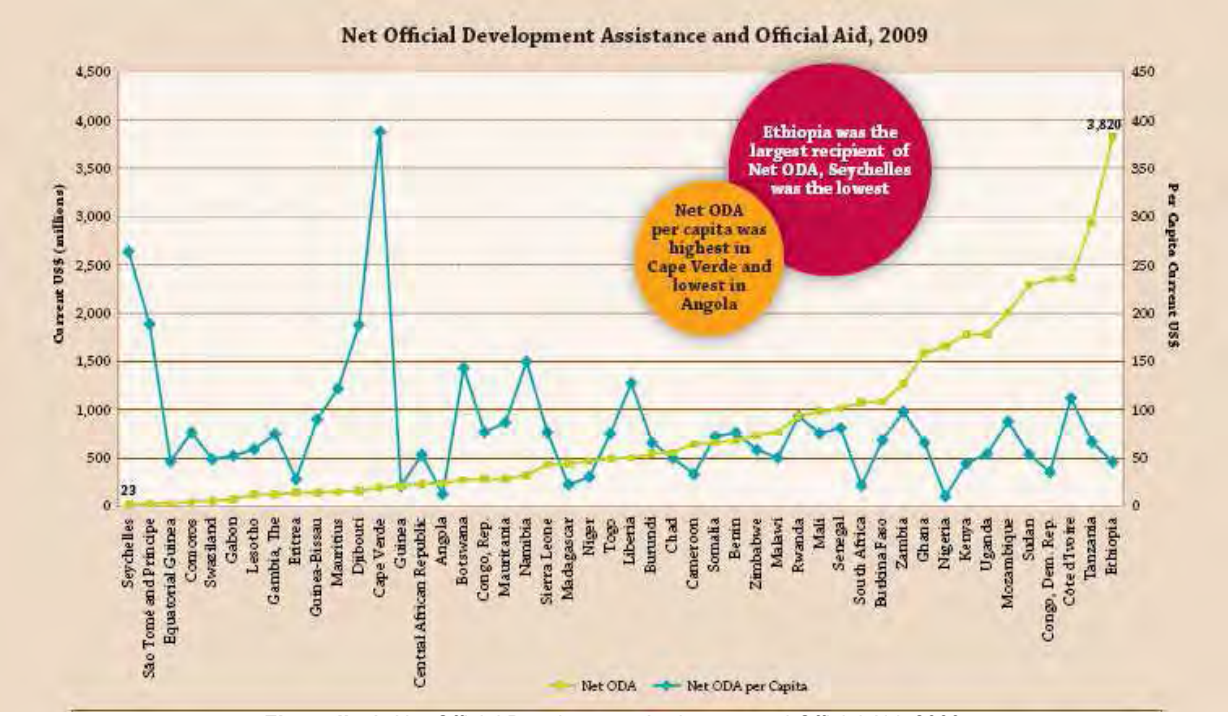


Figure II - 1: Net Official Development Assistance and Official Aid, 2009
Source: http://data.worldbank.org/sites/default/files/adi-2011-africa-factoids.pdf

Ranking: Who Receives More Official Aid?

Net Official Development Assistance (US$ millions) and ODA per capita (current US$), 2009

1.	Ethiopia	3,820.0	(46.1)
2.	Tanzania	2,934.2	(67.1)
3.	Côte d'Ivoire	2,366.3	(112.3)
4.	Congo, Dem. Rep.	2,353.6	(35.6)
5.	Sudan	2,288.9	(54.1)
6.	Mozambique	2,013.3	(87.9)
7.	Uganda	1,785.9	(54.6)
8.	Kenya	1,778.0	(44.7)
9.	Nigeria	1,659.1	(10.7)
10.	Ghana	1,582.6	(66.4)
11.	Zambia	1,268.7	(98.1)
12.	Burkina Faso	1,083.9	(68.8)
13.	South Africa	1,075.0	(21.8)
14.	Senegal	1,017.6	(81.2)
15.	Mali	985.1	(75.7)
16.	Rwanda	934.4	(93.5)
17.	Malawi	772.4	(50.6)
18.	Zimbabwe	736.8	(58.8)
19.	Benin	682.9	(76.4)
20.	Somalia	661.7	(72.4)
21.	Cameroon	649.4	(33.3)
22.	Chad	561.2	(50.1)
23.	Burundi	548.8	(66.1)
24.	Liberia	505.0	(127.7)
25.	Togo	499.0	(75.4)
26.	Niger	470.0	(30.7)
27.	Madagascar	445.5	(22.7)
28.	Sierra Leone	437.3	(76.8)
29.	Namibia	326.2	(150.2)
30.	Mauritania	286.7	(87.1)
31.	Congo, Rep.	283.0	(76.8)
32.	Botswana	279.6	(143.4)
33.	Angola	239.5	(12.9)
34.	Central African Republic	236.9	(53.6)
35.	Guinea	214.7	(21.3)
36.	Cape Verde	195.9	(387.5)
37.	Djibouti	162.2	(187.7)
38.	Mauritius	155.6	(122.0)
39.	Guinea-Bissau	145.5	(90.3)
40.	Eritrea	144.8	(28.5)
41.	Gambia, The	128.0	(75.1)
42.	Lesotho	123.0	(59.5)
43.	Gabon	77.6	(52.6)
44.	Swaziland	58.0	(48.9)
45.	Comoros	50.6	(76.8)
46.	Equatorial Guinea	31.6	(46.7)
47.	São Tomé and Principe	30.7	(188.7)
48.	Seychelles	23.2	(263.7)

Figure II - 2: Ranking, Net Official Development Assistance and Official Aid, 2009
Source: http://data.worldbank.org/sites/default/files/adi-2011-africa-factoids.pdf

2. THE SOCIAL AND ECONOMIC CONTEXT IN THE AREA OF OPERATIONS

The social and economic context in the area of operations as assessed by the Evaluation Team has seemed to be in line with the overall Ethiopian trend. A very poor area - but not in a state of utter desolation - which in trend terms would seem to be finding a development perspective based on solid grounds. As we shall mention during impact assessment, the GGII construction phase has in some ways provided what could turn out to be a lasting impulse towards growth and social cohesion.

The general terms of reference for an overall evaluation of the social and economic context have been acquired by the Evaluation Team during the few days spent during the field mission at the site of operations, in the cities of Fofa and Sukoru and, more in general, during the more extensive "trips", covering a vaster area, which enabled the observation of customs and traditions and particularly the efforts of the population and the individual people.

As far as the statistical evidence published by the Central Statistical Agency (CSA), the official references are (i) the Statistical Abstract 2011/2012, of December 2011, focused on updating the data on population for the individual *wereda* in terms of urban centres and rural areas; (ii) the Statistical Tables of the general census of 2007. The official statistical data (at least those available that have been analysed) do not offer great scope for analysis and any conclusions drawn from them could appear "risky"[8].

The Statistical Tables provide the following data for 2007;

Part I: Size and characteristics of the Population;

Part II: Education and Status of economic activities;

Part III: Population dynamics (migration; fertility; mortality);

Part IV: Characteristics and conditions of residential homes

Part V: Population of the Kebeles (neighbourhoods).

The statistical handbook on the Ethiopian population only takes into consideration and presents the figures relative to the inhabitants (men and women), the surface area of the woreda where they reside and the relative population density [9].

To define the statistical survey area the Evaluation team has only taken an in depth look at the two areas directly affected by the GGII operations, the towns of Fofa (Yem Special Woreda), in the S.N.N.P. federal region) and Suokoru (Suokoru Wereda, in the federal region of Oromyia). Salini has carried out significant activities of a social nature in these areas. The Evaluation Group has held meetings and focus groups with the population and the local institutions, thus integrating the *primary* data (the meetings and the focus groups) with the *secondary* data (the official statistics).

[8] See MEANS Criterion n.4. **Reliable data:** The primary and secondary data turned out to be appropriate and may reliably be used. They have been used as both statistical data and significant qualitative data. When only weak data was available, the evaluator has explained its weakness and the limitations imposed on their use.

[9] The population projections in the document analysed are based on the results of the *National Population and Housing Census* held in May 2007. The 2012 projections refer to all the capitals, zones and weredas of the Ethiopian regions and include the localities with urban *kebeles*, in which the inhabitants are primarily engaged in non-agricultural activities.

Part I: Size and characteristics of the Population

The population in the Sokoru and Fofa weredas based on the 2012 statistical projections amounts to 251,490 inhabitants, with a slight majority of men (50.2%) compared to women (49.8%). The overall surface area of the two weredas is of 1,652.67 sq. km. with a population density of 143.5 inhabitants per sq. km.

:

	Males	Females	Total	Area (Sq.Km)	Density
OROMYIA					
Sokoru - Wereda	75,293	74,721	150,014	1004.77	157.00
Sokoru Town	3,918	3,769	7,687		
	79,211	78,490	157,701		
SNNPR					
Yem Special Wereda	43,925	43,152	87,077	647.90	144.80
Fofa Town	3,187	3,525	6,712		
	47,112	46,677	93,789		
Total population	**126,323**	**125,167**	**251,490**	**1,652,67**	**143.52**

Table II - 5: Sokoru and Fofa population (2012 projections)
Source: Ethiopia, Central Statistical Agency (CSA) - Statistical Abstract 2011

Part II: Education and Status of economic activities;

Among the tables on education and the status of economic activities, in the Yem Special Wereda the total literacy level stands at 43%, with a prevalence of men compared to women and an even more marked literacy disparity between urban and rural environments.

Geographical area	Population (5 years and over)	Literate population aged 5 or over: 2007					
		Literate total	Literate total	Literate women	Total	Men	Women
Sokoru Wereda							
- urban	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
- rural							
Yem Special Wereda	*68,579*	*29,506*	*16,448*	*13,058*	*43.0%*	*47.4%.*	*38.5%.*
- urban	*6,876*	*4,901*	*2,515*	*2,386*	*71.3%*	*76.5%.*	*66.5%.*
- rural	*61,073*	*24,607*	*13,935*	*10,672*	*39.9%*	*44.4%.*	*35.2%.*

Table - 6: Literate population aged 5 or over: 2007
Source: Ethiopia, Central Statistical Agency (CSA) - Statistical Abstract 2011

Geographical area	Population aged 10 or over engaged in economic activities: 2007					
	Population (10 years and over)	Active	Inactive	M+F	M	F
Sokoru Wereda	88,027	70,667	17,360	80.3%	85.5%	75.0%
- urban	9,526	5,327	4,235	55.7%	67.1%	43.9%
- rural	78,456	65,340	13,125	83.3%	87.8%	78.7%
Yem Special Wereda	54,405	35,110	19,295	67.2%	73.0%	55.8%
- urban	5,830	3,345	2,485	57.4%	64.4%	50.8%
- rural	48,575	31,765	16,810	65.4%	73.9%	56.5%

Table II - 7: Population aged 10 or over engaged in economic activities: 2007
Source: Ethiopia, Central Statistical Agency (CSA) - Statistical Abstract 2011

Geographical area	Active	In employment	Unemployed	M+F	M	F
Sokoru Wereda	5,327	4,686	207	12.1%	6.4%.	21.0%.
Sokoru Town	2,464	2,296	51	6.8%	3.3%.	12.4%.
Yem Special Wereda	3,345	3,136	210	6.3%	2.1%.	11.2%.
Fofa Town	2,170	1,972	199	9.2%	2.3%.	17.0%.

Table II - 8: Economically active persons 2007
Source: Ethiopia, Central Statistical Agency (CSA) - Statistical Abstract 2011

Part III: Population dynamics (migration; fertility; mortality)

The table on population dynamics provides details of the proportion of children that survive after birth. For the Yem Special Wereda the proportion is 83%, while there is a considerable difference in the number of children born per woman (1.7 for urban areas and 2.8 for rural areas).

Geographical area	Women (total)	Children born and surviving Proportion of surviving children			
		Children		Average number of children per woman	Proportion of surviving children
		Total born	Survived		
Sokoru Wereda - urban - rural	ND	ND	ND	ND	ND
Yem Special Wereda	26,744	71,596	60,028	2.7	83.8%
- urban	3,024	5,089	4,210	1.7	82.7%
- rural	23.720	66,511	55,821	2.8	83.9%

Table II -9: Children born and surviving. Proportion of surviving children: 2007
Source: Ethiopia, Central Statistical Agency (CSA) - Statistical Abstract 2011

Geographical area	Population	Deceased in the twelve months prior to the 2007 census					
		Total	Men	Women	Total	Men	Women
Sokoru Wereda - urban - rural	ND	ND	ND	ND	ND	ND	ND
Yem Special Wereda	79,646	742	433	309	0.9%	1.1%.	0.8%.
- urban	7,747	66	41	25	0.9%	1.1%.	0.6%.
- rural	71,899	676	392	284	0.9%	1.1%.	0.8%.

Table II - 10: Deceased in the twelve months prior to the 2007 census 2007
Source: Ethiopia, Central Statistical Agency (CSA) - Statistical Abstract 2011

Part IV: Characteristics and conditions of residential homes

The characteristics of the residential homes detailed in the 2007 census witness a significant level of backwardness in the two weredas of Fofa and Sukoru.

The field investigations carried out by the Evaluation Team showed that compared to 2007, the level of urbanization and the quality of the homes appears to be partially modernised and developed (with the problems this brings with it). At a rural level there has been no such obvious "progress" compared to the statistics. The rural conditions appears to be very basic but not wretched.

Urban and rural residential units	Residential units (total)	Roof construction material			
		Corrugated iron	Concrete / cement	Straw	Other
Sokoru Wereda	28,283	7,486	230	19,505	1,264
- urban	3,468	3,313	-	150	5
- rural	24,815	4,173	230	19,355	1,259
Yem Special Wereda	17,205	3,151	279	12,635	1,140
- urban	2,073	1,567	5	471	30
- rural	15,132	1,584	274	12.164	795

Table II - 11: Residential units detailed by roof construction material 2007
Source: Ethiopia, Central Statistical Agency (CSA) - Statistical Abstract 2011

Geographical area	Residential units (total)	Source of drinking water				
		Tap outside compound	Protected well	Unprotected well	River / Lake / pond	Other
Sokoru Wereda	3,468	2,527	256	69	-	-
Sokoru Town	1,740	1,373	213	64	-	-
Yem Special Wereda	2,073	1,411	423	193	41	5
Fofa Town	1,437	1,107	145	150	30	5

Table II - 12: Residential units with a source of drinking water, 2007
Source: Ethiopia, Central Statistical Agency (CSA) - Statistical Abstract 2011

As far as the GGII evaluation is concerned, the figures relating to the type of lighting used for the various residential units, the 2007 Census already shows quite a high level of lighting, with a ratio of approx. 30% of homes with a private electricity meter.

Geographical area	Residential units (total)	Type of lighting				
		Electricity with private meter	Electricity with shared meter	Generator powered electricity supply	Lamps	Other
Sokoru Wereda	3,468	1,250	2,020	11	155	32
Sokoru Town	1,740	623	1,022	5	69	21
Yem Special Wereda	2,073	607	967	15	410	73
Fofa Town	1,437	351	882	15	180	10

Table II - 13: Residential units by lighting power source, 2007
Source: Ethiopia, Central Statistical Agency (CSA) - Statistical Abstract 2011

Geographical area	Residential units (total)	Residential units in which the animals spend the night		
		"YES"	"NO"	Don't have animals
Sokoru Wereda	24.815	18.357	4.386	2.072
Yem Special Wereda	15,131	7,767	6,471	893

Table II - 14: Residential units in which the animals spend the night
Source: Ethiopia, Central Statistical Agency (CSA) - Statistical Abstract 2011

3. THE ENVIRONMENTAL CONTEXT OF THE AREA OF OPERATION

Ethiopia's physical landscape is identified with its plateau, known as the Ethiopian Highlands, bordered by the extensive Sudanese plains, the Danakil depression, also known as the Afar Triangle to the east towards the Red Sea, the Ethiopian Rift or Ethiopian rift lakes and the Somali plateau which gradually slopes down towards the Indian Ocean.

The complex of works that constitute the Gilgel Gibe II plant are set in the basin of the Omo River, South Western Ethiopian Plateau, which runs for over 700 km in a region of breathtaking beauty, still for the most part uncontaminated and rich in biodiversity.

Beyond the the GGI plant dam, the Gilgel Gibe River runs for another 25 Km north, then in the vicinity of the Gibe Bridge, on the Addis - Jimma motorway it flows into the large Gibe River which springs from the Wollega plateau. Once beyond the Gibe Bridge, the river changes its name to Omo River, even though it is at times referred to as the Great Gibe River, then after the meeting with the Gojeb it finally becomes the Omo River proper. The river has excavated a long, deep and tortuous canyon on its descent south, from the 2,500 m above sea level to the 500 m. above sea level where it flows into Lake Turkana on the border with Kenya.

Figure II - 3: Gilgel Gibe River at the Intake area
Source: Salini photo doc.

Around 200,000 people live along its shores, mainly shepherds and farmers, to a lesser degree fishermen, belonging to over 8 different tribal communities, whose food safety and survival is directly linked to the natural resources and delicate equilibrium of the area.

The entire basin is of considerable importance both geologically speaking, as it is in the heart of the Rift Valley, as well as for its archaeological significance, as this is the site where the first Australopithecus remains were found dating back to 2.4 million years ago.

Although Ethiopia lies between the Tropic of Cancer and the Equator it has a very varied climate and strongly linked to its regional topography. The Ethiopian Highlands and in general all areas above 2000 m above sea level present a considerable thermal uniformity, with an average temperature of 18°C and slight annual variations between the maximum and minimum temperatures. The hottest period is generally between March and May, with peaks around 31°C and then to a lesser extent between September and November, while the relatively cold period is between June and August with the lowest temperatures between December and February, during which time at the higher altitudes the temperature can drop to 0°C.

In the areas lying between 500 and 1800 m. above sea level, along the Sudan border, on the north western slopes of the Somali plateau and the Main Rift depression, one encounters the essential characteristics of a tropical climate, with annual temperatures around 20°C which occasionally go as high as 38°C. If one drops down towards Harar the climate is influenced by the Indian Ocean and is much more regular and enjoyable with average temperatures of 19°C and a maximum temperature of 25°C.

The desert area of the Ogaden towards Somalia and the Danakil depression are among the hottest and driest in the world, with average temperatures between May and June of 35°C and peaks in Danakil of even > 48°C.

The most important aspect of the climate is the rainfall. The rainy season generally goes from April to September with the greatest intensity between July and August, while the dry season is between October and March. The rains clearly vary, even quite considerably, depending on the lay of the land and the altitude of the region.

The area where the GGII project is sited has a damp tropical climate, with a very standard rain pattern. The most rainy month is august, with 1800 mm/year in the area of the Gilgel Gibe springs and approximately 1100 mm/year at the confluence with the Great Gibe.

In the area of the Power House, the rainfall varies between 600 mm/year and the 30°C of the Great Gibe Gorge and the 1800 mm/year and 12°C of Fofa, with 19.2°C being the average temperature for the area.

Throughout the Gilgel Gibe - Great Gibe (Omo River) basin the rainfall varies between the 1300 ÷ 1800 mm/year gradually diminishing the lower the altitude. In short the climate of the region involved can be defined as sub-tropical humid highland weather, with average temperatures and a rainy and a dry season.

The Ethiopian highlands are essentially a large plateau of volcanic rock resting on a basement of Mesozoic rock and ancient crystal sediment, heavily affected by the intense tectonics connected to the genesis of the Main African Rift and lined by a complex river system, which from over 2500 m above sea level, drops and spreads out towards the Sudan, Kenya and right down into the Danakil depression.

The area where the GG II project is sited features a widespread presence of volcanic rock with an alkali or intermediate PH (sub silicates), with frequent inclusions of ash dust, red tufa rocks and paleosoils and basalt dikes, dolerites and occasionally syenites, that have risen up through the fractures.

Starting from the bottom, and thus the most ancient, one can identify the following formations:

Omo Basalts Formation**,** comprised of a succession of fine grain basalt flows with average widths of more than 10 m, intercalated with ash powders, tufa rocks and red lateritic paleosoils (Oligocene – Miocene).

Jimma Volcanic Formation, comprised of white, to pink and grey rhyolites and secondarily trachytes, deposited in powerful flows or domes, with tufa intercalations and intrusions of basalt dikes and dolerites (Oligocene – Miocene).

Wollega Basalts, columnar basalts intecalated with acid tufa rock and lightly packed lake sediments (Miocene – Pliocene).

Recent volcanism, comprised mainly of large domes or banks of acid and intermediate lavas such as rhyolites, with veins of andesites and trachytes and trachyte intrusions (Pliocene – Lower Quaternary).

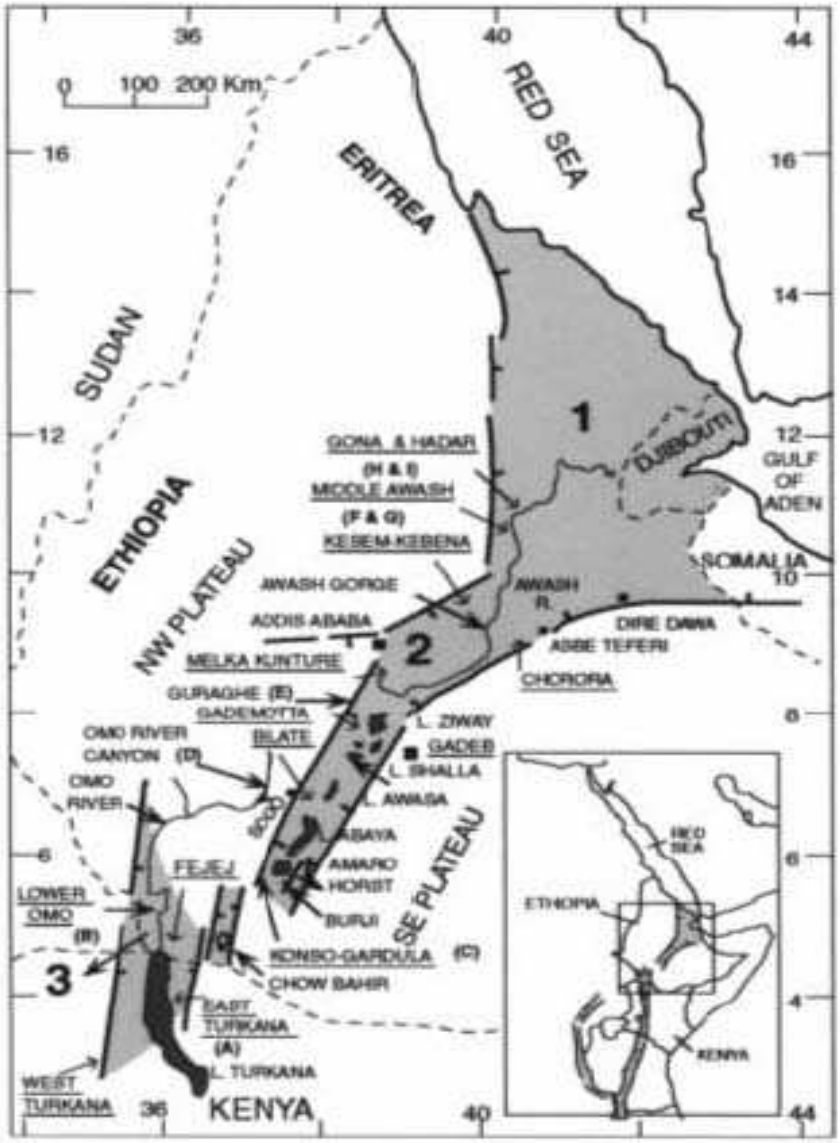


Figure II- 4: Sketch of the Afar Triangle and Mid African Rift
Source: internet

In short starting from the Oligocene, a series of repeated basalt flows have covered the sedimentary and crystalline substratum of the Ethiopian highlands. This powerful succession

of repeated basalt flows, for the most part deposited sub-horizontally and often separated by thin thickness of ash powders, colluvial deposits and red lateritic paleosoils, has been subdivided into blocks and graben by the intense extensional tectonics connected to the Mid Africa Rift.

Subsequently the volcanic activity resumed out of the wide faults that have dislocated the region, with the emission of further lava flows, this time with a more acid chemical composition, such as trachytes and particularly rhyolites, for the most part in large stratified veins or domes and in some cases, when they didn't reach daylight, crystallized into syenites. The subsequent tectonic activity has then allowed the intrusion of numerous basalt dikes and dolerite. The entire volcanic sequence is generally covered by a layer of residual colluvial material and lateritic crusts typical of subtropical climes. The effects on the rock substratum of the thermal fracturing caused by the day night thermal variations and especially by the run off water flows, connected to the particularly intense rains, concentrated in a short time span, are clearly visible throughout the area, where one can observe thick layers of materials undergoing alteration, mainly comprised of fractured rocks and mylonites in a silty sand material matrix, layers of oxidation and red clay soils, which reach the highest thicknesses at the foot of the hilly regions.

The range crossed by the "Power Tunnel" is comprised mainly of rock of volcanic origin. On the Intake side there's a prevalence of basalts of the Omo Formation, slightly sloping towards SW and crossed by a system of faults and fractures mainly lining up along the NE÷SW and NW÷SE directions, paralleling the alignment of the Ethiopian Rift Proceeding along the tunnel the basalts become at first sub-horizontal and then clearly submerge to SE towards the gorges of the Omo River.

The trachytes and thus the rhyolites of the Jimma Formation prevail instead halfway along the tunnel and as far as the Outlet side, with a layout that as it heads East becomes increasingly more unclear due to the intense fracturing that has dislocated the rock mass into vertical blocks and of the numerous intercluded dikes. Many of the dikes mapped have the same N - S trend of the Omo Gorges, which run for approximately 200 Km along the eponymous fault.

The products of the **Wollega Formation**, particularly the tufa and lake deposits lie in a discordant layering above the powerful layers of lava of the **Omo/Jimma Formation*.***

The powerful volcano product complex described shows vary variable permeability, both due to its chemical composition and the weave of the individual lithotypes, as well as to their primary and secondary state of fracturing. More specifically the basalt flows are generally massive towards the middle while they are often scoriaceous and vacuolar due to the out pour of gas particularly at the roof of each flow. Even the primary fracturing, due to cooling, is more in tense at the roof and on the sides of the flows. The more basic magmas, such as the basalts, the dolerites and the trachytes, reveal high temperatures and a greater fluidity, giving rise to very extensive flows with a relatively limited thickness for each flow. This would seem to indicate a rather fast cooling process and therefore a more widespread fracturing and often in blocks or polygons, as found for example in the columnar basalts.

The acid magmas, those with higher levels of silica, particularly the rhyolites and to a lesser degree the andesites and syenites, are much less fluid and with lower temperatures compared to the basic ones, therefore travelling relatively shorter distances from the emission fracture and arranging themselves in layers of considerable thickness or large domes, with a lower cooling process and less aggressive fracturing. These general characteristics, typical of every lithology, generally speaking determine their primary permeability which is usually greater for the basalts and the trachytes compared to the rhyolites.

A fundamental role is played however by both the tectonics, which are very intense in the area, and the rock alteration phenomena, very accelerated due to both mechanical and physical stress, as well as the chemical and physical action of the waters and the changes in temperature. The entire volcanic complex is affected by a system of primary and secondary

faults, that have heavily dislocated it mainly into large sub-vertical blocks. In fracture zones the waters circulating often at high temperatures and with the aggressive kind of chemical properties typical of post-volcanic areas, have had an easy time inducing alteration and dissolution processes in the strip of previously stressed and intensely fractured materials.

Consequently large thicknesses of breccia materials mixed with a loamy sand matrix tend to form in the fault areas as well as strips or pockets of sandy loams that have been altered by the action of the circulating waters. It therefore transpires that the fault areas can become either areas where there is a favourable water flow or act as a permeability limitation to its seepage. To all this we have to add the dikes and the presence of pyroclastic products such as tufa and ash powder, which generally show little permeability.

The situation described consequently highlights a particularly complex hydro-geological picture, which may be structured around a series of blocks with their own circulation with an extremely variable dimensions and extension, with partial, total or entirely absent continuity, or as buffer or closing strips or finally as preferential flow channels. This often leads to the formation of a series of distinct, suspended faults, not necessarily intercommunicating, with a profoundly different permeability, hydraulic load, piezometrics, temperature and chemical properties.

The reconstruction of the hydrological model representing the entire area is therefore particularly complex, all the more considering the limits posed to the detail of the investigation by the morphology, the orography and the inaccessibility of the territory.

As far as the vegetation is concerned, the Gibe valley is covered in deciduous broadleaved forests. One can identify three vegetational landscapes: the high altitude forest (Acanthaceae, Combretaceae, Solanaceae), the medium to low altitude forest (mainly populated by deciduous species belonging primarily to the Combratacea family) and the strip of riparian vegetation, dominated by trees such as the tamarind, sausage trees, the shola and species of acacia and euphorbia.

The riparian vegetation constitutes a fundamental component of the river ecosystem, a haven for birds, reptiles, amphibians, ungulates, primates and their predators during the forest fire season, which are frequent in this area between the end of February and the beginning of April.

In these valleys fire plays an important ecological role. To some extent it determines the maintenance, regression or success of entire communities of plants or animals. The animal population in fact follows the seasonal progress of the fires. During fires, the small animals can seek refuge in corners and cracks in the rock, while the large ones can migrate towards the highlands or towards the rain forests in groups or individually.

The Omo-Gibe basin, which includes the Gilgel Gibe sub-basin, has a rich fish population: 14 families and 35 species of fish have been reported in the Omo-Gibe basin. As far as terrestrial fauna is concerned the area hosts monkeys, warthogs, water antelopes, gemsbucks, zebras, giraffes, gazelles and elephants, while the carnivores include lions, cheetahs, leopards, the golden African cat and Burchell's zebra (Equus quagga burchellii), found in the Omo National Park. The study drawn up by the Environmental Investigation Agency in 1997 specifies that in the area of the Gilgel Gibe basin there are also endemic species such as the Lelwel antelope and the bushbuck. The Omo river basin is not populated by endemic ornithic species; the predominant species are those belonging to the Somali-Masai biome (parrots, larks) and the Sudan- Guinea biome (Fox kestrel, dusky babbler).

4. THE STAKEHOLDERS INVOLVED IN THE PROJECT'S IMPLEMENTATION

The Gilgel Gibe II project is part of a framework policy introduced by the **Ethiopian Government (EthGov)** for the development of Ethiopian energy resources, as indicated in the letters of the Foreign Office Minister of the Ethiopian Government Seyoum Mesfin to the undersecretary sen. A. Mantica on 26.06.2003, on 03.09.2003 and 04.11.2003. The Ethiopian Government has therefore undertaken this project through a state company that is responsible for the installation of new electrical power plants, energy distribution and the overall management of the entire national electrical grid called **Ethiopian Electric Power Corporation (EEPCo).**

The EEPCo has therefore assigned the design and construction of the works by means of an "EPC – Engineering Procurement and Construction" contract (a "turnkey" contract) to **Salini Costruttori S.p.A.**[10]**,** which has therefore acted as *General Contractor.*

Following the signing of the EPC Contract Agreement, the EEPCo entered into a contract with **ELC Elettroconsult** for consultancy, management and supervision of the works, as specified in the document *Terms of Reference Consultancy services for management and supervision*. The **ELC-Electroconsult** of Milan has therefore acted as *Owner Engineer.*

Besides the EthGov, the other main backer of the project has been the **Italian Ministry of Foreign Affairs (MAE)**, which via its **General Directorate for Development Cooperation (DGCS)** has signed a financial agreement with the **Ethiopian Ministry of Finance and Economic Development (MoFED)** on 05.07.2005 by which it granted an assistance loan of 220,000,000 Euro with an annual interest of 1% for 20 years and a free period of 5 years. The bank agency charged with issuing the assistance loan was **Artigiancassa.**[11]**.**

The MAE-DGCS has also verified the use of the funds received through the assistance loan on a number of fact finding field missions carried out between 2005 and 2010[12].

On 4 March 2005 **The European Investment Bank (EIB)** granted Ethiopia a soft loan of 50.000.000 Euros to co-finance the electro-mechanical provisioning included in the EPC Contract.

The electro-mechanical systems where then supplied by **Voith-Siemens**, following an international call for tenders.

The environmental study was commissioned by Salini from the Italian company **CESI**[13] and approved by the Ethiopian authority entitled **Environmental Protection Authority (EPA)**[14]**, while the EEPCo,** as prescribed by local legislation, had set up an environmental monitoring unit, the **EMU-Environmental Monitoring Unit.**

Today EPA delegates the environmental impact approval and control activities for this kind of works to the **Environmental Impact Assessment and Social Development Office** of the **Ministry of Water and Energy of Ethiopia.**

10 Contract Signed by Salini Costruttori and EEPCo 15/04/2004.
11 Agreed minutes of 23/07/2004 and Financial Agreement the Ministry of Finance and Economic Development of the Federal Republic of 5/07/2005
12 Reports and notes of Ing. R. Save
13 Environmental Impact Assessment – CESI - 2004
14 EPA comments on CESI document

5. THE GGII PROJECT WITHIN ITALIAN COOPERATION PROGRAMS

As the web site of the Italian Cooperation organisation informs in great detail[15], "*the start of cooperation relations with Ethiopia begins back in 1976, the year of the signing of the first Bilateral Agreement for the implementation of development projects.* Since the second half of the Eighties and up to today, Ethiopia is one of the priority countries in the Italian Cooperation strategy and the beneficiary of a considerable share of Italian support, mainly guaranteed through bilateral and multi-bilateral channels, and secondly multilateral and NGO promoted".

Among the most significant aspects it should be noted that:

- in the past operations have touched many areas, since 2009 the Italian presence has tended to concentrate on a limited number of sectors, in compliance with Paris principles and the Construction Supervision Code of Conduct.
- In 2010 a few major programs foreseen by the "1999 - 2001 Country program" (7 initiatives still underway for a total value of over 63.4 million Euro) or agreed within the context of the Inter-governmental Memorandum of Understanding reached during the Italy- Ethiopia summit which took place in Rome in November of 2004.
- Furthermore the implementation of the most important works foreseen by the '2009-2011 Country Program' signed in Addis Abeba in April of 2009 and worth 46.3 million Euro is now fully operational.

Currently there are four priority action sectors of the Italian Cooperation in Ethiopia:

- health,
- education,
- rural development,
- water.

The main initiatives underway, funded by the Ministry of Foreign Affairs, are:

- Education and Information
- Health
- Energy (Gigel Gibe II Hydroelectric Project)
- Economy and Finance
- Agriculture and Fishing
- Minors

[15] See. http://www.cooperazioneallosviluppo.esteri.it/pdgcs/italiano/iniziative/Paese.asp?id=60

- Multisectorial
- Water and Hygiene

The cross fertilizing areas *good governance* and *gender/children* should be added to these sectors.

All the initiatives foreseen by the '2009-2011 Country Program' *have been conceived in collaboration the Government, in the context of national development strategies, with an eye to the pursuit of the Millennium Development Goals (OSM) and compliance with the Paris/Accra principles.*

From the first design idea (2003) to the decision of the Development Cooperation Steering Committee (October 2004), the Gilgel Gibe II Hydroelectric project had a very fast preliminary and start up phase and was promptly included in the implementation programs of the Italian Cooperation.

The speed of this process is connected to the principle of urgency and need claimed by the Ethiopian authorities due to the frequent blackouts recorded on the grid powering both companies and families.

6. GIGEL GIBE II HYDROELECTRIC POWER PLANT

The Gigel Gibe II hydroelectric power plant is included in a broader context of plant works which aim to exploit the hydroelectric resources of the Omo basin for energy production purposes. The power plant has been conceived as a follow-on completion of the Gilgel Gibe I power plant, using the same water accumulation basin without the need for the construction of a new major sized lake.

In basic terms the water of the Gilgel Gibe released by the GG I plant is routed down a hydraulic tunnel 26 km long, exploiting a fall of approx. 500 m. which leads to the power station positioned at the base and capable of generating up to 420 MW before releasing the deviated waters into the Omo river.

The plant therefore extends over a very vast area which may be roughly divided into: Intake Area, where the waters of the Gilgel Gibe are harnessed, the hydraulic tunnel and the Outlet area, where the hydraulic jump is fashioned and consequently the generation of electricity with the subsequent release of the waters into the Omo.

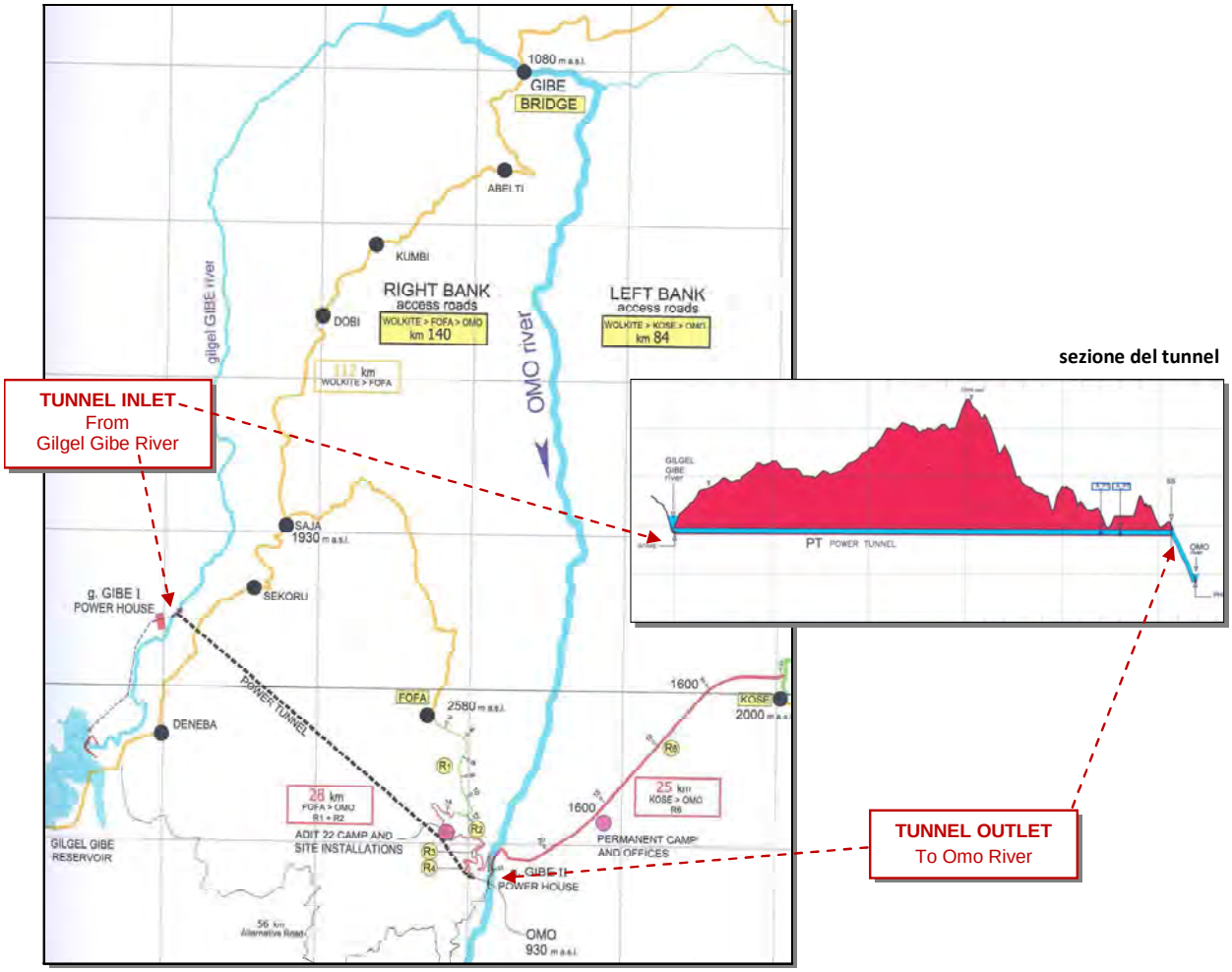


Figure II - 5: Area of operation
Source: www.itacaddis.org

6.1 Localisation of the operation and access roads

The site of the operation straddles the regions of Oromia and SNNP (South Nation and Nationalities People). More specifically the Intake area is in the Sokoru Wereda approximately 80 km to the north-east of the town of Jimma and about 250 Km from Addis Abeba, while the Outlet area is in the Special Yem Wereda (town of Fofa).

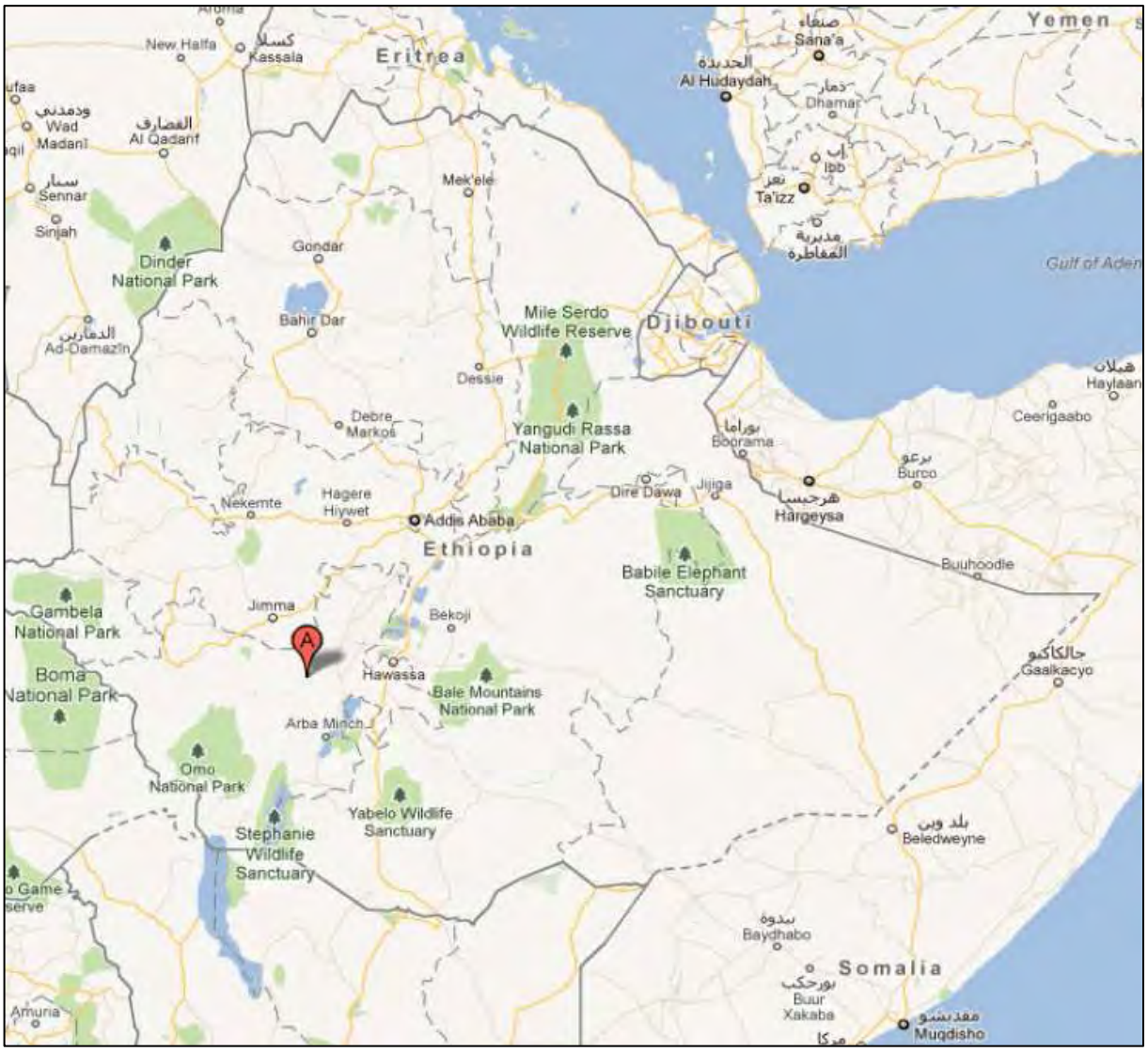


Figure II - 6: Operation localization
Source: www.google.map.com

To reach the power plant from Addis Abeba, on reaching the village of Wolkite, one leaves the state road heading towards Jimma, and travelling along a gravel road, after about 60 km one reaches the village of Kose (2,000 m above sea level), from where one takes the paved road R6 (32 km), built as part of the GGII project, which leads to the electrical substation and the river over the River Omo 930 m above sea level). After crossing the bridge one reaches the power station.

Figure II - 7: Bridge over the River Omo
Source: photographic documentation of the evaluation team

In the design, this bridge was meant to provide a permanent link between the right bank and the left bank of the River Omo, enabling the two villages of Kose and Fofa to be easily connected (approx. 40 km along this route). Unfortunately to this day this has not been the case, seeing as the entire site of the Outlet and consequently the above mentioned bridge over the Omo is forbidden for free transit by the Ethiopian authorities, leaving the two villages connected by means of 170 km of inland roads. In addition to this, during the course of the mission of the evaluation team, it was ascertained that the roads close to the plant are unsafe for public use, seeing as the lythological covering layers and the steepness of the slopes, without appropriate containment works on the cuttings, allow a continuous fall of rocks onto the roads surface, which worsens considerably during the rainy season making circulation on these road not compliant to international safety standards.

Figure II - 8: Road that from the Outlet leads to Fofa
Source: photographic documentation of the evaluation team

Figure II- 9: Rockfall on the roadway
Source: photographic documentation of the evaluation team

From the power station, along the roads built as part of the GGII project one can reach all the parts of the plant located in the area of the Outlet (base camp, inspection tunnel, stabilization shaft, valve building) and then one can turn down along the road, also built as part of the GGII project, that from the plant leads to the town of Fofa (2,580 m above sea level). From Fofa one can take the existing road as far as the village of Saja from where one can turn onto the state road as far as Sokoru which is only a few kilometres from the Intake structures.

6.2 Intake Area

The works built in the Intake area are:

- De-silting
- The storage weir
- The intake tower

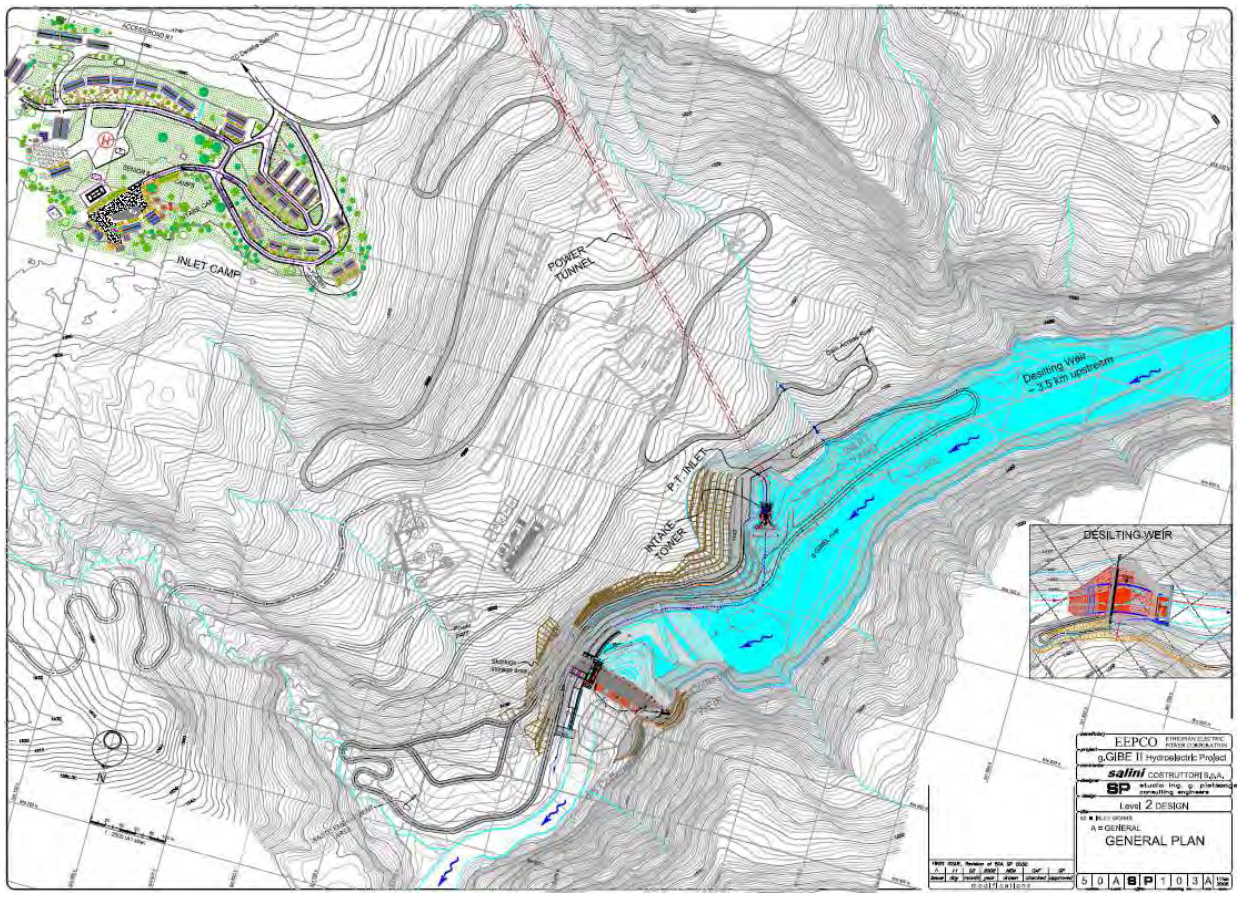


Figure II -10: Intake Area
Source: *Salini Project*

6.2.1 De-silting

This is the first spillway on the Gilgel Gibe River located about 1 km upstream of the water outlet point of the GGI power plant. It is conceived as an embankment 16 m. high and 201 m. long. It's purpose is to hold back the sediments from the nearby drainage area, as well as increasing the area for the disposal of the excavation material produced by the intake works. To ensure the plant is operational for the 50 years envisioned in the project it will be necessary to remove a volume of approx. 150,000 m^3 from the upstream basin every four years.

*6.2.2 **The storage weir***

The main weir on the Gilgel Gibe river is a massive concrete structure 33 m. high. It's purpose is to create an accumulation basin with a useful volume of1.3 Mm^3 in order to be able to control the flow into the tunnel. The barrier does in any case guarantee a constant outflow into the Gigel Gibe of 2 m^3/sec.

The barrier can be inspected along a service tunnel which runs the length of the structure which however, at the time of the visit of the Evaluation Team could not be inspected due to a failure in the lighting system.

Figure II -11: Weir on the Gilgel Gibe River
Source: photographic documentation of the evaluation team

The steeper sector of the slope on the left side of the Weir, due to the presence of an extensive and significant cover layer comprised of the alteration products of the underlying basalts which are columnar in places, dating back to the Omo Formation, mixed with silt and clay colluvial materials, has been reshaped by extensive terracing, that has set back the summit of the hill, reduced its overall steepness and at the same time removed the degraded material.

The entire terraced area has been subjected to a spritz beton treatment designed to stabilize it and inhibit the alteration and surface run off of the surface layer of the rocks left bear of vegetation, phenomena that are very active and aggressive in subtropical climates with intense rainfall.

The lower terraced area has been further stabilized with a series of holes and the injection of low pressure cement compounds, designed to consolidate the fractured and cataclastic materials.

Figure II - 12: "Weir" on the Gilgel Gibe and slope stabilization
Source: Salini photographic doc.

For the plant to operate the basin surface water height must be at least 1,424 m above sea level with a warning level set at 1,432 m above sea level.

*6.2.3 **The intake tower***

These are the works designed to empty the accumulation basin waters into the tunnel. It is a concrete structure 35 m. high, 27 m. wide and 42 m. long. The tunnel connector pipe is 6.5 m. in diameter and is equipped with roller gates and stop logs used to close the tunnel for maintenance purposes. The main purpose of these works is to feed the hydraulic tunnel (100 m^3/sec) with a water head capable of avoiding air entry with negligible water loss.

6.3 Hydraulic tunnel

The excavation of the headrace tunnel, which represents the main hydraulic works and the major undertaking involved in the Gilgel Gibe II project, was achieved using two TBMs (Tunnel Boring Machine), with double shields, specifically designed for the perforations involved in this project.

Each TBM is comprised of a 7.0 m diameter rotating head equipped with cutting disks made out of a steel alloy specially produced for the lythologies involved. A double shield, meaning

two steel cylinders located right behind the rotating head and designed to support the first 12 m. stretch of tunnel just excavated and protect all of the machine's vital organs. Inside the front cylinder there is a chamber which receives all the excavated material, which is collected and lifted by a feed screw and placed on a conveyor belt which conveys it towards the outside of the tunnel. Further back there is the tunnel lining positioning system. The tunnel linings sections are made of prefabricated reinforced concrete and are 1.6 m long, 0.25 m thick and have a final internal diameter of 6.3 m.

Figure II - 13: TBM 2. Outlet side works start up
Source: doc. photo Salini

The machine advances under the thrust of hydraulic rams positioned on the casing, which keep the shield constantly in contact with the excavation face with a pressure calibrated based on the rock to be excavated. The total length of the assembly of each of the two TBMs is 220m.

The precast segments, the personnel and all the equipment and consumables are moved along inside the tunnel and up to the excavation face by means of trucks on rails.

The expected length of the tunnel was 25,485 m. which had to be dug out completely between July 2005 and May 2007. More specifically, the TMB 1 was expected to excavate12,058 m, with an expected progress of 600 m/month, while the TBM2 was expected to excavate 13,192 m with an expected progress of 750 m/month.

In actual fact, besides the tunnel collapse due to mud intrusion, which halted the progress of TMB 1 from October 2006 to August 2008, the actual performance of both the TBM machines was less than expected, with TBM1 covering approx. 250 m/month and 510 m/month for TBM 2. In total TBM 1 excavated from the Inlet side up to Chainage 8 + 513, while TBM 2 from the Outlet side excavated 17 + 347 m.

The geological section of the tunnel starting from the Intake side is comprised of lythologies belonging to the Omo Formation with a predominance of basalts as far as CH. 11,000 with lesser amounts of trachytes which continue as far as Ch. 13+500 approx. More specifically,

we are looking at a series of Basalt flows which have flowed one on top of the other, from the ridge emission centres, occasionally in quick succession, at times with time intervals that have allowed the formation of at times extensive alteration materials and/or interspersed with linear lava flows with a more acid chemical make up such as Trachytes and to a lesser extent intrusions of Syenites.

Beyond Ch. 13+500 one encounters trachytes and traces of rhyolites attributable to the Jimma Volcanic Formation, along with basalt dikes and intervals of ashes and tufa. Beyond Ch. 15+000, acid lavas prevail with the Rhyolites of the Jimma Volcanic Formation, interrupted by frequent basalt dikes and dolerites, trachyte stretches, often with breccia and many intercalations of ashes and tufa even of considerable thickness. An extensive dolerite dike is located approximately between Ch. 20+200 ÷ Ch.21.100 and syenite intrusions between Ch. 23+500 ÷ Ch.24.500.

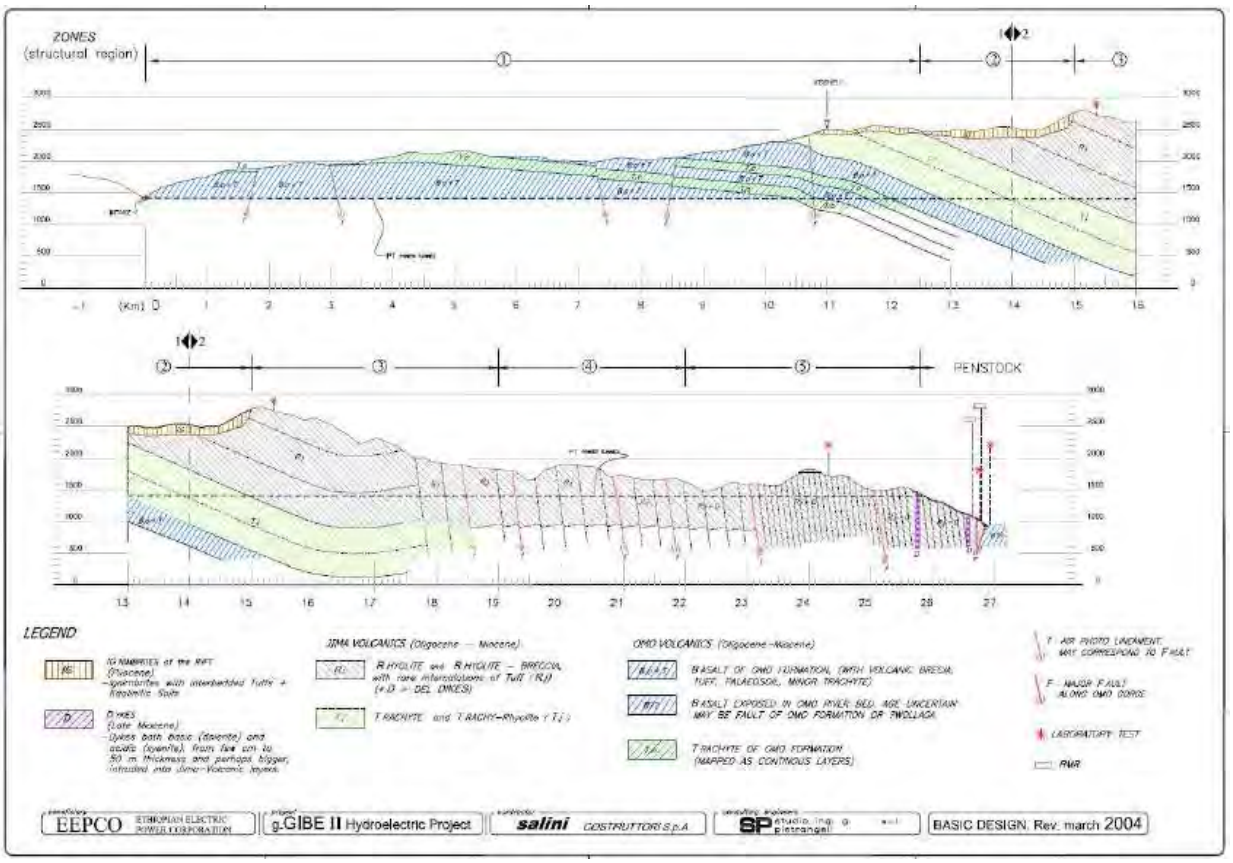


Figure II - 14: Expected tunnel geological section, March 2004
Source: SELI

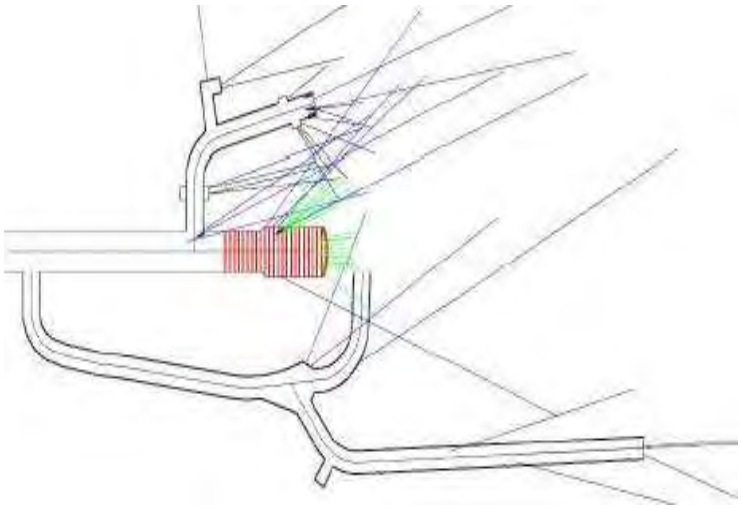
The entire tunnel length has been affected by intense and currently active tectonic activity, with primary fractures systems for the must part involving sub-vertical immersion and secondary fractures with varied immersion, featuring strong rejects, with broad strips comprised of heavily fractured friction materials, cataclasts and thick fillings of fine sandy loam materials.

The lythologies described, predominantly effusive, partially fractured through cooling, have then been subjected to the major tectonic stress which takes place in this area, which have led to the formation of extensive strips of mylonites, subsequently attacked even chemically by the waters, often at high temperature, that find their preferred flow path among the faults and fractures. The final resulting product is often a 'breccia' mixed with fine sandy loam, which prevails where the shear stress and the dissolving action of the surface run off has been greatest.

The collapse of the tunnel at Ch. 4+195 which blocked the TBM 1 for approx. 22 months was due to the influx of a vast quantity of fine sandy loam material carried by water at a pressure of over 40 bar and a temperature of 40°C.

The TBM was pushed back by over 60 cm and sideways to the right by over 40 cm, with damage to the shield and to 7 precast elements that had already been installed.

In order to free the wedged TBM, after having performed a number of exploration holes on the face and on the side of the tunnel to verify the properties and the thickness of the dissolved materials, an exploration tunnel was excavated to the left of the main one, and then in June 2007 three controlled mud releases where performed accounting for approx. 3,500 m^3, in order to reduce the water pressure in the fault area. A further pressure reduction was performed by perforations of the face in August of 2007.



Once the mud that had penetrated into the tunnel had been removed, it was then decided that a new exploration tunnel be built on the right side of the main tunnel, from which, by means of exploratory borings, the condition of the face could constantly be monitored. The exploration tunnel therefore bypassed the excavation face and then the fault area in December 2007.

Figure II- 15: Diagram of exploration tunnels
Source: SELI

At this point the decision was taken to reverse the TBM and resume the excavation of the tunnel from Ch. 3+805, along a new alignment to the right of the main tunnel, creating a bypass, with the old tunnel being filled with concrete.

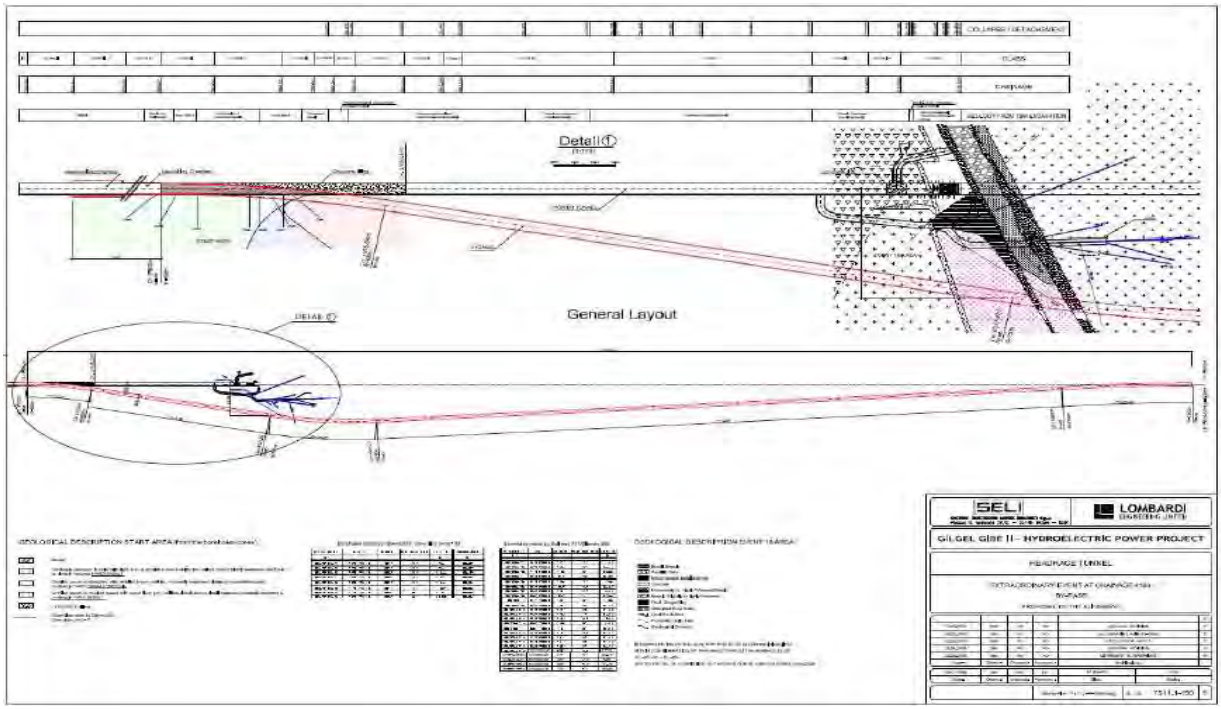


Figure II- 16: Bypass diagram Chainage 4+196
Source: SELI

The reassembled and modified TBM set on along the new alignment on 1 August 2008 clearing the fault area in October 2008 and the tunnel was finished on 6 June 2009 when the two TMBs met at Ch. 8+520,8. (*source SELI*)

Figure II - 17: Breaking the final tunnel diaphragm 06.2009
Source: doc. photo Salini

During the Evaluation Team's supervisory Mission in the Outlet area, inside the side maintenance access tunnel of the "Headrace Tunnel", many white salt incrustations were seen oozing out of the concrete cracks or through the joints between different lining elements so much so that in some cases they formed small salt stalactites clinking to the roof lining.

Figure II -18: Outlet area service tunnel (Adit 26)
Source: photographic documentation of the evaluation team

The rusting of the rails inside the service tunnel in any case seemed to point to a very aggressive environment, in all likelihood due to the chemical properties and the temperature of the seepage waters.

Seepage and salt incrustations identical to those found in tunnel were also identified along the terracing stabilized with Spritz beton on the slope above the "Surge shaft", which would seem to indicate that the circulating waters have a tendency to attack cement.

Figure II - 19: "Surge shaft" *slope with salt incrustations*
Source: photographic documentation of the evaluation team

At the end of the tunnel (80 m upstream of the outlet) a vertical shaft has been installed with an internal diameter of 18 m (Surge shaft) lined in concrete (excavation diameter of 20 m) and 95 m. high. The purpose of this well is to allow the dampening of the transitory hydraulic phenomena connected with the start up and stoppage of the turbines.

6.4 Output Area

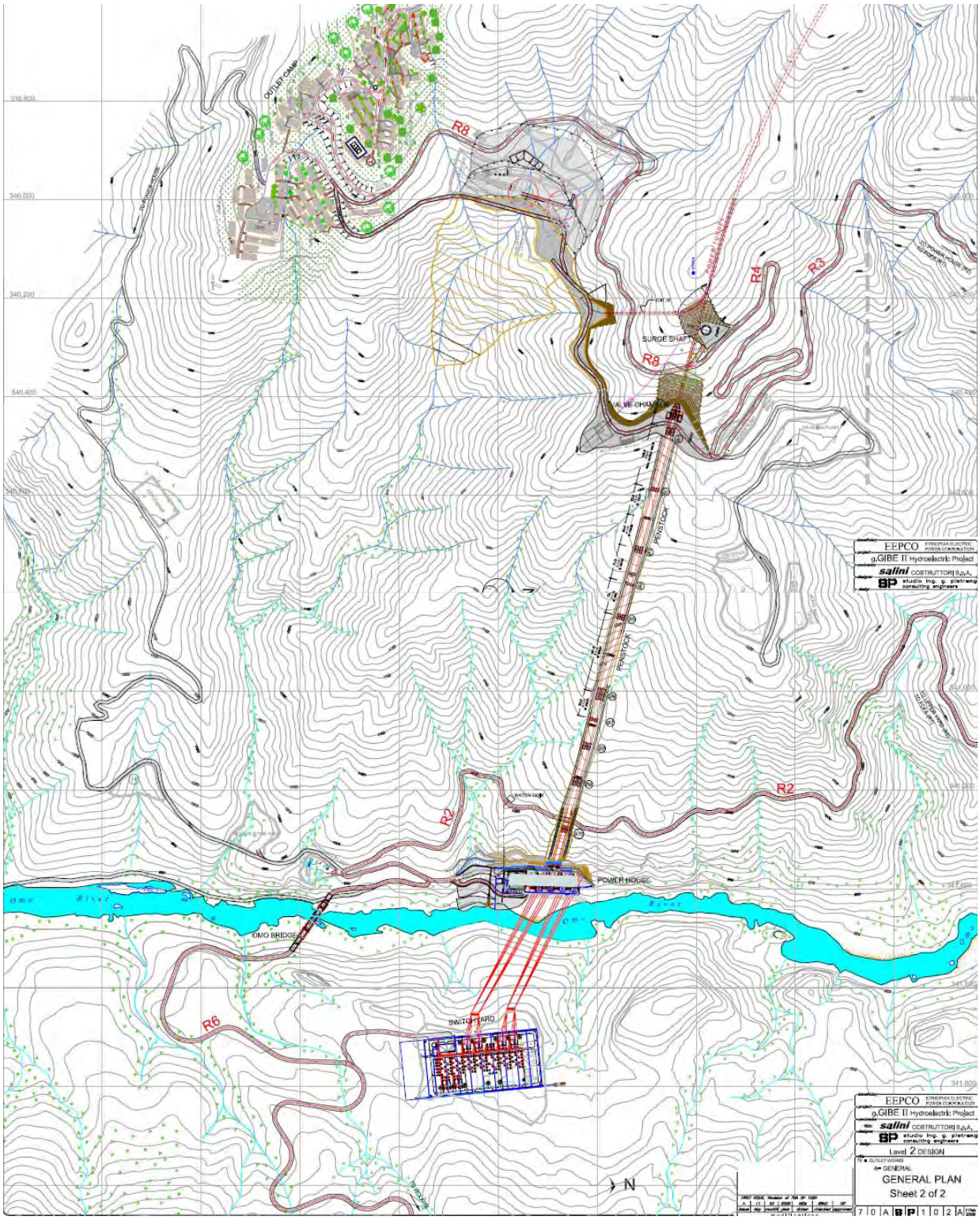


Figure II - 20: Output Area
Source: Salini Project

At the end of the tunnel stands the building (Figure II - 21) that houses the gravity shut-off valve (Figure II - 22) of the penstocks that receive the water from the hydraulic tunnel through the special deviation system.

Figure II - 21: Valve chambre
Source: photographic documentation of the evaluation team

Figure II - 22: Penstock closing valve
Source: photographic documentation of the evaluation team

A diesel vehicle is also housed in this building (Figure II - 23) and used for the inspection of the hydraulic tunnel. It has been specifically designed with its wheel base sized according to the cross section of the tunnel itself.

Figure II - 23: Hydraulic tunnel inspection vehicle
Source: photographic documentation of the evaluation team

6.4.1 *Penstocks*

The two penstocks that leave the building placed at the end of the hydraulic tunnel are approx. 1.2 km long with an internal diameter of between 2.8 and 3.6 m and they cover a total drop of 457 m. The two steel pipes follow the contours of the existing slope without further excavation and are anchored to the ground in 16 points each.

Figure II - 24: Penstocks
Source photographic documentation of the evaluation team

6.4.2 *Powerhouse*

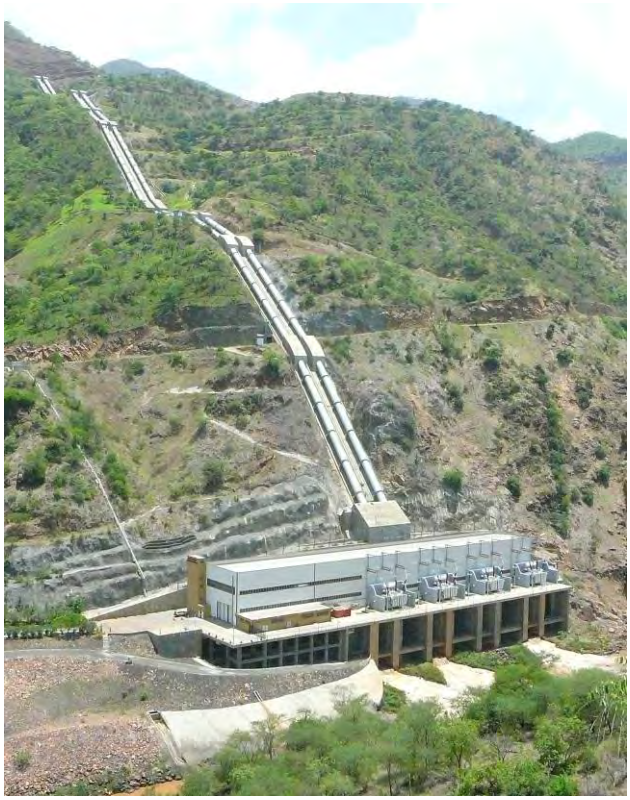


Figure II - 25: Electrical Powerhouse
Source: photographic documentation of the evaluation team

6.4.2.1 The Powerhouse Building

The powerhouse building has a part outside ground with a metal structure and a concrete structure below ground which houses the turbines. The building is 36 m high in total and its plan dimensions are 44x136 m.

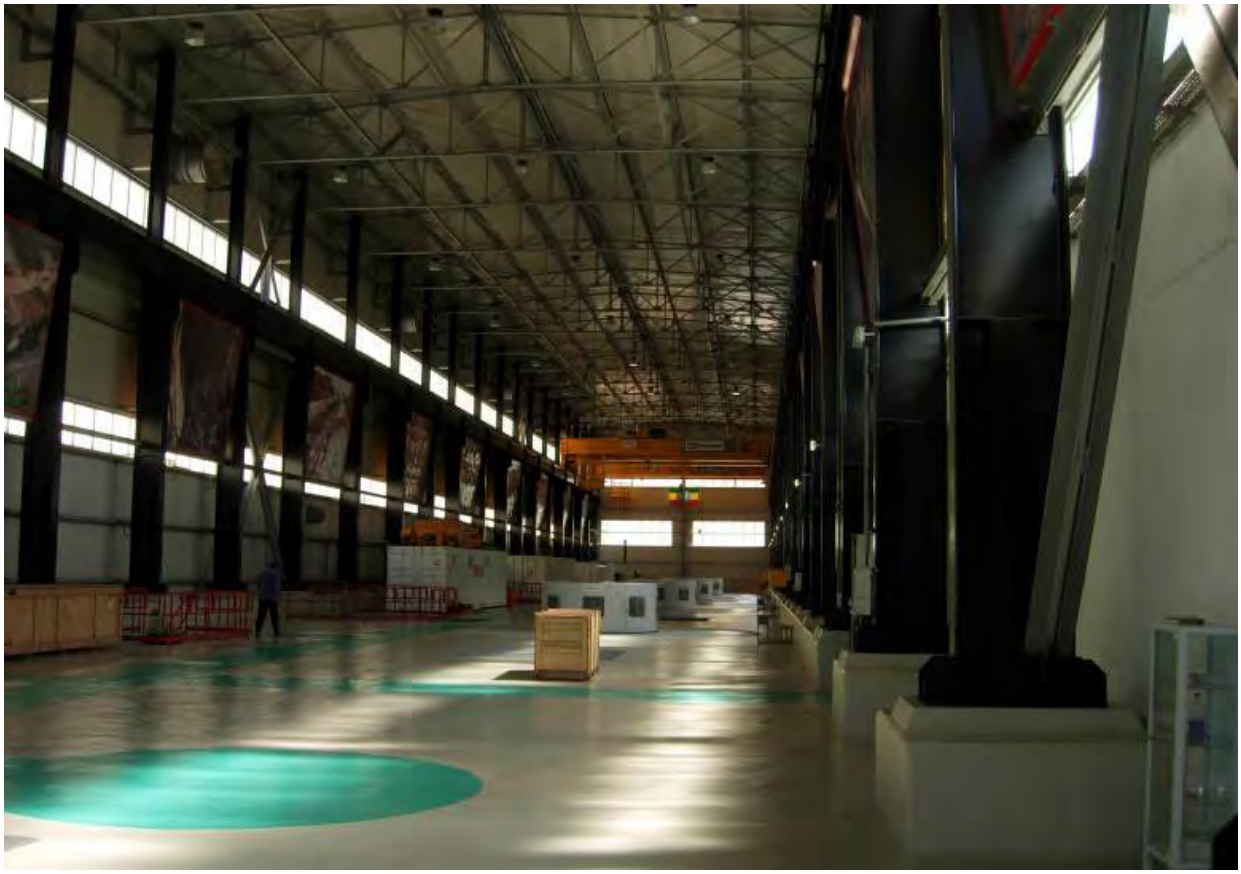


Figure II- 26: Interior of the elevated part
Source: photographic documentation of the evaluation team

The above ground part of the building houses the offices, the warehouses for spare part storage, the workshops and a large room equipped with two travelling cranes lifting 120t and 16t respectively where one can dismantle and move the turbines and all electromechanical machinery.

The above ground area also houses the control rooms from where one can control the level of the intake reservoirs, all the flow control valves, all the control parameters (pressures and temperatures) of the turbines and generators as well as all the emergency systems.

Beneath the steel warehouse there are three levels built out of reinforced concrete which house the turbines, the generators, the emergency systems and electromechanical equipment.

6.4.2.2 Electromechanical works

The water flowing out of each of the two penstocks (approx. 50 m^3/sec) is divided into two flows of approx. 25 m^3/sec which pass through the four main valves (MIV – Main Inlet Valve - Figure II - 27) which channel the flow into the turbines. These 1.9m diameter spherical valves are operated by two high oil pressure servo motors (60 bar standard operating oil pressure).

The turbines are vertical axis Pelton turbines with 6 nozzles whose main technical specifications are detailed in Table II - 15.

	Minimum	Normal	Maximum
Load	462 m	485 m	495 m
Power	102 MW	107 MW	108.6 MW
Flow rate	24,710 m^3/sec	24,531 m^3/sec	24,538 m^3/sec
Nominal Speed	333.33 MW		
Maximum Speed	603 rpm		
Rotation direction	Clockwise (seen from above)		

Table II - 15: Pelton turbine technical specifications
Source: Voith-Simens plaque installed on the turbines

The turbines are equipped with a system to collect the oils (Figure II - 28) that evaporate due to the high pressures they are subjected to.

Figure II - 27: Main Inlet Valve
Source: photographic documentation of the evaluation tea

Figure II - 28: Oil recovery system
Source: photographic documentation of the evaluation team

A generator is installed on each turbine which consists of a three-phase synchronous machine with 18 poles (frequency of 50 HZ) and a power rating of 125 MVA. The generator produces electrical energy as a proportion of the water flow that passes through the turbines and depends on the electrical demand of the system. The generators are equipped with a carbon dioxide fire fighting system (Figure II - 29).

The 15kV electrical production is lifted to 400 kV for transportation thanks to transformers placed in conjunction with each generator and located outside the building (Figure II - 30). All transformers are separated by a firewall and are equipped with an oil recovery system and a water fire system.

Figure II - 29: CO_2 Fire system
Source: photographic documentation of the evaluation team

Figure II - 30: 15/400 kV transformers
Source: photographic documentation of the evaluation team

6.4.3 ***Switchyard***

Figure II - 31: Switchyard
Source: photographic documentation of the evaluation team

The Gilgel Gibe II hydroelectric power plant is connected to the EEPCo's national grid via an switchyard (400 kV) built on the right bank of the Omo River. This switchyard covers an area of 240x120 m^2. Two 400 kV lines leave this substation, one of which reaches the GGI substation, 30 km away, and the other the Sebeta substation, near Addis Abeba, approx. 185 km away.

PART III:

EVALUATION QUESTIONS

INDEX

1. A RELEVANT AND SIGNIFICANT PROJECT FOR ETHIOPIAN DEVELOPMENT

The GGII operation can be considered as highly most relevant and significant for the social and economic development in Ethiopia.

An initial evaluation analysis perspective concerns the relevance criterion, according to the definition of the MV operating manual of the Ministry of Foreign Affairs[1], "*The degree to which the APS satisfies the coherence, priorities and the policies of the receivers, the beneficiary and the donor*". In particular, as summed up in the MAE document, the relevance analysis measures on the one hand the intensity of the relationship between the initiative objectives (general and specific) and the needs of the community involved and on the other hand the objectives of other development policies/programmes.

To obtain an overall evaluation on the relevance of the GGII operation a few evaluation questions have been prepared which aim to verify the coherence of the project compared to the objectives of the Italian and European cooperation policies and, generally speaking, compliance with the millennium goals pursued by the international community.

Among the aspects that have been investigated, particular attention has been paid to the coherence and correspondence of the operation to the Ethiopian development policies and in particular to the poverty reduction policies outlined in the official documents and by the local community.

From a strategic standpoint, as far as the results and the effect of the operation are concerned, the relevance analysis has concerned the exploitation and promotion of the national hydroelectric potential, the expansion of the energy export capacity and the contribution of the operation to Ethiopia's energy independence.

The evaluation analysis has been carried out during the desk phase investigation involving the examination of the available documentation and interviews with the persons responsible in Rome at the Ministry of Foreign Affairs. This first phase was followed by specific in depth evaluations performed by the Evaluation Team during the course of their field mission in Ethiopia in May of 2012. In particular, we here refer to meetings with the representatives of: UTL, EU delegation, World Bank, UNDP, and for the Ethiopian Government the contact person of the Ministry of Finance and the Ministry for Energy and Water. The outcome of the documentary analysis and the field interviews is reported below for each of the evaluation questions. The detailed indicators and the performance achievements are listed in the annex.

More specifically the evaluation carried out on project relevance focused on the following two main issues:

- The internal and external coherence of the operation compared to international co-operation and Ethiopian development policies.
- To what extent the co-operation investment has helped in the exploitation of Ethiopia's electrical potential?

Each of these two main issues has thus been developed when answering the specific evaluation questions, the detailed answers to which are provided below.

[1] Ministry of Foreign Affairs - General Directorate for Development Cooperation. MAE-DGCS, *Operating Manual for Monitoring and evaluation of Development Cooperation initiatives,* April 2002

1.1 Does the internal and external coherence of the operation comply with international co-operation policies and Ethiopian development policies ?

The documentary analysis and the field investigation have enables us to express a positive evaluation assessment on the relevance of the project in terms of external coherence with international cooperation policies and internal coherence with Ethiopian development policies.

The investigation procedure involved five evaluation questions, three of which were designed to verify correspondence of the objectives with Italian and European Commission cooperation policies, and in a broader context, with international community policies. To verify internal coherence the investigation has taken a close look at how the initiative related to Ethiopian development policies and the expectations of the population including the poorer sections.

More specifically, the evaluation questions that have enables us to pass judgement on this aspect are:

- RR1 Are the objectives pursued by the evaluated initiative in line with Italian Cooperation policies ?
- RR2 Are the objectives pursued with this initiative and now under evaluation in line with Ethiopian development policies and Ethiopia's Poverty Reduction Strategy Paper in particular ?
- RR3 Are the objectives being pursued in line with the development expectations of the Ethiopian population, particularly the poorer sections, as expressed by the more representative sections of the local society (democratic ownership)?
- RR4 Are the objectives pursued by this initiative and currently under evaluation in line with the cooperation policies detailed in the official documents of the European Commission?
- RR5 Are the development objectives pursued and currently under evaluation in line with the objectives agreed by the International Community and the Millennium Development Goals in particular?

RR1 Are the objectives pursued by the evaluated initiative in line with Italian Cooperation policies ?

The first answers to this evaluation question, based on MAE and DGCS statements, provide positive feedback regarding the initiative's compliance with Italian Cooperation policies. The meeting with the UTL in Addis Ababa and more in general the results of the missions have essentially confirmed this coherence. The answer rating to the evaluation question is medium - high (MA)

In general terms, the Italian cooperation with developing countries is governed by Law n. 49 of 26/02/1987 and its implementation regulations. Articles 1 (Purpose) and 2 (Cooperation activities) outline the basic principles governing the initiatives promoted by the Italian Cooperation. The development cooperation is an integral part of Italy's foreign policy and pursues the objective of solidarity between peoples and the full implementation of fundamental human rights, inspired by the principles ratified by the United Nations and in the EEC ACP agreements .

From a documentary point of view, the correspondence of the GGII project with the Italian Cooperation policies lies in the Cooperation Agreement signed in November of 2004 with the

Ethiopian Government, which identifies - among others - the sectors of energy and water resources.

In specific terms:

- Ethiopia is one of the priority countries in the Italian Cooperation strategy and the beneficiary of a substantial share of Italian support.
- The start of cooperation relations with Ethiopia began back in1976, the year of the signing of the first Bilateral Agreement for the implementation of development projects.
- The current framework of Italian Cooperation with Ethiopia is based on the bilateral agreements: "Italian-Ethiopian Country Program 1999-2001" and the Cooperation Agreement of November 2004 which identified four priority sectors: food safety and rural development; private sector; energy, water resources.
- Italy is a partner in Rounds I, II and IV of the Global Fund to combat AIDS, malaria and Tuberculosis.
- In 2005 Italy and Ethiopia signed a Bilateral Agreement for final debt cancellation, which erases the entire Ethiopian foreign debt up until 20 June 1999.
- Over the course of the last three year period (2009-2011), the resources allocated to the country by the cooperation have amounted to 47 million Euros. In line with the Ethiopian Government objectives as outlined in the Growth and Transformation Plan (GTP), the Italian Cooperation has concentrated its activities in the following priority areas: Education, Health, Rural Development, Energy, Water and Environmental Hygiene.
- Even the future Italian Cooperation Country Program for the period 2012-2014 will be coherent with Ethiopian national priorities, in line with the Government objectives and closely coordinated with the other donors.

As an integration to the answer to the evaluation question one may also add:

- The objectives pursued by the initiative are coherent with those of the Italian Cooperation;
- The Italian Cooperation policies have not backed such considerable investment volumes for other projects;
- Up until now, the Italian exchange with Ethiopia was not so proportionally significant;
- The GGII operation is at least to some extent "commercial" and the objectives pursued (exports) are not necessarily included in Italian Cooperation policies. For other projects currently in the development stage, as is the case of GGIII and the Millennium Renaissance Dam, Ethiopia has called on local resources and funds or on initiatives promoted by the People's Republic of China.

RR2 Are the objectives pursued with this initiative and currently being evaluated in line with Ethiopian development policies and Ethiopia's Poverty Reduction Strategy Paper in particular ?

There is full correspondence - and a high rating (A) - between the objectives pursued by the evaluated initiative and Ethiopian Development policies, even with reference to the Poverty Reduction Strategy Paper and the recent "Growth and Transformation Plan" (GTP). This aspect had already been noted by the evaluator during the desk analysis of the documentation and was underlined by all people interviewed in the public sector, the private sector and donors met during the course of the mission, who were all asked a specific evaluation question.

The Ethiopian Government had developed the Poverty Reduction Program (PRSP) I and II, (which took place over the years 2002 - 2005 and 2006 - 2010, respectively). Donor governments and international organisations contribute to the implementation of this program. Reduction of Poverty is the main objective of PRSP. The last version of the document "Plan for Accelerated and Sustained Development to End Poverty" (PASDEP) covers five years 2006 - 2012 and foresees 8 objectives, among which in particular: Objective 1. A strong impulse towards development acceleration: recognising economic growth as the only sustainable way to leave poverty behind; Objective 5. Infrastructure Development: the PASDEP envisions the development of the road and telecommunication networks, as well as an improved use of water and energy resources in the country.

A more recent reference which bears witness to the coherence between objectives foreseen by the GGII initiative and the Ethiopian development policies can be read in the document of the Ministry of Finance and Economic Growth in the "Growth and Transformation Plan" (GTP) relative to the 2010/11 - 2014/2015 five year period[2]. This document explicitly states that the removal of poverty constitutes the "main development agenda" of the Ethiopian Government: all development policies and strategies are therefore focused on this purpose. The document expressly mentions the issues of: agricultural and rural development; industry; infrastructures; social and human development; good governance and democratisation.

The GTP reports on the results of the previous PASDEP and, for the energy sector, direct reference is made to the GGII initiative. This initiative, along with the Tekeze and Tana Beles projects, have strongly enhanced Ethiopia's energy generation capacity[3]. In the long term, the GTP assigns a central role to infrastructural development (such as the energy sub-sector) as a major factor in economic growth, the creation of employment, social well-being and the expansion of the industrial sector.

For the energy sub-sector in particular, the GTP provides a significant picture of the relevance it assigns to it and particularly stresses: strategic indications (development of renewable energies; extension of energy infrastructures; creation of institutional capacities), objectives (balance the growing energy demands) and the most relevant targets for the five year Plan[4].

[2] FDRE - Ministry of Finance and Economic Development "*Growth and Transformation Plan, 2010/11-2014/15*" November 2010

[3] See GTP, Chapter 2

[4] See GTP, Chapter 5

GTP: Target for the Energy sub-sector	2009/10	2014/15
1 Generation capacity of hydro-electrical plants (MW)	2,000	10,000
2 Total length of distribution lines (km)	126,038	258,000
3 Total length of the rehabilitated distribution lines (km)	450	8,130
Reduction of power wastage (%)	11.5	5.6
5 Number of consumers with access to electricity	2,000,000	4,000,000
6 Electrical service coverage (%)	41	75
7 Underground distribution system (km)	97	150

Table III - 1: Target for the Energy sub-sector
Source: Growth and Transformation Plan 2010/11-2014/15

In terms of strategic relevance, the Director of bilateral cooperation at the Ministry of Finance underlined how energy is one of the country's main priorities and Ethiopia has very much appreciated the Italian Cooperation involvement for GGII. The resources allocated are coherent with the development plan and are earmarked for agriculture and rural development. An increasing number of new activities are growing up in rural areas, industry is growing and agriculture is exporting its products. *The nation is growing at rate of 11% per year.* In order to attract investment however there must be an infrastructure in place.

The project is fully coherent and strictly connected to the "poverty reduction strategy" as well as a rural area modernisation scenario. Everyone (management, operators and their families) *has a positive feeling.*

Even during the course of the meeting with the Ethiopian Economics Association (EEA) the Principal Researcher reiterated that electricity was of strategic importance for the development of Ethiopia and that the GGII initiative was not only relevant but necessary to provide energy for economic growth. GGII contributes to the country's transformation and to its economy, favouring the manufacturing and industrial sectors, and particularly the development and enhancement of railways.

In strategic terms, Ethiopia needs more energy from different sources, as has been highlighted in the EEA annual reports and particularly in the *Development, Prospects and Challenges of the Energy Sector in Ethiopia* which was collected and examined during the course of the mission[5]. Currently there is plenty of demand for electricity but the system is still not sufficient. There are many power failures which do not guarantee full capacity to companies. In general energy terms Ethiopia imports more than it exports.

For the UTL contact persons in Addis Ababa, the project was very important for the Italian Cooperation and the GGII plant has played a major part in satisfying the demand for electrical energy in the country and without it the country would have been left on its own for a long time to come.

The EthGov had correctly taken into consideration the need to increase the country's electrical capacity to answer the needs of the population. This urgent need was evident given the frequent electrical power failures that had been experienced before the initiative was put in

[5] EEA "Report on the Ethiopian Economy: Development, Prospects and Challenges of the Energy Sector in Ethiopia" December 2009 and EEA "Report on the Ethiopian Economy: Financial Sector Development in Ethiopia: Performance, Challenges and Policy Issues" June 2011.

place (and which could have had an influence on the reduction of the GDP by as much as 1%). Now the system certainly works a great deal better and even the local businesses are satisfied. These aspects are also vouched for by the local press. The strategic choice of exploiting the hydro-electrical potential is correct and relevant even relative to the possibility of creating an increase in currency reserves through exports.

Aspects of the relevance and particularly the coherence of the GGII operation with Ethiopian development guidelines were also confirmed in the meetings with the EU delegation, the UNDP and the World Bank[6].

During the course of a focus group the EEPCo's representatives underlined a very strongly felt need for this type of operation, particularly seeing as the project area was particularly suited. The objective was to distribute the energy produced to the majority of the population. The EthGov has specific development policies for the poorer areas: on the one hand the Millennium Goals (education, health, etc...) which without energy cannot be met, on the other a substantial reduction of poverty where energy can play a major role in many sectors and particularly in the rural world. *If we now removed the GGII energy we'd see how much the system would suffer, that's how important GGII is.*

For the EEPCo. representatives "the main objective is the local use and development". At present the energy contribution is proportional to what may be internally distributed. We nevertheless have a great potential, considering the extra capacity of the future plants, in terms of export value".

RR3 Are the objectives being pursued in line with the development expectations of the Ethiopian population, particularly the poorer sections, as expressed by the more representative sections of the local society (democratic ownership)?

In general terms is there correspondence between the objectives pursued by the initiative and the development expectations of the Ethiopian population also mentioned in the previously quoted "Plan for Accelerated and Sustained Development to End Poverty" (PASDEP). The field activity was designed among other things to verify the expectations with the most significant parts of the local society and also directly the poorer sections. The MAE Guidelines on democratic ownership (2009) lead one to express an essentially positive evaluation, bearing in mind the social and political condition of Ethiopia. The answer rating to the evaluation question is medium - high (MA).

The persons in the public and private sector we met and interviewed in Addis Ababa have all very pronouncedly reiterated the positive correspondence between the GGII initiative objectives and their development expectations for the Ethiopian population (of course there is correspondence between the initiative objectives and the expectations of the more better off sections of the population). During the mission phase in the areas around the GGII site, the interpretation of data was much more complex.

Out of the focus groups and interviews performed by the Evaluation Team and the Communities of Fofa and Soukoru it was not possible to verify the correspondence between the initiative's objectives and the development expectations of the poorer sections of the population.

The initiative objectives were of a much "higher and more strategic" nature that the immediate and urgent needs of the poorer populations living in the two places. In terms of relevance for

[6] The World Bank had also been asked to take part in the funding of the GGII project. This funding was not granted because there had not been a study of environmental impact (ecological plan)

the local population, even in its poorer sections, the immediate aspect concerned the possibility of having a working relationship with the contractor both during the construction phase as well as in terms of exploitation of the acquired abilities and skills once the project was completed. Another issue that certain reliable local representatives brought up concerned a few aspects of local development in a framework which includes positive but also negative factors. Not immediately nor directly will the poorer sections of the populations be able to obtain a direct benefit from the initiative.

In any case, the evaluation question refers to development expectations of the local population and the effects of the initiative. Moreover, despite the efforts of the Evaluation Team to arrange meetings even with the poorer members of the population, the visits to Fofa and Soukoru were essentially "guided" towards interviewees selected by the political and administrative representatives of the two woredas.

Going back to the MAE reference to democratic ownership, the Steering Committee of the Development Cooperation, in the meeting held on 8 November 2010 voted for the approval of the *Italian Cooperation Guidelines for Democratic Ownership.* These Guidelines include the objectives, the recommendations, and the operational implementation procedures. The document was drawn up in line with the the provisions of the "DAC Peer Review of Italy" of 2009[7].

From the examination of the document a few points can be underlined that could be referred to the GGII initiative seeing as among other things it is a project begun in 2004 with Italian funding.

Ownership	Capacity of the beneficiary countries to exercise control over the active side of the identification, decision, implementation end evaluation processes of its own development policies
Democratic Ownership	The Democratic Ownership emphasizes the role and the participation of all social and political stakeholders who guarantee a democratic process that may lead to the improvement of the citizens' condition.
Civil society	The Civil Society refers to that broad slice of the community set aside from the state and from the market created by individuals and groups that are unaffected by outside pressures.
Accountability	The donor countries and the beneficiary countries must be more accountable (responsible) both mutually and with regard to their respective people, regarding the use of the resources dedicated to development and the results obtained.
Development effectiveness	Not only must aid be effective, but in a broader sense, so should the entire (global) process. Development effectiveness implies and promotes long term change that takes stock of the deep reasons for poverty and inequality.
Partnership	The key to democratic ownership reinforcement is partnership, meaning the interdependent relationship between the stakeholders of the North and the South of the world based on the recognition and respect for mutual interests
Conditionality	The nature of the conditionality must reinforce the ownership of the partner company and ensure that donor and partner companies find agreement to gradually remove the conditions connected to the economic policies.

Table III - 2: Democratic ownership
Source: Evaluator elaboration from MAE Guidelines

[7] See: http://www.cooperazioneallosviluppo.esteri.it/pdgcs/documentazione/PubblicazioniTrattati/2010-11-29_LineeGuidaDemocraticOwnership.pdf

A few considerations on the GGII initiative can be drawn based on the Democratic Ownership Guidelines adopted by MAE:

- in terms of ownership, right from the outset of the operation Ethiopia has exercised control and has been an active party to the identification, decision and implementation process of the development policy connected to the GGII initiative;
- the democratic ownership is still an unclear dimension that certainly is not represented in the Ethiopian rural communities;
- as expressly indicated in the MAE Guidelines on Democratic Ownership the civil society is missing "the recognition and legitimating on behalf of local authorities, particularly in fragile countries ". This happens in Ethiopia as well;
- in terms of accountability the two countries have completed the initiative showing a high level of responsibility and mutual respect, even in their efforts to communicate the results achieved (Ethiopia) and the resources used (ex-post MAE evaluation);
- for the *development effectiveness,* the GGII initiative implies and promotes a long term change that also takes into consideration the deep rooted causes for poverty and inequality;
- as far as *partnership* is concerned, both the two countries and the individual stakeholders involved have carried the project through with mutual acknowledgement and respect;
- in the future, one may progressively remove the *conditionalities* linked to the economic policies of the two countries.

RR4 Are the objectives pursued by this initiative and now under evaluation in line with the cooperation policies detailed in the official documents of the European Commission?

The GGII initiative objectives are coherent with the cooperation policies reported in the official documents of the European Community. The answer rating is medium - high (MA) As a priority for Ethiopia, the European Delegation is under the belief that energy could play a major role and constitute one of the three possible issues in the next 11th European Development Fund 2014-2020 (FES)[8].

In general terms, the GGII objectives match the European Community policies already in the presentation of the *europeaid* site for Ethiopia [9]"If we take into consideration the volume of the population, the economic power and the supply of natural resources, Ethiopia occupies a significant geopolitical position in the Horn of Africa. *The cooperation partnership of the European Commission with Ethiopia was designed to contribute to:*

- *reduction in inequality of regional income;*
- *acceleration of sustainable economic development and regional integration;*
- *reinforce the democratic process so as to reach and maintain peace, safety and economic prosperity in the Horn of Africa.*

The European Consensus on Development, signed on 20 December 2005 has drafted a joint view on development. Today, the primary objective of the European Cooperation policy is the

[9] http://ec.europa.eu/europeaid/where/acp/country-cooperation/ethiopia/ethiopia_en.htm

eradication of poverty in the context of a sustainable development that should include the attainment of the Millennium Objectives. The EC, on 13 October 2011 presented its "Agenda for Change", setting in motion a more strategic approach to poverty reduction. In particular the Agenda foresees among other things: 1. The reduction of poverty in a world undergoing a fast evolution; 3. An inclusive and sustainable growth for human development.

In particular, on point 3.3, on matters of energy, the Agenda suggested that the EU should offer technology, experience and development resources, even on energy safety issues and access to reliable, clean, safe and sustainable energy services.

The Country Strategy Paper signed between the European Commission and Ethiopia on 2 December 2007[10] focuses on three priorities: (i) transportation and regional integration; (ii) rural development and food safety; (iii) macro-economic support and governance. Overall the FES 2008-2013 for Ethiopia has donated 674 million Euros.

In the Country Strategy Paper, the correspondence of the GGII initiative to the European community cooperation policies were made even more explicit in the paragraphs:

- *Water and energy resources* (§ II.1.4.) where it is pointed out that Ethiopia's water resources will be used to develop three times the installed power within five years. The capacity will be increased by moving from the 791 MW existing at the time (2007) to over 2,218 MW, "mainly through small and large hydro-power projects.
- § IV.3.2.5 *Rural electrification (Energy)*, the EIB, Italy and Austria have supported and still support the hydro-power development in Ethiopia by providing strategic consultancy, financial assistance to policy formulation capacity building and system expansion.

During the course of a meeting at the EU delegation it was underlined that energy production is extremely important for Ethiopia and energy in any case is among European Community objectives.

In this context, the European delegation is involved in the *Eastern Africa Power Pool* (EAPP), an organism comprised of 11 East African member countries which is committed to developing common rules for an integrated energy market among the various states involved[11]. In fact, for the purpose of the creation of a market to this end, it is extremely important that agreements are reached between the states involved.

RR5 Are the development objectives pursued and now under evaluation in line with the objectives agreed by the International Community and the Millennium Development Goals in particular?

The development objectives pursued by the Italian cooperation through the GGII initiative are coherent with the Millennium Development Goals (MDG) agreed with the international community and in particular with objective No. 1 *Eradicating extreme poverty and hunger*, No. 7 *Ensuring Environmental Sustainability* and No. 8 *Developing a global partnership for Development.* The answer rating is medium - high (MA).

In September of 2000, with the unanimous approval of the Millennium Declaration, the 191 Heads of State and Government have underwritten a global pact on joint commitment between rich countries and poor countries. From the United National Millennium Declaration came the eight objectives (MDG/OSM) that constitute a planetary pact between rich and poor countries based on the mutual commitment to do all that is necessary to create a safer, more

[10] http://ec.europa.eu/development/icenter/repository/scanned_et_csp10_en.pdf
http://eeas.europa.eu/delegations/ethiopia/eu_ethiopia/political_relations/index_en.htm

[11] See § III-4.2

prosperous and fairer world for everyone. These are the eight crucial objectives that must be achieved by 2015[12].

Following the results of the mission in Ethiopia, it has been possible to verify that the energy sector is fated to become of increasing importance. This makes it foreseeable that Ethiopia should enter into a global partnership.

- Relative to objective 1, the GGII initiative contributes to the creation of a respectable context for the Ethiopian population and indirectly helps to strengthen the welfare, revenue and employment systems.
- As far as objective 7 is concerned, the initiative is coherent with sustainable development principles and fights to tendency to squander environmental resources. Its action includes sectors such as education, health, access to drinking water, all implemented within the framework of GIBE II.
- With regard to objective no. 8, as has been previously mentioned, the initiative contributes to the promotion of a global development partnership for Ethiopia.

The aspects of the GGII initiative that contribute to the Millennium Development Goals are detailed in the box below.

1 Eradicating extreme poverty and hunger

• Halving the percentage of people whose income is under 1 $ a day between 1990 and 2015
• Achieve Decent Employment for Women, Men, and Young People
• Halve the proportion of people who suffer from hunger between 1990 and 2015

7 Ensuring environmental sustainability

• Integrate the principles of sustainable development into country policies and programs; reverse loss of environmental resources
• Reduce biodiversity loss, achieving, by 2010, a significant reduction in the loss rate
• Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation

8 Develop a global partnership for development

• Address the Special Needs of the Least Developed Countries, landlocked developing countries and small island developing States
• Develop an open, rule-based, predictable, non-discriminatory trading and financial system

Table III - 3: Elaborated by MAE,
Source: Development Cooperation site

All the initiatives foreseen by the Italian Cooperation in the "Country Program 2009-2011' have been conceived in collaboration with the Government, in the context of national development strategies, with an eye to the pursuit of the Millennium Development Goals (OSM) and compliance with the Paris/Accra principles.

During the meetings in Ethiopia, it has been possible to ascertain that great attention is paid to the development objectives of the international community (OCSE/DAC) and in particular to

[12] http://www.cooperazioneallosviluppo.esteri.it/pdgcs/italiano/Millennium/Millennium.html

the Millennium Development Goals which constitute a precise general reference. Three interviewees can be quoted here:

- "Only Italy has implemented such a major initiative among the European countries and for a certain period at world level. Compared to the Millennium Development goals the GGII facilitates the implementation of all its actions (poverty, health, etc..) and represents a key issue (Ministry of Finance *Tilahun Tadesse, Head of Bilateral Cooperation).*
- "Energy production is extremely important for Ethiopia and energy in any case falls within the objectives of the European Community. It fully complies with Millennium goals. It is extremely difficult to calculate how much of the GGII production contributes to the reduction of poverty, but it is certainly useful for the country's development (EU delegation).
- "In the last 5 years, compared to the millennium objectives the level of poverty in Ethiopia has dropped (World Bank and EthGov figures). The country's substantial economic growth to which GGII has contributed with an overall increase of the per head income, is one of the factors that has enabled such an improvement". (UTL)

1.2 Does the co-operation investment focus on the exploitation of Ethiopia's electrical potential?

The documentary analysis and the field investigations enabled a positive assessment to be made even in relation to the relevance of the project in terms of the exploitation of the national hydro-electric potential. The evaluation was therefore based on the analysis of the exploitation of the hydro-electric potential in terms of satisfaction of internal energy demands and the capacity to export energy towards bordering countries.

Thus, we evaluated the degree of Ethiopian energy independence.

More specifically, the evaluation questions that have enabled us to pass a judgement on this aspect are:

- RR6 To what extend is the exploitation and development of the national hydro-electric potential promoted within a sustainable environmental framework?
- RR7 To what extent does the objective pursued favour the expansion of the export capability of the national energy sector?
- RR8 To what extent does the objective pursued contribute to Ethiopia's energy independence.

RR6 To what extent is the exploitation and development of the national hydro-electric potential promoted within a sustainable environmental framework?

The GGII project is perfectly in line with the program for the exploitation of the national hydro-electric potential by contributing in a relevant way both now and in the near future to the satisfaction of internal demand for electrical energy. The answer rating is medium - high (MA).

The analysis performed has brought to light that in Ethiopia the average annual growth in electrical energy between 1991 and 2008 has been of over 7%, with a growth varying

between 1% and 15% and that this exploitation and promotion of the hydro-electric potential took place within an environmentally and socially sustainable framework[13].

From the data received from the EEPCo, it turned out that the annual production of electrical energy from hydro-electric plants in the year 2011 amounted to 5,600 GWh[14] and that this production has grown by 34% compared to 2010. The main reason for this increase has to be attributed to the start up of the Gilgel Gibe II plant which currently accounts for 20% of the national electricity production (Table III - 4).

Operating plants	Projects at the building stage	Projects at the drawing board stage
Koka	Ashegoda Wind	Genale VI
T.Abay-I	Gibe III	Chemoga Yeda
Awash II	Grand Renaissance	Halele Werabesa
Awash III	Ganale dawa III	Geba
Finchaa including IVth Unit	Adama wind	Ayisha Wind
Melka Wakena	Thermal	Adama II Wind
Tis Abay II		•Assela Wind
Gilgel gibe I		Debre Birehan Wind
Awash 7 kilo Thermal		Messobo Wind
Kaliti Diesel		Galema wind
Diredawa Diesel		Aluto Geothermal
Tekeze I		
Gilgele gibe II		
Beles		
•Fincha Amerti Neshe		
2097MW	**8374 MW**	**2637MW**

Table III - 4: Main present and future energy plants in Ethiopia
Source: EEPCo

The 20% share compared to the power installed in Ethiopia is below the expectations of the TEE which stated that once commissioned, the installed power of the plant, expected for 2008, should cover 43% of all the Ethiopian electrical generation capacity. This discrepancy is ascribable to the fact that, due to the delay with which the plant came into full operation (2011), new production plants have come into operation that have led to a drop in the relative

[13] GGIII Hydropower Project Final EFTA Study Report – EIB - March 2010

[14] EEPCo document prot. 68.19/233/04 of 08/05/2012

weight of the GGII within the Ethiopian energy production system. It should however be noted how this is only a relative discrepancy and that, although this weight will tend to drop further in the future, seeing as new plant are currently being built, in absolute terms, the production capacity of GGII is in any case of vital importance to the country's energy generation system.

It should also be noted that the increase in production has gone hand in hand with the electrification of the entire country which has shown a considerable increase over the last 4 years (Figure III - 1), thanks to the parallel expansion of both the transmission lines (Figure III - 2) that have increased from the 3,578 km in 1998 to the over 10,000 km currently covered and the distribution lines (Figure III - 3) that have moved from 9,972 km in 1992 to the 140,000 km available today.

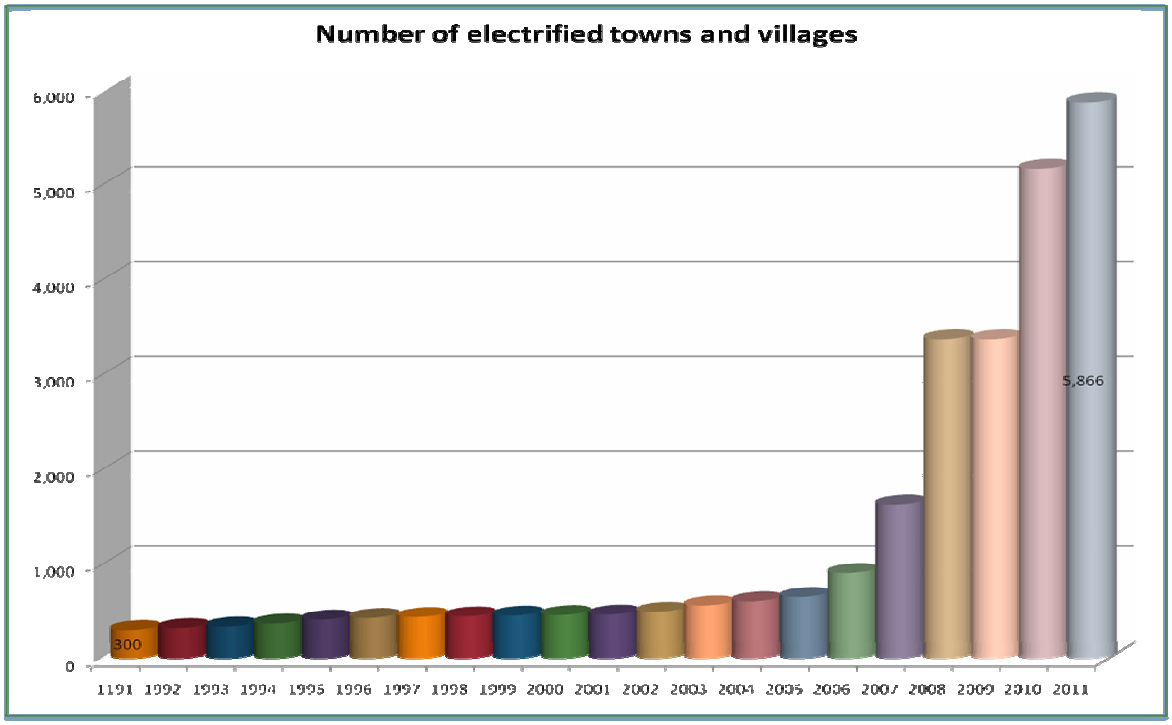


Figure III - 1: Number of electrified Ethiopian cities and villages
Source: EEPCo

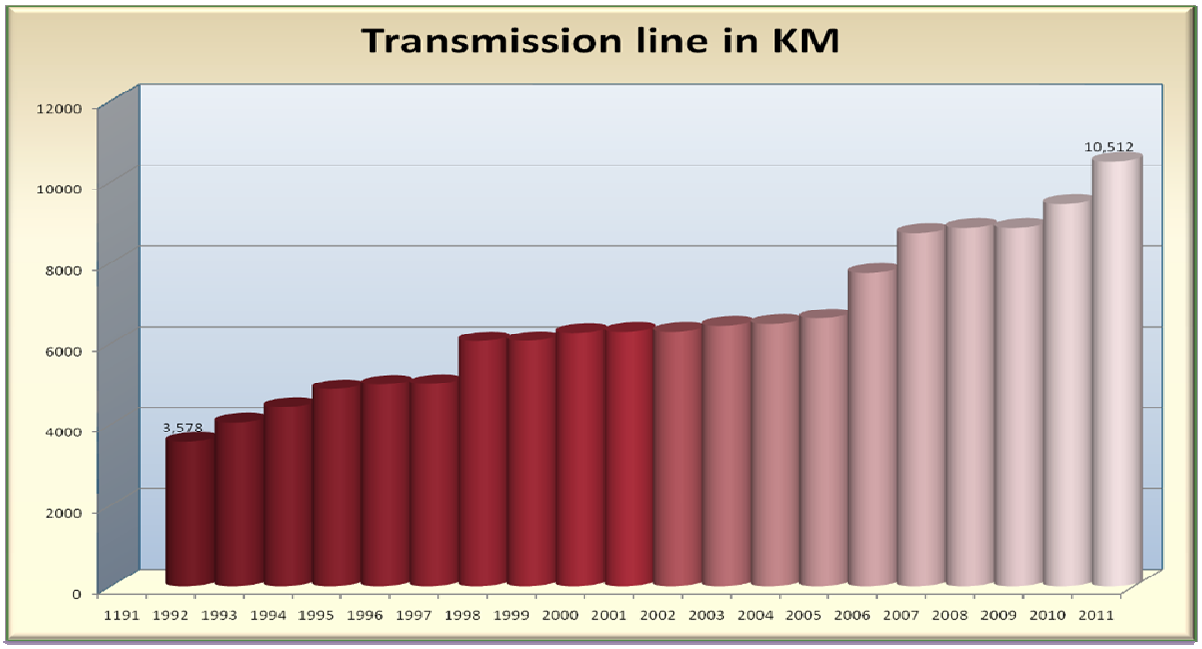


Figure III - 2: km of transmission lines installed
Source EEPCo

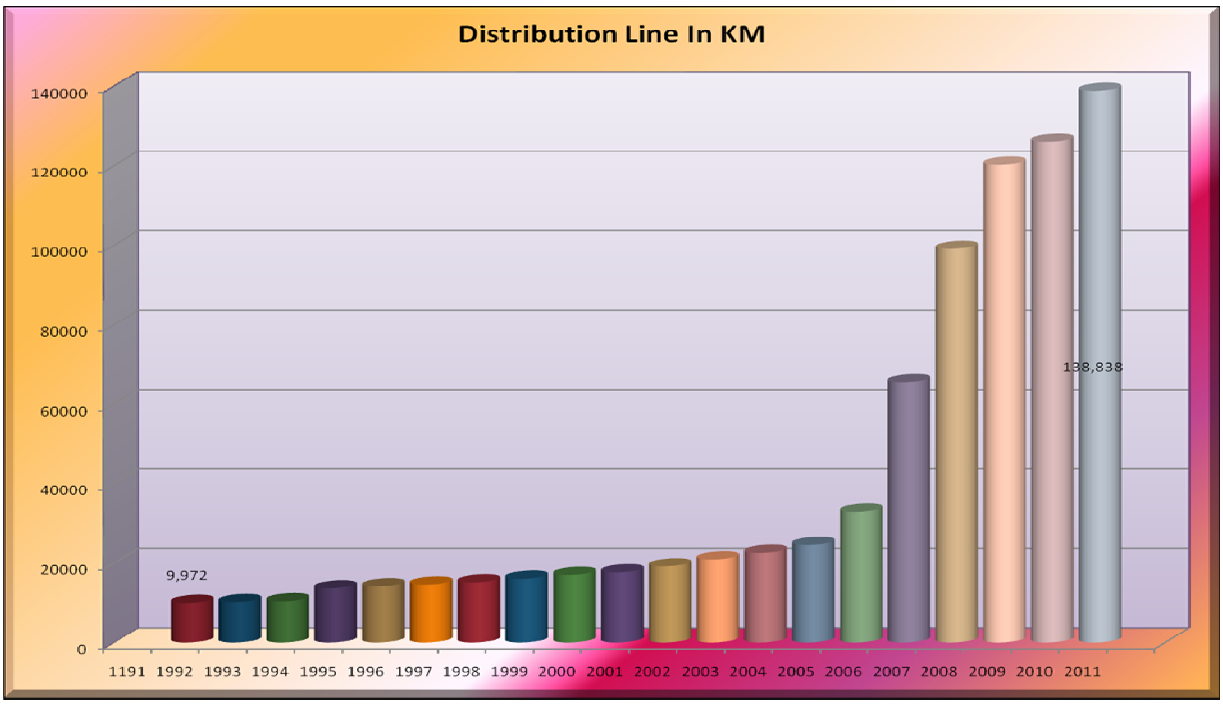


Figure III - 3: km of distribution lines installed
Source: EEPCo

The growth in the internal demand for electrical energy may be ascribed mainly to two factors: the growth in the population and the growth of the Gross Domestic Product. In particular, the latter over the last 5 years has grown by approx. 11% per year and, in fact, the average increase reported for internal energy demand is of approx. 25% per year(Figure III - 4).

Therefore, if we assume a constant GDP growth of approx. 10% even for the next 5 years it is easily predictable that there will be a constant increase in internal demand of around 25% per year, even if we assume a GDP increase of up to 15%, the studies undertaken (Figure III - 5) reveal a scenario where the increase in internal demand could rise as high as 32% per year.

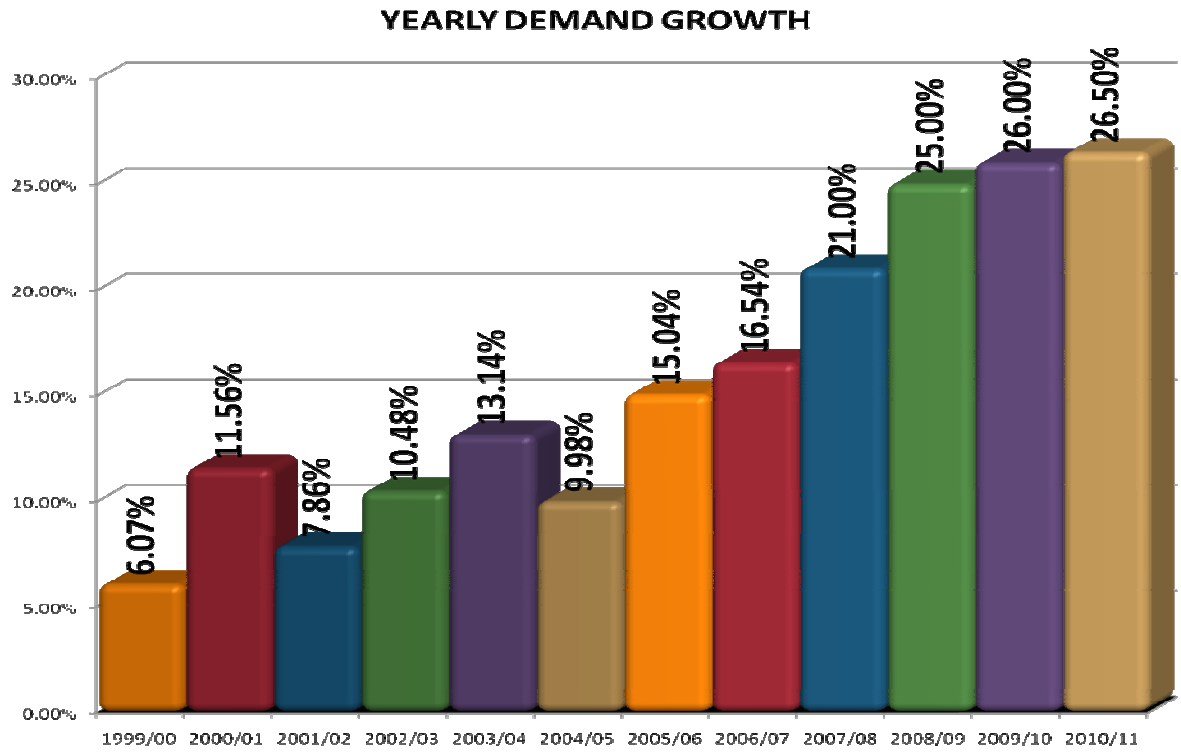


Figure III - 4: Increase in internal demand for energy
Source: EEPCo

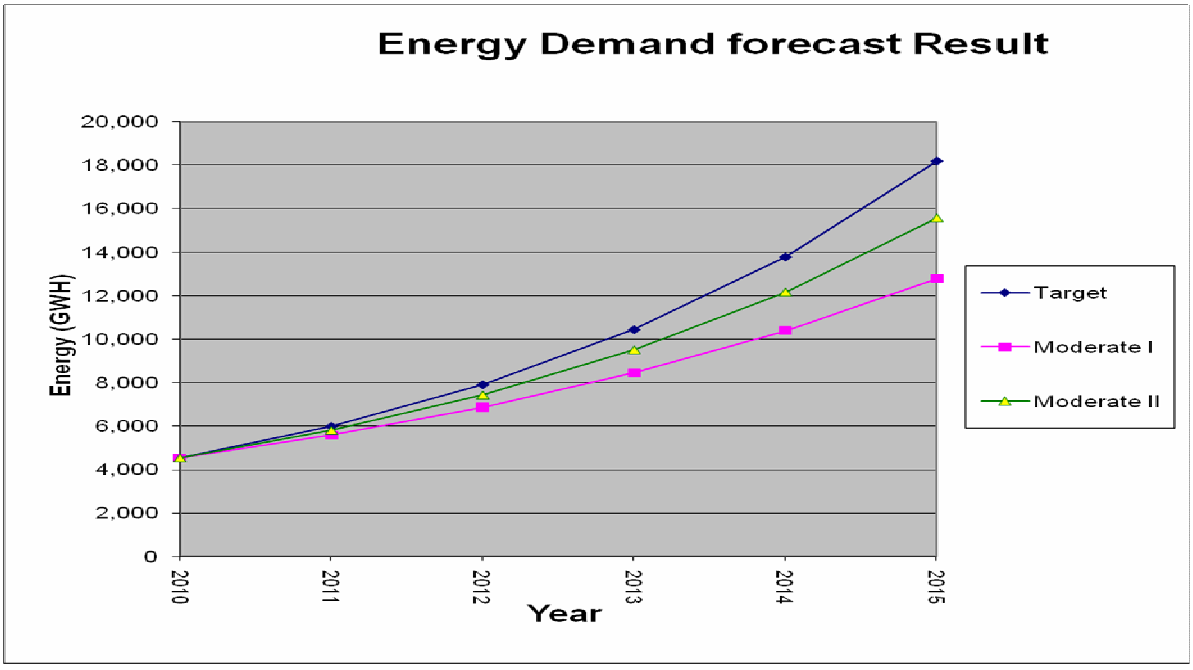


Figure III - 5: Projected in increases in internal energy demand
Source: EEPCo

RR7 To what extent does the objective pursued favour the expansion of the export capability of the national energy sector?

Currently the exportation of energy produced in Ethiopia is extremely low seeing as almost all production is earmarked for the satisfaction of internal demand. However, given the great production potential that the country will be able to dispose of over the course of the next few years, the expansion of the transmission network also to bordering countries and the international agreements that are being underwritten, a fast increase in exports in the near future seems quite likely. The answer rating is medium - high (MA)

EEPCo has come up with a number of projections on export volumes which indicate that exports could represent a substantial part of national production by 2018. According to the Power Sector Development Program (PSDP), the ratio between exports and national demand will be between 37% and 46% in 2018. In energy terms, it is estimated that exports could grow by 9.6-11.6 TWh in 2018 and 2000MW in terms of power[13].

In (14) the EEPCo has stated that exports abroad began at the end of May 2011. More specifically, the quantity of energy exported to Djibouti between May 2011 and December 2011 amounted to 345,422 MWh and in the first three months of 2012 it amounted to 65,999 MWh, for a total of 411,421 MWh, while exports towards the city of Moyale on the border with Kenya from October 2011 to March 2012 amounted to 301 MWh.

In other word, therefore, currently 7% of production is exported abroad, which leads us to infer that most of the energy produced in Ethiopia goes to satisfy internal demand.

According to many observers (UTL, EU delegation, Ethiopian Ministry of Finance, EEPCo), the increase in foreign exports results in considerable benefits which can contribute to the development of the entire country. In fact, beside the immediate benefit of being able to export energy when the internal demand drops (i.e. at night), thus ensuring a constant level of production and reducing, in the end, the net production costs, it also leads to the setting up of commercial partnerships with bordering countries that in addition to increasing the security of the national economy tend to create even greater political stability in the area.

In such a context the European delegation is involved in the *Eastern Africa Power Pool* (EAPP)[15], (see box in page). In fact, for the purposes of the creation of a market of this kind, it is extremely important to set up agreements with the states involved.

In the near future, therefore, Ethiopia intends to export energy to other countries besides Djibouti such as Sudan, Kenya, Somalia and in

The Eastern Africa Power Pool (EAPP)

In February 2005 an agreement was reached between East African Countries to create a regional energy pool. The countries that have joined the EAPP are: Burundi, Democratic Republic of Congo, Egypt, Ethiopia, Kenya, Libya, Rwanda, Sudan and Tanzania. Membership is open to other countries in the area.

The EAPP organisation includes the Conference of Energy Ministers and a Steering Committee on which sit the various utility companies of the member companies (such as for example EEPCo for Ethiopia). The activities are coordinated by a Permanent Secretary. An Independent Regulatory Board is also expected to be set up to regulate the energy market at a regional level.

EAPP is currently overseeing a few projects with funding AfDB-, MFA Norway, USAID and in particular is providing technical assistance and capacity building in order to contribute to the development of the integrated electricity market in East Africa, funded by the European Commission.

[15] http://www.eappool.org/eng/members.html

the distant future, even to Egypt (Figure III - 6).

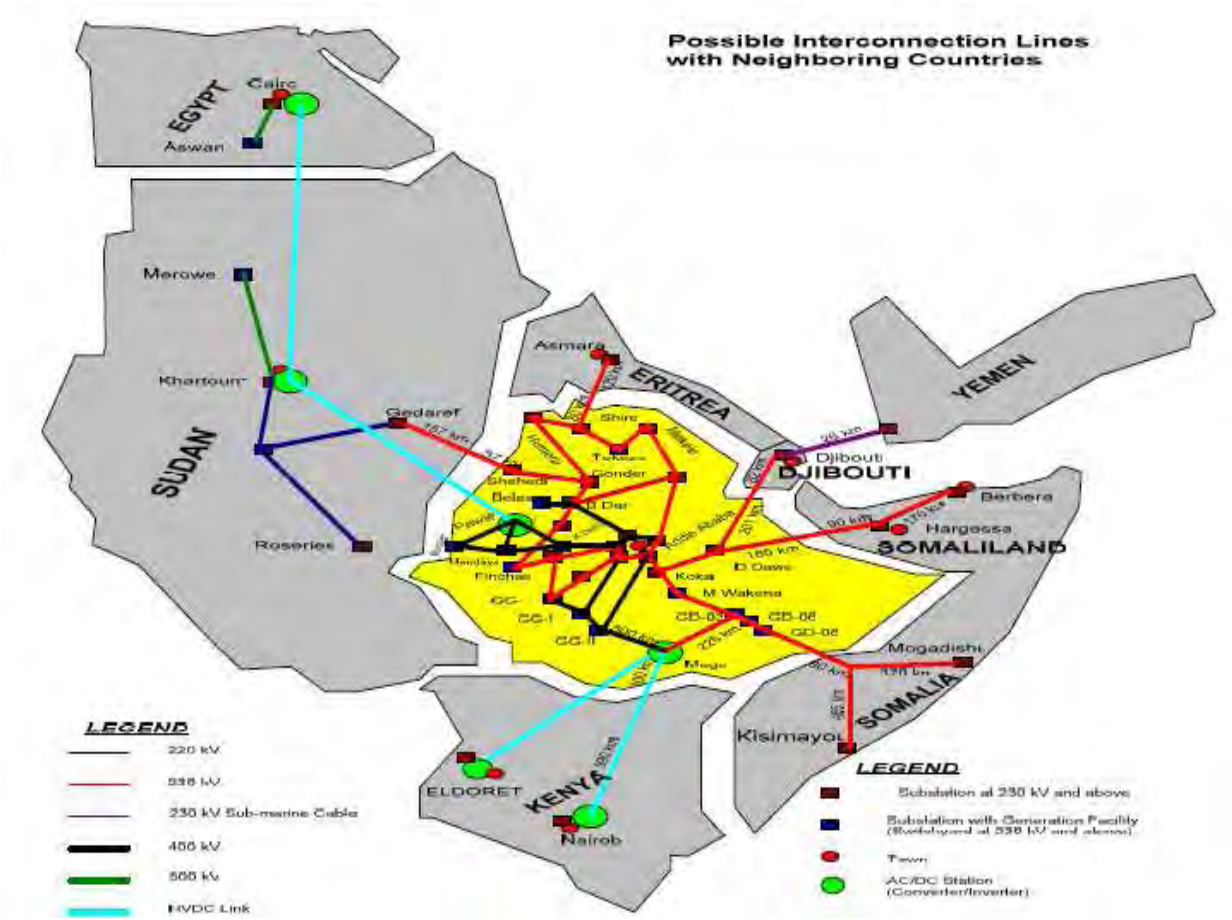


Figure III - 6: Possible lines of interconnection with bordering countries

As things stand construction is being completed on transmission lines towards Sudan where it expected that approx. 832,200 MWh may be exported per year.

RR8 To what extent does the objective pursued contribute to Ethiopia's energy independence.

The objective pursued contributes to Ethiopian energy independence if one considers that the GGII contributes approximately 20% (see **RR6**) of the internal energy demand thus making Ethiopia less dependent on imported resources (Diesel). The answer rating is medium - high (MA).

The current strategy of extending the interconnected national electrical system (ICS - *Inter-Connected System*) tends to gradually scrap the old unconnected local Systems (SCS Self-contained systems), comprised of isolated generators operating in small towns or isolated areas. The incidence of such a form of electrification is difficult to estimate seeing as the production actually distributed and the losses are very variable and hard to quantify for a variety of reasons: many small diesel generators often operate with low or even no loads, they are often on for just a few hours a day with frequent stops and starts and not always is the

personnel involved capable of keeping the operation registers updated. Anyhow already in 2004, the incidence of this kind of minor generation dropped from 7.5% to 3% [16] If one then considers the quick expansion of the ICS system, which the GII is a part of, it is believed the dependence on SCS systems has been further curtailed.

Furthermore the availability of installed energy has drastically reduced the frequent energy blackouts that one was forced to operate throughout the country and thus the recourse to emergency diesel generators has consequently been reduced. This figure is confirmed by all persons interviewed in the field (UTL, EEPCo, Local Authorities, International organisations, Non Governmental Organisations).

In short, it would seem therefore that the recourse to the installation of renewable source production plants available to the country (with hydro-electric energy production in the forefront) and the extension of the ICS system have contributed to **Ethiopia's energy independence by reducing the demand for Diesel (imported energy source) in favour of the production of electrical energy.**

While it seems difficult to evaluate the reduction of energy imports, Ethiopian energy independence can be assessed indirectly by verifying its effects on the national GDP. EEPCo has stated[14] that the energy sector along with the hydraulic one accounts for approx. 1% of Ethiopia's Gross Domestic Product.

[16] TEE MAE document 2004

2. GILGEL GIBE II: IMPORTANT BENEFITS FOR THE POPULATION

The evaluation questions related to **effectiveness** essentially refer to the real performance capacity of the hydro-electric plant and the verification of the extent to which the energy produced reaches local customers which includes both companies and families.

To sum up very briefly, the analysis performed by the Evaluator has helped to establish that **the plant is operational and is achieving the performance levels foreseen by the project,** with a production capacity which in the last year has reached expected values. The high voltage 400 kV lines foreseen in the project to enable the GGII plant to be connected to the national interconnected system appear to have been installed and operational. Plus, the commissioning of GGII has effectively increased the internal clientele, achieving the objective of hooking up 20% of the local population with close to a year's headway on expectations. Finally, the tariffs currently applied by EEPCo appear to be lower than those previously calculated on the basis of market research enabling a broader access to electrical energy for families.

During the desk investigation, and more precisely out of the discussions with the General Contractor and the expert sent by MAE to Ethiopia to monitor the Project we had already had the opportunity to verify that the plant was operational, but we were not in a position to express judgements concerning its performance capacity. The necessary information to answer the effectiveness evaluation questions thoroughly were thus collected during the course of the field mission.

In particular, the main sources that have enabled us to provide the answers were: a) production data documents supplied by EEPCo, b) the information supplied during the course of the interviews and the focus groups with EEPCo and the General Contractor personnel both in Addis Ababa and at the plant, c) the data collected directly by the evaluation team that visited the plant.

It should be emphasised here how during the course of the meetings held with both the General Contract and ELC, even if the *Taking Over Certificate* were issued in November 2009, the plant appears to be still lacking the "Performance Certificate", which is the final act foreseen by the contract and is supposed to certify the correct and proper execution of all the civil and electro-mechanical works.

Below we have provided details of the answers to the evaluation questions and the performances achieved compared to the target values described in the Technical and Economic Evaluation drafted by MAE in 2004. The detailed indicators are outlined in the enclosure.

2.1 Does the energy produced by GGII reach the expected capacity and has it contributed to satisfying the needs of the population?

The documentary analysis and the field investigations have enabled us to express a positive value judgement relative to the expected technical performance of the plant and connected transmission works and therefore that the established objectives in favour of the Project's beneficiary population have been achieved.

The logical reasoning that has enabled us to formulate a pertinent answer to this evaluation question has therefore been: (a) to verify whether the GGII plant is operational, achieves expected performance levels and whether the energy produced is regularly distributed on the national electrical grid; (b) to verify whether there has been an increase in local served customers particularly in terms of population and whether the overall access to energy has been extended; (c) verify whether the tariff policies implemented allow or not access for a broad sector of the local population.

More specifically, the evaluation questions that have enabled us to pass a judgement on the Effectiveness criterion are:

- EE1 Is the GGII plant currently operational and does it reach the expected performance levels?
- EE2 Is the energy produced by GGII regularly distributed throughout the national electricity grid?
- EE3 Has the Ethiopian electricity user base been expanded ?
- EE4 Has access to electrical energy been extended within the local Ethiopian population?
- EE5 Does the currently adopted tariff policy enable access to be extended to a broad section of the population?

The rating assigned to the effectiveness evaluation questions is high (A).

EE1 Is the GGII plant currently operational and does it reach the expected performance levels?

The annual estimated energy production of the Gilgel Gibe II hydro-electric plant achieved thanks to the four Pelton turbines (420 MW installed) amounts to 1,650 GWh[17].

From the meetings with both the General Contractor and the EEPCo management, the plant became operational at the end of October 2009 only to be closed due to a collapse of the hydraulic tunnel at the end of January 2010. The production was thus halted until the end of December 2010 when regular energy production was resumed.

The evaluation team visited the plant on 15/05/2012 and verified that 3 of the 4 turbines were operating, and in particular turbine 2 had been stopped for measurements and control tests by Voith-Siemens personnel, a circumstance that is standard procedure particularly during the first period of plant operation. At the time of our visit, the three operating turbines were issuing 65% of their maximum production potential.

[17] Technical and Economic Evaluation - dott. A Senatori, Ing. G. Palma - 2004

The graph Figure III - 7 shows the GGII's daily production starting from 20/10/2009 up to 10/12/2011. Note the break in production from 27/01/2010 to 26/12/2010.

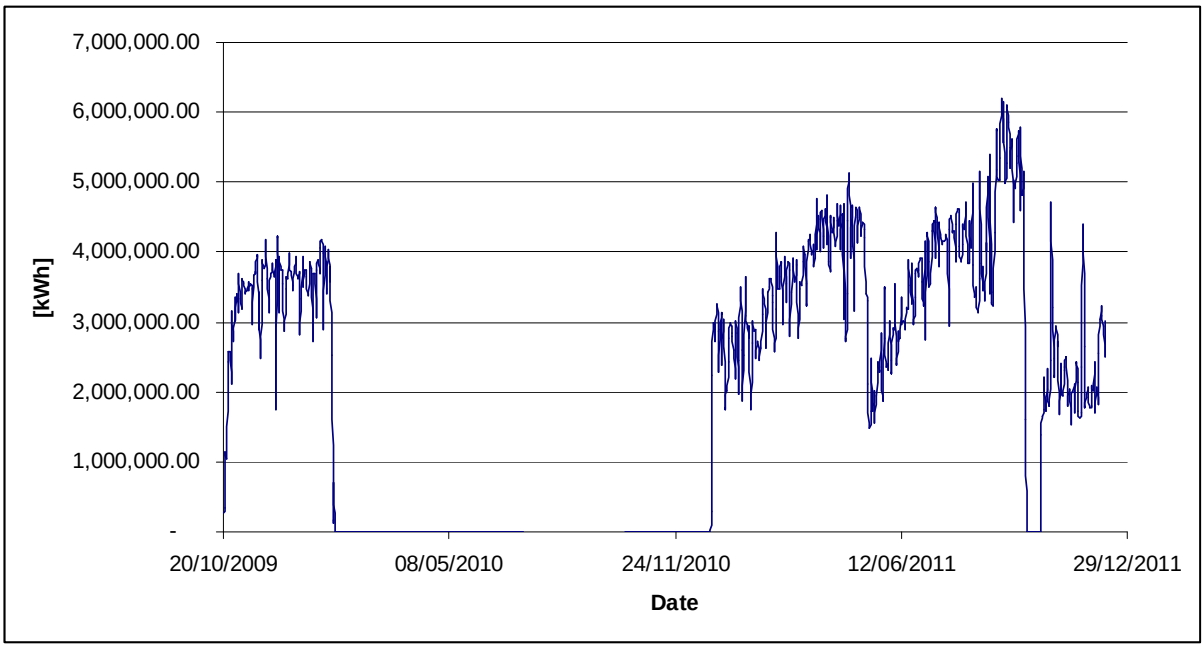


Figure III - 7: Daily GGII production in kWh
Source: EEPCo

The EEPCo has certified that during the course of 2011[18] the overall production has been of 1,556,368,50 MWh, therefore fairly in line with expectations. The same EEPCo has provided the production figures for the first three months of 2012, which stand at 279,264.50 MWh. This last figure would seem to indicate a reduction in production compared to expectations of around 25%. It is believed however that the estimates on annual production carried out only on the available records for a few months are not entirely reliable due to the irregular rainfall patterns, and consequently of water resources, so it is advisable that any assessment be carried out on an annual basis. On the other hand, we believe that an accurate evaluation should be carried out over figures representing many years (at least three continuous years of production). In order to provide an answer to the evaluation question we believe it is appropriate to base our production data on the year 2011, from which one gathers that the annual production has been slightly below, by less than 6%, compared to the expected yield. Considering that this estimate is based on the first year of production, when systems are still undergoing testing and technical verifications, the figure should be viewed as highly positive.

EE2 Is the energy produced by GGII regularly distributed throughout the national electrical grid?

In order to distribute the energy produced by the plant, the GGII project also included 230 km of 400 kV high voltage power line towards the "Sebeta" hub near Addis Ababa, and a 45 km 400 kV line.

The EEPCo has clarified that the main purpose of the high voltage lines (400kV) installed as part of the GGII project, was to connect the new plant to the National Interconnected System and that the GGII substation is approx. 30 km away from the GGI substation and 185 km away

[18] EEPCo document prot. 68.19/233/04 of 08/05/2012

from the Sebeta substation. Therefore, the total length of 400 kV lines built has amounted to 215 km and these lines have been operational since November of 2009[19].

From the discussions held with the EEPCo personnel it appears that from the Sebeta substation a further five medium voltage lines depart, while 10 medium voltage lines depart from the Sokuru (GGI) substation. Despite the technical problems concerning the interface of the new plant's systems with the existing network as far as data transmission is concerned and which are currently being resolved, the plant appears to be connected and integrated within the Ethiopian national electricity system.

Figure III - 8: High voltage 400 kV pylon from GGII to GGI

EE3 Has the Ethiopian electricity user base been expanded ?

The Ethiopian electricity user base has been broadened by much more than expected.

In the project forecasts the GGII plant was supposed to guarantee access to electrical energy for 774,000 new "users"[17]. The term "users" is here meant to refer to individual people benefiting from electrical current. The data collected by EEPCo[18] , informs us that thanks to GGII there have been 165,791 new network connections, of which 73% are domestic contracts, 22% are commercial contracts, 4% are industrial contracts and 1% is public street lighting. Considering that the average Ethiopian family nucleus is comprised of 7.4[20] individuals, one can infer that the population benefiting from the electrical energy produced by GGII can be estimated at around 895,000 individuals.

The figure is confirmed by the findings detailed in the document *Gibe III Hydropower Project - Economic, Financial and Technical Assessment* which reports that between 2004 and 2009 the Ethiopian utility subscribers increased overall by approx. 1,000,000 units.

Additionally, from a number of statements collected in the field and from the acquired documentation, it turns out that in the period when GGII was halted, energy rationing was resumed nationwide after having been suspended following the inauguration of the plant. This rationing policy slowed during June of 2010 with the opening of another important hydro-electric plant (Beles 460 MW), and then was completely phased out once GGII went back into operation (December 2010). This confirms that almost all the energy produced by GGII is currently being used to satisfy the country's internal demand.

[19] EEPCo Quarterly Report October - December 2009.

[20] Guttmacher Institute www.guttmacher.org

EE4 Has access to electrical energy been extended within the local Ethiopian population?

The access to electrical energy on behalf of the local population has been extended much more than expected.

According to project forecasts, GGII was supposed to help reach the objective of serving 20% of the population by the end of 2013. The EEPCo has stated that currently electricity has reached 51% of the total number of cities and villages (where connection is possible) which amounts to approx. 20% of the total Ethiopian population. Therefore the objective set in the TEE **has been achieved a year in advance**, leading to an annual increase in population served of 0.625% (from 2004 to 2012) compared to the 0.555% forecast (from 2004 to 2013).

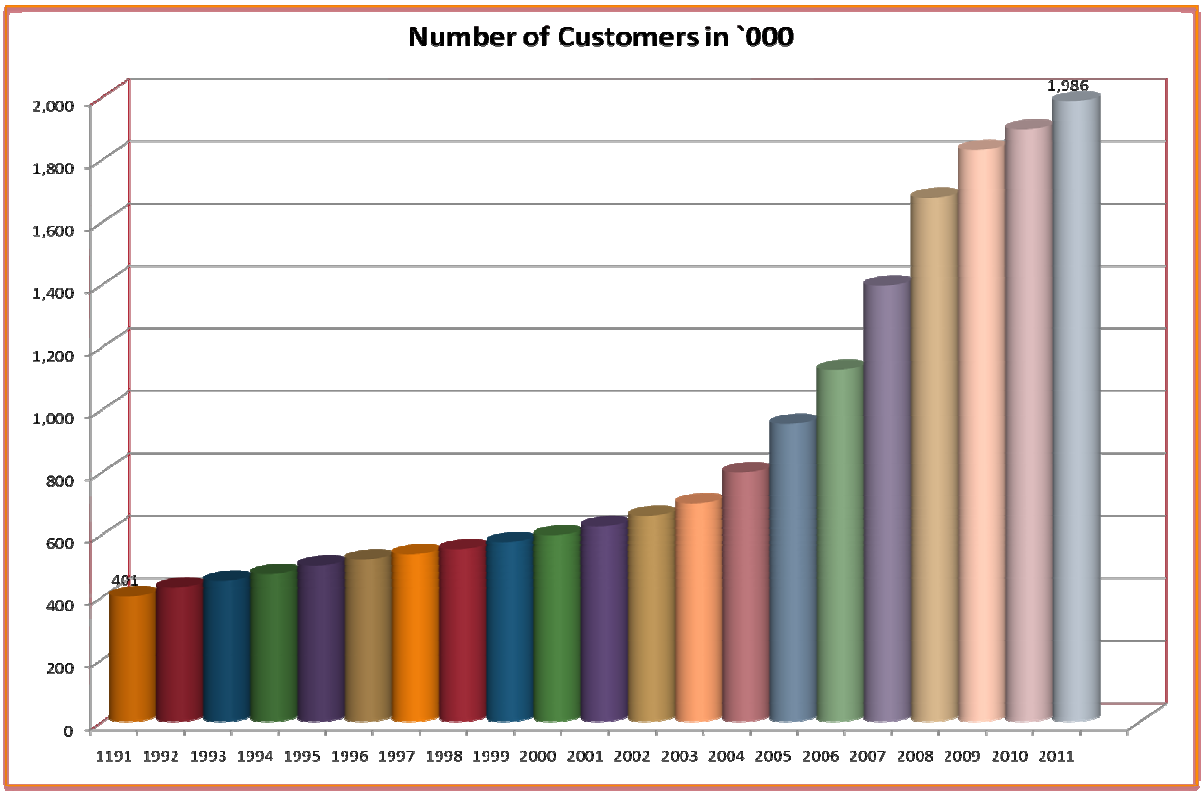


Figure III - 9: No. of connections to the national electricity grid (EEPCo clients) [21]) in thousands.
Source EEPCo

[21] Which amounts to a percentage relative to the total population of 1.986.000x7,4/17.000.000=19.86%

EE5 Does the currently adopted tariff policy enable access to be extended to a broad section of the population?

The tariff policy currently being applied by EEPCo is very affordable, lower compared to expectations and thus enables access to electrical energy to a broad cross-section of the population.

In order to make access to electrical energy truly sustainable for the local population, the project forecasts had considered sale tariffs within a range of between 3.5 and 6 Euro/cents. In the document *Gibe III Hydropower Project - Economic, Financial and Technical Assessment* a value of approx. 5 Euro/cents is reported, and thus in line with what had been expected.

The tariff system applied by EEPCo[18] is subdivided into 6 types of utility contract: domestic, commercial, low voltage industrial, 15kV industrial, 132 kV industrial and street lighting. Each category is then subdivided into subcategories based on the actual consumption figures posted. Table Table III - 5 shows the equivalent tariffs that are currently being applied for each utility category.

Category	BIRR/kWh	Euro/kWh (1 Euro=23.6712 BIRR)
Domestic	0.4735	0.0200
Commercial	0.6723	0.0284
Low voltage industrial	0.5778	0.0244
15 kV industrial	0.4086	0.0173
132 kV industrial	0.3085	0.0161
Street lighting	0.4843	0.0205

Table III - 5: Equivalent electrical energy sale tariffs
Source EEPCo

The domestic tariff is the lowest and amounts to 0.22 BIRR (0.001 euro). The electrical tariffs are very low even given the project forecasts. The last tariff review was performed in 2006, and it is the opinion of many (WB, EEPCo) that a further review of said tariffs is expected in order to be able to undertake further investments that are currently required for new production sites. However, basing one's calculations exclusively on current figures the tariffs applied enable energy access to a broad section of the population.

3. AN EFFICIENT USE OF RESOURCES, DESPITE THE TECHNICAL DIFFICULTIES

The use of the available resources has been in line with foreseen operating objectives and expected results. The technical difficulties that arose during construction and after the works had been completed have affected the times target of the operating output.

All funding channels have been regular, ensuring a flow in line with project implementation schedules. The investment and operation cost management is in line with initial forecasts and enables the profitability of the investment to be guaranteed.

The delays in plant commissioning compared to the expected date have affected the revenue side of the investment, due to both the increase in the specific operation costs and the postponement of the plant's actual start up date.

The management of the investment costs, operating costs and operating revenue guarantees the financial profitability of the investment, but with a very low internal rate of return (5.72%). This rate may improve considerably with a tariff of c€ 3.5, foreseen as the lowest tariff in the hypothesis drawn up by the TEE in 2004.

It is believed that the geological risk, besides having been underestimated during the hydraulic tunnel excavation phase (leading to a series of technical problems which, all in all, have set back the start up of the plant by two years) is still being managed in an inappropriate way by EEPCo which makes all forecasts of future maintenance costs uncertain.

The assessment of the role played by the stakeholders involved in terms of operational, management and decision making efficiency is positive. All involved have shown great thoroughness and a correct overall management of the project and an increasing level of co-ordination amongst each other.

Bearing in mind the overall investment total of € 493.742.322, the relationship between the total cost of the Gilgel Gibe II and the additional population served (cost/efficiency) is of € 552 per utility unit (where by utility unit we are referring to the individual persons that benefits from the electricity). This figure is an improvement on the target of € 633 for single beneficiary forecast as an objective for 2013 in the DGCS' Technical and Economic Evaluation of 2004.

The Inga Dams, located in the Democratic Republic of Congo, are hydro-electric plants on the largest water fall in the world, the Inga falls. The two first plants named Inga I and Inga II have a total installed capacity of 1,775 MW. Studies are underway for an Inga III project and for a Grand Inga, two new and very powerful hydro electric power stations.

With reference to the cost / effectiveness in Sub-Saharan Africa, the Inga Dams enable us to gain an overview and a very focused view on a system made up of four hydro-electric plants with different capacities and different investment sizes.

The initiatives that could be used for *benchmarking* purposes and act as reference examples for GGII, particularly in Sub-Saharan Africa, are difficult to identify, particularly given the peculiarities of GGII (tunnel system, without significant environmental impact; without negative repercussions from a social and economic level and in particular no need for the relocation of villages and populations).

More specifically the evaluation carried out on project efficiency focused on the following three issues:

- The balance of the profitability over time;
- The project cycle and its stakeholders;

- The cost / effectiveness of GGII in the Sub-Saharan scenario of hydro-electrical development.

Each of these main issues has thus been developed when answering the specific evaluation questions, the detailed answers to which are provided below.

3.1 Can the profitability of the investment over time be considered to be well-balanced?

The documentary analysis and the field investigations have enabled us to express a positive judgement on the balance of the profitability over time. The investigation procedure adopted is based on four evaluation questions, three of which are designed to verify the efficient use of the resources, even in relation to the profitability of the investment and relative to the delays accumulated in the construction of the works. A fourth question focuses instead more specifically on the relationship between the geological problems encountered and the tunnel's future maintenance costs.

More specifically, the evaluation questions that have enabled us to pass a judgement on these aspects are:

- EF1 Has the use of the available resources been in line with foreseen operating objectives and expected results?
- EF2 Is the management of investment costs, running costs, operating revenue, etc... still capable of guaranteeing the financial profitability of the investment?
- EF3 What effects have the delays accumulated had on investment profitability?
- EF4 Is it expected that the problems and geological contingencies encountered during the excavation may limit the efficiency of the works due to more frequent and costly tunnel maintenance operations?

EF1 Has the use of the available resources been in line with foreseen operating objectives and expected results?

The use of the available resources has been coherent with the foreseen operating objectives and expected results, essentially confirming an overall efficiency of the use of the available resources. The answer rating to the evaluation question is medium - high (MA)

The technical difficulties that arose during the construction phase (tunnel construction, upstream end) and after the works had been completed (tunnel collapse) have affected the times target of the operating output. All funding channels have been regular, ensuring a flow in line with project implementation schedules.

In particular:

- The Italian assistance loan of 220 Meuro has guaranteed funding of 59.5% of the EPC Contract between EEPCo and SALINI (Meuro 375.5). The use of the Italian assistance loan has made it possible to achieve the foreseen operating objectives (executive design; civil works, installation of the hydro- mechanical and electro-mechanical components).
- The EIB assistance loan of 50 Meuro, has funded 13% of the EPC Contract, funding only the tender for the supply of the electro-mechanical components.
- The Ethiopian co-financing, in local currency, has covered the remaining 28% of the EPC Contract, amounting to a total sum of 103.5 Meuro.

- The discrepancy between the initial forecast prepared when the project was first being formulated (Meuro 422, including the transmission line of Meuro 39.5) amounted to an additional 68.9 Meuro and it has been necessary to increase the originally available resources by 16.5%. This discrepancy has been entirely financed by EEPCo and the EthGov, without affecting the Italian co-funding. The overall investment (as ascertained based on the break-down provided by the EEPCo on 8 May 2012) amounts to the overall sum of € 493.7 million, of which € 445.8 million relative to the EPC contract with Salini (including the extra costs acknowledged by EEPCo to Salini amounting to 23.5 Meuro).

The compatibility of the financial cash flow of the Italian assistance loan compared to the investment is confirmed by the relationship between disbursements and progress in tunnel excavation. The initial disbursements (December 2005 and January 2006) provided a considerable start up supply with 79.9 Meuro (36.3% of the total of 220 Meuro) and the subsequent payments were balanced in relation to the percentage of excavation progress.

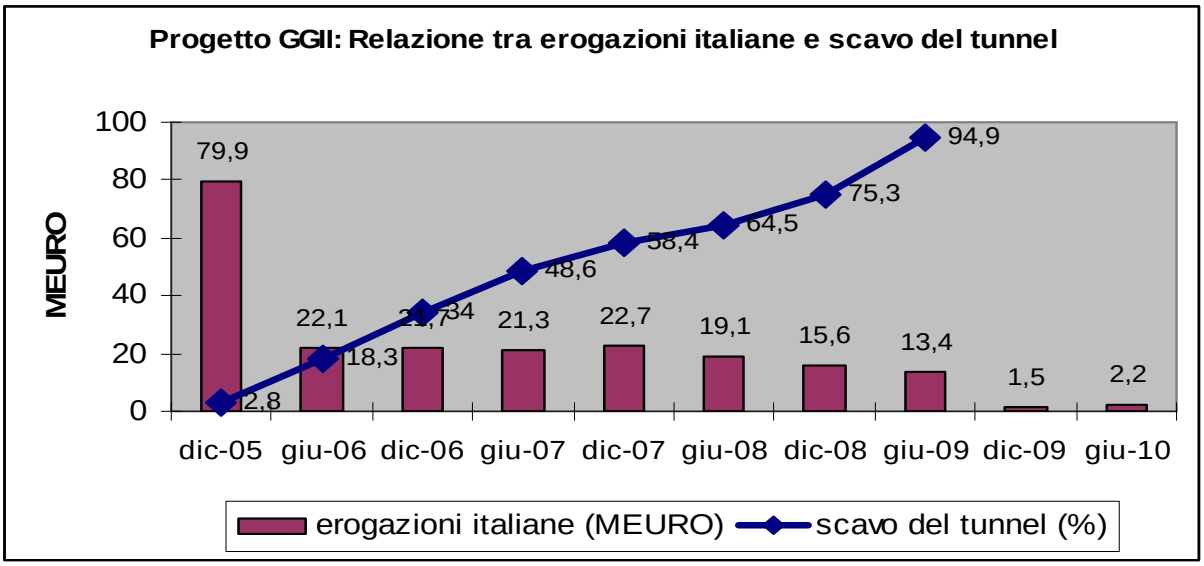


Table III - 6: Relation between Italian disbursements and tunnel excavation
Source: DGCS project monitoring data and our processing

During the focus group with the evaluator (11.05.2012), the EEPCo representatives pointed out that:

- the investments were consistent with expectations, even if there was an increase in raw material cost during the period when the project was built;
- in the process, all technical problems have been faced and solved. For the first collapse EEPCo paid Salini an extra-cost of 23.5 Meuro, while for the last collapse, which took place after plant start up, Salini received no extra-costs;
- the significant delay to the production start up phase is to be ascribed exclusively to the tunnel blockage, which entailed 11 months of interruption to reactivate production and the electricity supply. According to EEPCo, besides the tunnel collapse, the GGII hydro-electric plant was built in less than four years (44 months).

The overall investment, as detailed in the break-down prepared by EEPCo on 8 May 2012, amounts to € 493.7 Million of which € 445.8 million are ascribable to the EPC contract with Salini.

Description	Costs in Euro (1)	BIRR (2)	BIRR/Euro[22] (3)	Total EURO (1+3)
1. EPC Contract	286.978.404	1.959.100.724	158.828.515	445.806.920
Civil works	*191,998,620*	*1,115,218,348*	*90,413,090*	*282,411,710*
Electro-mechanical works	*69,991,393*	*47,981,197*	*3,889,936*	*73,881,329*
Hydraulic structures	*24,998,391*	*17,402,299*	*1,410,840*	*26,409,232*
VAT and import tax		*409,273,527*	*33,180,663*	*33,180,663*
Variation in cement and gas		*369,225,351*	*29,933,873*	*29,933,873*
2. Road contract	10.261.390	99.945.813	8.856.129	19.117.519
3. Consultancy services;	8.428.324	22.293.068	1.807.345	10.235.670
4. Project Implementation Unit		229.206.128	18.582.221	18.582.221
Total	**305.668.119**	**2.310.545.735**	**188.074.212**	**493.742.332**

Table III - 7: GGII - Overall investment
Source: EEPCo, 08 May 2012

EF2 Is the management of investment costs, running costs, operating revenue, etc... still capable of guaranteeing the financial profitability of the investment?

The internal rate of return (TIR) of the investment is low 5.72% and below the lowest minimum hypothesis (10.6%) previously forecast in the 2004 TEE. If, on the one hand, the operating, maintenance and administrative costs are actually very contained (0.5% against an estimated 2% figure indicated in the quote), on the other hand, the current tariff rates are clearly lower (Euro/cent 2.11) compared to the minimum foreseen by the TEE (Euro/cent 3.5). The rating assigned by the evaluator is therefore low (B)[23].

The financial profitability of the investment is in fact directly connected to the energy sale price. Currently the tariffs charged by EEPCO range between the highest commercial tariff of 0.0284 and the lowest high voltage industrial electricity of 0.0162. On average, in May of 2012 the tariff was of 0.0211 Euro (€/cent 2.11). The current tariffs are therefore considerably lower than those indicated in the DGCS Technical and Economic Evaluation document (2004) which were taken from the March 2003 Economic Analysis drafted by Salini and the Studio Ing. Pietrangeli[24].

One should bear in mind that the tariffs applied by the EEPCo on the exported energy produced by GGII are much greater than those charged on average in Ethiopia. More

[22] (1 Euro = 12,3347 Birr)

[23] The "low" rating awarded by the evaluator for this evaluation question is exclusively related to the financial profitability of the investment. This rating does not consider the positive repercussions of the tariff policy which enables access to be extended to a broad sector of the population (see EE5, with a "high" rating).

[24] The economic analysis of March 2003 drafted by Salini / Pietrangeli, the TEE and the subsequent elaborations, have considered the GGII project as an independent power plant that sells its product at a certain price and uses this revenue to cover the investment and the running costs.

specifically, they amount to €/cent 6 for energy exported to Kenya and €cent 5.3 for energy exported to Djibouti[25].

On the basis of the accounts collected by EEPCo[26] and following the processing of said data it is noted that:

- the overall cost of the implementation of the Gilgel Gibe II project has been of 493 Meuro, against the expected 382 Meuro forecast in 2004, and included in the TEE (without considering the transmission line which cost a further 39.5 MEuro);
- more specifically, the cost of the civil works has amounted to 282.5 Meuro against the 280 Meuro forecast in 2004;
- the electrical, mechanical and hydraulic equipment costs have amounted to 100.3 Meuro compared to the similar previously estimated figure of 100 Meuro;
- in the 2004 quote other costs are not shown that are not accounted for in the EEPCo accounts (Road Contract, consultancy services; Project Implementation Unit (PIU); VAT; variation of cement price, import taxes) which add up to 110.3 Meuro;
- the operating, maintenance and administration (OMA) costs for the GGII plant are very limited and stand at around 0.5% of the overall project cost (against a 2% figure that had been estimated at the quotation stage). For the year 2011, this cost has been estimated at € 588,842;
- on the basis of the EEPCo data, it is possible to quantify the energy production for the year 2011 in GWh 1,556. On the basis of the average tariffs at May 2012 (0.0211 Euro/kWh) it is possible to estimate an annual revenue of € 32,378,909.66;
- however by applying the same conservative energy dispersion parameter (-12%) estimated in the Salini / TEE economic analysis we obtain an actual energy production for the year 2011 of GWh 1,370 and a resulting income of € 28,898,650.

Construction costs		2004 Estimate		Tariff 2012	2012 final balance
Civil works	Meuro	280			282.5
Hydraulic and electro-mechanical equipment	Meuro	100			100.3
Other costs	Meuro				110.3
Total investment	Meuro	380			493.0
Operating, maintenance and administration costs (OMA)					
0.5% per year for civil works and other costs	Meuro	1.4	2.0		
1.5% per year for E&L equipment	Meuro	1.5	1.5		
OMA total		2.9	3.5		588,842.00
Gross energy produced	GWh	1,625	1,556	0.0211	32,839,375
Net energy for sale	GWh	1,439	1,370	0.0211	28,898,650

Table III - 8: Cost summary break-down
Source: evaluator processing of EEPCo data

[25] See EEPCo Letter and note of 08.05.2012 to Italsocotec, on Input data requested for the Evaluation of the post-construction phase of the Gigel Gibe II Project.

[26] See EEPCo Letter and note of 08.05.2012 to Italsocotec, on Input data requested for the Evaluation of the post-construction phase of the Gigel Gibe II Project.

On the basis of what has just been described, one can state that the management of the investment costs, operating costs and operating revenue guarantees the financial profitability of the investment, but with a very low internal yield rate (5.72%). This rate may improve considerably with a tariff of c€ 3.5, foreseen as the lowest tariff in the hypothesis drawn up by the TEE in 2004.

By applying the hypothesis of tariffs foreseen in TEE, the internal yield rate for the initiative would be much higher[27].

INTERNAL RATE OF RETURN (TIR)	TARIFF 2012	TARIFFS SUGGESTED BY THE TEE		
Tariffs in euro/cents	2,1	3,5	4	5
Investment Costs	493	493	493	493
O&M Costs	16	16	16	16
Total Expenses (C)	509	509	509	509
Benefits (B)	315	522	598	747
Total NPV (B-C)	-194	13	89	238
Internal Rate of Return (%)	5,72%	10,26%	11,85%	14,93%
Repayment Period (Years)	16	9,8	8,4	6,7

Table III-9: Estimate of TIR on the basis of the average energy sale tariffs to the population.

The estimate of the TIR has been carried out on the basis of financial data on the startup data management and on the basis of the assumptions set out in TEE. In particular, we have taken into account: 50 years of operation, a discount rate of 10%, an estimate of the costs (M € 16), conservatively calculated by comparing the data management of the early years of GGII with initial estimates reported in TEE (M € 32).

EF3 What effects have the delays accumulated had on investment profitability?

Compared to the foreseen commissioning date for the plant, the delays have certainly affected the profitability of the investment, due to both the increase in the specific operation costs (tunnel bypass in 2008 and tunnel collapse on 26 December 2010) and the postponement of the plant's actual start up date. Even the monitoring reports confirm the overall influence of the delay on profitability. The rating assigned to this question is medium-low.

To these elements, and due to these very elements, despite not impacting on investment profitability, one should somehow also add the damage to image and visibility suffered by EEPCo and Salini, but also to the external backers (Italian Cooperation and EIB)[28].

[27] Bearing in mind the objectives of the GGII cooperation project it seems appropriate to underline how the TIR tends to be lower compared to projects with a fair distribution of the benefits over time. The TIR is an indicator of relative and not absolute project efficiency.

The matter was discussed during the course of the evaluator focus group with EEPCo held on the 11 of May 2012. It turned out that:

- The costs relating to compensation for the extraordinary geological event, which kept one of the tunnel boring machines blocked for 18 months, amounting to € 23 million were paid by EEPCo to Salini;
- the reactivation costs following the tunnel collapse were entirely borne by the Contractor himself. Seeing as this incident did in fact take place during the *Defect Liability Period*. The collapse led to the interruption of energy production for another 11 months. The plant became fully operational once again in December 2010, following the refurbishing work carried out by the Contractor;
- These critical events have had a significant effect on the operational planning and on energy production. In any case, according to the EEPCo representatives, "... these technical problems may have led to delays, but now there are no more problems".

The revenue generated by GGII since the beginning of operations (January 2011) to March 2012 are estimated at approx. € 40.5 million, with an average monthly revenue of € 2.7 million approx.[29].

Revenue generation	internal use	export	Total
Production (MWh)	1,780,499.11	55,133.89	1,835,633.00
Tariff (Euro/kwh)	0.0211	0.053	
Revenue (Euro)	**37,571,365.43**	**2,902,271.65**	**40,473,637.08**

Table III - 10: Plant investement return table
Source: evaluator processing of EEPCo data

Basing ourselves on this data and considering the two critical events which took place, one can estimate that:

- the delay due to the extraordinary geological event which took place in October 2006 has been quantified by EEPCo in approximately 18 months[30] and has led to a loss of revenue of more than € 48 million. This estimate is obtained by calculating the average monthly revenue of the first 15 months of activity (€ 2,698,242) for the first 18 months of delay on the works schedule;
- due to the collapse of the tunnel once the works were complete (January 2010), the interruption of energy production for 11 months led to a loss of revenue of approx € 30 million. This estimate is obtained by calculating the average monthly revenue of the first 15 months of activity (€ 2,698,242) by the 11 months of production interruption.

Overall, one can estimate that the accumulated delays totalling 29 months, have led to a loss of revenue of approximately € 78 million.

[28] See: Note Ing. Radio Save 11 June 2010

[29] See EEPCo Letter and note of 08.05.2012 to Italsocotec, on Input data requested for the Evaluation of the post-construction phase of the Gigel Gibe II Project.

[30] See: Note Ing. Radio Save 11 June 2010

EF4 Is it expected that the problems and geological contingencies encountered during the excavation may limit the efficiency of the works due to more frequent and costly tunnel maintenance operations?

We believe that the geological risk besides not having been managed appropriately during the tunnel excavation works, continues to be managed in an unsatisfactory manner in the running of the plant, and consequently future maintenance costs may not be in line with the budgeted figures. The relative rating is low (B).

During the desk analysis and the discussions with EEPCo management, it turned out that the financial investment plan foresees, during the course of the useful life of the plant, a maintenance cost of 1% for the civil works and approx. 2.5% for the electro-mechanical systems.

The Evaluation Team does not have enough information to be able to guarantee compliance with these forecasts for the future, in fact one must report that the appropriate tools required to foresee and manage the geological risk are not in place.

The excavation of the power tunnel, the most important and complex hydraulic undertaking of the entire Gilgel Gibe II complex, was achieved using two TBM's with a disk diameter of 7.0 m. According to the project forecasts the total length of the tunnel was supposed to be 25.785 m, of which 485 to be excavated using the DB (Drill and Blast) procedure and the remaining 25.300 m to be perforated with the TBM's of which, 12,780 m by TBM 1 from the Inlet side and 12,520 m by TBM 2 from the Outlet side.

The excavation program was supposed to be completed between July 2005 and May 2007 with an expected performance of 600 m/month for TBM 1 and 750 m/month for TBM 2. In actual fact, besides the tunnel collapse which halted the progress of TMB 1 from October 2006 to August 2008, the actual performance of both the TBM machines was less than expected, with TBM1 covering approx. 250 m/month and 510 m/month for TBM 2. Considering the bypass performed to overcome the incident at Ch. 4+196, in total TBM 1 excavated from the Inlet side up to Chainage 8 + 513, while TBM 2 from the Outlet side excavated 17 + 347 m. totalling 25,860 m, not including the DB stretches.

The geological section of the tunnel shows a prevalence of basalts of the Omo Formation up to approx. Ch. 11+000 along with trachytes up until Ch. 13+500. Beyond this point there is a prevalence of rhyolytes of the Jimma Formation and frequent basalt dykes and dolerites with stretches of fractured trachytes.

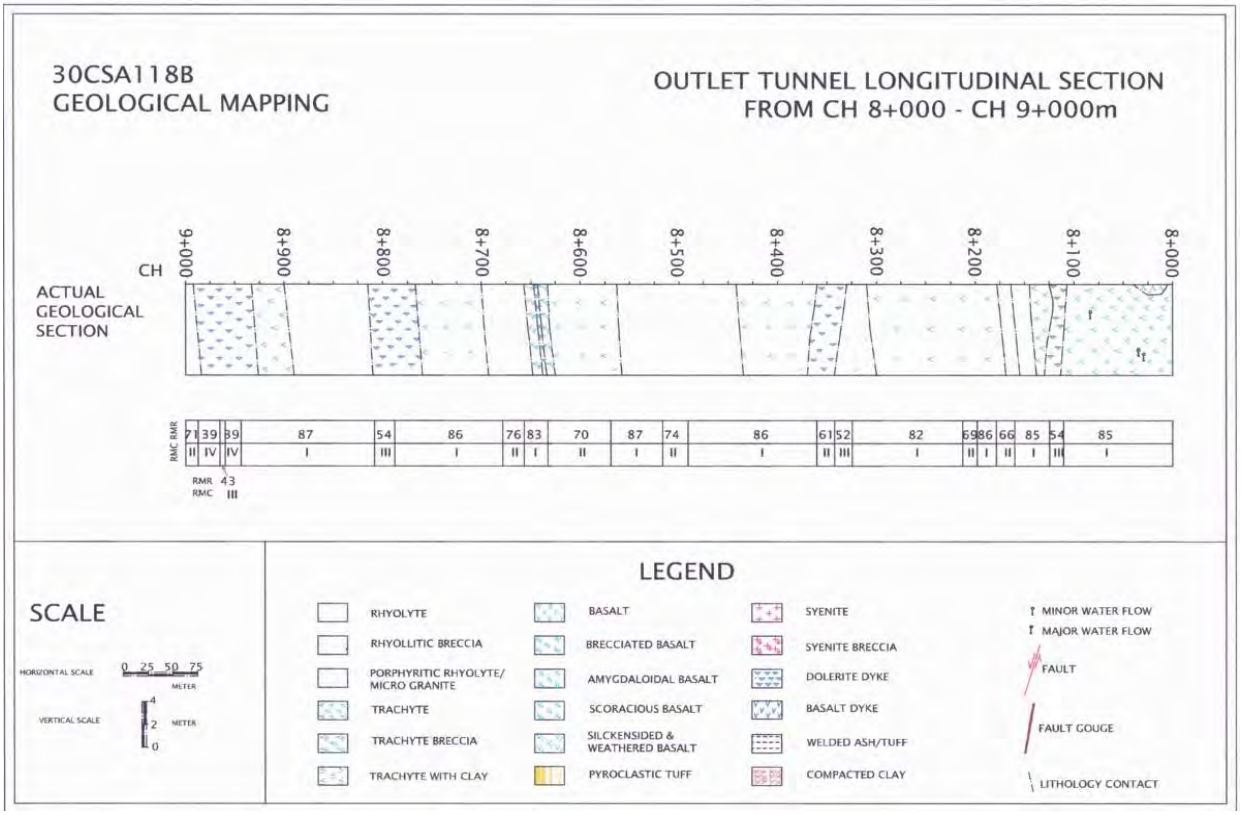


Figure III - 10: Extract from "Tunnel Geological Mapping", section between Ch. 8+000 and Ch.9+000 from Outlet
Source: Salini

The entire tunnel length has been affected by intense fracturing, with primary fracture systems for the must part involving sub-vertical immersion and secondary fracture systems with varied immersion, featuring strong rejects, with broad strips comprised of heavily fractured friction materials, cataclasts and thick fillings of fine sandy loam materials.

The collapse of the tunnel in October 2006 at Ch. 4+195 which blocked the TBM 1 for approx. 22 months was due to the influx of a vast quantity of fine sandy loam material carried by water at a pressure of over 40 bar and a temperature of 40°C. This first event was followed by two more in June 2007 in the left exploration tunnel and then again in August of 2007. Overall between October 2006 and August 2008 over 40,000 m^3 of influx material had to be removed.

On the other hand the tunnel collapse which took place a few weeks after plant commissioning, on 26 January 2010, with the collapse of the tunnel lining for approx. 15 m, led to the entry of over 4,000 m^3 of mud and rocks, with the interruption of energy production for approximately 11 months.

The exact reasons for this last collapse are not clear, but it has been surmised that it could have been caused by the lythostratigraphic pressure being particularly high on the tunnel lining in conjunction with the main fault, with the entry into the tunnel of mud and large blocks of uncemented dolorite. One of the possible explanations is that the strip of cataclastic friction and alteration materials mixed with mud associated to a major fracture, was concealed and separated from the tunnel by a relatively thin diaphragm comprised of a fractured dolorite dyke. Under the enormous pressure exerted by the mud material and the blocks, the dolerite diaphragm gave in and the lining was no longer capable of withstanding the pressure and collapsed. The stretch of tunnel was subsequently rebuilt and reinforced with a double lining.

The lythological tectonic structure and particularly the mechanical characteristics of the formations encountered during tunnel perforation seem to be on the whole rather poor compared to what had been expected in the design phase, as confirmed by the average

performance of both the TBMs, definitely below what had perhaps optimistically been foreseen.

The last collapse did not take place during tunnel perforation but once the tunnel was finished and lined. At this point we have to ask the question:

- "could there be other faults or particularly degraded friction materials, whose size and geometry cannot be ascertained and that have not been identified or are concealed behind diaphragms of good quality rock, pressing directly on other sections of tunnel lining?

The tunnel has been designed to withstand a maximum pressure of 7 bar, but the pressure during the incident in October 2006 was as high as 40 bar.

Following the refurbishing of the tunnel and plant start up, in April of 2011 a visual and topographic check was performed inside the tunnel with a positive outcome. The check involved the verification of lining integrity, but this does not guarantee that other problems, not necessarily as serious, could take place during the works' operational life.

- How often should the visual checks inside the tunnel take place which entails halting plant production, in order to guarantee the plant's functionality and the best plant efficiency?
- Has a check schedule been drafted?
- What is the cost of interrupting production to carry out visual tunnel inspections?
- Has a damage and energy production interruption cost assessment been carried out in case of further structural problems inside the tunnel?

A plant of the size and relevance of GGII is currently managed exclusively by means of visual checks, left up to the experience and subjective evaluation of the inspector.

In short, based on the productivity recorded in 2011 and for the first quarter of 2012 one can undoubtedly state that currently the GGII plant is efficient and capable of achieving the expected production targets, but it appears to be lacking in monitoring and control systems that are essential in order to guarantee the same productivity in the long term.

We believe it is necessary that EEPCo be made aware of the need to install a system of continuous structural monitoring capable of detecting excess pressures, collapses or vibration frequencies that may send "warnings" calibrated on the basis of pre-established warning and alert thresholds.

A hydrological and structural monitoring system for the whole plant certainly has an installation and management cost, but it would certainly have a positive effect on efficiency, by reducing the times and costs of stoppages for visual tunnel inspections, and by contributing to the formation of a class of technicians to be used on the other plants currently undergoing construction.

3.2 What were the factors of success / failure and how they were managed by the actors involved?

The methodological approach indicated in the MAE's M&V Operating manual suggests that project development be verified throughout the six project cycle phases, from the concept right through to its implementation and evaluation. During the various phases of the cycle the individual stakeholders play a different and interrelated role which we feel needs to be looked at closely, particularly in order to verify the efficiency and effectiveness of the actions undertaken.

More specifically, the evaluation questions that have enabled us to pass a judgement on these aspects are:

- EF5 What are the main factors to have affected the successful / failed achievement of the objectives and results during the various phases of the project cycle?
- EF6 In terms of operating, management and decision making efficiency, what has been the role of the stakeholders involved such as DGCS (Central and local offices), Local Authorities and General Contractor?

EF5 What are the main factors to have affected the successful / failed achievement of the objectives and results during the various phases of the project cycle?

The Evaluation Team, believing that the expected objectives and results of the GGII Cooperation Project have been essentially achieved, expresses a medium-high rating on this issue.

Certain factors that have become apparent during the project cycle implementation have been noted which could affect the full attainment of the Project's objectives and results.

From the analysis performed, we can ascertain that:

1) where the **general objective** is concerned, given the successful completion of objectives a) the promotion of the exploitation and enhancement of the national hydroelectric potential, b) the expansion of the export capacity of the national energy sector and c) the increase of national energetic independence, certain critical elements have nevertheless been detected concerning the exploitation and enhancement of the energy sector *in an environmentally sustainable context*. The main factor here is located in the *formulation* phase seeing as in drafting the analysis and feasibility of the project, the environmental impact assessment appears to be very wanting (see subsequent evaluation questions of the IP group) and as a consequence has led to the failure to draft an environmental monitoring plan that could take into account the specific nature of the project and its environmental context. This would have guaranteed the correct management of certain construction processes and would have therefore enabled the implementation of appropriate environmental mitigation measures.

2) as far as the **specific objective** is concerned, given the successful achievement of objectives a) improvement of access to electrical energy, b) satisfaction of the energy demands of the population and development requirements, a few critical elements have

been detected concerning the satisfaction of internal demand *with the least environmental impact* and so that it may be *economically sustainable***.** The factor that has influenced the failure to completely minimize the environmental impact is to be sought, as was with the case for the general objective, in the *formulation* phase. While the factors that have influenced the reduced economic sustainability compared to the project forecasts need to be sought in the *Identification, Formulation* and Implementation phases.

As far as this last aspect is concerned, the "contingencies" of a geological nature that have been outlined in detail in EF4 which took place during the *implementation* phase have led to an increase in construction costs, partly covered by further funding on behalf of the EthGov (see EF1), a delay of a total of approximately 30 months compared to the expected start of plant operation, with the loss of revenue that this has entailed (see EF3). The overall delay along with the increased costs incurred in solving the geological problems have therefore had a partially negative economic impact on the Project.

It must also be pointed out that in the Evaluator's opinion, very little was done both during the *identification* phase but particularly in the *formulation* phase to minimize geological risk which instead should have been one of the main risk factors that needed assessing with greater thoroughness.

In particular the Evaluation Team believes that there has been a lack of:

a) competitive comparisons between design alternatives in the *identification* phase
b) an independent technical and economic check over the project on behalf of a third party (project validation) in the *formulation* phase.

The Evaluation Team believes that both the factors mentioned above could have helped to minimize the possibility of occurrence of the geological incidents that have taken place.

3) as far as **expected results** are concerned, which means having the GGII plant operational and capable of supplying additional supplementary power and an operating system capable of ensuring transmission of the energy produced, we have to acknowledge that the project has not yet been formally closed. We have in fact been able to certify that to this day, even if the "*Taking Over Certificates"* have been issued, no final report by the ELC, nor any final testing certificates have been issued (Performance Certificates) for either the civil or the electro-mechanical works. These documents constitute the final stage of the *Implementation* phase. It is clear that, although the data and the statements collected would lead one to express a positive assessment regarding the full and correct operation of the systems implemented, the absence of formally closed testing with a positive outcome introduces an element of technical and operational uncertainty due the lack of certification.

EF6 In terms of operating, management and decision making efficiency, what has been the role of the stakeholders involved such as DGCS (Central and local offices), Local Authorities and General Contractor?

The assessment of the role played by the stakeholders involved in terms of operational, management and decision making efficiency is positive. The rating assigned is High (A). All stakeholders involved have shown great thoroughness and a correct overall management of

the project and an increasing level of co-ordination between them on all operational, management and decision making actions[31].

The operational approach of the turnkey contract separates the action of the DGCS from the operating efficiency of Local Authorities, EEPCo and General Contractor. The role of the DGCS is mainly in the initial stages, during the negotiation phase with the MoFA and the MoFED and preparatory surveying activities.

On the Italian side, the operational efficiency has concerned the control and the assistance in monitoring the initiative. The UTL has kept the Central Technical Unit and the Office IV "Development Aid in favour of Sub-Saharan Africa" of the DGCS constantly updated. The Office IV has been engaged in technical and administrative monitoring activities for the project A large part of the available documentation at MAE level has been directly prepared, analysed and published by the external expert that has been involved in regular missions to Ethiopia during the various years of the appointment, within the context of the Addis Ababa UTL[32]. The external expert at the meeting of 29.12.2011 showed a good capacity to manage relations between all partners.

Quarterly progress reports				
drafted by	**presented by**	**forwarded by**	**analysed by**	**transmitted to MAE**
ELC	**EEPCo**	**UTL**	**monitoring service**	**UTC-Uff.IV**

Table III - 11: Quarterly progress reports for GGII
Source: devised by the Evaluator

The operating efficiency can also be established in terms of the assistance loan financial management plan which did not encounter any particular problems. The payment certificates issued by Salini Costruzioni were approved by ELC and presented to the EEPCo, to MAE (UTC, Office IV and DGCS-X on matters of assistance loans). They were subsequently forwarded to Artigiancassa[33]for the payment of the balance to Salini.

Payment certificates				
issued by	**approved by**	**forwarded by EEPCo to MAE**		**issued by**
Salini	**ELC**	**EEPCo**	**UTC-Uff.IV DGCS-X**	**Artigiancasse**

Table III - 12: Payment certificates for GGII
Source: data processed by the Evaluator

[31] See Final Report II-4 *The stakeholders involved in Project implementation*

[32] UTL Addis Ababa Monitoring Report and Ing. Radio Save

[33] See - Financial Agreement between the Ethiopian Ministry of Finance and Economic Development and Artigiancasse.

The local Authorities have provided all their support for the initiative thanks to their efforts to ensure a very relaxed and collaborative atmosphere in all work contexts. The EEPCo, the ELC and Salini have guaranteed an open and correct collaboration for the entire duration of project implementation. Even during the two critical technical events that took place during the implementation of the works, the collaboration between EEPCo , ELC and Salini was always constructive and directed towards finding a solution to the problems, showing among other things a considerable efficiency in both their decision making and their operational capacity.

During the focus group with the Evaluator on 11 May 2012, the EEPCo representatives confirmed that they had no problems with the other stakeholders: *... the stakeholders, have worked together like a good team. A constant follow up procedure has been established with the Italian Cooperation that has been of great help, and ensured excellent technical assistance with a very friendly attitude.*

3.3 What kind of assessment can be made of the cost/effectiveness of hydro-electric energy development in the Sub-Saharan scenario?

A few evaluation questions have been used to verify the cost / effectiveness of the GGII initiative relative to the additional population served, and compare it with a few initiatives that could have been taken as reference in terms of cost / efficiency but also as a reference benchmark.

More specifically, the evaluation questions that have enabled us to pass a judgement on these aspects are:

- EF7.1 In cost/effectiveness terms, what is the ratio between total cost of the operation/additional population served?
- EF7.2 In cost / effectiveness terms, which similar operations, performed in developing countries, could be of reference for GGII, particularly in Sub-Saharan Africa?
- EF8 In terms of benchmarking, which similar operations, performed in developing countries, could be a reference for GGII?

EF7.1 In cost/effectiveness terms, what is the ratio between total cost of the operation/additional population served?

Bearing in mind the overall investment total of € 493.742.322, the relationship between the total cost of GG II and the additional population served is of € 552 per utility (intending by utility the individual persons that benefits from the electricity). The answer to the evaluation question is therefore to be considered positive and with a high rating (A), thanks to excellent cost /effectiveness ratio for the population.

From the information provided by EEPCo during the course of the Evaluator's mission in Ethiopia[34], it resulted that following the activation of GGII, no.165,791 new connections were hooked onto the grid by March 2012. Of these connections 73% are domestic contracts.

Considering that the average Ethiopian family nucleus is comprised of 7.4[35] individuals, one can infer that the population benefiting from the electrical energy produced by GGII can be estimated at around 895,000 individuals. The ratio between total investment and individual beneficiary is therefore € 552. This figure is an improvement over the target of € 633 for single beneficiary forecast as an objective for 2013 in the DGCS' Technical and Economic Evaluation of 2004. In this document, based on EEPCo explanations and a letter of the Ethiopian Foreign Minister[36], it was estimated that the cost/effectiveness ratio relative to the additional population served should have enabled network connection of 774,000 new individuals (source EEPCo), equal to 20% of the population, by 2013. The new individual utilities (895,000) therefore exceed by 15.6% the target foreseen by the TEE.

[34] See EEPCo Letter and note of 08.05.2012 to Italsocotec, on Input data requested for the Evaluation of the post-construction phase of the Gigel Gibe II Project.

[35] Guttmacher Institute www.guttmacher.org

[36] EEPCo explanations sent by letter to MAE/DGCS on 10 September 2004 and letter of the Ethiopian Foreign Minister to Sen. A. Mantica dated 4 November 2003.

EF7.2 In cost / effectiveness terms, which similar operations, performed in developing countries, could be of reference for GGII, particularly in Sub-Saharan Africa?

From the analysis of documentation relative to projects in the Sub-Saharan area the rating allocated is medium-high (MA). The Inga Dams, located in the Democratic Republic of Congo, are two hydro-electric plants on the largest waterfall in the world, the Inga falls. The first two plants named Inga I and Inga II have a total installed capacity of 1,775 MW. Studies are underway for an Inga III project and for a Grand Inga, two new and very powerful hydro electric power stations[37].

Starting with the first plant Inga 1 MW 351 (medium - large) right up to the MW 39,000 Grand Inga (mega sized plant), the integrated project enables us to get an overview and at the same time a fairly detailed picture of a system comprised of hydro-electric plants of different capacities and involving different sizes of investment.

The prospectus that follows offers some specific information on the Inga complex as compared to the GGII plant. The forecast appears "futuristic", but the rehabilitation initiatives for the first two

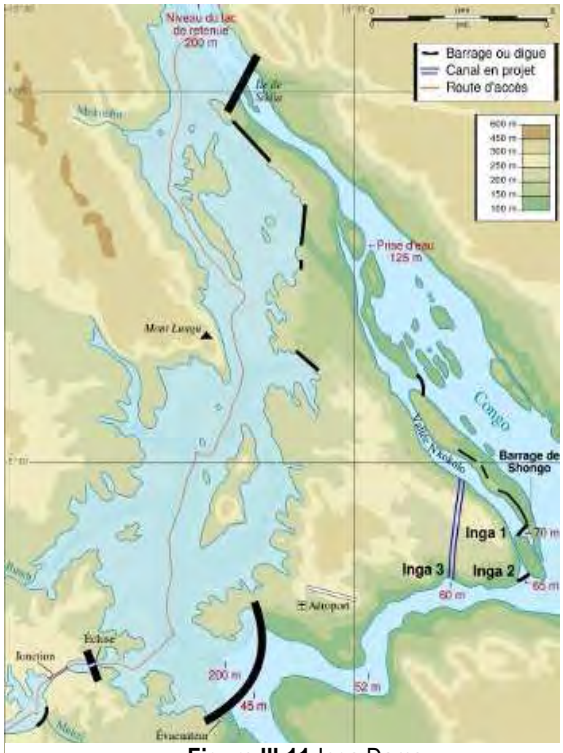


Figure III-11: Inga Dams

Inga 1 and Inga 2 power stations are underway, and the initial works for the Inga 3 dam are at an advanced planning stage. The Inga Dams should represent a dynamic reference which GGII should take as a point of reference. The tunnel solution for Inga 3 would essentially be identical to the one used for GGII.

	DEMOCRATIC REPUBLIC OF CONGO				ETHIOPIA
	INGA 1	INGA 2	INGA 3	GRAND INGA	GGII
In operation	1972	1982	At the planning stage		2011
MW	351	1,424	3,500/4,500	39,000	420
Expected cost	The WB has estimated the rehabilitation costs at around 435 Meuro		€ 3.2 / € 6.0[38] billion	€ 63 billion	Meuro 493
Funders	Rehabilitations underway: WB, BEI, AdB, South Africa IDV.		WB, AdB,BEI, JFPI, and others	WEC, AfDB, WB, BEI etc.	Italian Cooperation, BEI, EthGov

Table III - 13: Comparison of Inga Dams (DRC) with GGII
Source: data processed by the Evaluator

[37] Source: http://www.howwemadeitinafrica.com/how-the-drcs-inga-project-could-solve-much-of-africas-power-problems/10583/ with descriptive image

[38] The difference between 3.2 and 6 billion € depends on the different design solutions adopted: an ordinary dam or a tunnel that leads to the turbines (see GGII).

Below we have included a map taken from International Rivers which shows the distribution of dams in African territory.

Figure III - 12: Map of the distribution of dams on African territory
Source: International Rivers 2010 http://www.internationalrivers.org/files/attached-files/2010africamap.pdf

EF8 In terms of benchmarking, which similar operations, performed in developing countries, could be a reference for GGII?

Besides the Inga Dams in Sub-Saharan Africa it is difficult to to identify initiatives that could be used as a benchmark and reference examples for GGII. The difficulty lines in the fact that:

- there is no hydro-electric plant currently operational that involves a tunnel leading to the turbines that is any where near 26 km long;
- for GGII, one did not have a significant environmental impact (seeing as it was built using an underground tunnel), something that in many ways concerns the other initiatives;
- for GGII it has not been necessary to resort to forced population displacement with the consequent negative fallout in social and economic turns.

Based on the explanations provided above, one can consider a medium - high rating level (MA).

In the Sub-Saharan region an increasing amount of investment is going into the hydro-electric power station sector[39].

China is an extremely significant partner in African countries and is often seriously involved in the funding and implementation of these plants. A few Chinese initiatives however have triggered serious alarm among international environmentalist associations. Among the most relevant aspects, one that is particularly highlighted and contested is the forced displacement of the population. In the cases described below 50,000 people were displaced for the Merowe Dam and 10,000 displacements were arranged for the Kajbar Dam.

	North Sudan	North Sudan	Nigeria	Zambia	Ethiopia
	Merowe Dam	Kajbar Dam	Mabilla HP	Kafue Gorge Lower HP	GGII
In operation	2009				2011
Under construction		(2010-2015)		(2011-2017)	(2005-2011)
MW	1,250	360	2,600	750	420
Expected cost (Meuro)	1418	555	1182	1576	493
Cost per installable MW	1,134,662	1,543,088	454,592	2,101,227	1,173,810
Funders	China Export Import Bank and Arab funders		China Exim Bank	Zesco; China Hydro Corp. China Africa Dev. Fund	Italian Cooperation, BEI, EthGov
Construction companies	Chinese, German, French	Sinohydro (China)	Chinese constructors	Chinese constructors	Salini (Italy)
Forced removals	50,000	10,000			

Table III - 14: Comparison of hydro-electric initiatives in Sub-Saharan Africa with GGII
Source: data processed by the Evaluator

[39] In order to carry out a more detailed analysis of all the African dams, many of which are sites of major hydro-electric plants, reference should be made to African Dams Briefing 2010, a document prepared by International Rivers in 2010 www.internationalrivers.org.

Below we present a map of African taken from "International rivers"[40] which shows new hydro-electric plant proposals. Ethiopia is among the countries with the highest percentage of electricity produced from hydro-electric plants.

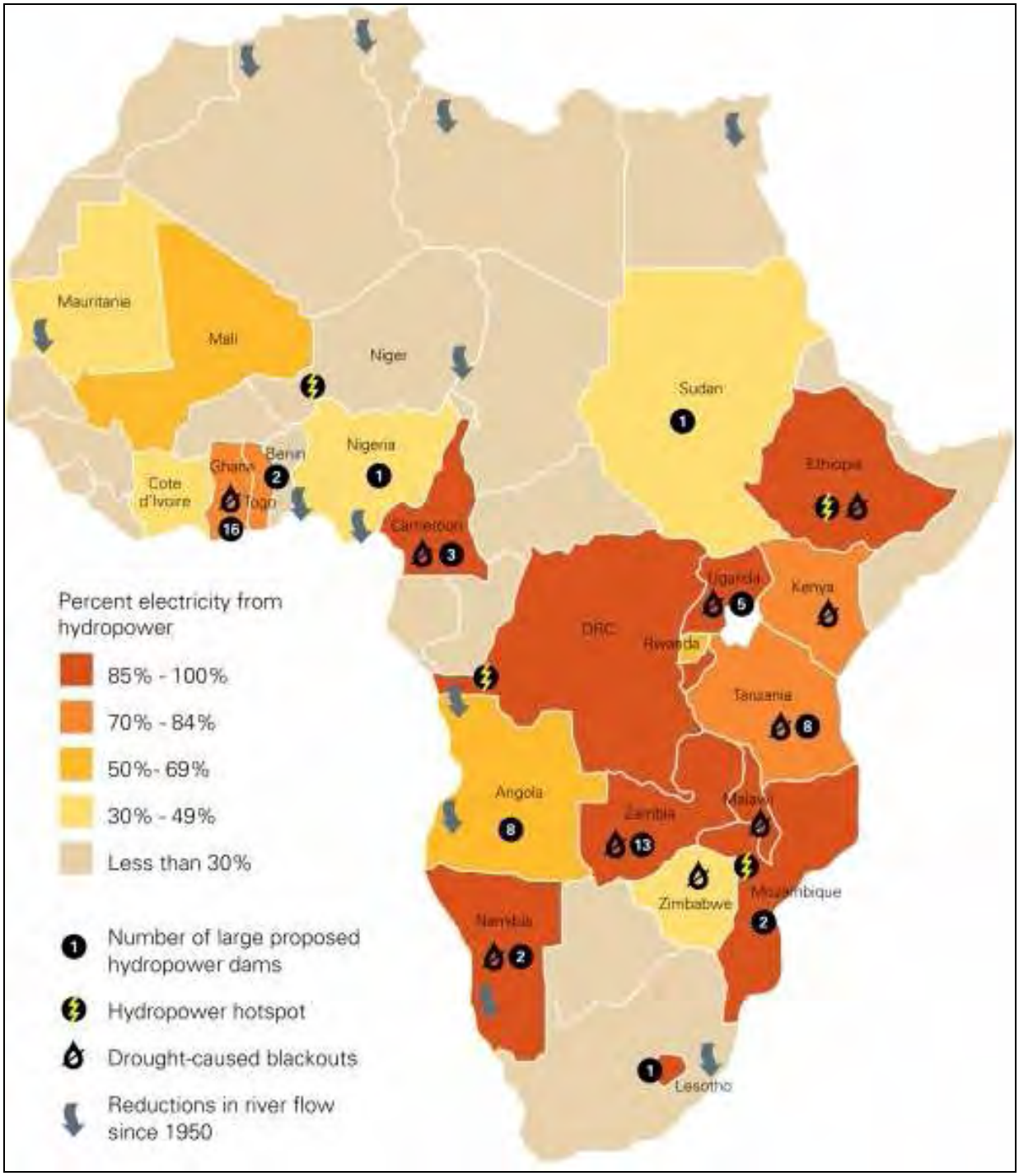


Figure III - 13: Hydrodependency in Africa: Risky Business (20 April 2012)
Source: International Rivers 2012 http://www.internationalrivers.org/files/attached-files/2010africamap.pdf

[40] http://www.internationalrivers.org/resources/hydrodependency-in-africa-risky-business-4559

4. SIGNIFICANT SOCIAL AND ECONOMIC IMPACT AT LOCAL LEVEL

From the social and economic point of view the GGII project has had a significant impact on the areas of the two Weredas (Ethiopian districts) which border the plant, and in particular on the two villages of Fofa (Yem Special Wereda) and Soukoru (Soukoru Wereda).

The impact on employment has been significant, and continues to be apparent, under different guises, after the completion of the construction work The local work force on average amounted to 2,410 workers (with a maximum of 3,552 workers in September of 2006). Approximately 50% of the local work force (equal to 1,700 units) came from the two Weredas of Sokoru and Fofa. The *direct* impact on occupation during construction site operation concerned 0.7% of the total population of the area.

In terms of *direct downstream activities*, the construction of the GGII has contributed not so much to the creation of new companies, as to the development of professional expertise and craft skills. These acquired skills have led to many individual craft activities being set up. A few local craftsmen have taken part in the implementation of "good neighbourhood works" in the two villages and continue to be involved in an independent activity. Where *indirect downstream activities* are concerned, the construction of the GGII plant has boosted the development of sectors such as tourism, trade and agriculture.

Figure III - 14: View of the city of Fofa

Source: data processed by the Evaluator

Two factors that seem to ensure that the directly induced occupational impact *will be a lasting one* are*:* the level of skills acquired by certain professional segments and the competence acquired by local personnel in line with national labour demands. A particularly significant

aspect here is the knowledge transfer that has taken place in favour of younger segments of the population.

Alongside the construction of the GGII plant on the territory, an improved dynamic for the area has also been developed that has led to a positive transformation of the rural economy and enabled the development of the two towns of Fofa and Sokoru, with obvious effects on the main economic sectors. All the traditional sectors have been able to benefit by the improved context, the effects have been positive and to some extent still persist now that the GGII project has been completed.

Within the context of the construction of the GGII plant, the income of local families has improved. The improved income has also been used to develop pre-existing economic activities and to trigger forms of diversification. The activities that have been triggered are usually small and in line with the local reference market.

The most tangible effects on the community are those connected to the improvements and the "good neighbourhood" actions implemented by Salini in the towns of Fofa and Sokoru. These actions, despite not being included within a specific feasibility plan, have been developed coherently with the needs of the two places by guaranteeing and/or providing a series of basic services for the population.

From a safety point of view, the strong influx of people from other areas during the building phase has also had a few negative effects. In particular this has led to an increase in theft and a degree of insecurity has been introduced which was not present before. The negative effects effectively ceased at the end of the construction phase, once these additional presences had moved on.

In relation to the workplace safety issue, during the construction phase there were 36 work related deaths (many due to car accidents). During the building site phase the people assigned to safety management were around twenty. The procedures used complied with European standards: the personnel was required to use safety equipment and to implement the necessary procedures.

During the construction of the GGII plant, there were no strikes, while during the course of the construction of GGI there had been strikes of considerable length (even as long as a month).

The effects of the GGII project from a social, cultural and political-institutional standpoint in the area in question are mainly positive. The negative consequences reported by the population (many young boys went to work there attracted by the increased earnings and no longer went to school) or which were initially considered negative (greater female emancipation, in contrast with the local culture), have been limited to the work construction period or have been assimilated within the local culture.

During the construction of the GGII plant, there was an increase in HIV positivity in the areas of Sokoru and Fofa, due to the heavy increase in presences in the area. In quantitative terms, in the Sokoru area the number of HIV positive persons recorded moved from 133 instances in 2004 to 190 instances in 2009.

More specifically the evaluation carried out on social and economic impact focused on the following two main issues:

- The general effects in terms of occupation, downstream activities and know-how;
- The effects of a social, cultural, political and institutional nature.

Each of these two main issues has thus been developed when answering the specific evaluation questions, the detailed answers to which are provided below.

4.1 What effects have been generated in terms of occupation, downstream activities and know-how?

The documentary analysis but particularly the field investigation have enabled us to express an evaluation judgement on the occupation impact that the GGII initiative has had particularly at a local level, both during the construction of the works and in the long term. The occupational factors have been ascertained both directly and indirectly in order to verify their duration in time and the benefit acquired due to knowledge transfer.

More specifically, the evaluation questions that have enabled us to pass a judgement on these aspects are:

- IP1 Did the works construction phase have an occupational impact on the local population during the construction phase and to what extent?
- IP2 Has there been an increase in downstream activities that can be directly linked to the works construction?
- IP3 Can a "lasting" occupational impact for the local population be established that will continue even during plant operation?
- IP4 What know-how has been transferred to the local population thanks to the construction of GGII?

IP1 Did the works construction phase have an occupational impact on the local population during the construction phase and to what extent?

The impact on employment has been significant during the construction phase, and continues to be apparent, under different guises, even after the completion of the construction work. The local work force employed on the construction site on average amounted to 2,410 workers reaching a maximum of 3,552 workers in September of 2006. The ex-patriot work force never went above 4.4% of the total. For this question, the rating awarded by the Evaluator is medium-high (MA).

The graph shows the work force employed on the construction site in the various months of activity of the work site for GGII implementation, as could be ascertained from the documentation provided by Salini.

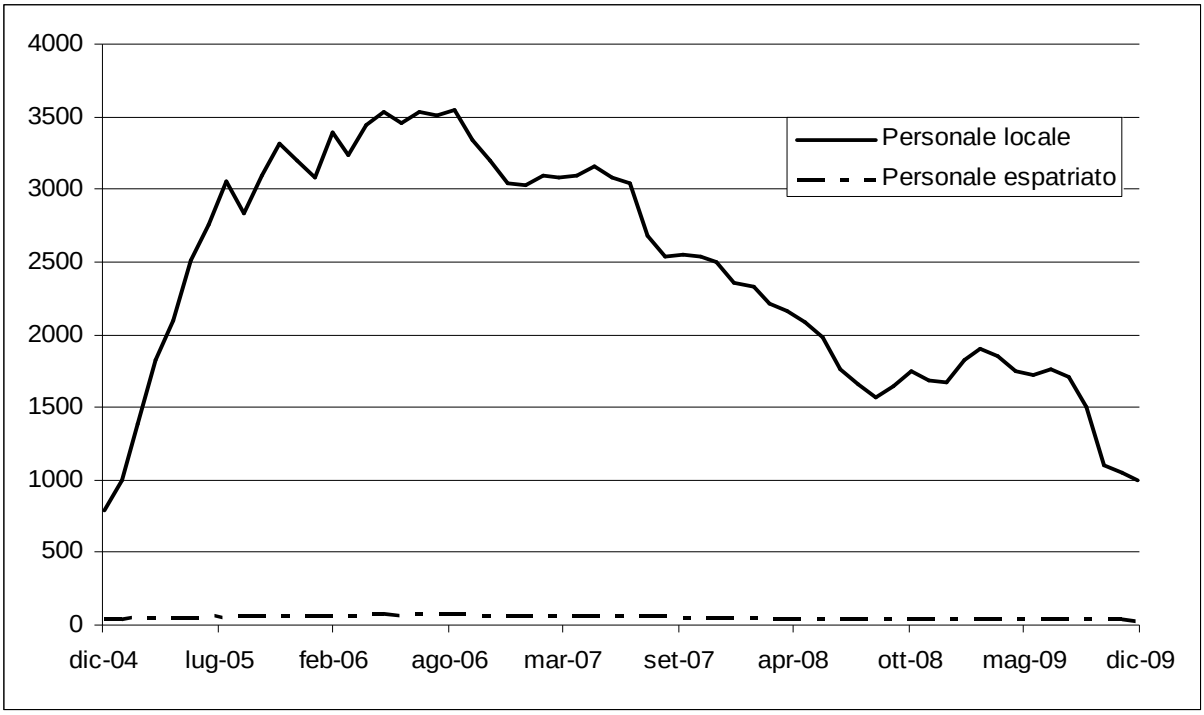


Figure III - 15: Personnel employed during GGII construction
Source Salini Costruttori S.p.a.

Approximately 50% of the local work force (equal to 1,700 units) used in the construction work came from the two Weredas of Sokoru and Fofa. The direct impact on occupation during construction site operation concerned 0.7% of the total population of the area.

GGII: RESIDENT POPULATION AND DIRECT OCCUPATION	Total
Resident population in the area: Sokoru – Wereda and Yem Special Wereda	251,490
Direct occupation from the Sokoru – Wereda and Yem Special Wereda regions	1,700
Ratio of direct occupation at site from the area / resident population	0.7%

Table III - 15: Average direct occupation created in the Sokoru and Fofa Weredas
Source: Data processed based on Salini data and from the Ethiopia, Central Statistical Agency (CSA) - Statistical Abstract 2011

The occupational impact concerned different sectors of the population and included the young and the women. Salini found an excellent willingness to learn and a considerable learning ability.

IP2 Has there been an increase in downstream activities that can be directly linked to the works construction?

The evaluator's rating, in answer to the question, is medium-high (MA). In terms of direct downstream activities connected to the site work, the construction of the GGII plant helped to develop professional skilled labour and job competence (mainly electricians, mechanics and

carpenters) which has led to the development of small craft activities mainly by individuals. A few local craftsmen have taken part in the implementation of "good neighbourhood works" implemented by Salini and which continue to run independently.

As far as the *indirect downstream activities* are concerned, the construction of the GGII has mainly promoted development in the following sectors:

Hotel and catering facilities

During the influx of people into the area during the construction site activities, in both the town of Fofa and Sokoru the local population rented their homes thus acquiring a considerable additional income. Only sporadically have any small lodging facilities been set up, some of which are still operating despite the reduced activity (often in connection with small commercial activities).

Commercial activities

Alongside the increase in accommodation requirements due to the influx of people, both cities also developed small commercial activities. These activities are mainly the result of the initiatives of "merchants" from outside the region; from an economic point of view these activities have posted excellent results. At the end of the construction phase, a large proportion of these commercial activities have been moved to other areas. Only a limited number of shops appear to be still active in the city of Fofa (2 shops) and Sokoru (3 shops).

Agriculture

The population increase has had a positive effect in terms of consumer demand; this effect has promoted a better production and an increase in the income of the agricultural population.

During the course of the field activities the Evaluation Team visited some of the commercial activities that were still running.

BOX: Example of indirect downstream activities in the town of Fofa

Commercial activities and hotel facilities in Fofa

During the field activities it was possible to visit two commercial activities that had been set up during the GGII construction phase and are still active in the town of Fofa.

These are small shops that sell a variety of products (from objects to

Figure III - 16: Commercial activities and hotel facilities in Fofa
Source: data processed by the Evaluator

IP3 Can a "lasting" occupational impact for the local population be established that will continue even during plant operation?

The rating for this question, is medium-high (MA). Two factors would seem to ensure that the direct occupational effects created during the construction phase will be *long lasting:*

- on the one hand, the level of competence acquired by certain skilled workers is considered particularly relevant. Having taken part in the construction of GGII is seen as a *good reference* and a guarantee of the quality of the acquired skills that has led to improved occupational opportunities.

- on the other hand, the skills acquired by the local personnel are coherent with the labour requirements which are developing throughout the country. In particular the plan for development of the energy sector in Ethiopia includes the implementation of numerous and significant hydro-electric projects which require a workforce thus creating a connection between offer and demand for employment. Even the construction sector and many re-qualification initiatives (in particular in Addis) represent a significant employment opportunity for the skill set acquired during GGII construction.

At present, it is estimated that approx. 50% of the workforce employed in the construction phase of the GGII has continued to work in the sector; more specifically:

- 180 units, of which 31 women, are currently employed by EEPCo in the management of the GGII plant. The positions held are either of a technical and administrative nature of they concern more general services and in particularly watchmen activities.
- Approximately 50 people continue to work on the GGIII Project site, run by Salini.
- a part of the personnel has been integrated by Salini in other projects the Company is running in other international contexts. A few of the units have found work with other companies in other contexts (Sierra Leone), or have found new occupation in Addis Ababa.

As previously indicated, lasting occupation includes a few local craftsmen who have been trained during the GGII construction phase, who have set up on their own or are working as freelance craftsmen in the Fofa and Sokoru area.

IP4 What knowledge has been transferred to the local population thanks to the construction of GGII?

The direct experience of building site activity has resulted in a considerable skill and knowledge transfer. The training of local labour was mainly achieved through practical on site coaching. Generally speaking, the GGII experience has been an excellent training ground for the local population in an occupation that has plenty of market demand. The experience acquired is seen as a good reference (a kind of "*Salini certification*"). The rating assigned by the evaluator is therefore medium-high (MA).

Based on the information collected at various levels (from academic circles to the local population), the knowledge transfer may be summed up as follows:

- Technical and engineering skills, directly connected to the construction and management of the plant that have involved Ethiopian engineers and technicians, but also new local graduates who were involved in certain phases of the project's implementation.
- Professional technical skills, directly connected to the plant construction activities which involved positions such as electricians, mechanics, plumbers, carpenters, builders and mechanical operators who have been able to acquire special skills and knowledge which has led to an improvement of their salaries and careers.
- Basic and cross-segment skills, which included administrative abilities, but also competence concerning safety at the workplace and health regulations.

A few of the highly professionally skilled personnel are currently employed by EEPCo in the management of the plant with strategic or supervisory responsibilities.

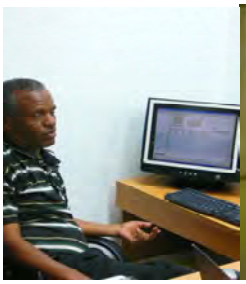
Maintenance	Plant manager	Control room	Head of the Intake facility
			

Figure III - 17: Activity in the GGII plant
Source: data processed by the Evaluator

A particularly significant aspect here is the knowledge transfer that has taken place in favour of younger segments of the population. For many young people taking part in the GGII construction work has been their first professional experience and has helped to direct them towards specific occupations (particularly towards professions such as electrician, mechanic and carpenter).

4.2 What effects have been generated at social, cultural and political-institutional level?

The field investigations have enabled a very painstaking evaluation of the impact of the initiative on a social, cultural, political and institutional level. Particular care was taken in the investigation of the effects on agriculture, livestock farming and those related to safety and social cohesion. A specific issue that has been addresses concerns pandemics and particularly HIV infections connected to construction site activity.

More specifically, the evaluation questions that have enabled us to pass a judgement on these aspects are:

- IP5 Have other economic sectors (agriculture, live stock farming, crafts, etc....) been affected in a positive/negative way by the construction and the subsequent operation of the GGII plant?
- IP6 Is it possible to detect specific positive or negative effects on the community, safety and local social cohesion that stem directly from the GGII undertaking?
- IP7 What short, medium or long term positive or negative social, cultural or political - institutional effects can be identified?
- IP8 Has there been any increase in pandemics (HIV, malaria, etc.) among the local population that may be linked to the construction works?
- IP9 What is the beneficiary's perception of the project's results and effects in the medium to long term and how future impacts may further improve these results?

IP5 Have other economic sectors (agriculture, live stock farming, crafts, etc....) been affected in a positive/negative way by the construction and the subsequent operation of the GGII plant?

The rating allocated by the evaluator as an answer to this question, is medium-high (MA). Alongside the construction of the GGII plant on the territory, an improved dynamic for the area has also been developed that has led to a positive transformation of the rural economy and enabled the development of the two towns of Fofa and Sokoru, with positive repercussions on the main economic sectors.

The increased number of people in the area has also brought with it an increase in consumption and average family income. This market trend has also led to a considerable improvement of the town thanks to the many improvements to the roads, energy and water systems and subsequent improvements in the production and distribution cycles.

All traditional sectors have been able to benefit from the improved context. The effects have been positive and, to some extent still persist beyond the completion of the GGII plant.

Sector	Effects encountered in other economic centres
Agriculture	During the construction phase a demand for agricultural products developed which promoted improved production. Part of the accumulated economic wealth has been invested in improving the activities. The improvement of the road system has enabled new localisations and made it easier to transport the produce.
Livestock farming	The improvement and extension of the road and communication systems have helped to reduce the daily animal relocation times.
Crafts	For the craft sector, the GGII experience has provided a considerable increase in skill development.
Trade	A series of commercial activities have developed exclusively for the construction phase due to the increase in consumer demand. Only a few of these activities continued to operate beyond the GGII construction phase.

Table III - 16: Effects encountered in other economic centres
Source: data processed by the Evaluator

Besides the positive effects previously described, the GGII experience has generally speaking increased the average income of local families. The improved income has also been used to develop pre-existing economic activities or to activate forms of income diversification. The activities are small in size and are substantially in line with the relative reference markets, almost exclusively of a local nature.

Mr. Negussie, a farmer by trade, worked on the GGII plant during the construction phase.

At the end of the construction phase he decided to invest part of the income earned to expand his agricultural activity by setting up a chicken farm in the city of Sokoru.

Figure III - 18 : The experience of Mr. Negussie Woldeamanuel (Sokoru)
Source: data processed by the Evaluator

IP6 Is it possible to detect specific positive or negative effects on the community, safety and local social cohesion that stem directly from the GGII undertaking?

The most tangible effects on the community are those connected to the improvements and the "good neighbourhood" actions implemented by Salini in the towns of Fofa and Sokoru. These actions, despite not being included within a specific feasibility plan, have been developed coherently with the needs of the two towns by guaranteeing and/or providing a series of basic services for the population. The evaluator answer rating is medium - high (MA)

The table below ref. III - 18 illustrates a few of the "good neighbourhood" initiatives implemented by Salini during the GGII construction period and reported as particularly significant for the community during the evaluator's field mission.

SOCIAL INITIATIVES UNDERTAKEN IN FOFA AND SOUKORU	
Initiative site	**Type**
Fofa	⇒ Woreda Administration building ⇒ Fofa Maternity clinic and Fofa Health Center ⇒ Police station ⇒ Water reservoir ⇒ Improvement of road system ⇒ Structures for the School, the Church and leisure activities (football field)
Soukoru	⇒ Water reservoir and 4.2 km of water pipes installed. ⇒ Construction of internal roads ⇒ Police station ⇒ Water reservoir ⇒ Sokoru Health Center ⇒ Parish recreation centre
Addis Ababa	⇒ Gefersa mental rehabilitation centre

Table III - 17: Social initiatives built by the GC as part of the GGII project
Source: data processed by the Evaluator

In terms of safety and local cohesion, during the construction phase the strong influx of people from other areas did have some negative repercussions. In particular this has led to an increase in theft and in the degree of insecurity (something that was not present before in the area). The negative effects effectively ceased at the end of the construction phase, once these additional presences had moved on.

In relation to the workplace safety issue, during the construction phase there were 36 work related deaths (many due to car accidents). During the building site phase there were around twenty people assigned to safety management. The procedures used complied with European standards: the personnel was required to use safety equipment and to implement the necessary procedures.

In the short and long terms the effects of the GGII project on the area in questions are mainly positive.

	Positive effects	Negative effects
Community	The good neighbourhood works have improved the availability of basic services for the community thus improving the quality of life. These works include initiatives in the field of health, water reservoirs, road rebuilding. The community awareness seems essentially to have been reinforced even in relation to the future management of the common initiatives implemented.	During the construction phase, in areas of Sokoru and Fofa the number of HIV cases increased. This increase was partly due to the strong influx of people into the area.
Safety	Police station buildings have been built in both the cities of Fofa and Sokoru. A greater awareness by construction site personnel on workplace safety issues.	During the construction phase, the strong number of additional personnel from other areas has made the area less safe. A marked increase in thefts has been reported. These episodes effectively died down once the construction activity was completed.
Local cohesion	The greater levels of occupation have raised average family incomes. During the construction phase there were excellent occupational opportunities even for young people and women; these sectors of the population had particularly low occupation levels.	Among the negative effects in the medium term one must include the reduction of the levels of occupation once the plant was completed. A part of the population has not managed to retain its income levels and consequently the quality of life they had attained during the construction phase.

Table III - 18: Effects on the community, safety and social cohesion
Source: data processed by the Evaluator

Besides what has been outlined above, it seems worthwhile highlighting how during the GGII construction phase there were no recorded strikes. Conversely, during the course of the GGI construction there were a number of strikes some of which even of considerable length (1 month).

Box: A summary of the evaluation of the improvements to basic services in the town of Fofa and Sokoru

The Evaluation team has visited the towns of Fofa and Sokoru where the contribution provided by the works implemented in order to improve the quality of life is clearly visible.

The good neighbourhood projects are not the result of a specific design analysis but instead answer the need of promoting the acceptance on behalf of the local population of a project of great national significance. For both areas, the initiatives implemented satisfy specific requirements and requests of the population and are all linked by the common purpose of improving the overall quality of living in the area.

A few of the works built in the town of Fofa

A few of the works built in the town of Sokoru

Figure III - 19: Details of implemented initiatives
Source: data processed by the Evaluator

The following table shows an integrated evaluation of the initiatives implemented assessed based on the criteria of relevance, effectiveness, efficiency, impact and sustainability.

Evaluation criteria	Rating (A MA MB B)	Evaluation considerations
Relevance	A	The initiatives implemented satisfy the specific requirements of the two communities and have been activated following a specific request from the Administrations. The initiatives aim to improve the availability of basic services for the population (health, safety, water availability, road systems, education).
Effectiveness	MA	The services are fully operational and usable by the local population
Efficiency	MA	The works fully integrate the existing ones. The service management is integrated within the population's daily activities.
Impact	A	The population's perception is unanimous in reporting how these initiatives have had a great impact in improving their quality of life. Bearing in mind the kind of initiatives, there are no negative impacts.
Sustainability	MA	The authorities (along with the local population) have an interest and a will to ensure that the initiatives and the services implemented are sustained in time.

Table II - 19: Integrated evaluation of the initiatives implemented in Fofa and Soukoru
Source: data processed by the Evaluator

IP7 What short, medium or long term positive or negative social, cultural or political/institutional effects can be identified?

In the short and long term the effects of the GGII project are mainly positive on the social, cultural, political and institutional level in the areas in question. The negative effects that have been reported by the population have been short lived and essentially limited to the works construction period. The rating assigned by the evaluator is therefore medium-high (MA).

The table sums up the opinions collected during the course of the meetings and focus groups with the population and local administrations.

	Positive effects	Negative effects
Social level	The populations have benefited directly from the improvements and services set up in the cities of Fofa and Sokoru. Both cities have grown in terms of quality of life (life expectancy in these areas is higher than the national average). The positive effects can already be seen in the short term. These effects may extend to the medium and long term.	During the construction phase, the strong influx of people to the area has reduced the level of safety in the cities. Thefts, which were previously very rare, showed a marked increase. These negative effects have in any case ceased since the completion of the GGII construction. Also during the construction period many youngsters went to work attracted by the earning opportunity instead of going to school.
Cultural level	The population has grown accustomed to a work ethic and culture, viewed as a correct use of time. There has been an increase in female participation and occupation in sectors where women were not previously involved. Both these effects have had a positive repercussion on both the medium and long term.	The comparison with other customs has led to cultural changes in opposition to traditional culture. These include aspects connected to female fashion (the use of trousers).
Political and Institutional level	The capacity to administrate and manage the territory has increased. This has been matched by a strong awareness of the local administrations on the need not to squander the towns new infrastructure and make it sustainable.	No negative effects have been reported on a political or institutional level.

Table III - 20: Perceptions voiced in the focus groups
Source: data processed by the Evaluator

To further back our investigation results, the following table assesses a few of the effects of the changes that have taken place for women. The Table III - 22 links a few of the considerations that have been noted regarding the impact of the GGII project in terms of equal opportunity. From a methodological point of view, the evaluation takes as its point of

reference the Vispo Guidelines[41] which provide indications on the type of possible impacts in terms of equal opportunities that the initiatives can produce. The attention is focused on four contexts/objectives considered as strategic by the European Commission.

The social and economic impact of the project on the female population		
Strategic objective	**Considerations**	**Rating (A - MA -MB - B)**
IMPROVEMENT OF WOMEN'S LIVING CONDITIONS	A few of the services set up in the cities (a clinic and maternity centre, electric grid, water availability, roads) have a direct effect on the improvement of the living conditions for women. Conversely, during the construction phase, there was an increase in the birth of fatherless children and HIV contagion.	MA
IMPROVEMENT OF WOMEN'S ACCESS TO THE LABOUR MARKET AND TRAINING OPPORTUNITIES	Before the GGII experience, female work was limited to domestic activities. During the construction phase women's participation in working activities increased. A part of the female personnel employed on the GGII project has continued to work for EEPCo (31 people) in the management of the plant and in other similar projects in other contexts (20 women from Sokoru are currently working on GGIII).	MA
IMPROVEMENT OF WORK SITUATION OF WOMEN AT THE WORKPLACE AND REDISTRUBUTION OF CARE WORK	The GGII experience has helped to expand the knowledge base in a number of sectors (from administrative aspects, to gardening activities). The acquired skills remain and continue to generate profits and develop new work opportunities for women (as factory workers, drivers, etc..).	MB
PROMOTION OF FEMALE PARTICIPATION IN THE SETTING UP OF SOCIAL AND ECONOMIC ACTIVITIES	The development of women's businesses has been limited and mainly involved hotel facilities and small shops	MB

Table III - 21: The social and economic impact of the project on the female population
Source: data processed by the Evaluator

IP8 Has there been any increase in pandemics (HIV, malaria, etc.) among the local population that may be linked to the construction works?

During the construction of the GGII plant, there was an increase in HIV positivity in the areas of Sokoru and Fofa, due to the heavy influx of people into the area. In quantitative terms, in the Sokoru area the number of HIV positive persons recorded moved from 133 instances in 2004 to 190 instances in 2009, as verified by the data collected by the evaluator during the course of the mission. This question has been assigned a medium-low (MB) rating considering on the one hand the increase of cases and on the other the initiatives developed as part of the project.

[41] Ministry of Labour: *VISPO, Strategic Gender Impact Assessment of Equal Opportunities*

A number of contrasting actions were put in place during the period.

- During the construction phase, Salini took special measures to curtail the risk of pandemic infections. In particular, the area was sanitised in order to reduce the risk of malaria and regular health checks were carried out on personnel, performed by an on site doctor.
- Particular emphasis was placed on prevention and control activities concerning HIV/AIDS both among the workers and the area's population. A free condom dispenser was placed at the base camp (and is still present and operational).
- Preventive actions against malaria were carried out among the work force (2007) along with the sponsoring of HIV prevention campaigns and vaccination of the population against measles and tetanus.
- The services promoted and issued by the clinics (Sokoru Health Center; Fofa Health Center) were considered very positively by the population.
- The promotion and assistance activities on HIV have promoted an increase in awareness of the problem among the population.

The Italian Contribution to the Global fund

Ethiopia is one of the major beneficiaries of the Global Fund. 9 approved programs (3 HIV, 3 Tuberculosis, 3 Malaria), for a total of over 1,900 USD disbursed, of which 700 million disbursed between 2003 and 2009 (416 for HIV, 36 for TB, 250 for Malaria).

The contribution of the Global Fund to the country has been essential as it has provided the financial coverage guarantee for the national programs for major pandemic control.

Calculations based on official data indicate that the Italian contribution to the Global Fund for Ethiopia amounts to over 45 million USD (26.8 for HIV, 2.3 for TB and 16.5 for malaria).

IP9 What is the beneficiary's perception of the project's results and effects in the medium to long term and of how future impacts may further improve these results?

The perception of the medium and long term effects of the GGII project and the potential impact connected to it is positive. This appreciation has been been expressed unanimously both as far as the specific impact in the local areas is concerned and the general impact at system level. The rating assigned by the evaluator is therefore medium-high (MA). Below we present the perceptions we have collected, divided according to the type of interviewee.

National institutions and stakeholders

Among the factors that over the years have enabled the reduction of the level of poverty and the country's substantial economic growth, a major contribution has been provided by the improvement of the national energy production to which the GGII plant contributes directly. The expansion of the distribution network and the introduction of a diversified tariff structure has further helped to distribute the energy to various sectors of the population.

Locally speaking, the experience connected to GGII has meant an excellent employment opportunity for the population and a favourable situation in which to acquire professional skills.

Even the improvements implemented in the local areas have had a positive impact on the population's quality of life.

Academic world

From a technical and engineering point of view, the construction of the GGII plant has offered an excellent opportunity of confrontation and transfer of skills and knowledge. The study and conception of the project is entirely Italian. The local technicians have been involved in the construction but could have provided a contribution also in the design phase. The local knowledge base would have benefited more if the local technicians had been involved even during the initial phase.

From an occupational point of view, the impacts have been significant and lasting, providing further job opportunities. For university students and recent graduates the opportunity has represented an excellent testing ground and a chance to grow professionally.

From an economic point of view, the energy produced by the GGII plant is "consumed" internally and contributes to reducing the blackouts / energy service interruptions which have tended to hold back many economic activities. Among the expected future impacts, the energy exports will not only contribute to the growth of commercial relations, but will also improve institutional relations and give a substantial hand in guaranteeing the stability and safety between nations.

Administration and Local Population

Both the local administration representatives and the population we met during the field activities consider the construction of the GGII facility and the "good neighbourhood" works as an excellent opportunity that has enabled the growth and development of the area. The level of satisfaction is decidedly high with significant impact prospects in terms of improvement of the quality of life.

Interviewee	Level of satisfaction for results, effects and impact prospects.
National institutions and stakeholders	Very high
Academic world	Fairly high
Administration and Local Population	Very high

Table III - 22: Perceptions voiced based on the type of interviewee
Source: data processed by the Evaluator

5. THE EFFECTS ON THE ENVIRONMENT

The ex post evaluation of the project's environmental impacts aim to certify and verify whether the economic advantages guaranteed by the greater production of electrical energy are counter-balanced by possibly relevant environmental costs in terms of both impacts on quality of life and the safety of the local population and in terms of impacts on the broader biotic community.

The analyses carried out during the Desk phase followed by the on site investigations which included interviews and direct exchange of views with local technicians and administrators have been very useful to help to reach an understanding of the probable medium to long term impacts ensuing from the design and management choices adopted and the specific vulnerability of the site, without the intent of performing a post operam environmental impact evaluation.

In short, it is believed that the project is undoubtedly relevant and significant in terms of the impact it has and will have on the country's economy, but that certain negative environmental impacts should be pointed out which could have been minimized by introducing a few management and at times design solutions often suggested by the ELC environmental expert and requested by the same EEPCo and the environmental experts sent by MAE on site during the mission which took place in 2008 with the precise task of carrying out evaluations regarding the extent of the critical incidents reported and to suggest design and management solutions to try and overcome them.

The environmental impact associated with the construction of the Gilgel Gibe II plant is undoubtedly quite considerable and an important and useful consideration is to assess the scale and entity of the impacts.

As far as the river ecosystem is concerned, the impact due to the diversion of the natural water course are to a large extent unavoidable, but here one must add impacts connected to a partial/inadequate/failed processing of the waters running off from work site activities and areas and the water runoff of the excavation debris deposits, which could have been minimized had the General Contractor implemented some of the recommendations received.

The most important works of the entire project was the construction of the 26 km diversion tunnel bridging the Gilgel Gibe and the Omo Rivers, doesn't appear to have interfered with the drinkable ground waters used by the populations that inhabit the highlands above it. This is due to the considerable difference in height between the tunnel path and the highlands, and in all probability to the particular hydrological situation on the crest, marked by a series of separate circulations and suspended superficial faults. The analysis is however based on deduction, in the absence of any complaints or requests on behalf of the local communities, seeing as no documentation or hydrological study has been produced ante operam, nor have the faults been monitored in any way during the construction phase.

The other plant works, such as weir, the Power House, the Penstocks and the Switchyard, lie in rather narrow valleys and in areas that are virtually uninhabited. The territorial impacts reported may all in all be considered acceptable, given on the one hand the strategic relevance of the project and on the other the morphological vulnerability that is a feature of these lands. The General Contractor for the most part has taken steps to clear the unstable covering layers and the mountainsides rising up directly above the plant, without taking excessive action, by implementing regularisation and stabilisation works that have generally been limited to what was absolutely necessary and seemed appropriate for the purpose.

On the other hand one can't help pointing out the total absence of any monitoring and control systems or activities on the structural, geo-technical and hydrological aspects of the slopes above the accommodation basin and and other relevant areas.

The failure to monitor the quality of the process waters and the repercussions on the vegetation and animal population (with particular reference to the water fauna and the riparian belt) has made it impossible to assess alternative design solutions that might have contained the impacts (construction of waste processing plants and/or development/ upgrading of the existent ones), or the verification of the correctness of the ex ante assessments of the value of the minimum acceptable flow (the flow necessary to maintain the river's ecosystem).

As far as the landscape is concerned, the General Contractor has taken steps to tidy up various construction site areas by landscaping and planting initiatives involving bushes and trees, while in other areas (but not all) the vegetation is gradually reclaiming the areas of its own accord. One cannot however deny the partly unavoidable negative impact of the roads which according to ELC were in any case built "without any attempt to reduce the impact on the landscape".

But besides this detailed aspect of the evaluation, it is believed that on the issue of the impact on the landscape the most critical element has been the lack of a landscape and environmental clean-up of the construction site, as had been repeatedly requested by both ELC and EEPCo. Irrespective of the adequacy and the extent of the environmental refurbishing initiatives carried out by the General Contract, (mostly once the works were completed), this constitutes a critical element from a procedural standpoint with indirect repercussions at the environmental level.

For the sake of completeness, any accurate summary of the impacts cannot avoid underlining the relevant positive environmental impact due to the reduction in CO2 emissions into the atmosphere associated with the production of electrical energy by means of the hydro-electric power station.

More specifically the evaluation carried out on the environmental impact focused on the following three main issues:

- Impacts associated with GGII's interference with the water ecosystem and the hydro-geological equilibrium.
- Impact of GGII on the geo-morphological condition and landscape.
- Energy sustainability.

Each of these two main issues has thus been developed when answering the specific evaluation questions, the detailed answers to which are provided below.

5.1 What kind of impact can be associated with GGII's interference with the water ecosystem and the hydro-geological equilibrium?

The documentary analysis but particularly the field investigations have enabled us to express an evaluation judgement on the environmental impact on the water component by analysing a few of the indirect affects on other environmental components.

More specifically, the evaluation questions that have enabled us to pass a judgement on these aspects are:

- IA1.1 Has the deviation of a considerable water flow from its natural water course had any detectable effects?
- IA1.2 Has any unforeseen flooding taken place during plant construction and operation?

- IA3.1 Has the construction of the tunnel interfered with the hydro-logical equilibrium (ground water level and availability of water resources)?
- IA 3.2 What specific studies have been undertaken in order to carefully assess the interference of the excavation operations and the implementation of the tunnel on the hydrological balance?
- IA5 Effects on the natural vegetation and fauna as a result of works construction (water intake system, access roads, etc...) - Have check-lists for vegetation and fauna species been carried out during the works phase and system operation that can provide useful indications for the assessment of changes in ecosystem equilibriums?
- IA6 Have regular measurements on the physical and chemical properties of the superficial and underground waters been carried out upstream and downstream of the newly built plants ? Has a monitoring procedure been foreseen during plant operation?

Below we provide a summarizing table containing the evaluations made with reference also to the impacts and relative mitigation measures foreseen by the Environmental Impact Study carried out be Cesi in 2004.

IA1.1 Has the deviation of a considerable water flow from its natural water course had any detectable effects?

The technical choices taken by the General Contractor appear to be adequate to maintain a minimum flow of water in order to safeguard the river ecosystem, however, there is no documentary evidence that environmental monitoring activities have been carried out following the entry into operation of the hydro-electric power plant. The Evaluation Group was able to observe the actual release of a flow of water downstream of the dam, but the absence of feedback on compliance with the ecological flow since the entry into operation of the plant is however a critical management. the indicator has been assigned a rating Medium High (MA), the evaluator does not consider that there may be significant negative effect on the environment.

Considering the low water levels on the river during the dry season, a minimum acceptable water flow of 2 mc/sec must be guaranteed (*ecological flow*), which is the flow necessary to maintain the river ecosystem, downstream of the barrier.

A few technical and design choices have been implemented during plant construction which should guarantee the minimum acceptable flow and the Evaluation Team has been able to verify the actual release of this flow.

The micro-climactic conditions in the valley of the Gilgel Gibe River (temperature, humidity) and particularly the ecosystemic balance of the riparian layers have been considerably altered by the rerouting of the water flow down the plant tunnel.

The minimum acceptable vital flow has been determined as the minimum flow necessary to guarantee the safeguarding of the physical (morphology, hydrology, hydraulics),chemical-physical (quality of the waters) and biotic characteristics typical of the natural communities.

In particular, during the dry season the minimum acceptable flow must be guaranteed, in order to provide a minimum of protection to the aquatic population to enable migration towards the confluence of the Gilgel Gibe - Gibe or the survival of natural pools that may form along he river (an issue connected to the IA5 indicator concerning the project impact evaluation on the fauna).

IA1.2 Has any unforeseen flooding taken place during the construction or the running of the plant?

Analysis of available documents and the information gained through interviews with the local engineers and population have not supplied to the evaluator information so that it may be taken into consideration a negative environmental impact on flora and fauna downstream of the Omo River hydroelectric plant, as it is not considered that the alteration of river hydrodynamics has created hardships for the local population as a result of unexpected flooding. For this reason, the indicator has been assigned a rating of High (A).

IA3.1 Has the construction of the tunnel interfered with the hydro-geological equilibrium (ground water level and availability of water resources)?

Although the analysis of documents and information obtained through the interviews have not provided sufficient information to assess the possible alteration of the groundwater quality, it is believed that interventions has not significantly altered the water balance, not having local authorities and local people reported problems with the current availability of water resources. For this account, the rating assigned by the evaluator is high (A).

The EIA document did include as a mitigation measure the creation of new catchment systems in case there had been evidence that during tunnel construction the excavation activities interfered with the water feed of the elevation wells (see EIA- mitigation measures: par. 9.1.3).

Based on the interviews recorded and the documentary analysis, one can safely say that the local population did not suffer any inconvenience, both in terms of water availability and the quality of the drinking waters, although it has to be said that on this last aspect the available documentation does not contain sufficient elements to allow the necessary assessments to be made.

The report drafted by the EEPCo in 2004 "Additional Comments on Basic Design Project, 2004 " along with the later report drafted in March of 2006 by the ELC environmental expert both expressed the following misgivings on tunnel excavation interference with the ground waters feeding the wells and springs which provide drinking water to the populations living on the highlands above the tunnel: " *The problem appears to have been underestimated by the team of technicians in charge of drafting the VIA, considering that all the inhabitants living on the plateau above the tunnel draw their water from springs or elevation wells. The city of Sekoru, Deneba and Saja have a drinking water distribution system fed by wells and those residing in the rural area of Woreda use spring water. The tunnel excavation work could have dried up the existing wells along the tunnel axis. It follows that in the environmental monitoring plan this aspect must be taken into serious consideration and the compensation costs for the construction of new wells and the refurbishing of the water distribution system must be foreseen. The problem must be faced before beginning the tunnel excavation works, in order to avoid complaints from the inhabitants".*

However, from the documentary analysis performed it appears that the measurement of the piezometric (water pressure) level of the groundwater in the elevation wells of the Sekoru aqueduct was performed on a daily and weekly basis at least until the month of September 2007, always with positive results.

After the mission, the General Contractor provided the Evaluation Team with documentary evidence of the evaluations performed during the month of October 2009, on water availability at the springs located along the new road network and along the tunnel axis (Adit 22); these evaluations show that no relevant variations to the colour level of the ground water was reported.

The General Contractor claims that the tunnel perforation has had no effect on the ground water used for drinking purposes by the populations living on the highlands above and that no complaints from the local communities were recorded. This because the tunnel path runs at a very great depth, with rock coverings that vary between 700 and 1200 m.

IA3.2 What specific studies have been undertaken in order to carefully assess the interference of the excavation operations and tunnel implementation with the hydro-geologic balance?

The Evaluation Team could not refer to any hydro-geological study, theme mapping, ground water piezometrics or specific data on the wells and springs located in the area.

It is therefore believed that prior to the start of the works (during the preliminary design phase) no specific hydro-geological assessments were performed to adequately assess the interference of the excavation operations and tunnel construction with the hydrogeological balance.

Therefore, without any documentation that can document the area's hydro-geological situation one can only formulate hypotheses.

The rating assigned by the evaluator is low (B).

In short, the ridge crossed by the tunnel is a homocline structure with a few Omo Formation products at its base, comprised mainly of brecciated and scouriaceous flood basalts, with tufa and acid lava intercalations, particularly in the Western sector, on the Intake side. Above the basalts, in regular stratigraphic layers, one finds acid lavas such as rhyolytes and trachytes with sub vertical intrusions of basalt dykes and dolerites of the Jimma Formation, mainly in the Eastern sector on the Outlet side.

The entire succession is then intensely dislocated into large sub-vertical blocks, mainly by tension faults connected to the Rift tectonics, along which lavas and tufa rocks have risen to the surface.

This structure, dislocated into large blocks by faults with dyke and tufa material intrusions, or with broad layers of brecciated friction materials which range between altered to clayey and whose permeability is directly related to the state of the fracturing of the various lythologies, could have given rise to the formation of a series of fault, with entirely closed or partially communicating circulations, with different hydraulic loads, piezometrics and chemical properties.

The faults can in actual fact act as either a preferential channel for water circulation or as a permeability limit when filled with sufficient altered and clayey friction material.

The available data, and the details provided in the EEPCo reports would seem to indicate that during the tunnel excavation there was no report of ground water interception with particularly significant flow rates: Even during the event of October 2006 at CH 4+196, the water pressure was high, up to approx. 40 bar, but the flow rate turned out to be manageable.

IA5 Effects on the natural vegetation and fauna as a result of works construction (water intake system, access roads, etc...) - Have check-lists for vegetation and fauna species been carried out during the construction phase and plant operation that can provide useful indications for the assessment of changes in ecosystem equilibriums?

Some design choices (some of which are suggested by the EIA document) could have been taken to reduce the impact measuring their effectiveness following the entry into operation of the energy plant. It is believed that were not carried out monitoring of the impacts on wildlife and vegetation (as required by the EIA document) and that, in the absence of data to adequately assess impacts nature and extent, no measures have been taken for the preservation of an ecosystem whose balance was undoubtedly significantly altered. So, the rating assigned by the evaluator is low (B).

From the analysis of the available documentation and our on site interviews with technicians, managers and heads of local non governmental associations we established that no monitoring activities of project impacts on flora and fauna were performed during the construction phase, let alone once the plant was operational.

The absence of any monitoring program by which to assess the impact of the works on the fauna and flora components is a condition that testifies to the scarce attention paid by Ethiopian authorities and the General Contractor to the predictable impact during plant construction and operation.

This makes it impossible to evaluate the appropriateness of the (very limited) mitigation measures foreseen and detailed below, and the difficulty in identifying more suitable actions which might help achieve the objectives of the Via document (minimization of impacts on the vegetation and fauna):

- although the absence of endemic or rare species at risk of extinction meant the construction of aquatic animal passages was not taken into consideration (it was adjudged a "costly option"), nevertheless monitoring activities of the water fauna should have been foreseen [check-list] (ref. EIA,par. 9.2.2);
- the monitoring activity should be carried out both during the construction work and during plant operation to verify that the impacts on the fauna are suitably assessed and possibly in order to establish procedures and activities in order to minimize said impacts (ref. EIA, par. 9.2.2);
- large animals such as hippopotamuses and crocodiles will have to be encouraged to move downriver before the construction of the dam in order to reduce the population that will be trapped in the artificial basin, where the food reserves will be depleted in a relatively short time (ref. EIA, par. 7.2.2 and 9.2.2) - on this issue, although no evidence would seem to indicate that actions have been taken to safeguard the large animals (crocodiles, hippopotamuses), it is worth underlining that during the Evaluation Team's visit a few specimens of hippopotamus were sighted along the river downstream of the barrier.

The absence of any monitoring activity during project implementation is confirmed by the interviews carried out by the Evaluation Team during their mission in Ethiopia in May of 2012.

As far as the vegetation is concerned only two relevant pieces of information could be obtained from the analysis of the documentation:

- the General Contractor was repeatedly asked during the construction phase to implement initiatives designed to minimize the impact of dust pollution on the environment by spraying water (EEPCo quarterly report) - the ELC report drafted in November of 2006 assessed the pollution due to dust blowing off roads and the construction site areas due to

large vehicle movement and the excavation activities as one of the project's most critical environmental problems;

- the General Contractor, in collaboration with the local authorities, has taken steps to plant over 20,000 specimens of bush and tree in construction site areas that were recovered after use. The bushes and trees were supplied by local nurseries (period 2006 - 2007).

Although within the layer of riparian vegetation (directly affected by the river micro-climate) no seriously endangered or endemic Ethiopian plant species appear to have taken root, the balance of the eco-system between the various vegetation belts (starting with the riparian one) will be profoundly affected, with knock on repercussions on the fauna (ref. EIA - potential impacts [par. 7.2.1]).

IA6 Have regular measurements been taken upstream and downstream of the newly built plants on the physical and chemical properties of the superficial and underground waters? Has a monitoring procedure been foreseen during plant operation?

The impacts of such a project on the quality of surface water and groundwater are potentially relevant if adequate planning and management measures are not taken in order to minimize them. The adequacy of these measures can only be assessed by analyzing the results of periodic monitoring of the physico-chemical characteristics of surface water and groundwater. There is no evidence that such activities have been carried out in the process, despite the EPA technicians, the ELC experts and the same EEPCo have reported several times in the construction phase the inadequacy of planning and management solution adopted by the General Contractor for ensure the quality of water. So, the rating assigned by the evaluator is low (B).

From the analysis of the available documentation it would seem that no suitable design or management measures have been implemented by the General Contractor during the construction phase to minimize the environmental impact on the waters, nor have appropriate regular monitoring activities been introduced in order to assess the extent of such an impact.

Very useful information on the impact on water quality was included in the documentation drafted by ELC during the construction phase between 2006 and 2009. It includes detailed considerations and assessments backed by appropriate photographic documentation and it also very clearly outlines its own recommendations (often also voiced by the EEPCo), to which the General Contractor doesn't appear to have provided any answer.

The lack of monitoring of the vegetation and fauna (including water fauna) (ref. indicator IA5) makes the assessment of the impact of water pollution on these same components very problematic. It is believed that the taking of samples and chemical-biological analyses in various sediment locations may at this point provide useful information for the evaluation of the extent and reversibility of these impacts.

In any case, the VIA document drafted by CESI leaves no room for interpretation regarding the foreseeable impacts associated to work site activity, which we have listed below:

- pollution of surface and underground water by drainage waters from tunnel excavation, contaminated by chemical substances such as additives for mortar and concrete mixtures, explosive dust, oil and lubricants off the equipment used in tunnel operations (ref. EIA, par. 3.6.1);
- pollution of the surface and ground waters caused by the water run off from temporary construction material deposits, hydrocarbons and chemical substances (ref. EIA, par. 7.1.6);

- pollution from (inappropriately) purified waste waters from the sanitation services used by the workforce (ref. EIA, par. 7.1.6)

From the Report drafted by EPA in February of 2006 on the application of mitigation measures it transpires that the General Contractor has taken steps to build a sedimentation plant (in order to reduce the Total Suspended Solids, SST) where all the waters from the excavation tunnel were channelled before being dumped back into the water courses (the system was put in place, as can be inferred from the subsequent documentation analysed, only on the Inlet side). Furthermore, the EPA underlines that the system devised by the General Contractor is not appropriate to the quantity/kind of waste to be processed, that only partially processed liquids were poured back into the Gibe River and soil contamination was detected from oils, grease and lubricants often at the "workshop site". The EPA team underlined how the waste liquids containing oils, earth and sand from the excavation tunnel and dumped into the river may prejudice the use of the river water for the populations downstream of the plant. finally the EPA team underlined that the drinking water and hygienic services for the workers were not suitably supplied.

Subsequently, in its quarterly reports drafted starting in December of 2006, the EEPCo stated that the quantity of drinking water supplied by the General Contractor to the workers was generous (25 - 80 l/day) and that it was analysed on a weekly basis. At the same time the EEPCo December report also indicated that irregular biological testing is performed on the waters from the tunnel and that no chemical analysis data has been provided.

We hereby quote the statement made in the mission report by the MAE expert sent in December 2007. "*One can clearly make out at the construction site the spillage of waste from the aggregate processing plant directly into the water courses (according to the EEPCo only partially processed)".*

The reports drafted by ELC between 2006 and 2009 highlight the following critical areas:

- on the processing unit of the tunnel waters on the inlet side (Figure III - 20 and Figure III - 21) it states no water analyses have ever been delivered to the EMU since the beginning of the excavation works although regular analyses were supposed and should have been performed in order to verify compliance with the quality parameters for disposal of the waters into the environment set by the Ethiopian Standards Authority and the EPA - it was recommended that the foreseen analyses be promptly performed and the results delivered to the EMU and to the ELC;
- as already indicated in the previous reports, as far as the outlet side is concerned, the water from the excavation tunnel was dumped into the river without any processing, despite the high pollution potential and the foreseeable ensuing impact on the quality of the river water, its fauna and flora - no analysis of the waters has ever been delivered to the EMU since the beginning of the excavation works (Figure III - 22 and Figure III - 23); the General Contractor presented a single analysis to ELC performed in 2006 by the Ethiopian Health and Nutrition Research Institute which seemed to indicate the lack of pollutants in the tunnel water. ELC viewed this single analysis report dated 2006 as insufficient and in February of 2009 supplied the same recommendations expressed in 2007 and reported below:
    - sampling of waste waters in the presence of EMU personnel;
    - delivery of the sample to an approved laboratory;
    - delivery of a copy of the lab chemical analyses to EMU;
    - comparison of analysis results with the parameters set by the Ethiopian Standards;
    - immediate adoption of suitable waste water processing measures if the waters fail to comply with the water quality parameters.

Figure III - 20 Processing unit (sedimentation only) of the waters discharged from the TBM boring activity S*ource: ELC, December 2007*

Figure III - 21: Processing unit (sedimentation only) of the waters discharged from the TBM boring activity
Source: ELC, February 2009

Figure III - 22: Waters discharged from the TBM excavation activity and dumped directly into the river without any processing
Source: ELC, November 2006

Figure III - 23: Waters discharged from the TBM excavation activity and dumped directly into the river without any processing
Source: ELC, February 2009

- on the settling basins used to process the waters from the excavation plants, ELC reported the following problems: the excessive murkiness of the waters coming out of the tanks due to the excessive flow rate of the water in the settling basins, partially due to excessive sediment accumulations - the repeated reports of this problem supported by photographic documentation (Figure III - 24 and Figure III - 25) up until October of 2009 (the last available report drafted by ELC) suggests that the General Contractor did not implement adequate measures to overcome the problem;

Figure III - 24: Partially soil filled settling basins
Source: ELC, December 2007

Figure III - 25: Partially soil filled settling basins
Source: ELC, October 2009

- with reference to the "batching plants" placed close to the hydro-electric power station where all vehicle cleaning operations take place, the water contaminated with cement, oil, grease and chemical additives is poured into the river without any form of processing - the repeated reports of this problem supported by photographic documentation (Figure III - 26 and Figure III 27) until October 2009 (last available report drafted by ELC) , suggests the General Contractor did not adopt appropriate measures to overcome the problem.

Figure III - 26: Contaminated water from the "batching plants" discharged into the river without any processing
Source: ELC, December 2007

Figure III - 27: Contaminated water from the "batching plants" ends up in the river without any processing
Source: ELC, October 2009

5.2 What kind of impact has GGII had on the local geomorphology and the landscape?

The documentary analysis but particularly the field investigations have enabled us to express an evaluation judgement on the environmental impact as far as the geomorphology and the landscape are concerned.

More specifically, the evaluation questions that have enabled us to pass a judgement on these aspects are:

- IA2.1 What has been the effect on slope stability?
- IA2.2 Have any roads been built which may be used by the resident population?
- IA4 Have the indications of the EIA document concerning the disposal procedures for excavation waste materials been complied with?
- IA7 What landscape re-qualification activities have been foreseen for the area of operations and the aggregate quarries? To what extent have they already been undertaken?

Below we provide a summary of the evaluations performed with reference to the impacts and relative mitigation measures foreseen by the Environmental Impact study drawn up CESI in 2004.

IA2.1 What has been the effect on slope stability?

The rating assigned by the evaluator is medium-low (MB).

The area which hosts the GGII plant has a rather hilly morphology with fairly steep slopes particularly in the Outlet area by the Gibe River. The geological structure reveals a series of flood basalt alternated and overlaid by trachyte and rhyolyte lavas some of which in "dome" formations, all heavily fractured by the intense tectonic activity of the "Rift Valley". The alteration of these rocks, due to tectonic stresses allied to chemical and climactic phenomena has given rise to widespread layers occasionally of considerable thickness comprised of crumbled and chaotic materials with a prevalence of breccias in a sand and clay matrix along with frequent lateritic encrustations.

Considering the intrinsic vulnerability to erosion and distress of the alteration and colluvial layers that cover the hilly areas, which is justified by the steepness of the landscape and the intensity of the rainfall during the wet season, the construction of the major plant works has necessarily generated an impact on the stability of certain mountainsides.

The report drafted in 2008 by the environmental experts sent by MAE details the geo-technical and environmental problems with appropriate photographic documentation, stating that it considers essential that a "*detailed geo-technical study be carried out to identify the unstable aspects of the fronts and slopes, both relative to the initiatives in the area (roads, dams, basins, excavations, etc.) and those areas where the solid materials have been stowed. The study must establish the possible causes, assess the risk to the community and suggest the most suitable solutions to limit future damage, even for the landscaping of both the inlet and outlet sites. The study must also take stock of the faces that are currently being excavated in the borrow pits".*

The recommendations formulated by EEPCo and ELC to the General Contractor requiring the implementation of planned and designed containment and stabilization works have been

ongoing and reiterated, apparently to little effect. Most of the mountainside tidying up, refurbishing and stabilisation works, particularly on the slopes not immediately overlooking the entrances and the construction works, have been carried out at the end of the construction activities.

In the power plant area, the fronts of the two tunnel entrances on the Inlet and Outlet sides have been cleared of all vegetation and the layer of altered and fractured rock, then excavated, terraced and stabilized using shotcrete and injections of concrete mixtures.

Extensive reprofiling, terracing and stabilisation works have been done on the slope directly overlooking the Outlet tunnel and over the entire slope bearing the penstocks right down to the Power House building.

Figure III - 28
Reprofiling and settlement of the Outlet area slopes - Penstock
Source: General Contractor photographic doc.

Figure III - 29 Reprofiling and settlement of the Outlet area slopes - Penstock
Source: General Contractor photographic doc.

Overall the terrace reprofiling and the shotcrete stabilisation along with the concrete injections in some of the terraces directly above the Outlet tunnel, the Surge Shaft, the Power House access road with wire netting and riveting being applied to other steep slopes, appear appropriate to the steepness of the mountainsides and the on site lythologies.

Figure III - 30: Mountainside stabilisation, Power H. area, using wire netting and riveting
Source: General Contractor photographic doc., 08.2009

Figure III - 31: Mountainside stabilisation, Power H. area, using wire netting and riveting
Source: General Contractor photographic doc., 08.2009

The cutting and reprofiling of these slopes was clearly unavoidable in order to implement the works involved, but overall the impact can almost be considered acceptable and limited and the vegetation in many areas has already covered a large part of the harmed areas connected to the works and equipment movements.

IA2.2 Have any roads been built which may be used by the resident population?

Following the surveys performed it turns out that the roads built by the General Contractor are practicable and in a good state of preservation and sufficiently functional.

However, the site area and its access roads have been involved in the construction phase by instability phenomena favored by the construction of roads. The General Contractor has carried out initiatives in order to guarantee conditions of safety on the roads, but those interventions have not been systematically carried out along routes potentially affected by instability phenomena, as pointed out by the Evaluation Team during the inspections (rock falls from unprotected road slopes). It is therefore considered likely in the medium to long term, the occurrence of landslides that may affect the use of roads by the local population. For these considerations, rating assigned by the evaluator is therefore medium-low (MB).

During the course of the May 2012 mission the Evaluation Team encountered number of minor landslides with breccia collapse and rockfalls along the stretches of road that lead down to the plant which entailed very careful driving and frequent diversions, making the roads fairly unsafe, particularly in the night hours. It is conceivable that these phenomena become even more frequent during the rainy season.

Figure III - 32 Fall of breccia onto the road
Source, Evaluation Group photographic doc., 05.2012

Figure III - 33 Rockfall onto the road
Source, Evaluation Group photographic doc., 05.2012

In any event, the absence of technical documentation on the initiatives implemented, of any objective data and a final report on the works performed or on maintenance activities makes it impossible to properly evaluate the detail of the stabilisation operations implemented. Nevertheless, considering the lythologies found in the area, one can reasonably believe that these could potentially affect the road cuttings with steeper slopes that have affected the cover layer and the alteration layer and the fractured lythological substrate.

Generally speaking, and besides a few exceptions, during the entire duration of the GGII plant construction work, the maintenance of the roads was mainly designed and functional to enable movement of the works machinery and site personnel, mainly through medium term refurbishing operations.

From the reports drafted by the DGCS expert during the course of project construction it turns out that landslide phenomena have taken place along the slopes affected by the works, and particularly in conjunction with certain road cuttings, due to the intrinsically unstable nature of the alteration layer of the lithologies present and the steep average gradient of the hills. The mission report of March 2007 underlined that the General Contractor is forced to undertake ongoing maintenance work on many stretches of road located on steep and loose slopes due to the seasonal rains.

The report drafted by the MAE experts sent over in September 2008 underlines that "*the unpaved roads appear sufficiently wide to enable intense vehicular traffic (including trucks) which travel along them in both directions*", but at the same time pointed out with the help of appropriate photographic documentation, that *"the opening of the roads is a triggering factor for new landslides and the setting off of potential instability phenomena".*

Figure III - 34: A stretch of road from Fofa to the outlet site [September 2008]
Source: Report drafted by the environmental experts sent on a mission by the MAE in "2008

From the reports drafted by ELC following their inspections in February and October of 2009 the following can be ascertained:

- (inlet side) the roadsides seem stable but landslide phenomena which have taken place during the last rainy season suggests that further stabilisation actions are required;
- (outlet side) the General Contractor is engaged in an intense road maintenance program - a part of the roads has been paved and the road that leads from Fofa to the powerhouse has been refurbished and repaved.

Figure III - 35 and **Figure III - 36**
Instances of instability (landslides) in conjunction with streams crossing the roads - environmental adjustment operations and safety precautions
Source: ELC, February and October 2009

The slope cuttings, particularly in proximity of the ridges, are often very steep and have revealed the rock formations. Both the basalts, more frequent on the Intake side, and the trachytes and rhyolytes found prevalently on the Outlet side reveal extensive alteration layers.

The particular character of these formations, comprised of a sequence of flood basalts with subordinate trachytes, with interstratifications of decimetric to metric red paleosoils, intensely fractured by cooling and the subsequent tectonics, makes them particularly subject to alteration.

The meteoric processes, favoured by the particular subtropical climes and the circulating waters of the region, often with high temperatures due to post-volcanic and/or particularly chemically aggressive activities, have had an easy time taking advantage of the vacuolar and/or intensely fractures areas.

In many cases the alteration process is so intense it gives rise to the formation of lateritic crusts and coverings of fine sandy and clayey loam materials, ranging between dark to reddish brown due to the high iron oxide content, containing occasional lythological elements measurable in decimetres, with some more considerable thicknesses up to 10 m, lying on a substrate of a few metres formed by intensely fractured and altered rock.

Figure III - 37: Road cutting covered by alteration with a sandy loam grain with brecciated materials
Source: doc. EEPCo - ELC Report, 12.2007

The road cuttings have clearly moved these materials with slight cohesion, which particularly during the rainy season giver rise to a series of small landslides, breccia collapses and the fall of rocks and boulders.

The last consideration that needs to be made regarding the local population's use of the roads is connected to the added value for the inhabitants brought about by the creation of interconnection routes between the main urban centres and the actual dismantling of the construction roads that are no longer necessary and useful to the population (ref. VIA - mitigation measures: par. 9.1.10).

The link road between Fofa, the Outlet camp and the river on the Omo River (near the power station) has made it much easier for Fofa farmers to access lands placed at a lower altitude and still not used for agricultural purposes and drinkable water springs along the course of the river Omo. Additionally, it must be said that the inhabitants cannot take full advantage of the expansion of the Kose - Fofa - Sekoru - Deneba/GIbe Bridge road network seeing as currently it is out of bounds and cannot be used (with a military garrison present) in a stretch between the bridge over the Omo River and Fofa.

As far as the roads that are of no use to the local population, the field inspection carried out by the Evaluation Group has certified that they have been dismantled.

IA4 Have the indications of the EIA document concerning the disposal procedures for excavation waste materials been complied with?

Based on the details provided below, one can state that the initiatives designed to refurbish and provide safety containment for the excavation material deposits do not comply with the measures detailed in the EIA document. The rating assigned by the evaluator is low (B).

The evaluation of this aspect must clearly follow an analysis of said measures, which is provided below (ref. EIA):

- the debris from the tunnel excavation operations must be arranged in such a away as to guarantee the stability of the slopes in the long term and the morphological settlement of the areas affected by the deposit (ref. par. 9.1.6)
- as far as the excavation debris is concerned, drainage works will have to be carried out in order to protect the accumulations from the erosive action of rain water (par. 9.1.5.2)
- during plant operation, in order to reduce foreseeable impacts, the excavation debris must be placed in layers starting from the bottom upwards, proceeding with the replanting of the lower layers with indigenous tree species, in order to prevent erosion phenomena (par. 9.1.6)
- for all excavation fronts and for the accumulations of excavation deposits, specific structural works (containment walls, gabionades) must be envisaged in order to prevent landslides and fanning (par. 9.1.5)
- planning and implementation of a management plan for construction and waste materials (storage, stocking and disposal).

In addition to these measures we here quote the opinion expressed by EEPCo in the document "*Additional Comments on Basic Design Project"* drafted in 2004. "*the areas identified for accumulation of the excavation materials appear to be sufficient for the purpose but an analysis shall have to be performed on the general stability of the mounds in order to avoid landslides or slippage into the rivers (*ref. page 23).

From the quarterly reports drafted by EEPCo it emerges that the General Contractor is busy building gabionades, drainage channels and trenches to provide safety containment of the excavation areas.

In the report drafted by ELC in November of 2006 it turns out that an excavation material resettlement plan has been drafted for the inlet side, while none exists for the outlet side (which will have to receive more material than expected); it points out that the confinement of the excavation materials, for space reasons, is definitely more complicated on the Inlet side, in the narrow Gilgel Gibe valley, while the situation is much more favourable on the Outlet side where there is much more room. On average it is expected that debris accumulation shall amount to 600,000 m3 per site. It is worthwhile noting however that in the Outlet area, during the last rainy season the foot of the mound was eroded by the river waters and a considerable amount of material was washed away by the currents.

It should also be noted that the volumes of excavation materials could turn out to be considerably greater than expected seeing as the excavated rocks are mostly highly fractured and only in part can be used as aggregate.

The report expresses concern on the disposal procedures used and the lack of permanent slope recovery measures.

From the ELC report drafted in December of 2007 the following information can be ascertained:

- in the Inlet area, the debris excavated from the tunnel and relocated in the vicinity of the River Bidru must not obstruct the course of this river and the entire base of the contained mounds must be protected and supported in order to avoid landslides;
- in the Outlet area, the containment techniques do not comply with the procedures suggested during the previous inspection reports (such as the daily compaction of the relocated material, the containment of the material starting from the bottom, the construction of appropriate systems to improve water drainage [such as rain water drainage, containment structures inside the volumes and at the base] and the settlement of the covering areas with an appropriate layer of soil and replanting of a certain number of trees and bushes) and therefore invites the Contractor to apply these suggestions (ref. page 6).

Figure III - 38: The summit of the tunnel excavation debris containment area - outlet side

Source: ELC, December 2007

Figura III - 39: The foot of the same area and the stream running below - outlet side

Source: ELC, December 2007

In reports drafted by ELC between 2007 and 2009 indicate that:

- the General Contractor has not complied with the indications provided in the previous reports concerning compliance with the measures foreseen by the EIA document: the excavation material is still simply poured from the top onto the excavation material accumulation front (Figure III - 40); the foot of the accumulation deposit has already reached the bed of the downstream creek (as already visible in Figure III - 39 taken in December 2007) and a considerable amount of the material has been washed away along the water bed during the course of the last rainy season (Figure III - 41);
- in the Inlet area along the River Bidru a series of landslides of excavation material have been reported and a debris fan at the confluence of the Bidru and the Gibe Rivers is now present (Figure III - 42 and Figure III - 43);
- the General Contractor has vowed to draft a resettlement and containment plan and see to its implementation once the tunnel excavation work is completed.

In the Outlet area, even though the "Disposal Area" is vaster than the one in the Inlet area, the accumulated volumes, due to the greater progress made by the TBM on this side are definitely greater. The excavation materials are tipped from the top of the escarpment leading to the formation of a large mound of debris, the foot of which has already reached the river, and has been eaten away during the rainy season.

Figure III - 40: Tunnel excavation debris disposal area - outlet side
Source: ELC, February 2009

Figure III - 41: Tunnel excavation material washed away along the stream bed
Source: ELC, October 2009

Figure III - 42: Debris landslide in the Disposal area in the Bidru Creek, Inlet side
Source EEPCo - ELC report, 10.2009

Figure III – 43: Debris fan at the confluence of the Bidru Creek and Gibe River, Inlet area
Source EEPCo - ELC report, 10.2009

In a note of June 2010, the Ministry expert sent to monitor the project reports that the stabilisation works of the debris mounds has been underway for some time. In actual fact, as the photographic documentation provided by the General Contractor would seem to show, the stabilisation works on the "Disposal Area" on the Outlet side were already underway in February of 2010 involving reprofiling and terracing of the mound slopes.

Figure III - 44: Stabilisation reprofiling of the "Disposal Area", Outlet side

During the Evaluation Team's mission in May 2012, on the mound in the "Disposal Area" on the Outlet side, despite its overall stability, one could identify a series of small furrows of badland erosion, while the vegetation is still having a hard time taking root. Considering the type of accumulated material, mainly comprised of decimetric breccias immersed in a coarse sandy loam matrix and therefore with a poor compacting power, an immediate artificial replanting measure would certainly have guaranteed a greater stability to the entire slope, limiting and slowing the erosion processes triggered by the run off waters.

Unless maintenance is performed it is conceivable that these phenomena, during the rainy season, could become more significant over time, making slope reprofiling more complex and expensive.

Figure III - 45:
"Disposal Area" Outlet side, evidence of badland erosion furrows on the mound
Source Evaluation Team photographic doc. 05.2012

IA7 What landscape requalification activities have been foreseen for the area of operations and excavation? To what extent have they already been undertaken?

The rating assigned by the evaluator is therefore medium-low (MB).

During the field inspection performed by the Evaluation Team in May 2012 it was possible to assess the state of implementation of the landscaping and environmental requalification initiatives implemented by the General Contractor mostly after the end of the works.

Over 20,000 bushes and trees have been planted along with other construction site reclaiming operations in areas affected by landslippage and landslides. The Outlet side "Disposal Area" has been reprofiled.

The environmental recovery and landscaping measures have therefore only partially been performed both in terms of their extent and their completeness/compliance; many areas are still visible which would require further actions of this kind.

In general, one can definitely state that the evaluation of the landscape impact of the works implemented by the CESI team appears unsatisfactory as they seem to have underestimated their complexity.

ELC, through its regular reports and subsequently in the "Mission report on the Gilgel Gibe II Hydro-electric plant construction" drafted in September of 2008 highlight the disparity between the expectations of the VIA document and the reality of the construction building site.

Already in 2006 the ELC complained about a lack of a landscaping plan for the aggregate quarries (inlet and outlet) once the works were completed, and the same could be said for the inlet construction site which, its opinion read, seemed "*particularly impaired from an environmental point of view*". Furthermore, having considered the resettlement plan presented by the General Contractor for the tunnel excavation material disposal area on the inlet side as satisfactory, at the same time it reported the absence of a similar plan for the outlet side, expressing *"concern regarding the disposal procedures currently adopted and the lack of permanent slope recovery measures"* (Source: ELC report of November 2006).

Finally, when specifying the shortcomings of the EIA document, the same report states *"the impact of road construction on the landscape has not been taken into consideration"* and also *"the link roads between the inlet and outlet areas have been built without paying any attention to the minimization of their impact on the landscape".*

Figure III - 46: Link road between Fofa, the Outlet camp and the bridge on the Omo River
Source: "A summary of the company participation in the social sphere", General Contractor

Taking ones cue from the documents drafted by ELC, EEPCo has repeatedly asked the General Contract for a recovery plan for the quarry areas and generally speaking a landscaping plan for the construction areas.

The report drafted on behalf of the MAE in September of 2008 highlights the geo-technical and environmental problems with appropriate photographic documentation and reiterates the need to properly assess the issue of landscape refurbishing.

The Italian Embassy delivery note to MAE in May 2009 reads *"despite repeated requests by EEPCo, no general and organic plan for environmental refurbishing of the entire construction site has been produced. It should be noted that this recommendation has also been made by our experts and as such transmitted by EEPCo to UTL".*

Despite the General Contractor's commitment to drafting the required plan once the tunnel works were completed, in the wake of a meeting with the General Contractor, the ELC and the local administrations it turns out that such a refurbishing plan has yet to be devised.

Although the General Contractor has engaged in extraordinary maintenance activities to ensure road safety during the entire construction phase and the start up of plant operation, from the inspection performed it is clear that there are still areas that require environmental refurbishing actions (slopes and surrounding areas).

Figure III - 47: Stabilisation of slopes on the mountainside to the left of the dam
Source photographic documentation of the evaluation team. 05.2012

There are areas of the construction site where environmental and landscape refurbishing actions have clearly not been undertaken.

Figure III - 48: Construction site areas where environmental recovery actions have not been carried out
Sourc: photographic documentation of the evaluation team. 05.2012

The containment initiatives on the left (Fig. III - 49) and right hand slopes of the barrier over the Gilgel Gibe River have been implemented without worrying about curtailing the visual impact - it should however be noted that the works are located in a narrow valley where local traffic and anthropic activities are scarce.

Figure III - 49: Shotcrete slope stabilisation on the mountainside to the left of the dam
Source: ELC, October 2009

5.3 What impacts are expected in terms of energy sustainability?

The project has a positive impact in terms of energy sustainability which can be calculated estimating the CO2 emission reduction into the atmosphere associated with the production of electrical energy using a hydro-electric power plant.

More specifically, the evaluation question that has enabled us to pass a judgement on this aspect is:

- IA8 Will the electrical energy production provided by the Gilgel Gibe II hydro-electric plant lead to a reduction in CO2 emissions compared to conventional energy sources (fossil fuels)?

IA8 Will the electrical energy production provided by the Gilgel Gibe II hydro-electric plant lead to a reduction in CO2 emissions compared to conventional energy sources (fossil fuels)?

The rating assigned by the evaluator is medium-high (MA).

Hydro-electric energy is an energy source with no environmental impact in terms of the production of atmospheric pollutants such as CO2, NOx, SOx, etc. [“totally clean” Energy]. The production of hydro-electric energy has a positive impact as electrical energy can be used for both cooking and heating thus discouraging the felling of trees for firewood - deforestation is one of the main problems of the Ethiopian territory (ref. EIA, par. 7.1.7)

The electrical energy is produced by means of 4X105 MW Pelton turbines with a power output of 420 MW and an expected production of 1,650 GWh/year (a saving in CO2 emission terms of 155,100 tons). Following the Evaluation Team's Ethiopian mission it has been possible to ascertain that actual plant production amounts to 1,556 GWh/year (a saving in CO2 emission terms of 146,264 tons).

The plant therefore produces 94% of the planned electrical energy.

This CO2 emission reduction is comparable to the removing the pollution produced by approx. 77,000 cars in Italy over the course of a year.

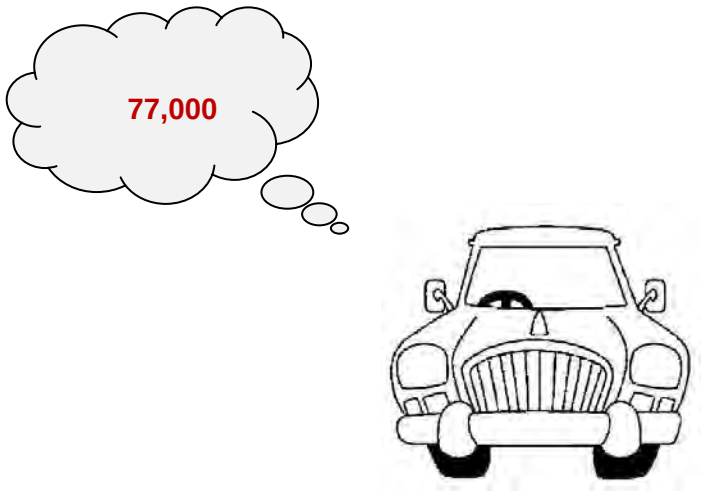


Figure III - 50: In 2011 GGII contributed to CO2 emission reductions comparable to the pollution produced by 77,000 cars in Italy over the course of a year .

6. A SUSTAINABLE FLY-WHEEL

Most of the positive effects generated by the GGII operation will continue to produce beneficial effects for the local population even in the future. According to sustainability criteria, the social services and structures that have been set up, the technical know-how and the development of the local institutions represent a fly-wheel capable of promoting sustainable effects.

A large part of the social services and structures built in the communities of Fofa and Sokoru have provided a specific answer to requirements-problems raised by the local administrations and the population. During the meetings we held the satisfaction of the population was clear to see but it was also seconded by the awareness that the services and structures must continue to be managed in a sustainable fashion.

Overall, the sustainability of the social services and structures seems highly satisfactory. However the sustainability of the new road network (particularly outside the towns) may only be guaranteed providing effective and regular maintenance is performed by the Ethiopian Road Authority (ERA).

The sustainability of direct occupation is generally speaking a lasting one, with personnel now working on other jobs for the EEPCo (GGII) and Salini (GGII) as well as in other contexts.

The companies created during the construction phase were all the result of local initiatives. Even though the number is limited, the new companies are still up and running (commercial and small hotel activities) and seem well rooted in the territory and economically sustainable.

The local technicians have acquired specific skills which enable a correct management of the plant over time. The local institutions have generally speaking benefited from the experience acquired through the GGII project implementation by improving their territorial management abilities.

The EEPCo internal organisation seems capable of managing the plant and the personnel employed has the required competence to perform the jobs assigned to it. The EEPCo seems less equipped to manage civil works. This shortcoming could have negative repercussions on the ability to predict and/or manage exceptional events.

Despite the various collapses that have taken place inside the hydraulic tunnel both during its construction and afterwards, no permanent monitoring systems have been introduced to acquire necessary geological, geo-technical and structural data. Without this monitoring system the plant's efficiency cannot be guaranteed.

More specifically the evaluation of project relevance focused on the following two main issues:

- the general perception at a local level of project benefits;
- the capacity of the EEPCo as a capable management organism.

Each of these two main issues has thus been developed when answering the specific evaluation questions, the detailed answers to which are provided below.

6.1 What is the perception at a local level of the project's medium and long term benefits?

One of the main evaluation criteria concerns the sustainability over time of the benefits produced by the initiative. To verify this criterion a part of the data and information was collected in the field while the rest is based on the opinions and perceptions of the beneficiary population.

More specifically, the evaluation questions that have enables us to pass a judgement on this criterion are:

- SO1 In time, will the local population be able to continue benefiting from the effects generated by the construction of the plant (community services and infrastructures built during the construction site phase; occupational opportunities; energy distribution; technical know-how; institutional development)?
- SO2 How does the benefiting population perceive the medium to long term effects and the sustainability of the project?

SO1 In time, will the local population be able to continue benefiting from the effects generated by the construction of the plant (community services and infrastructures built during the construction site phase; occupational opportunities; energy distribution; technical know-how; institutional development)?

It seems likely that most of the positive effects generated by the GGII operation will to continue to produce beneficial effects for the local population even in the future. In particular, the sustainability criterion would seem to be upheld by: the community services and structures created, the technical know-how acquired and the institutional growth that has been engendered. The rating assigned by the evaluator is high (A).

Community services and structures

A large part of the community services and structures built in the towns of Fofa and Sokoru have provided a specific answer to requirements-problems raised by the local administrations and the population and may continue to generate positive effects even in the future.

During the meetings held the satisfaction of the population was clear to see but it was also seconded by the awareness that the services and structures must continue to be managed in a sustainable fashion. As a guarantee of this it seems worthwhile highlighting how these initiatives, seeing as they are connected to basic services, are easily integrated within the standard administrative management of local life and tend to improve its quality. Overall, the sustainability evaluation of the community services and structures implemented is highly satisfactory.

A different matter is the road network (particularly in the more rural areas) whose management and maintenance is assigned to national authorities. The sustainability of these initiatives may only be guaranteed if effective and regular road maintenance is introduced which currently appears to be simply "*improvised*".

The occupational opportunities

On the sustainability of the opportunities that have been created as part of the GGII project a few distinctions need to be made:

- as far as *direct* construction site occupation is concerned; the occupational opportunities are "*lasting"* and sustainable.
- as far as *indirect* occupation is concerned*;* the occupational opportunities are of a "temporary" nature and are essentially limited to the construction phase. Even though to a limited extent, a few new businesses are still operating (commercial activities and small hotel facilities) and appear to be well rooted in the territory and economically sustainable.

The energy distribution

In general terms, in Ethiopia; an energy link has now been created in 51% of cities and villages with 20% of the population now hooked up. During the years of the GGII construction, the distribution network has been developed in parallel for both high, medium and low voltage transmission. The increase in both production and distribution represents an element of future sustainability of the effects of the GGII projects in terms of energy diffusion. This aspect of sustainability is accompanied by a tariff system subdivided into sub-categories with very controlled and accessible prices.

The technical know-how

The local technicians have acquired specific skills which enable a correct management of the plant over time. The technician's level of competence enables them to solve any new problems. In general, the EEPCo personnel has gained a considerable grasp over the electrical system management. Today the EEPCo is promoting its activities and is seeking contracts even outside Ethiopia. The work with Salini has enabled improvement of level of sustainability at both the structural and individual level.

The institutional development

The territorial administrative and management skills of the local administrations have benefited in general terms from the experience acquired as part of the GGII construction process. A very positive experience is represented by the network cooperation of a number of different stakeholders, which has always taken place organically and without any major problems, which leads one to suppose that the network is resilient and sustainable.

Context	Degree of Sustainability (A-MA-MB-B)
Community services and structures implemented	A
occupational opportunities	MA
energy distribution	MA
technical know-how	A
institutional development	A

Table III - 23: Sustainability by context
Source: data processed by the Evaluator

SO2 How does the benefiting population perceive the medium to long term effects and the sustainability of the project?

The rating assigned by the evaluator is therefore medium-high (MA).

The focus groups organised with the participation of the population have clearly shown how the GGII experience has represented an excellent opportunity for the overall development of the area.

The perceptions of the medium to long term effects are generally positive; *"the activities have changed people's lives; now we cannot go back, we have to make all of the town's infrastructures sustainable".*

The intrinsic sustainability of the project (the energy availability) is fully approved by the population.

6.2 Will the EEPCo and the local stakeholders be capable of running the plant?

In terms of Project sustainability we have assessed the actual capacity of EEPCo as the plant's managing body. In this guise, EEPCo is required to ensure the perfect efficiency of the plant in time through the implementation of planned maintenance programs and being able to prevent and, if necessary, face up to any unforeseen exceptional events. In this context we have therefore assessed the company's structural organisation, the competence of the personnel involved, the competence and adequacy of the supply companies operating at a local level, the level of risk assessment afforded by the tools designed to prevent catastrophic events.

More specifically, the evaluation questions that have enabled us to pass a judgement on this aspect are:

- SO3 Does the EEPCo have a suitable organisation and know-how to manage the plant during the course of its useful working life in normal operating conditions?
- SO4 Will EEPCo be capable of facing up to exceptional events (such as tunnel collapses, damage caused by calamitous event, etc...) so that even in the future it can handle structural problems?
- SO5 Have the local institutions and stakeholders acquired the know-how and the abilities required for the servicing and maintenance of the hydro-electric plant?
- SO6 Is there a long term hydrological, geo-technical and structural monitoring plan in place covering all aspects of the works?

SO3 Does the EEPCo have a suitable organisation and know-how to manage the plant during the course of its useful working life in normal operating conditions?

From the assessments made it appears that the EEPCo's internal organisation is capable of managing the plant and the personnel employed has the required competence to perform the jobs assigned to it. The rating assigned by the evaluator is medium-high (MA).

During the desk phase investigations it was pointed out that Chap. 7.3 “EEPCo Business Model” of the Final GIBE III, *EFTA Study Report, 2010*, by BEI, which took into account Capacity building, states that *EEPCo has shown its ability to develop projects, acquiring the competence of companies with an international reputation,* identifying also an increased development *of its capacities in sectors such as fault repair.*

Figure III - 51: EEPCo personnel at work
Source Evaluation Team mission

During the course of the interviews with the EEPCo management and the visits to the production plant it has come to light that:

- currently GGII has adequate staffing (180 people), with an adequate level of internal organisation permanently involved in plant maintenance;
- the training level of the personnel is appropriate to their assigned tasks;
- the plant is equipped with workshops for minor repairs and a stock of spare parts which should ensure complete efficiency for at least the next two years of operation;
- the plant staff must follow internal procedures based on an operating procedure manual, available on site both in hardcopy form and on computer supports, which provides instructions on the management of all inspection and maintenance activities as well as supply procedures for materials and equipment.

It should be noted that during the Evaluation team's visit to the plant structures, it was noted that while the level of cleanliness and maintenance of the power station and Valve Chamber were faultless, it was not possible to access the maintenance tunnel of the Weir, due to a fault in the tunnel's lighting system, and that a few faults in the hydraulic system of the base camp, now managed by EEPCo, were also reported.

Although these aspects do not concern the operating efficiency of the plant, it would be nevertheless advisable that greater attention be paid to the maintenance of services connected to production which, in the end, concern the safety and security of the workers who operate on the site. In conclusion, it is believed that EEPCo has all the means required to be able to manage the plant effectively according to international quality standards.

SO4 Will EEPCo be capable of facing up to exceptional events (such as tunnel collapses, damage caused by calamitous event, etc...) so that even in the future it can handle structural problems?

The rating assigned by the evaluator is medium-low (MB). Unlike GGI and GGIII, the GGII does not include a large size dam whose collapse and/or overflow can significantly compromise the environment downstream of the barrier or threaten the local population, partly because there don't appear to be any settlements anywhere along the course of the Gilgel Gibe right up to where it flows into the Omo, nor from here to the powerhouse. For this reason, no emergency plans have been prepared to this end as they were for GGI (see Introduction of the Final GIBE III, EFTA Study Report 201, by EIB, page xxvii *Emergency Preparedness and Communications Plan*).

Furthermore all the electro-mechanical installations seem to be provided with basic safety systems against unexpected malfunctions (i.e. conduits protected by gate valves, automatic warning and equipment protection systems, etc...), or fires (i.e. CO_2 systems for the generators, fire fighting systems on the transformers, extinguishers, etc...), that the personnel at the plant claim to understands and know how to use if necessary.

From the meetings held with EEPCo management it has emerged that all parts of the plant are insured against the main risks, which clearly shows a correct action by the company relative to "risk management", otherwise the insurance companies would have been unlikely to issue the relative policies.

However, according to the Evaluation Group and as reported by certain observers (the UTL project monitoring expert, General Contractor), the EEPCo, if on the one hand it has developed a considerable ability in the management of the electro-mechanical systems, it appears less geared up to handle civil work for which it always calls on external expertise. This shortcoming may lead to problems related to prediction and/or management of exceptional events which could damage the civil works. In other words it seems unlikely that the personnel employed at the plant has the required sensibility to correctly report any serious damage to the structures (weir, tunnel, buildings, etc...) based on the correct interpretation of potential warning signs (minor displacements, abnormal crack formation, etc...) nor does EEPCo seem capable of independently handling repairs on works damaged by calamitous events such as earthquakes, landslides, etc.... In these situations, the works repairs would have to be completely outsourced both in terms of design/planning and implementation. This fact is not entirely negative, so long as subjects continue to operate within the country who are capable of handling these kinds of problems.

SO5 Have the local institutions and stakeholders acquired the know-how and the abilities necessary for the servicing and maintenance of the hydro-electric plant?

From the discussions with EEPCo management and the local populations and the inspection of the site it would seem that the company is in a position to handle most plant repairs, thanks to its internal personnel and the equipment it can rely on and the very extensive network of local suppliers. As has emerged from the focus groups held with the local populations, one must take into account that many of the operators both internal and external to the EEPCo were trained within the ranks of the General Contractor during the construction of the site itself and thus acquired the competence and capacities connected to the service and maintenance of the hydro-electric plant. The rating assigned by the evaluator is medium-high (MA).

SO6 Is there a long term hydrological, geo-technical and structural monitoring plan in place covering all aspects of the works?

The rating assigned by the evaluator is low (B). During both the desk enquiry and the field work no documentation was provided on any monitoring plan. From the interviews conducted we have learned that monitoring has been installed for the level of the dam basin and the weir structure, but no true hydro-geological or structural monitoring plans of the works as a whole have been supplied.

The tunnel, following production resumption in December 201 has only been subjected to one visual check in April of 2011.

A project of the relevance and complexity of GGII should include a monitoring and control program not just of the plant systems but also of all the physical a morphological components of the land where it is sited.

The tunnel control procedures envision visual and topographic inspections of the tunnel lining, as in April 2011, which clearly require that it be emptied and production stopped, the frequency of which has not yet been established. By the same token it seems that no monitoring plan exists that might take into consideration other plant components such as the slopes, the sediment levels of the lake, the stability of the slopes above the major works, the state of the mounds of excavation deposits.

It is therefore essential, in our opinion, that EEPCo be made aware of the need to set up a monitoring program for the most sensitive elements, which must be managed by an appropriately trained team.

A structural geo-technical monitoring system run on a permanent basis and capable of detecting excess pressures, collapses or vibration frequencies must be installed for the tunnel, the barrier and the slopes above the accumulation basin.

Further checks, to be carried out on a broader time scale and with different relevance could concern the pressure of the ground waters in the area, the flow rates, chemical properties and possibly the clarity of the nearby streams, some of which have already been checked in October of 2009 and of the waters upstream and downstream of the water intake and outlet on the two rivers.

A topographic monitoring should be carried out on the barriers, the intake works, the conduits, all the slopes above the major works, the access roads headed towards the plants and the mounds of excavation material.

This system would provide a constantly updated picture of the works as a whole along with the evolution of the land on which it rests, help verify and assess any changes and the structural, morphological and environmental impacts over the vast area and enable the identification and prompt introduction of the most suitable mitigating actions. And an added advantage would be the training of a category of highly skilled technicians in the management of works of this complexity.

All this results in a guarantee of correct operation and long term working efficiency for the plant which is essential for its sustainability.

PART IV

CONCLUSIONS AND RECOMMENDATIONS

INDEX

INTRODUCTION

In line with the indications provided by the Guideline document for the MAE evaluation and the OCSE/DAC principles (know to decide, know to innovate, know to judge), the objectives of the ex-post evaluation of this project have been:

1. to provide the MAE with a consistent and objective evaluation of the results, the foreseen effects and the first impacts of the project;
2. to verify whether the project's costs and benefits are influenced by the specific implementation methods used;
3. to provide useful guidelines for future assessment of funding requests for major infrastructural projects.

On the basis of the *findings* obtained from the analysis performed (answers to the evaluation questions outlined in the previous section), we have reached 6 meta-conclusions, of which the first four relate to the first evaluation objective (*cluster 1)* and two to the second objective (*cluster 2)* From the conclusions we have then obtained the "lessons learned" and hence the strategic/operational recommendations we have produced. The logical process is therefore represented by Figure IV - 1.

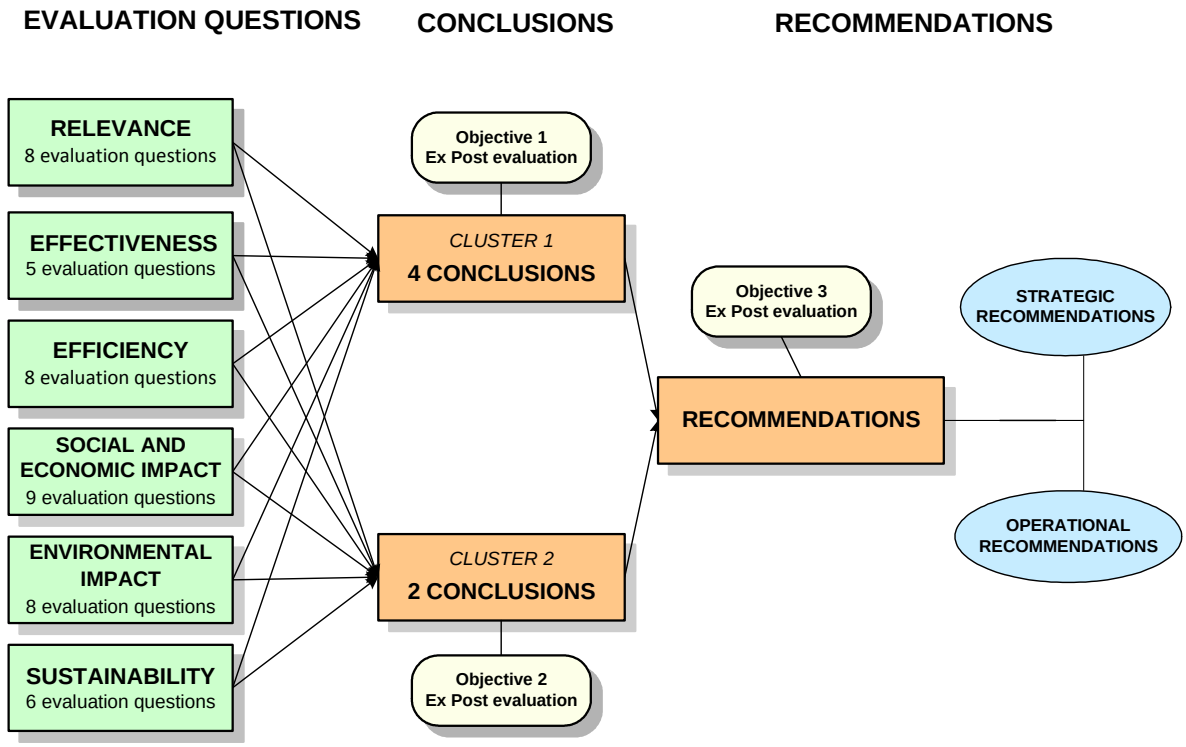


Figure IV - 1: Final logical conclusion diagram
Source: data processed by the Evaluator

CLUSTER 1	Conclusions on objectives, results, and future prospects for the project
CLUSTER 2	Conclusions on the project's implementation methods

THE GENERAL CONCLUSIONS REACHED BY THE EVALUATOR (Overall Conclusions)

In general terms, the Evaluator expresses a positive overall assessment of the Gilgel Gibe II Hydro-electric project, one of the most important projects funded by the Italian Cooperation.

This highly ambitious project has taken longer to implement than expected do to the significant technical problems that have arisen during the implementation and energy production start up phases. The role of the stakeholders involved, both on the Ethiopian and the Italian side has been highly integrated and very "cooperative". This has been the case throughout the entire project and particularly when the technical problems required a closer collaboration and an even more substantial effort on their part.

However it has to be underlined that, despite being earmarked as an initiative with a low environmental impact seeing as, unlike most major hydro-electric plants, the GGII does not involve the creation of a new large reservoir, the careless management of many of the construction phase processes, up to now, makes it difficult to verify the actual repercussions on the environment and therefore the possible medium and long term consequences.

During the implementation phase, and even after its completion, the initiative has generated a positive impact on the local society. The most positive of these concerns the capacity shown to transfer technical and operational knowledge to the human resources engaged in the operation so as to provide them with skills that can be exploited on the local labour market and be used in other initiatives currently under way or in the planning stages in the country. During the course of the on site inspections and the visits to the local community, the Evaluator has always been met by a very lively perception of the initiative.

The result and the effects produced have enabled Ethiopia to boost their electrical production capacity quite considerably, to broaden access to electricity to a large part of the local population and to contribute to the country's energy independence.

These initiative goals are consistent and coherent with the country's development policy (the Growth and Transformation Plan" 2010/11-2014/15) as well as with Italian, European and International cooperation policies. The initiative has also helped achieve some of the Ethiopia's Millennium Development Goals: the fight against extreme poverty; environmental sustainability; development of a global partnership.

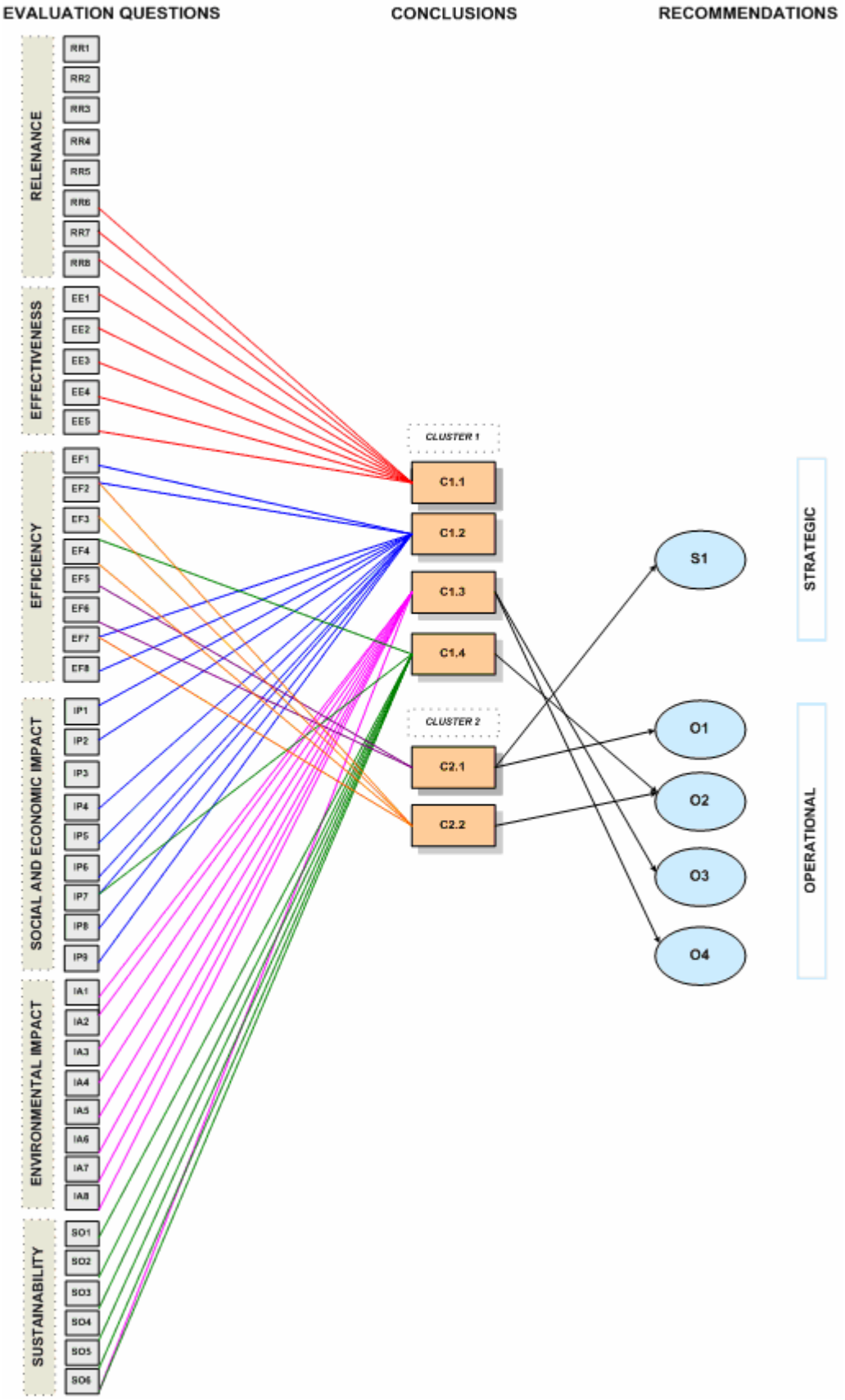


Figure IV - 2: Evaluation questions - Conclusions - Recommendations
Source: data processed by the Evaluator

1. THE CONCLUSIONS ON THE OBJECTIVES, THE RESULTS AND THE IMPACTS OF THE PROJECT (*CLUSTER 1*)

On the first objective of the evaluation one can state that:

C1.1 The overall objective, the specific objective and the project results have been fully achieved.

C1.2 The effects of the Project in terms of initial social and economic impact are positive.

C1.3 Although the project was conceived with a low environmental impact, the management of some of the implementation processes during construction have raised a few questions regarding the future environmental impact of the project.

C1.4 It is believed that the future prospects are positive with the exception of the medium and long term management of the civil works.

1.1 Project objectives and results

C1.1	**Purpose:**
	General objectives/specific objectives/results
Judgement:	**Findings for the following evaluation questions:**
Positive	RR6, RR7, RR8, EE1, EE2, EE3, EE4, EE5

*The project's **general objective** aimed to promote the exploitation and enhancement of the national hydro-electric potential in an environmentally sustainable context, expand the national energy sector export capacity and improve Ethiopia's energy independence.*

From the evaluation questions **RR6** and **RR8** it can be surmised that in 2012, the GGII with its 420 installed MW (**EE1**) represents approximately 20% of the total national electricity production, a considerable production level in both absolute and relative terms. This production, in addition to helping to satisfy internal demand, sets the stage for the expansion of the country's energy export capacity towards bordering companies. The exports for 2011 stand at round 350 GWh/year, but thanks to the start of production in other production plants in the near future it should approach 9600-11600 GWh/year by 2018 (**RR7**). The Evaluation Team believes that energy exports may in the near future contribute in a substantially positive way to balancing Ethiopia's energy payments, which are currently heavily weighted in favour of imports. Additionally, the exploitation of water resources, of which Ethiopia has plenty, contributes in no uncertain fashion to energy independence by contributing approx. 1% of the national GDP.

The project's ***specific objective*** aimed to improve access to electricity and satisfy the energy demands of the population and the country's development requirements, in an economically sustainable way and with the least environmental impact.

The answer to the **EE4** evaluation question underlines the fact that energy access is currently provided for 20% of the total Ethiopian population which is equivalent to 51% of connected cities and villages (2011). These values are considerably higher than those forecast in the Technical and Economic Evaluation carried out in 2004 which predicted that 20% of the population would only be connected by 2013. In other words the objective has been achieved approximately two years in advance. More specifically (**EE3**) the total population that benefits from the energy produced by GGII is in line with the expectations of the 2004 evaluation, partly thanks to the tariff policy implemented by the EEPCo (**EE5**) which is particularly advantageous for Ethiopian families.

The **Expected results**, *indicated the Gilgel Gibe II hydro-electric plant in operation capable of supplying an additional supplementary energy production and an operating system that could ensure transmission of the energy from Gilgel Gibe II to Addis Ababa.* These results have been successfully achieved.

From the outcome of the evaluation it turns out that the 420 MW production plant is operational and that in the first calendar year of production (2011) the plant output amounted to 1,556 GWh (**EE1**). Although this figure is slightly below the expected value included in the TEE of 2004 (1650 GWh/year), the result is nevertheless considered as highly positive, seeing as the estimate is based on the first year of production when the systems are still undergoing testing and technical verifications.

Furthermore,the evaluator has verified that the high voltage power lines, foreseen as part of the project to connect the GGII to the National Electricity Grid have been put in place and are operational as expected (**EE2**).

The conclusion we therefore reach is that the judgements expressed by the Evaluator relative to the general objective, the specific objective and the expected results are all positive.

1.2 Effects on society

C1.2	**Purpose:**
	Profitability, cost/effectiveness and social/economic impacts
Judgement:	**Findings for the following evaluation questions:**
Positive	EF1, EF2, EF7.1, EF8, IP1, IP2, IP4, IP5, IP6, IP7, IP8, IP9.

The Evaluator has ascertained that the use of the available resources (**EF1**) has been consistent with the foreseen operating objectives and expected results, but that the internal rate of return on the investment (**EF2**) of 5,72%, is below the lowest expected rate (10,6%) envisaged by the 2004 TEE . It has been noted from the available figures that while the

operating, maintenance and administrative costs are very low, the tariff policy for 2012 is very much lower (c€2.11) compared to the minimum tariff foreseen by the TEE (c€3.5) and this has a considerable effect on the initiative's internal rate of return. On the other hand it should be considered that the tariff policy has positive effects on the territory as it allows to extend access to electricity to a wide range of the population.

In terms of cost/effectiveness (**EF7.1**),the ratio between the total cost of the GGII project and the additional population served is of € 552 per utility (where by utility we here refer to the single individual who benefits from the use of electricity). By May 2012, 165,791 new grid connections had been implemented (of which 73% for domestic purposes), which amounts to a benefiting population which can be estimated at around 895,000 individuals. This figure is 15.6% greater than the target forecast in the TEE document (€ 633 for each new utility and an expectation of 774,000 new subscribers).

It is difficult to identify other initiatives in Sub-Saharan Africa which can be taken as benchmarks and reference examples for GGII (**EF8**), seeing as: (i) there is no operating hydro-electric plant currently in operation that involves a 26 km long hydraulic tunnel; (ii) GGII has not produced a significant environmental impact (as it does not require a major reservoir), something that instead is the case with the other initiatives; (iii) there has been no need to resort to forced population deportations and the ensuing negative repercussions that this can have from a social and economic standpoint.

As far as employment, the development of downstream occupation and knowledge transfer are concerned for the project areas of Fofa and Soukoru, the Evaluator's assessment is positive. The impact on employment has been significant during the GGII construction phase, and continues to be apparent, under different guises, even after the completion of the construction work. The local work force employed on the construction site on average amounted to 2,410 workers reaching a maximum of 3,552 workers in September of 2006 **(IP1)**.

In terms of direct downstream activities, the construction of the GGII plant helped to develop professional skilled labour and job competence (mainly electricians, mechanics and carpenters) which has led to the development of small craft activities mainly by individuals (**IP2**). The direct experience of work site activity has resulted in a considerable skill and knowledge transfer. Generally speaking, the GGII experience has been an excellent training ground for the local population in an occupational sector that has plenty of market demand (**IP4**).

The Evaluator shares the positive perception voiced by the beneficiaries on the medium and long term effects of the GGII project and the future impact connected with it. This appreciation has been been expressed unanimously both as far as the specific impact in the local areas is concerned and the general impact at system level (**IP9**).

Alongside the construction of the GGII plant on the territory, an improved dynamic for the area has also been developed that has led to a positive transformation of the rural economy and enabled the development of the two towns of Fofa and Sokoru, with positive impacts on the main economic sectors, yet without any indications of negative repercussions (**IP5**). The most tangible positive effects for the community (**IP6**) are those connected to the improvements and the initiatives implemented by the GC in the towns of Fofa and Sokoru, which have been developed coherently with the needs of the two settlements.

On a social, cultural, political and institutional level, the effects of the GGII project in the areas in question in the short and long term and generally speaking positive **(IP6).** The negative effects that have been reported by the population during the course of the focus groups held with the Evaluator have for the most part been limited to the work construction period (particularly for cultural reasons, due to the presence of considerable numbers of temporary resident workers).

During the construction of the GGII plant there was an increase in HIV positivity in the areas of Sokoru and Fofa, due to the heavy influx of people into the area (**IP8**). In quantitative terms, for example, the number of HIV positive persons recorded moved from 133 instances in 2004 to 190 instances in 2009, as verified by the data collected by the evaluator during the course of the visit to the Sokoru hospital.

1.3 Effects on the environment

C1.3	**Purpose:**
	Environmental impact
Judgement:	**Findings for the following evaluation questions:**
Partially positive	IA1, IA2, IA3, IA4, IA5, IA6, IA7, IA8, S06

The overall general and visual impact of the plant complex which consists of a small reservoir and extensive tunnel work is limited and can be considered acceptable, given the benefits it should provide.

However, the management of all the executive phase processes could certainly have been handles in a more sustainable way, showing a greater degree of care, attention and respect for the territory and the environment where the GGII plant is located, particularly if we consider that it is a scarcely populated area that is not exploited to any great degree agriculturally, and hosts numerous fauna and flora species, some of which of interest to conservationists.

For example, the management of the waste waters from both the tunnel excavation and the other systems such as the "batching plants", "Settling basins", etc... has been found wanting (**IA6**). Additionally, the absence of any form of monitoring of the process waters has not enabled any assessment of the appropriateness of the design solutions and good practices applied in order to contain the impacts (building of waste water treatment plants and/or improvement/updating of the existing ones). Or, regarding the accumulation and safety containment of the areas used for the disposal of the excavation materials (**IA4, IA7, IA2.1**), the absence of daily material compacting and the the failure to implement appropriate draining works to cater for rain water run off during the course of the works, raise a few questions as to the correct reprofiling of the slopes. It is in fact believed that having proceeded to install terracing and a partial reforestation only at the end of the works, in the absence of an effective plantation program and constant maintenance it can be expected that bad land erosion phenomena in time, particularly during the wet season, may become increasingly problematic and add to the complexity and cost of slope reprofiling.

Despite taking into account the objective technical and logistic difficulties in operating in areas without road connections, often very difficult to reach or having to pierce considerable depths of cover rock above the tunnel, the geological, geo-technical and hydro-geological investigations performed appear insufficient and essentially limited for the most part to the Inlet and Outlet areas. It does not appear that any hydro-geological study of the area has been performed, even on a large scale (**IA3.1**).

The lythological tectonic structure and particularly the mechanical characteristics of the formations encountered during tunnel perforation seem to be on the whole rather poor

compared to what had been expected in the design phase, as confirmed by the average performance of both the TBMs, definitely below what had been expected. The management of all the monitoring aspects, of the environmental, morphological and hydro-geological situation during the implementation phase has been fairly wanting (**IA4**).

The poor quality of a considerable amount of the rock extracted during the course of tunnel excavation, often highly fractured and altered by both mechanical and thermal stress, such as rhyolytes, trachytes, tufa and ashes as well as fault miolites, has led to much greater volumes of debris accumulated in the disposal sites, seeing as it was not possible to recycle them as aggregate for the production of concrete. In addition to this, the 18 month stoppage of the TBM 1 from the Intake side has meant that the TBM 2 had to travel much further from the Outlet side which has meant a greater accumulation of debris on this side that previously expected.

Accumulation deposits with greater volumes, with a prevalence of fine and degraded fine grain materials must necessarily be subject to frequent and costly maintenance and stabilisation works, in the absence of which, particularly during the rainy season, the mounds will be subject to increasing levels of erosion and material run off, with a considerable impact on the water courses.

However, the excavation of the tunnel does not appear (**IA3.1**) to have interfered with the drinking ground waters used by the populations living on the highlands above. This is due to the considerable height differential between the tunnel path and the highlands, and in all probability to the particular hydrological situation of the ridge, marked by a series of separate circulations and suspended superficial faults.

Additionally, (**S06**) one has to highlight the total absence of any form of monitoring or control systems or activities over the structural, geo-technical and hydro-geological aspects of the reservoir slopes and other relevant areas. This would have provided a regularly updated status of the works as a whole and the evolution of the territory in which it is located as well as enabling the verification and assessment of the changes and environmental impacts on this fairly extensive area and thus enabling the gradual and prompt identification of the most suitable mitigating actions.

On the issue of the impact on the landscape the most critical element (**IA7**) has been the lack of a landscape and environmental clean up plan for the construction site, as had been repeatedly requested by both ELC and EEPCo. Furthermore, the total absence of monitoring activities (**IA5**) of the impact on the vegetation and the fauna (with particular reference to the aquatic fauna and the vegetation of the riparian belt), has made it impossible to verify the correctness of the evaluations performed ex ante on these environmental components and the possible need to introduce suitable solutions to minimize impacts which are only partially unavoidable. Finally, it has been noted that the roads built in the area as part of the project are only partially usable by the local population either because they are denied access or because the initiatives so far undertaken on these roads do not seem appropriate to ensure satisfactory safety conditions in the medium to long term (**IA2.2**). Maintenance work is still being performed but it is mainly dealing with short term problems such as the removal of minor landslides that obstruct the carriageway on a fairly regular basis.

The evaluation of the project's environmental impact cannot however avoid underlining the relevant positive impact (**IA8**) produced by the reduction of CO_2 emissions into the atmosphere associated with the production of electrical energy by the hydro-electric power station. The energy sustainability of the plant undoubtedly constitutes a positive element in the context of the evaluation of the environmental impact of a project which could have certainly been managed with greater care in terms of environmental protection.

1.4 Future effects

C1.4	Purpose:
	Future effects
Judgement:	**Findings for the following evaluation questions:**
Partially positive	IP7, S01, S02,S03, S04, S05, S06, EF4

Most of the positive effects generated by the GGII operation **(IP7)** will continue to produce beneficial effects for the local population even in the future **(SO1)**. The Evaluator's assessment is confirmed by the positive perceptions voiced by the beneficiary population **(SO2)**.

According to the Evaluator, the EEPCo has a suitable organisation and appropriate know-how to manage the plant during the course of its useful working life in normal operating conditions **(SO3).** The company is capable of handling the majority of repairs thanks to its internal personnel and the equipment it has at its disposal. It can also rely on a sizeable network of local suppliers. **(SO5)**. However, according to the Evaluation Group, although the EEPCo has developed a considerable ability in the management of the electro-mechanical systems, it appears less geared up to handle civil work for which it always calls on external expertise. This shortcoming may lead to problems related to the prediction and/or management of exceptional events which could damage the civil works **(SO4)**.

The Evaluator has not been provided with any documentation relating to any form of hydro-geological, geo-technical or structural monitoring plan for the works as a whole **(SO6)**. The geological risk, besides having been managed unsatisfactorily during the tunnel excavation phase, continues to be managed inappropriately during the operating phase given the absence of a check and verification program or action guidelines. The failings reported on this issue may affect future maintenance costs which may then not tally with budgeted values **(EF4).**

2. CONCLUSIONS ON THE PROJECT'S IMPLEMENTATION METHODS (*CLUSTER 2*)

As for the second objective of the evaluation which involved certifying whether the project's costs and benefits had been influenced by the particular execution procedures; one can state that:

C 2.1 The critical elements reported during the various stages of the project cycle have been adequately managed by the stakeholders involved.

C 2.2 Although the technical difficulties encountered certainly had a negative affect on the delivery time for full operating efficiency, they did not substantially affect the project benefits.

2.1 Project Cycle and stakeholders involved

C2.1	**Purpose:**
	Project Cycle and stakeholders involved
Judgement:	**Findings for the following evaluation questions:**
Partially positive	EF5, EF6

The evaluation question **EF5** revealed that certain factors affecting the *identification, formulation* and *implementation* phases have produced a few critical situations that have threatened the successful achievement of certain objectives/results of the GGII cooperation project.

In brief, the factors identified were:

1. during the *identification* phase the lack of competitive comparisons between design alternatives;
2. during the **formulation** phase:
    a. the presence of an environmental impact assessment that was inadequate given the complexity and the specific nature of the works and the environmental context;
    b. the absence of a technical and economic verification of the third part (validation);
3. during the **implementation** phase:
    a. the occurrence of collapses inside the tunnel that has led to delays and cost increases;

b. the absence of any formal closing of the Project designed to certify the technical and operational correctness of the achieved results.

On the other hand, however, it must be noted that although the factors were of some significance and could have prevented the successful achievement of the project's objectives and results, the adequate management by the stakeholders involved has enabled the cooperation initiative's main targets to be met.

The assessment of the role played by the stakeholders involved in terms of operational, management and decision making efficiency is in fact extremely positive (**EF6**).
For example, even during the two critical technical events that took place during the implementation of the works (and the tunnel collapses above all), the collaboration between EEPCo , ELC and Salini was always constructive and directed towards finding a solution to the problems, showing considerable efficiency, in their respective roles, in terms of decision making and operational capacity.

On the Italian side, the operational efficiency has involved providing supervision and assistance for initiative monitoring purposes. The UTL has kept the UTC and the Office IV of the DGCS constantly updated. The Office IV has been engaged in technical and administrative monitoring activities for the project with the help of an outside expert.

The local Authorities have provided all their support for the initiative thanks to their efforts to ensure a very relaxed and collaborative atmosphere in all work contexts.

It is therefore believed that the problems encountered, which find their origin in a hurried management of the initial project phases (identification/formulation), have been excellently managed and solved by the effective collaborative strategies adopted by the stakeholders involved, which have essentially enabled the achievement of the Project's objectives and results.

2.2 Execution times, project costs and benefits

C2.2	**Purpose:**
	Execution times
Judgement:	**Findings for the following evaluation questions:**
Partially negative	EF2, EF3, EF4, EF7.1

The design approach adopted for the plant's constructions seems effective and positive both in cost and environmental terms, by essentially basing the production of hydro-electric energy on the construction of a 26 km tunnel that enables the downstream exploitation of the existing (GGI) reservoir with a height differential of 500 m. This has meant savings in terms of live costs but particularly in terms of the social and environmental costs connected to the building of a new reservoir.

The main works and the largest of the project's undertakings which more than any other component has affected the Project delivery times and costs is therefore the 26 km hydraulic tunnel that was built using two TBMs (Tunnel Boring Machine) with double shields specifically designed for this initiative.

The solutions adopted for the construction of the hydraulic tunnel despite being valid from a technical viewpoint, have shown a few problems that have negatively affected the delivery times and cost of the works.

Without denying the objective difficulties involved in the perforation of a 26 km tunnel in what are certainly difficult environmental and logistical circumstances, a more thorough and detailed study and investigation phase, with a more in depth assessment of the geological and structural condition of the mountain range the tunnel was bored through; along with a more effective geo-mechanical definition of the lythologies to be perforated, (highly stressed by the tectonics that affect the region), would nevertheless have provided additional valid supporting elements to help meet the challenge of such an important and complex operation.

After all, the excavation program was supposed to be completed between July 2005 and May 2007 with an expected performance of 600 m/month for TBM 1 and 750 m/month for TBM 2. In actual fact, besides the tunnel collapse which halted the progress of TMB 1 from October 2006 to August 2008, the actual performance of both the TBM machines was below expectations, with TBM1 covering approx. 250 m/month and TBM 2 510 m/month. If to this we add the tunnel collapses, which include the major ones on October 2008 and January 2010, the plant actually went into operation 29 months behind schedule (**EF3**), leading to a loss of revenue estimated at € 78 million.

The absence of detailed reports on the reasons for the two collapses, and particularly the one in January 2010 with the plant having only recently begun energy production, lead to the conclusion that the plant's efficiency may be curtailed due to the need for more frequent tunnel checks and inspections and possible extraordinary maintenance operations (**EF4**).

To this we need to add the extra-costs acknowledged to the GC for the first collapse (October 2008) equal to € 23,5 million (**EF1**), entirely paid out by the EthGov.

Overall we have had the chance to verify that (**EF2**) the internal rate of return on the investment is lower (5.72%) than the lowest hypothetical figure (10.6%) foreseen in the Technical and Economic Evaluation of 2004. However, the drop in the financial profitability of the investment is not due to the increased costs, which generally speaking are in any case limited having recorded an overall increase in construction costs of 16.5%, but is to be ascribed to the current tariff policy which is clearly below (c€2,11) compared to the minimum foreseen in the TEE (c€3.5), but that involves positive benefits for the population.

On the other hand the particularly advantageous current energy tariff policy in Ethiopia, has enabled a greater number of beneficiaries to be reached (**EF7.1**) by the project and therefore has substantially contributed to the successful achievement of the specific objective of the project itself.

Ultimately, therefore, despite the technical difficulties encountered during the construction process which delayed the start up of plant operation thus generating additional costs, in general terms it is not believed that the project benefits have been negatively influenced.

3. RECOMMENDATIONS

The recommendations of both a strategic and operational nature that we provide below are entirely based on the Conclusions outlined above which were in their turn connected to the *findings* of the evaluation questions (Figure IV -). In each case these recommendations are addressed to the stakeholders most directly involved.

3.1 Strategic recommendations

S1	**Purpose:**
	Project cycle
Priority	**Relative to the Conclusions**
HIGH	C2.1
Addressed to:	
Ministry of Foreign Affairs/DGCS	

The **C2.1** conclusion has highlighted that despite a few problems owed to certain factors encountered during the project cycle that have threatened the complete fulfilment of the objectives and results of the project, these have in any case been achieved thanks to an appropriate operational management of all stakeholders involved.

Based on this experience we therefore provide a series of strategic recommendations to be followed during the various project phases and addressed to the MAE/DGCS, with the aim of eliminating the risk that similar problems arise in future cooperation projects.

S1.1: Programming	
S1.2: Identification	It is advisable to proceed with a competitive comparison between design solutions, in order to select the most economically sustainable.
S1.3 Formulation	Proceed with project validation, in order to ensure the technical and economic adequacy of the initiative along the lines of what is foreseen in the Tender Code (Leg. Decree 163/03).
S 1.4: Financing	
S1.4: Implementation	
S1.5: Evaluation	

3.2 Operational recommendations

O1	**Purpose:**
	Project closure
Priority	**Relative to the Conclusions**
HIGH	C2.1
Addressed to:	
EEPCo/GC+Owner Engineer	

In conclusion **C2.1** it was highlighted how the Project appears not to have been formally closed due to the absence of the final report by the Owner Engineer (ELC) and particularly given that the test certificates (Performance Certificates) had yet to be issued, despite the *Taking Over Certificate* were issued.

This has led to the following operational recommendation O1:

RECOMMENDATION O1

In order for the Project to be closed even from a formal point of view, it would be advisable that the EEPCo request the *Owner Engineer.*

- the *Performance Certificate,* if necessary by applying pressure on all subjects involved so that they supply what is required by the ELC;
- the *Final Project Report* including the description of all the environmental refurbishments performed by the General Contractor.

O2	**Purpose:**
	Hydraulic tunnel study and relative monitoring plan
Priority	**Relative to the Conclusions**
AVERAGE	C1.4, C2.2
Addressed to:	
EEPCo/GC+Owner Engineer	

The absence of any kind of technical documentation and a geo-technical and/or structural monitoring system for the tunnel, both during the implementation phase following the collapses reported during work progress, nor once the plant began operating, has led us to conclude that in addition to having negatively affected the achievement of the operating outputs (**C2.2**), even (**C1.4**) the costs connected to the maintenance of the civil works in the medium to long term appear to be uncertain.

This has led to the following operational recommendation O2:

RECOMMENDATION O2

- ensure that a technical report is drafted which in addition to describing the event of January 2010 also provide indications on the possible causes for the collapse, on the evaluations subsequently performed and demonstrate that the refurbishment measures implemented are adequate and decisive.
- assess the possibility of implementing a permanent monitoring system inside the tunnel capable of acquiring data of a geological/geo-technical and structural nature over time that may enable appropriate back analysis and consequently suitable preventive and targeted actions.

O3	**Purpose:**
	Road use by the local population
Priority	**Relative to the Conclusions**
AVERAGE	C1.3
Addressed to:	
EEPCo/RTA	

The analyses carried out have led us to the conclusion (**C1.3**) that the roads built as part of the Project in question are only partially usable by the local population. In particular the guarantee that the bridge built over the Omo River in the vicinity of the power station and the access roads to the power plant were meant to provide a permanent connection between the left and right banks of the river and should be at the disposal of the local populations. These indications should have been included in the project forecasts, the MAE assistance loan agreements and possibly in additional contracts.

We have also had the opportunity to verify that the roads built close to the plant are unsafe for public use. In fact, due to the nature and thickness of the heavily altered and degraded lythological covering layers, the steepness of the slopes and the complete absence of appropriate landscaping and containment works on the excavation fronts, the road surface is constantly obstructed by rock falls and minor landslides, a situation that worsens during the rainy season, making traffic circulation not in line with international safety standards.

This has led to the following operational recommendation O3:

RECOMMENDATION O3

Implement all necessary actions in order to make the roads and infrastructures built as part of the project usable by the local population and in particular:

- Negotiate with the authorities responsible for plant safety the access procedures for the area, for example by keeping only certain "sensitive" areas out of bounds (e.g. the power house, the base camp, the "Valve Chamber", etc....) while allowing free access to the main road as initially foreseen. Or at least arrange for regulated access to be arranged by issuing individual passes to the local populations.
- Ensure that the "Road Authority" is aware of the need to carry out appropriate checks on road safety and therefore take appropriate action in order to prevent accidental rock falls (containment works, rock protection nets, etc....)

	Purpose:
O4	Environmental Management plan and relative monitoring
Priority	**Relative to the Conclusions**
AVERAGE	C1.3
Addressed to:	
EEPCo	

Finally, the analyses have brought us to the conclusion (**C1.3**) that there remain a few problem areas in the sustainable management of the effects on the territory, the landscape and the environment and there appears to be no plan/project for landscape restoration nor any form of environmental monitoring plan.

The mitigation of any negative environmental effects, sustainable management and environmental monitoring are fundamental elements on which the sustainability of major works depends.

This essentially entails 2 main consequences:

1) The lack of both design and management elements which might enable mitigation compatible with technical and management requirements of at least a part of the negative repercussions to the territory, the landscape and the environment;
2) The impossibility of checking the environmental effects of the works and consequently verifying the presumed impacts and the evolution of the environmental status, both in terms of the site (area affected by the works) and a broader area (nearby territory affected by the environmental impacts); a monitoring plan would also enable appropriate technical initiatives and/or mitigation or compensation actions to be taken if unforeseen yet significant effects are detected.

This has led to the following operational recommendation O4:

RECOMMENDATION O4

The drafting of an Environmental Management Plan for the area that should identify the environmental issues particular to the territory associated and/or resulting from the construction and operation of the plant and establish environmental mitigation and compensation measures designed to overcome them (identification of the actions with definition of priorities, responsibilities and required resources).

Drafting of a plan / program for landscape refurbishment.
It is also particularly necessary to prepare an environmental monitoring plan to be able to verify the Plan progress status, the actual environmental impacts and the successful achievement of the specific objectives pursued by the plan's actions.

Summary table IV - 1 details the recommendations that have been produced on the back of this evaluation process and assigns a priority level to each on a scale of 1 (low priority) to 4 (high priority).

Recommendation	Purpose	Addressed to:	Priority
S1	Project cycle	MAE DGCS	4
O1	Project closure	EEPCo GC+ELC	4
O2	Road use by local population	EEPCo RTA	2
O3	Hydraulic tunnel study and relative monitoring plan	EEPCo ELC	3
O4	Environmental Management Plan and relative monitoring	EEPCo	3

Table IV - 1: Recommendation summary table

ANNEX

ANNEX: INDICATORS OF THE EVALUATION QUESTIONS

The current value of each indicator refers to the moment of the detection, i.e. the first semester of 2012.

In the fields “base line” and “target”:

ND means that the datum is not available in the TEE2004 and now is no more obtainable.

NR means that the datum is not relevant for the evaluation of the indicator.

The rating scale set for all indicators is as follows:

A	Rating High
MA	Rating Average-High
MB	Rating Average-Low
B	Rating Low

Where by high rating we refer to a result that is positive even compared to expectations while vice versa a low rating refers to a negative result.

A1.1 RELEVANCE

RR1 Are the objectives pursued by the evaluated initiative in line with Italian Cooperation policies?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Objectives pursued by the Project/Italian Cooperation policies	A-MA-MB-B
	BASE LINE	**TARGET**
	ND	High
CURRENT FIGURE	MA	
RATING	**MA**	

RR2 Are the objectives pursued with this initiative and currently being evaluated in line with Ethiopian development policies and Ethiopia's Poverty Reduction Strategy Paper in particular?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Objectives pursued by the Ethiopian Development policies	A-MA-MB-B
	BASE LINE	**TARGET**
	ND	High
CURRENT FIGURE	MA	
RATING	**A**	

RR3 Are the objectives being pursued in line with the development expectations of the Ethiopian population, particularly the poorer sectors, as expressed by the more representative sections of the local society (democratic ownership)?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Objectives pursued by the Project/Italian Cooperation policies	A-MA-MB-B
	BASE LINE	**TARGET**
	ND	High
CURRENT FIGURE	MA	
RATING	**MA**	

RR4 Are the objectives pursued with this initiative and currently being evaluated in line with the cooperation policies detailed in the official documents of the European Commission?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Objectives pursued by the Project/Italian Cooperation policies	A-MA-MB-B
	BASE LINE	**TARGET**
	ND	High
CURRENT FIGURE	MA	
RATING	**MA**	

RR5 Are the development objectives pursued and undergoing this evaluation in line with the objectives agreed by the International Community and the Millennium Development Goals in particular?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Objectives pursued by the Project/Italian Cooperation policies	A-MA-MB-B
	BASE LINE	**TARGET**
	ND	High
CURRENT FIGURE	MA	
RATING	**MA**	

RR6 To what extend is the exploitation and development of the national hydro-electric potential promoted within a sustainable environmental framework.		
	INDICATOR	**UNITS of MEASUREMENTS**
	Added generation capacity	% MW on existing
	BASE LINE	**TARGET**
	ND	43% (2008)
CURRENT FIGURE	20% (2012)	
RATING	**MA**	

RR7 To what extent does the objective pursued favour the expansion of the export capability of the national energy sector?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Electrical Energy Exported	GWh/year
	BASE LINE	**TARGET**
	ND	9.600-11.600 (2018)
CURRENT FIGURE	411 (2011)	
RATING	**MA**	

RR8 To what extend does the objective pursued contribute to Ethiopia's energy independence?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Contribution to GDP of Ethiopia	%
	BASE LINE	**TARGET**
	ND	ND
CURRENT FIGURE	1%	
RATING	**MA**	

A1.2 EFFECTIVENESS

EE1 Is the GGII plant currently operational and does it reach the expected performance levels?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Annual production of GGII	GWh/year
	BASE LINE	**TARGET**
	0	1.650
CURRENT FIGURE	1.556	
RATING	**MA**	

EE2 Is the energy produced by GGII regularly distributed throughout the national electrical grid?		
	INDICATOR	**UNITS of MEASUREMENTS**
	400kV line in operation	km
	BASE LINE	**TARGET**
	0	185
CURRENT FIGURE	185	
RATING	**A**	

EE3 Has the Ethiopian electricity user base been expanded (population/companies)?		
	INDICATOR	**UNITS of MEASUREMENTS**
	New costumers	Number of new costumers
	BASE LINE	**TARGET**
	0	774.000
CURRENT FIGURE	895.000	
RATING	**A**	

EE4 Has access to electrical energy been extended within the local Ethiopian population?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Ethiopian population served by electricity	% on the total
	BASE LINE	**TARGET**
	15% (2004)	20% (2013)
CURRENT FIGURE	20% (2012)	
RATING	**A**	

EE5 Does the currently adopted fee policy enable access to be extended to a broad section of the population?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Rates	Euro
	BASE LINE	**TARGET**
	-	0.0035
CURRENT FIGURE	0.002	
RATING	**A**	

A1.3 EFFICENCY

EF1 Has the use of the available resources been in line with foreseen operating objectives and expected results?		
	INDICATOR	**UNITS of MEASUREMENTS**
	available resources/ foreseen operating objectives and expected results	MEuro
	BASE LINE	**TARGET**
	MEuro 465,8	MEuro 465,8
CURRENT FIGURE	Meuro 493 (+ 5,8%)	
RATING	**MA**	

EF2 Is the management of investment costs, running costs, operating revenue, etc... still capable of guaranteeing the financial profitability of the investment?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Management costs/ financial profitability of the investment	%
	BASE LINE	**TARGET**
	NR	internal rate of return from 10,6% (3,5 c€) to 17,2%(6 c€)
CURRENT FIGURE	5,72%, with rate 0,0211 €	
RATING	**B**	

EF3 What effects have the delays accumulated had on investment profitability?		
	INDICATOR	**UNITS of MEASUREMENTS**
	cost management plant updated after event	€/year
	BASE LINE	**TARGET**
	NR	NR
CURRENT FIGURE	€ 32,4 M/ year	
RATING	**MB**	

EF4 Is it expected that the problems and geological contingencies encountered during the excavation may limit the efficiency of the works due to more frequent and costly tunnel maintenance operations?		
	INDICATOR	**UNITS of MEASUREMENTS**
	impact of delays on the efficiency of the plant	% rating
	BASE LINE	**TARGET**
	NR	NR
CURRENT FIGURE	Current maintenance costs: 1% per year on civil works and 2.5% per per year on the electromechanical works	
RATING	**B**	

EF5 What are the main factors to have affected the successful / failed achievement of the objectives and results during the various phases of the project cycle?		
	INDICATOR	**UNITS of MEASUREMENTS**
	factors that influenced the performance of the project cycle	Nr. of factors
	BASE LINE	**TARGET**
	NR	NR
CURRENT FIGURE	5	
RATING	**MA**	

EF6 In terms of operating, management and decision making efficiency, what has been the role of the figures involved such as DGCS (Central and local offices), Local Authorities and General Contractor?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Efficency of the involved figures: DGCS, Autorità locali, General Contractor	Nr. of involved figures
	BASE LINE	**TARGET**
	NR	NR
CURRENT FIGURE	Good	
RATING	**A**	

EF7.1 In cost/effectiveness terms, what is the ratio between total cost of the operation/additional population served?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Total cost/ Additional population served	%
	BASE LINE	**TARGET**
	ND	€ 633 per individual beneficiary
CURRENT FIGURE	€ 552 per individual beneficiary	
RATING	**A**	

EF7.2 In cost / effectiveness terms, which similar operations, performed in developing countries, could be of reference for GGII, particularly in Sub-Saharan Africa?		
	INDICATOR	**UNITS of MEASUREMENTS**
	cost / effectiveness	NR
	BASE LINE	**TARGET**
	ND	ND
CURRENT FIGURE	Comparing of GGII with Ingma Dams (RDC)	
RATING	**MA**	

EF8 In terms of benchmarking, which similar operations, performed in developing countries, could be a reference for GGII?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Benchmarking index	NR
	BASE LINE	**TARGET**
	ND	ND
CURRENT FIGURE	Comparing of GGII with other hydroelectrical installation	
RATING	**MA**	

A1.4 SOCIAL-ECONOMIC IMPACT

IP1 Did the works construction phase have an occupational impact on the local population and to what extent?

	INDICATOR	UNITS of MEASUREMENTS
	Local direct employment, during the construction work	Nr. Local direct employees
	BASE LINE	**TARGET**
	0	ND
CURRENT FIGURE	2410 unità in media 3552 in September 2006	
RATING	**MA**	

IP2 Has there been an increase in downstream activities that can be directly linked to the works construction?

	INDICATOR	UNITS of MEASUREMENTS
	Local indirect employment, during the construction work	Nr. Local indirect employees
	BASE LINE	**TARGET**
	0	ND
CURRENT FIGURE	120	
RATING	**MA**	

IP3 Can a "lasting" occupational impact for the local population be established that will continue even during plant operation?

	INDICATOR	UNITS of MEASUREMENTS
	Local employment, during the operation of the plant	Nr. Local employees
	BASE LINE	**TARGET**
	0	ND
CURRENT FIGURE	220 (8% of average employment)	
RATING	**MA**	

IP4 What know-how has been transferred to the local population thanks to the construction of GGII?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Benefits of know-how to local population	. know-how transferred (A-MA-MB-B)
	BASE LINE	**TARGET**
	NR	NR
CURRENT FIGURE	**MA**	
RATING	**MA**	

IP5 Have other economic sectors (agriculture, live stock farming, crafts, etc....) been affected in a positive/negative way by the construction and the subsequent operation of the GGII plant?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Positive and negative effects of the construction.	Nr. of factors
	BASE LINE	**TARGET**
	ND	ND
CURRENT FIGURE	New positive factors detected: 9	
RATING	**MA**	

IP6 Is it possible to detect specific positive or negative effects on the collectivity, safety and local social cohesion that stem directly from the GGII undertaking?		
	INDICATOR	**UNITS of MEASUREMENTS**
	positive or negative effects on the collectively, safety and local social cohesion	Nr. of negative and positive effetcs
	BASE LINE	**TARGET**
	ND	ND
CURRENT FIGURE	5 positive effects, 3 negative effects	
RATING	**MA**	

IP7 What short, medium or long term positive or negative social, cultural or political - institutional effects can be identified?		
	INDICATOR	**UNITS of MEASUREMENTS**
	positive and negative social, cultural or political - institutional effects	Nr. of negative and positive effetcs
	BASE LINE	**TARGET**
	ND	ND
CURRENT FIGURE	6 positive effects, 3 negative effects	
RATING	**MA**	

IP8 Has there been any increase in pandemics (HIV, malaria, etc.) among the local population that may be linked to the construction works?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Pandemic increasing linked to the construction work	Nr.of recorded cases
	BASE LINE	**TARGET**
	ND	ND
CURRENT FIGURE	from 133 in 2004 to 190 in 2009	
RATING	**MB**	

IP9 What is the beneficiary's perception of the project's results and effects in the medium to long term and of how future impacts may further improve these results?		
	INDICATOR	**UNITS of MEASUREMENTS**
	the beneficiary's perception of the project's results	Grade of satisfaction
	BASE LINE	**TARGET**
	NR	NR
CURRENT FIGURE	High	
RATING	**MA**	

A1.5 ENVIRONMENTAL IMPACT

IA1.1 What changes in water flow rates have been recorded in the Gilgel Gibe river between the upstream and downstream plants?		
	INDICATOR	**UNITS of MEASUREMENTS**
	ecological flow	mc/sec
	BASE LINE	**TARGET**
	NR	2
CURRENT FIGURE	2	
RATING	**MA**	

IA1.2 Have any problems been reported or observed regarding ground water height increases in specific areas due to the water deviation or the tunnel boring (i.e. partial flooding, inundations, new emergencies, slope instability due to rising ground water levels?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Flooded area	%
	BASE LINE	**TARGET**
	NR	0
CURRENT FIGURE	0	
RATING	**A**	

IA2.1 Which surfaces affected by geological instability before and after the completion of the works and within the project boundaries (including excavation areas) have been subjected to refurbishing operations and safety precautions (sq. km.)?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Areas affected by geological instability	A-MA-MB-B
	BASE LINE	**TARGET**
	MA	MA/A
CURRENT FIGURE	MB	
RATING	**MB**	

IA2.2 Percentage of roads built according to methods and criteria that will make them efficient in the long term and consequently of use to the local population?

	INDICATOR	UNITS of MEASUREMENTS
	roads built according to methods and criteria that will make them efficient by local population.	%
	BASE LINE	**TARGET**
	0	100
CURRENT FIGURE	40	
RATING	**MB**	

IA3.1 Have there been any reports of springs disappearing or wells/small water reservoirs drying up that were previously used by or the local population?

	INDICATOR	UNITS of MEASUREMENTS
	Population with problems of availability of water resource.	%
	BASE LINE	**TARGET**
	0	0
CURRENT FIGURE	0	
RATING	**A**	

IA3.2 Have any assessments of the potential hydrological impact been carried out over a sufficiently extensive area, both upstream and downstream of the construction works?

	INDICATOR	UNITS of MEASUREMENTS
	Hydrological studies	Yes/No
	BASE LINE	**TARGET**
	No	Yes
CURRENT FIGURE	No	
RATING	**B**	

IA4 Where and according to what procedure have the large masses of debris produced by tunnel excavation been disposed of? Have the foreseen excavation debris safe disposal measures been implemented?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Consistency with EIA measurements about the way of disposal of the debris produced by tunnel excavation.	Yes/No
	BASE LINE	**TARGET**
	NR	Yes
CURRENT FIGURE	No	
RATING	**B**	

IA5 Effects on the natural vegetation and fauna as a result of works construction (water uptake system, access roads, etc...) - Have check-lists for vegetation and fauna species been carried out during the works phase and system operation that can provide useful indications for the assessment of changes in ecosystem equilibriums?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Consistency with EIA measurements about the monitoring of impacts on vegetation and fauna species.	Yes/No
	BASE LINE	**TARGET**
	NR	Yes
CURRENT FIGURE	No	
RATING	**B**	

IA6 Have regular measurements been carried out upstream and downstream of the newly built plants on the physical and chemical properties of the superficial and underground waters? Has a monitoring procedure been foreseen during plant operation?

	INDICATOR	UNITS of MEASUREMENTS
	Existence of a monitoring plan on the quality of waters	Yes/No
	BASE LINE	**TARGET**
	NR	Yes
CURRENT FIGURE	No	
RATING	**B**	

IA7 What landscape re qualification activities have been foreseen for the area of operations and excavation? To what extent have they already been undertaken?

	INDICATOR	UNITS of MEASUREMENTS
	Enviromental requalification in the area of operations	%
	BASE LINE	**TARGET**
	A	A
CURRENT FIGURE	MB	
RATING	**MB**	

IA8 Will the electrical energy production provided by the Gilgel Gibe II hydro-electric plant lead to a reduction in CO2 emissions compared to conventional energy sources (fossil fuels)?

	INDICATOR	UNITS of MEASUREMENTS
	Reduction of CO_2 emissions	t CO_2
	BASE LINE	**TARGET**
	0	155.100 t
CURRENT FIGURE	146.264 t	
RATING	**MA**	

A1.6 SUSTAINABILITY

SO1 In time, will the local population be able to continue benefiting from the effects generated by the construction of the plant (social services and infrastructures built during the construction site phase; occupational opportunities; energy distribution; technical know-how; institutional development)?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Capacity of local population to benefit in time of the positive effects	A-MA-MB-B
	BASE LINE	**TARGET**
	NR	NR
CURRENT FIGURE	A	
RATING	**A**	

SO2 How does the benefiting population perceive the medium to long term effects and the sustainability of the project?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Perception of population of long term effects	A-MA-MB-B
	BASE LINE	**TARGET**
	NR	NR
CURRENT FIGURE	MA	
RATING	**MA**	

SO3 Does the EEPCo have a suitable organisation and know-how to manage the plant during the course of its useful working life in normal operating conditions?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Know-how of EEPCO to manage the plant	A-MA-MB-B
	BASE LINE	**TARGET**
	0	MA
CURRENT FIGURE	MA	
RATING	**MA**	

SO4 Will EEPCo be capable of facing up to exceptional events (such as tunnel collapses, damage caused by calamitous event, etc...) so that even in the future it can handle structural problems?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Capacity of EEPCo sto manage exceptional events	A-MA-MB-B
	BASE LINE	**TARGET**
	0	MA
CURRENT FIGURE	MB	
RATING	**MB**	

SO5 Have the local institutions and stakeholders acquired the know-how and the abilities required for the servicing and maintenance of the hydro-electric plant?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Capacity of local organism for operation and maintenance of the plant	A-MA-MB-B
	BASE LINE	**TARGET**
	0	MA
CURRENT FIGURE	MA	
RATING	**MA**	

SO6 Is there a long term hydrological, geo-technical and structural monitoring plan in place covering all aspects of the works?		
	INDICATOR	**UNITS of MEASUREMENTS**
	Existence of hydrological, geo-technical and structural monitoring plan	Yes/NO
	BASE LINE	**TARGET**
	0	Yes
CURRENT FIGURE	NO	
RATING	**B**	