



REPUBLIC OF TURKEY
MINISTRY OF ENERGY AND NATURAL RESOURCES
GENERAL DIRECTORATE OF STATE HYDRAULIC WORKS

YUSUFELI DAM AND HEPP PROJECT

CHAPTER I **INTRODUCTION**

ENVIRONMENTAL IMPACT ASSESSMENT
DRAFT FINAL REPORT (Rev F)



ENVIRONMENTAL CONSULTANCY CO.

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LIST OF ABBREVIATIONS

AIGM	General Directorate of Disaster Affairs
ASL	Above Sea Level
B/C	Benefit-cost ratio
Bern Convention	Convention on the Conservation of European Wildlife and Natural Habitats
BOD	Biological Oxygen Demand
BTEP	Thousand Tons of Petroleum Equivalent
CHY	Cable Head Yard
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
CR	Critically Endangered
COD	Chemical Oxygen Demand
dB	Decibels
DD	Data Deficient
DIE	State Institute of Statistics
DMI	General Directorate of State Meteorological Institute
DO	Dissolved Oxygen
D/S	Downstream
DPT	State Planning Organization
DSI	General Directorate of State Hydraulic Works
EC	Electrical Conductivity
EDF	Electric de France
EIA	Environmental Impact Assessment
EIE	General Directorate of Electrical Power Resources Survey and Development Administration
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
ENCON	ENCON Cevre Danismanlik Ltd. Sti. (Environmental Consultancy Co.)
EN	Endangered
ENE	East-northeast
ENPEP	Energy and Power Evaluation Program
EPDC	Electric Power Development Company
ERL	IUCN (European) Red List
ETL	Electric Transmission Lines
EU	European Union
EUAS	Turkish Electricity Production Corporation
GCCW	Georgian Centre for Wildlife Conservation

GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gases
GIS	Geographic Information Systems
GNP	Gross National Product
GWh	Giga Watt Hour
HH	Household
HEPP	Hydroelectric Power Plant
HSE	Health, Safety and Environment
HWCR	Hazardous Waste Control Regulation
HWL	High Water Level
IBA	Important Bird Area
ICOLD	International Commission on Large Dams
IPP	Independent Power Producers
IRR	Internal rate of return
IMS	Integrated Management System
IUCN	The World Conservation Union
JICA	Japan International Cooperation Agency
KEP	Kilogram Petroleum Equivalent
KGM	General Directorate of State Highways
KHGM	General Directorate of Rural Affairs
kWh	Kilo Watt Hour
Leq	Noise Level Equivalent
LTL	Long Term Limits
MAED	Model for Analysis of Energy Demand
MAK	Central Hunting Commission
MARA	Ministry of Agriculture and Rural Affairs
MCE	Maximum Credible Earthquake
MoEF	Ministry of Environment and Forestry
MENR	Ministry of Energy and Natural Resources
MOH	Ministry of Health
MPWS	Ministry of Public Works and Settlement
MTA	General Directorate of Mining Exploration and Research
MW	Mega Watt
MWCR	Medical Waste Control Regulation
MWL	Maximum Water Level
NGO	Non-Governmental Organization
NOAA	National Oceanic and Atmospheric Administration Environmental Data Service
OECD	Organization for Economic Cooperation and Development
OP	World Bank Operational Policy

PAP	Project Affected Person
PIO	Public Information Office
PM	Particulate Matter
RAP	Resettlement Action Plan
ROW	Right of Way
RS	Remote Sensing
SE	Southeast
SRF	Special Resettlement Fund
SS	Suspended Solids
STL	Short Term Limits
SY	Switch Yard
TCK	General Directorate of State Highways
TDS	Total Dissolved Solids
TEIAS	Turkish Electricity Transmission/Distribution Corporation
TKN	Total Kjeldahl Nitrogen
TKVKK	Trabzon Natural Wealth Preservation Committee
TPAO	Turkish Petroleum Corporation
TPE	Total Petroleum Equivalent
TPP	Thermal Power Plant
TRDB	Turkish Red Data Book
TSWCR	Turkish Solid Waste Control Regulation
TUGEM	General Directorate of Agricultural Production and Improvement
UNDP	United Nations Development Programme
U/S	Upstream
VU	Vulnerable
WB	World Bank
WCD	World Commission on Dams
WEC	World Energy Council
WPCR	Water Pollution Control Regulation
WWF	World Wildlife Foundation

I. INTRODUCTION

I.1. Energy Sector in Turkey and Policy Background

I.1.1. Overview

Turkey, as a rapidly developing and industrializing country, is in need of reliable, inexpensive, and high quality energy. The average primary energy demand increases by 6.2% annually (DPT, 2004). In the last decade, primary energy production has decreased by 6% (1995 – 2004). In 2004 production was 24,750 thousand tons of petroleum equivalent. In the energy sector, oil products have a 39.1% share and natural gas has a 21.8% share, where approximately 50% of the oil products and 95% of the natural gas are dependent on imported resources. As of the end of 2004, total primary energy consumption was about 87,900 thousand tons of petroleum equivalent (DPT, 2004). The estimations for 2005, for primary energy source production and consumption are 26,617 and 93,335 thousand tons of petroleum equivalent, respectively (DPT, 2004). The difference between consumption and domestic production is imported.

I.1.2. Energy Policy of Turkey

In 1970's energy policies of countries throughout the world changed significantly due to the oil crisis. Fossil fuel resources, including coal, petroleum and natural gas are going to be exhausted in time and their prices are also going to increase parallel to the decrease in their availability, unless new energy resources replace these. This points to the importance of other energy resources, especially renewable ones.

The energy policy of Turkey, as formulated in the development plans and programs prepared by State Planning Organization (DPT), is to meet the energy demand in the country reliably, continually and with appropriate costs (DPT, 2004). Development of the renewable energy is among the issues that Turkey attaches importance and preparation of a programme to increase production utilizing renewable energy resources has been stated among the short-term objectives in the Accession Partnership with EU (DPT, 2004). Hydropower is one of the most important and usable of these resources.

The Eighth Five Year Development Plan (covering the years 2001-2005) aimed to establish a stable and sustainable development trend through implementation of structural harmonization with the European Union and macroeconomics, social, and cultural policies. Reducing unemployment and establishing regional balances for investment and development are also among the main targets. The State Planning Organization estimated that during the Eighth Plan period, Gross Domestic Product (GDP) will increase by 6.5% annually and Gross National Product (GNP) will grow by about 6.7% on an annual average. One of the objectives of the Eighth Plan is to increase the share of the private sector in investments and operational activities in the energy sector, in order to meet the electricity demand in a sustainable and continuous way.

The preliminary national development plan for 2004-2006 (DPT, 2003) and the 2005 program (DPT, 2004) prepared in line with the Eighth Plan and the requirements of the pre-accession process for EU membership follow up the above-mentioned issues.

Current energy policy emphasizes the importance of meeting the energy demand of the increasing population and a developing economy by using, as far as possible, domestic energy resources in a feasible and sustainable way.

The only significant source of domestic fossil energy resources is lignite. The lignite reserves of Turkey are 8.4 billion tons, however the lignite found in Turkey is of low quality (i.e. low calorific value and high sulphur content) and is only fired in old power station whereas in new thermal power stations imported high quality lignite and coal are used.

Obviously, when the average annual primary energy demand increase of 6.2% is taken into account, the development of renewable resources, such as hydropower, is especially important for Turkey, as it is throughout the world.

I.1.3. Role of Hydropower in Turkey

The use of hydraulic energy sources is still relatively low when compared to the potential existing in Turkey. The technical and economic hydroelectric energy potential in Turkey is presently estimated to be 127,381 GWh (DSI, 2005). By the end of 2004, the installed capacity of hydroelectric power was 12,654 MW, which constitutes 33.8% of total installed energy production capacity (37,480 MW) in Turkey. In 2004, 47,614 GWh electrical energy was produced from hydropower (DSI, 2005). As of the end of 2004, 37% (47.614 GWh) out of a total of 127,381 GWh economic hydroelectric potential is in operation, 8% (10.645 GWh) is under construction and the remaining 55% (69.122 billion kWh) is in various planning stages (DSI, 2005).

Since energy production from hydroelectric power plants is dependent on the amount of rainfall, their share in the annual production rate naturally varies every year. Currently, hydropower contributes about 30% to the electrical energy production in Turkey (DSI, 2005).

I.2. Yusufeli Project Identification and Development Background

I.2.1. Project History Brief

The Coruh River rises at Civilikaya Hill, located in the Mescit Mountains at the North of the Erzurum Plateau, and flows through East Anatolia and the East Black Sea Regions of Turkey to finally reach the Black Sea near Batumi in Georgia. On the way it flows 390 km on the Turkish territory and about 25 km through Georgia.

In 1982, the hydroelectric development plan for the Coruh River was developed on a Master Plan level by Temelsu Engineering limited Company for the General Directorate of Electrical Power Resources Survey and Development Administration (EIE). A total of 10 project sites were planned to be developed in cascade series along the main river. The total head of 1,424 meters, from the most upstream Laleli Site to the most downstream Muratli Site close to the Georgian border provides for the generation of 8,320 GWh of electricity. In this cascade, Yusufeli together with Artvin project form the hydropower development for the Middle Coruh.

The Yusufeli Project was incorporated into the project development plans of State Hydraulic Works (DSI) in the late 80's. Japan International Cooperation Agency (JICA) prepared a feasibility report (1986) and the proposed project was determined to be economically and technically feasible. In the next planning step Japan Electric Power Development Company (EPDC), Su-Is Project Engineering Company, and Terzibasoglu Consultancy and Engineering Company prepared the final design documents in October 1990 and these were approved by the General Directorate of Electrical Power Resources Survey and Development Administration (EIE) in the same year.

The services to be conducted in accordance with the approved development plan, or special plans and projects approved by the related ministries are considered as serving public interest in Turkey (Turkish Expropriation Law No: 2942, November 8, 1983). Thus, Yusufeli Project is a project for public interest.

A Protocol between French Undersecretary of State for Energy and Raw Materials and Turkish Undersecretary of State for Energy was signed on September 3, 1996 and an international Consortium was formed initially comprised of SPIE BATIGNOLLES T.P. (Leader), CEGELEC, GEC ALSTOM Neypric, GEC ALSTOM Electromecanique S.A., SPIE ENERTRANS/France and DOGUS Insaat ve Ticaret A.S. (Turkey).

The Ministry of Energy and Natural Resources, in accordance with the energy policies of Turkish Republic, decided to build the Yusufeli Dam and Hydroelectric Power Plant as a part of the Development Plan of Coruh River with the approval of the Minister of Energy and Natural Resources on 19 October 1996. The project was put into the 1997 Investment Program by the Turkish Government.

By the Turkish Governmental Decree No.97/9689 dated 23 July 1997, the Consortium was nominated to negotiate a contract for Yusufeli and Artvin Projects provided that the necessary loans for the financing of the complete local and foreign needs of the projects are secured by the Consortium and are acceptable by the Turkish Treasury.

Subsequently, in view of the size of the Yusufeli project and in order to diversify the equipment supply and have a better spreading of related buyer's credits the Consortium was widened to take in Belgian, Spanish and English companies. Furthermore, Coyne & Bellier (France) and Dolsar Muhendislik (Turkey) joined the Consortium to render Engineering and Consultancy services in the name of the Owner General Directorate of State Hydraulic Works (DSI).

In the mean time AMEC, one of the consortium members joining later, took the strategic decision to leave the Consortium in line with their revised company policy. Soon after Spie Batignolles (Leader), which was fully taken over by AMEC, also left the Consortium again in line with the same AMEC policy. As a consequence, all the other members of the Consortium, except DOGUS, ALSTOM, COYNE & BELLIER and DOLSAR, decided to leave the Consortium giving their consent to the remaining members to pursue the project.

The new Consortium pursuing the project was successful in re-negotiating the Contract with the General Directorate of State Hydraulic Works by end of 2003.

The Cabinet of Ministers issued on July 5th, 2004 the Government Decree No. 2004/7588. This Government Decree is an amendment to the original Decree and authorizes the new Consortium members with DOGUS as the leader of the Consortium to work on the implementation of the Yusufeli and Artvin Projects.

On August 13th, the Ministry of Energy and Natural Resources authorized DSI to finalize the contract negotiations with the Consortium and to initialize the Contract. The Contract initializing took place on September 1st, 2004.

The Consortium will be the contractor of DSI, who owns the project. Funding for the project investment will be obtained from international and national finance sources. The Turkish Electricity Production Authority (EUAS) is the responsible agency for the operation of hydroelectric power plants in Turkey. Thus, after the construction of the Project, DSI will transfer the plant to EUAS for operation.

I.2.2. Salient Features of the Project

Yusufeli Project site is located about 40 km southwest of Artvin City center and about 10 km downstream of Yusufeli Town. The Yusufeli Dam Axis is located at 800 m downstream of the confluence of Oltu and Coruh River. In the downstream of the Yusufeli Project, Artvin, Deriner, Borcka and Muratli Hydropower Projects are located. Muratli started operation in June 2005, Borcka and Deriner are under construction.

It is planned that Artvin is completed at the same time as Yusufeli. In the upstream of Yusufeli, Arkun, Aksu, Gullubag, Ispir and Laleli Projects are planned to be implemented according to the Coruh River Development Plan. More information on the other projects of the Coruh Cascade is provided in Chapter IV.

The Yusufeli Dam and Hydroelectric Power Plant Project will be constructed according to the design as set out in 1990, consisting of a rock fill dam (with a height of 223 m from the riverbed), a 540 MW underground type powerhouse, and the associated switchyard site.

Also, two relocation roads will be built to replace the roads, which will be inundated by the reservoir. The new roads comprise of, a 55 km relocation section of the Artvin-Bayburt state highway and a 31 km relocation section of the Artvin-Erzurum state highway. These new roads are generally going in parallel above the future reservoir boundary.

The electricity produced will be fed into to the interconnected system and thus will be distributed to various parts of Turkey. The power transmission lines are planned and built by Turkish Electricity Transmission Corporation (TEIAS). As Yusufeli Project is one of the projects in Coruh River Development Plan the transmission lines for these projects are interconnected and are planned and built in the context of the other projects. A detailed description of the Yusufeli Project and components is provided in Chapter IV.

I.3. Environmental Impact Assessment for the Project

I.3.1. Regulatory Background

Turkish EIA Requirements

The Turkish Environmental Impact Assessment Regulation entered into force on 07.02.1993 and the latest revision was published in Official Gazette No. 25318 dated 16.12.2003.

According to this regulation, storage dam projects and run-off river projects of a certain size (Annex 1, Items 14 and 33 of the EIA regulation) are subject to EIA. By its dimensions Yusufeli Project would fall under the applicability criteria. However, according to the provisional Article 3, provisions of the EIA regulation do not apply to those projects; (i) whose final design was approved, or (ii) for which permission, license or approval was obtained pursuant to environment and other related legislation, or (iii) expropriation decision was taken, or (iv) site selection was made based on relevant legislation, or were (v) taken into investment programme, before February 7, 1993. With reference to this provisional Article, the Ministry of Environment, by letter to DSI dated 2 March 1999, exempted Yusufeli Project from EIA requirements.¹

International EIA Standards

According to the World Bank screening criteria of its Operational Policy 4.01, Yusufeli Project would be a Category "A" Project, for which a full-scale environmental impact assessment is required.

This Environmental Impact Assessment Report (EIA) was prepared to fulfill the requirements of international lending organizations involved in financing of the project investment. The preparation of the EIA Study was guided by the relevant World Bank environmental safeguard policies for dam projects. Thus, this environmental impact assessment study was prepared along the requirements of World Bank Operational Policy (OP) 4.01 Annex A (Environmental Assessment) and Annex B (Environmental Policy for Dam and Reservoir Projects).

Paragraph 8 of Operational Policy 4.01 defines Category A project as a project that is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. The definition of the "sensitive" impact is provided in the same operational policy as; the impact that may be irreversible or raise issues related to the natural habitats; covered under the Bank's Operational Policy OP 4.04 (*Natural Habitats*), cultural properties; covered under OP 4.11 (*Safeguarding Cultural Property in Bank-Financed Projects*), or might result in involuntary resettlement covered under OP 4.12 (*Involuntary Resettlement*).

¹ At the time of the exemption by the Ministry (March 1999), the said provisional Article was No.1, this has shifted in the meantime to No.3 due to the insertion of further provisional articles in the process of revision of the EIA Regulation

As a result, the below listed World Bank Safeguard Policies dealing with environmental and social issues related to the project were taken into consideration for EIA studies and for the preparation of this report. Additionally, specific mitigation of the impacts related to the resettlement issue was dealt with the Resettlement Action Plan that was prepared in accordance with the Social Safeguard Policies of the World Bank. The impacts on socio-economic environment and the respective mitigation measures are described in detail in the Resettlement Action Plan for Yusufeli Project (ENCON, 2005).

Environmental Safeguard Policies

- OP 4.01 Environmental Assessment
- OP 4.04 Natural Habitats
- OP 4.36 Forests
- OP 4.37 Safety of Dams

Social Safeguard Policies

- OP 4.11 Cultural Property
- OP 4.12 Involuntary Resettlement that replaced OD 4.30

In the preparation of this report, the “Environmental Assessment Source Book and updates”, published in the World Bank's Technical Papers Series as well as other EIA good practice and standard guides and handbooks were used for guidance throughout the environmental assessment process. For the resettlement issues “Involuntary Resettlement Sourcebook: Planning and Implementation in Development Projects” was used in the preparation of the RAP report.

EA practices worldwide is based on common principles, which in essence require a project proponent to set out the following in an appropriate report:

- A description of the proposed project.
- A characterization of the existing environmental conditions and any significant trends.
- An assessment of the environmental impacts of the project and comparison with the relevant limits, standards and/or thresholds proposed.
- A proposed environmental management plan including the mitigation strategy and the monitoring activities.

This EIA report is to serve as a main input for the environmental appraisal of the project by the lending organizations for funding decision. Furthermore, the study shall form the basis for specifying the environmental provisions for detailed engineering, procurement and construction, and operation and maintenance documents to be elaborated in the subsequent project planning steps, to ensure that the design, construction and operation of the Project will be in an environmentally acceptable manner to international standards.

I.3.2. Environmental Studies for the Project

All environmental studies for the Yusufeli Project including this EIA Report were carried out by ENCON Cevre Danismanlik Ltd. Sti. (ENCON Environmental Consultancy Co.), Ankara, Turkey, which was appointed by the Consortium.

Environmental studies regarding the Yusufeli Project were first conducted in 1998, and additional work was carried out in 2000 and 2002. In spring 2004, work was continued with detailed baseline studies for the preparation of this EIA report, which include the vegetation – land use – habitat mapping studies to identify actual status in the project impact area using state of the art techniques. Baseline studies were carried out on throughout 2004. For the Resettlement Action Plan (ENCON, 2005) socio-economic surveys and other related studies were carried out in spring 2005. Results of this have been used in this EIA report.

The studies of ENCON were supported by ERM Germany (Environmental Recourses Management) staff of ERM Germany's Frankfurt office. ERM was appointed by the Consortium as an advisor for the EIA and RAP preparation process aiming at internationally recognised good practice standards and relevant issues being properly addressed in the studies.

Relevant impact assessment methodologies were used, such as mathematical modeling, geographical information systems, and experts' opinions. For a number of study topics covered in this EIA, associated individual experts of ENCON and expert teams from Gazi University (Department of Biology, Hacettepe University (Department of Biology), Ankara University (Faculty of Agricultural Engineering, Department of Soil Sciences), Hacettepe University (Departments of Archeology and History of Art and Middle East Technical University (Department of Sociology) contributed expertise in the EIA studies. This includes extensive field study campaigns in particular on the ecological environment.

A list of Persons who have contributed in the preparation of this EIA Study is included in Annex A.

The EIA team has closely liased with the Consortium and the project owner State Hydraulic Works-DSI for including up to date information on the Project in this EIA report, inter alia on project justification, alternatives, construction and operation.

A number of organisations, including government administrations and agencies at various levels have provided information to this EIA study (see respective references).

Various documents were consulted during the preparation of the EIA, including policy and legal reports, laws and regulations, technical and economic reports regarding the project, the resettlement action plan (RAP) for the project, publications on land use, natural resources, geology, socio-economic features of the area/region, maps, various data on water quality, hydrology, and climatology obtained from different agencies. Field studies were carried out in 2004-2005 to collect baseline data on the

physical, biological and socio-economic environments. The impacts were identified and evaluated in the light of the results of this information.

Moreover, a series of public consultations was conducted and information was provided to the project affected people in the project area, non-governmental organizations (NGOs), and governmental agencies at various levels and other related organizations. The details related to these consultations are provided in Chapter V, in the Socio-Economic Environment Section. To facilitate interagency coordination and to learn and understand the concerns of the related governmental and non-governmental agencies, affected groups and the public, meetings were held throughout the EIA and RAP studies. The findings of detailed surveys and consultations conducted during the studies for RAP are presented in the RAP Report (ENCON, 2005). Surveys and public meetings were carried on in the region affected by the Project to gain an understanding of the views of the local people living in the area.

I.4. Structure of the EIA Report

The general outline of this EIA report is guided by the requirements of OP 4.01 of the World Bank (for Category "A" Projects) and includes the following major headings:

- Executive Summary
- I. Introduction
- II. Policy, Legal, and Administrative Framework
- III. Project Purpose
- IV. Project Description
- V. Environmental Baseline
- VI. Environmental Impacts
- VII. Analysis of Alternatives
- VIII. Environmental Management Plan (EMP)
- Appendices