Monitoring report form (Version 03.1)

Monitoring report

Title of the project activity	ARALIK HEPP
Reference number of the project activity	GS663
Version number of the monitoring report	05
Completion date of the monitoring report	21/05/2014
Registration date of the project activity	18/11/2011
Monitoring period number and duration of this monitoring period	1st period. 01/05/2010-30/09/2013 (41 Months)
Project participant(s)	1- Artvin Çoruh Elektrik Üretim San. ve Tic. A.Ş (Private Entity, Project Owner) 2-Global Tan Energy Ltd. (Private Entity, Project Developer)
Host Party(ies)	Turkey
Sectoral scope(s) and applied methodology(ies)	Sectoral scope 1: Energy Industries (Renewable-/non-renewable sources) Applied methodology: AMS I.D., version 14
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	2010(01/05/2010 – 31/12/2010) – 16,916 tCO_2e 2011 – 25,374 tCO_2e 2012 – 25,374 tCO_2e 2013(01/01/2013 – 30/09/2013) – 19,030 tCO_2e **Total: 86,694 tCO_2e**
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	2010(01/05/2010 – 31/12/2010) – 6,827 tCO_2e 2011 – 26,939 tCO_2e 2012 – 23,465 tCO_2e 2013(01/01/2013 – 30/09/2013) – 20,725 tCO_2e **Total: 77,956 tCO_2e**

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

ARALIK is a 'run-of-river' type hydroelectric power plant (HEPP). Project is located on Aralik River in Borcka District of Artvin Province. The Project is implemented by KAR-EN Karadeniz Elektrik ve Üretim Ticaret A.Ş. (The company name was later changed as Artvin Coruh Elektrik Üretim Sanayi ve Ticaret AŞ)

Figure 1: Aralık HPP Project Area

Main goal of the project is to generate clean energy by harnessing the hydro power and providing the energy to the Turkish national grid. By implementing the project, investors also aim to reduce dependency to the fossil fuels thereby reducing the sources of environmental pollution. When working at the design capacity, the project has the potential to deliver emission reductions of about 25,000 tCO_{2e} annually. According to the actual generation within this monitoring period (41 months), the realised net emission reductions were at the level of 77,956 tCO2 e. In order to achieve the highest possible power output and the emission reductions associated with it; the project owner invested in state-of-the-art turbines and all the necessary assessments were carried out before the implementation. Net electricity generation breakdown has occurred as follows during the current monitoring period:

Net Electricity Generation Breakdown (MWh)	
2010	12,148.191
2011	47,936.180
2012	41,756.178
2013	36,879.623
Total	138,720.172

Table 1: Net Electricity Generation Breakdown for ARALIK HPP

The project was granted an operating license by Energy Market Regulatory Authority (EMRA) on 16.05.2006. The project aims to generate energy from the 300 meters fall on Aralik River 1km. upstream before the river merges with Çoruh river. The project maintains steady flow of water to the river to ensure the natural life is unaffected.

The 2682m tunnel enables water flow at a 5.0m^3/sec to the turbine, and the water is released to the river without a change in the chemical composition. The annual electricity energy generation is estimated at 45.15 GWh.

According to calculations based on electricity generation estimates, Aralik HEPP project is expected to result in a CO_2 reduction of around 25,000 tons per year due to use of renewable resources for electricity generation.

The construction period has commenced for two years as planned and it is assumed that the project will be in operation for 46 years. The project provides permanent job opportunities for about 17 personnel during the operation phase and local applicants will be given priority in the further recruitment processes.

Figure 2: Aralık HPP Penstock and Powerhouse Location

Aralık HEPP Project is classified as a run-of-river type HEPP and consists of a regulator, conveying channel, penstock, power generation turbines, office buildings and switchgear area. For the proposed project, only an abandoned house and the land around weir have been used. The house and land have been first purchased by plant manager via mutual agreement, and then the official expropriation has been made.

Run-of-river type hydroelectric power plants do not have significant storage capacity on the contrary to plants with dam and storage facility. Therefore electricity generation in river type HEPPs depend on flow regime of the river. Whenever the water is available the hydroelectric power plant generates electricity and when there is no water no power is generated. During rainy seasons when there is maximum flow of water available in the rivers, they produce maximum power[1]. These types of hydroelectric power plants produce the power continuously only as long as flowing water is available.

Technical characteristics of Aralık HEPP have been summarized below.

► Plant Characteristics	
Type:	Channel type.
Channel Length:	2,873 m
Design Discharge:	5.00 m3/sec
► Total Installed Capacity:	12.41 MW
► Powerhouse Characteristics	
Net Head:	292.23 m
Turbine Type:	Horizontal Pelton type.
Turbine Power:	2 each x 6.205 MWe
Generator Capacity:	2 each x 6.21 MVA
► Hydrology:	Regular regime with high seasonal precipitation in the form of rain.
► Annual Energy Generation	
Firm Energy:	-
Secondary Energy:	-
Total Energy:	45.15 GWh
► Switchyard:	34.5 kV switchgear equipment, 6.3/34.5 kV power transformer and 5.0 km long 34.5 kV capacity overhead transmission line for connection to the national grid *.
► Commencement of Operation:	30/04/2010.
► Licence Duration:	49 years.

Table 2: ARALIK HEPP Technical Summary[2]

Project construction has started on 21/03/2008. Project is operational since May 2010.

A.2. Location of project activity

The coordinates of the project is given as;

	Latitude	Longitude
Weir	41°23′53″ N	41°44′06″ E
Powerhouse	41°23′36″ N	41°41′49″ E

Table 3: ARALIK HPP Project Coordinates

The Project is located in Borçka district of Artvin province which is located in the north-eastern Turkey, The site is accessed via Borçka and Artvin by using a paved town road of 10 km and 45 km long respectively.

[1] http://www.brighthub.com/engineering/mechanical/articles/7826.aspx
[2] ARALIK HPP Project Introductory File p.6-8 , Tables 1.2 to 1.10

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Turkey	1- Artvin Çoruh Elektrik Üretim San. ve Tic. A.Ş (Private Entity, Project Owner) 2-Global Tan Energy Ltd. (Private Entity, Project Developer)	No

A.4. Reference of applied methodology

The UNFCCC approved simplified baseline and monitoring methodology AMS I.D., version 14[3], valid after 30th July 2009 was applied for the project activity as the most recent version when the project has been submitted to DOE

The tools which are used in calculations and referred in this methodology are;

"Tool for the demonstration and assessment of additionality" version 5.2[4]

"Tool to calculate the emission factor for an electricity system" version 2.0[5]

The choice of methodology AMS I.D, is justified as the project activity meets its applicability criteria:

- The Aralık HEPP is a grid connected renewable electricity generation project,
- The project does not involve combined heat and power generation activity,
- Installed power capacity of the project is below 15 MW and it does not cause any new reservoir formation.
- Project activity does not involve addition of new unit
- Project activity does not seek for retrofit or modify an existing unit.

A.5. Crediting period of project activity

The project uses two times renewable crediting period (7years). This is the first crediting period.

Crediting period interval is 01/05/2010-30/04/2017

Start date and length of the crediting period corresponding to this monitoring period:

01/05/2010 – 30/09/2013 (41 Months)

[3] http://cdm.unfccc.int/UserManagement/FileStorage/UQ8WZYCH5IVSPBNF276OMGE10TDX9A
[4] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf/history_view
[5] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.pdf

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

Main milestones of the project are given in table below.

Milestone	Date
License Issuance	16/05/2006
Board Decision for Consideration of Carbon Revenue	20/10/2006
Feasibility Study Report	November 2006
EIA Approval Letter	08/12/2006
Equipment Purchase Agreement(Investment Decision)	27/07/2007
Start of Construction	21/03/2008
Loan Agreement	10/04/2008
Preliminary Stakeholder consultation Meeting	14/03/2009
Completion of PFA by GS	10/03/2010
Commissioning Date	30/04/2010
SFR Meeting	06/05/2010
Continued Operation Start Date	30/04/2010

Table 4: ARALIK HEPP Milestones

In hydroelectric power plants, kinetic energy of the river and elevation difference along the river bed is converted to electrical energy. Water used to produce electricity is fed back to the river after passing through the turbines. Aralık HEPP Project is also classified as a run-of-river type HEPP and consists of a regulator, conveying channel, penstock, power generation turbines, office buildings and switchgear area. For the proposed project, only an abandoned house and the land around weir have been used. The house and land have been first purchased by plant manager via mutual agreement, and then the official expropriation has been made.

Run-of-river type hydroelectric power plants do not have significant storage capacity on the contrary to plants with dam and storage facility. Therefore electricity generation in river type HEPPs depends on flow regime of the river. Whenever the water is available, the hydroelectric power plant generates electricity and when there is no water, no power is generated. During rainy seasons when there is maximum flow of water available in the rivers, they produce maximum power[6]. These types of hydroelectric power plants produce the power continuously only as long as flowing water is available.

Technical characteristics of Aralık HEPP have been summarized below.

►***Plant Characteristics***

Type: *Channel type.*
Channel Length: *2,873 m*
Design Discharge: *5.00 m3/sec*
►***Total Installed Capacity:*** *12.41 MW*
►***Powerhouse Characteristics***
Net Head: *292.23 m*
Turbine Type: *Horizontal Pelton type.*
Turbine Power: *2 each x 6.205 MWe*
Generator Capacity: *2 each x 6.21 MVA*
►***Hydrology:*** *Regular regime with high seasonal precipitation in the form of rain.*
►***Annual Energy Generation***
Firm Energy: *-*
Secondary Energy: *-*

[6] http://www.brighthub.com/engineering/mechanical/articles/7826.aspx

Total Energy:	*45.15 GWh*
►***Switchyard:***	*34.5 kV switchgear equipment, 6.3/34.5 kV power transformer and 5.0 km long 34.5 kV capacity overhead transmission line for connection to the national grid *.*
►***Commencement of Operation:***	*30/04/2010.*
►***Licence Duration:***	*49 years.*

Table 5: ARALIK HEPP Technical Summary

Building the transmission line is within the responsibility of TEIAS. However, in order to accelerate the process and prevent delay of commissioning due to budget constraints of TEIAS, the investment cost will be paid by project owner (Source: Grid Connection Agreement).

An external diesel generator is also being used by the facility which serves as an emergency power supply in case auxiliary power is required. Specifications of the diesel generator is as follows:

Manufacturer	Cummins
Model	APD 110 C
Governor	Electronic
Total displacement	5900 L
Fuel Consumption	22 L (100% load)
Maximum Standby Power	1500 rpm (92kW , 123 HP)

Table 6: Diesel Generator Specifications[7]

No event or situation that may prevent applicability of methodology has occurred during the current monitoring period**.** Corrective action requests from the validation period were addressed and they have been resolved as per the latest validation assessment report. Also there were no forward action requests (FARs) raised during validation.

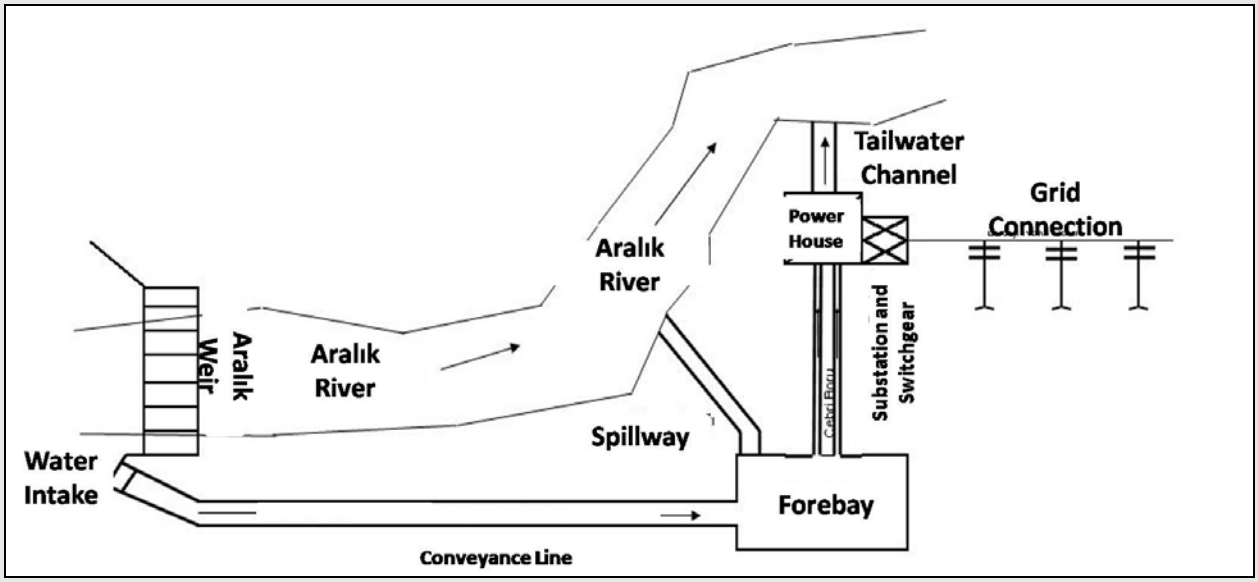

Figure 3: Aralık HPP Schematic Layout

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

No temporary deviations from registered monitoring plan or applied methodology is reported during the monitoring period.

[7] http://www.aksa.com.tr/Assets/pdf/DieselGenerator/177-en-GB.pdf

B.2.2. Corrections

No corrections to project information or parameters have been made.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

No permanent changes from the registered monitoring plan or applied methodologies have been approved during this monitoring period or submitted with this monitoring report.

B.2.4. Changes to project design of registered project activity

No changes to the project design of the project activity have been approved during this monitoring period or submitted with this monitoring report

B.2.5. Changes to start date of crediting period

No changes to the start date of crediting period have been approved during this monitoring period or submitted with this monitoring report

B.2.6. Types of changes specific to afforestation or reforestation project activity

NA.

SECTION C. Description of monitoring system

Monitoring plan has been applied in line with the selected methodology. According to the applied methodology, all data collected as part of monitoring will be archived electronically and be kept at least for 2 years after the end of the last crediting period. Essential parameters will be monitored if not indicated otherwise in the tables below. All measurements will be conducted with calibrated measurement equipment according to relevant standards. First calibration date of the metering devices is 30/04/2010

The results of the readings are saved electronically and made available by TEİAŞ via a website. Invoicing is based on the data published on the website.

The monitoring system organization chart is shown in figure below, in which the authority and responsibility of project management are defined.

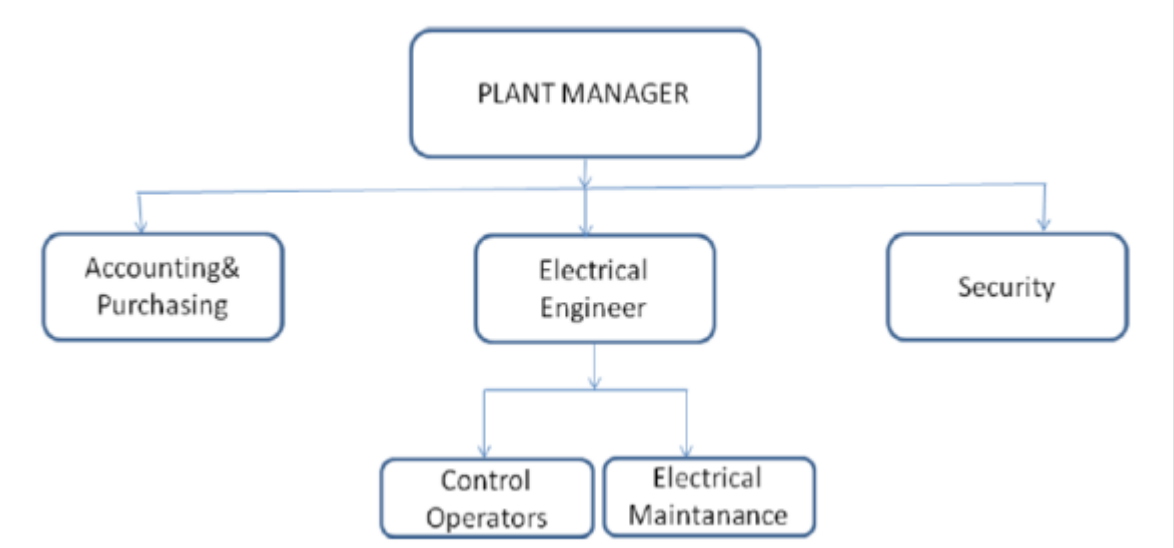

Figure 4: Monitoring Plan Organization Chart

Plant Manager & Electrical Engineer:

Plant Manager has been assigned as both plant manager and for the general responsible of compliance with VER monitoring plan. He is responsible for day to day running of plant, recording and monitoring of relevant data.

Accounting Manager:

Responsible for keeping data about power sales, social security documents invoicing and purchasing..

GTE Carbon(Global Tan Enerji Ltd):

Responsible for emission reduction calculations, preparing monitoring report and periodical verification process.

Installation of meter and data monitoring has been carried out according to the regulations by TEIAS. Two metering devices (one of them used as spare) have been used for monitoring the electricity generated by the power plant ad defined in PDD. Readings has been done using main metering devices and spare metering device will be used for comparison only. Data from metering devices is recorded by TEIAS monthly and formed the basis for invoicing. In addition to the two metering devices, generation of the project activity has been cross checked from TEIAS – PMUM web site (http://pmum.teias.gov.tr) which is accessible using a password provided to electricity generation companies.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data / Parameter:	**EG_y**
Unit:	MWh
Description:	Net Electricity delivered to the grid by the project in year y
Source of data:	Generation license for the project
Value(s) applied):	45,150
Purpose of data:	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comment:	-

Data / Parameter:	$EG_{y, Total}$
Unit:	GWh
Description:	Net Electricity delivered to the grid by power plants in Turkey in year 2011
Source of data:	TEIAS statistics[8]
Value(s) applied):	229.395
Purpose of data:	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comment:	-

Data / Parameter:	EF_{CO2, i, y_i}
Unit:	tCO_2/TJ
Description:	CO_2 emission factor of fossil fuel type i in year y
Source of data:	For EF of fossil fuels, IPCC values at the lower limit has been used
Value(s) applied):	**Fuel Source** / **EF(tCO2/Tj)** Coal 89.5 Lignite 90.9 Fuel Oil 75.5 Diesel 72.6 LPG 61.6 Naphta 69.3 Natural Gas 54.3
Purpose of data:	Calculation of project emissions or actual net GHG removals by sinks
Additional comment:	According to applied tool, IPCC default values at lower limit of 95% confidence interval can be used. Although, the actual emission reduction is expected to be higher due to high EF of fuels consumed in existing power plants, IPCC values have been used for conservativeness as requested by the methodology.

Data / Parameter:	$FC_{i, y}$
Unit:	Tons or 1000 m^3 for gases
Description:	Amount of fuels consumed by thermal power plants for electricity generation in terms of fossil fuel type i in year y
Source of data:	TEIAS statistics
Value(s) applied):	http://www.teias.gov.tr/ist2007/45.xls
Purpose of data:	Calculation of project emissions or actual net GHG removals by sinks
Additional comment:	According to applied tool, IPCC default values at lower limit of 95% confidence interval can be used. Although, the actual emission reduction is expected to be higher due to high EF of fuels consumed in existing power plants, IPCC values have been used for conservativeness as requested by the methodology.

[8] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/uretim%20tuketim(22-45)/23.xls

Data / Parameter:	NCV
Unit:	Tj/kt
Description:	Net Calorific Values of Fuel combusted in power plants.
Source of data:	Table 1.2, Chapter 1, Volume 2, IPCC 2006 Inventory Guidelines (Lower limit value of the 95% confidence interval has been used for conservativeness)
Value(s) applied):	41.4
Purpose of data:	Calculation of project emissions or actual net GHG removals by sinks
Additional comment:	Data used for CM calculations

D.2. Data and parameters monitored

Data / Parameter:	$EG_{facility,y}$
Unit:	MWh
Description:	Net Electricity generated and delivered to the grid by the project in year y
Measured/ Calculated / Default:	Measured
Source of data:	Metering devices used in power plants, monthly records signed by TEIAS and plants manager and invoices are used.
Value(s) of monitored parameter:	Net electricity generation is observed to be about 138.720 GWh for the current monitoring period (41months) Monthly generation records have been presented in the excel worksheet for verification calculations.
Monitoring equipment:	Specifications of the metering devices are as follows: Meters should not require calibration for a period of less than 10 years from the date of commissioning as per the regulations and be in compliance with regulations of EPDK.
Measuring/ Reading/ Recording frequency:	Monthly
Calculation method (if applicable):	Generation data is recorded by two metering devices continuously. These records will provide the data for the monthly invoicing to TEIAS. Each month, an officer from TEIAS and the plant manager/electricity technician of the plant will record the reading and sign. This record will form the basis for monthly invoicing.

Manufacturer	Device Model	Precision	Date of First Calibration	Serial Number
ABB-ELSTER (main meter)	A1500	< 0.05 %	30/04/2010	376500
ABB-ELSTER (back-up meter)	A1500	< 0.05 %		376498

QA/QC procedures:	Two ammeters will backup each other. These meters will be chosen according to national regulations and approved and sealed by TEIAS at startup of the plant. Maintenance and calibration of the metering devices will be made by TEIAS periodically. In addition to invoices and metering devices, the electricity delivered to the grid can be cross checked through TEIAS web page(http://pmum.teias.gov.tr) using the ID and password of the project owner. All records will be kept for at least two years as requested by the applied methodology. Meters should not require calibration for a period of less than 10 years as per the regulations[9] and be in compliance with regulations of EPDK.[10]
Purpose of data:	Calculation of baseline emissions or baseline net GHG removals by sinks
Additional comment:	-

Data / Parameter:	**$FC_{i,j,y}$**
Unit:	Liters
Description:	Quantity of fuel type i combusted in Diesel power generator during the year y
Measured/ Calculated / Default:	Calculated
Source of data:	Onsite follow-up documents. Data can be checked from invoices provided by the plant operator for fuel purchase.
Value(s) of monitored parameter:	1,254
Monitoring equipment:	Gauges and reading devices on diesel generator
Measuring/ Reading/ Recording frequency:	Every crediting period
Calculation method (if applicable):	Total working hours for the diesel generator was read on the equipment's control panel. Since there was no separate document available, working hours were taken as 57 hours which is total working hours from the start-up of the plant. Maximum hourly fuel consumption of the generator was also used for conservativeness. Manufacturer's specification sheet gives the maximum hourly consumption of the generator as 22L/h [11] and the quantity of diesel is obtained by multiplying the maximum consumption with the working hours. Emission factor coefficient of diesel was calculated by multiplying the literature values for diesel net calorific value and CO2 emission factor for diesel. Since the emission factor coefficient has units of tCO2/t , amount of consumed fuel was converted into mass units by using its density. Project emissions are then the multiplication of mass of consumed diesel and emission factor coefficient.
QA/QC procedures:	Data recorded by the equipment will be cross-checked by the fuel invoices
Purpose of data:	Calculation of project emissions or actual net GHG removals by sinks

[9] Standard for meters used in electricity meters (submitted to DOE)
[10] http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44
[11] http://www.aksa.com.tr/Assets/pdf/DieselGenerator/177-en-GB.pdf

Additional comment:	-

Data / Parameter:	**Cap_{PJ}**
Unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data:	Data from project site
Value(s) applied):	12,410,000
Purpose of data:	Calculation of project emissions or actual net GHG removals by sinks
Additional comment:	-

Data / Parameter:	**A_{PJ}**
Unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data:	Reservoir Map
Value(s) applied):	Existing area
Purpose of data:	Calculation of project emissions or actual net GHG removals by sinks
Additional comment:	The project does not cause any new reservoir formation. The weir is at the same level with the river bed. Excess water will spill over the weir therefore the area will be limited to the existing river bed.

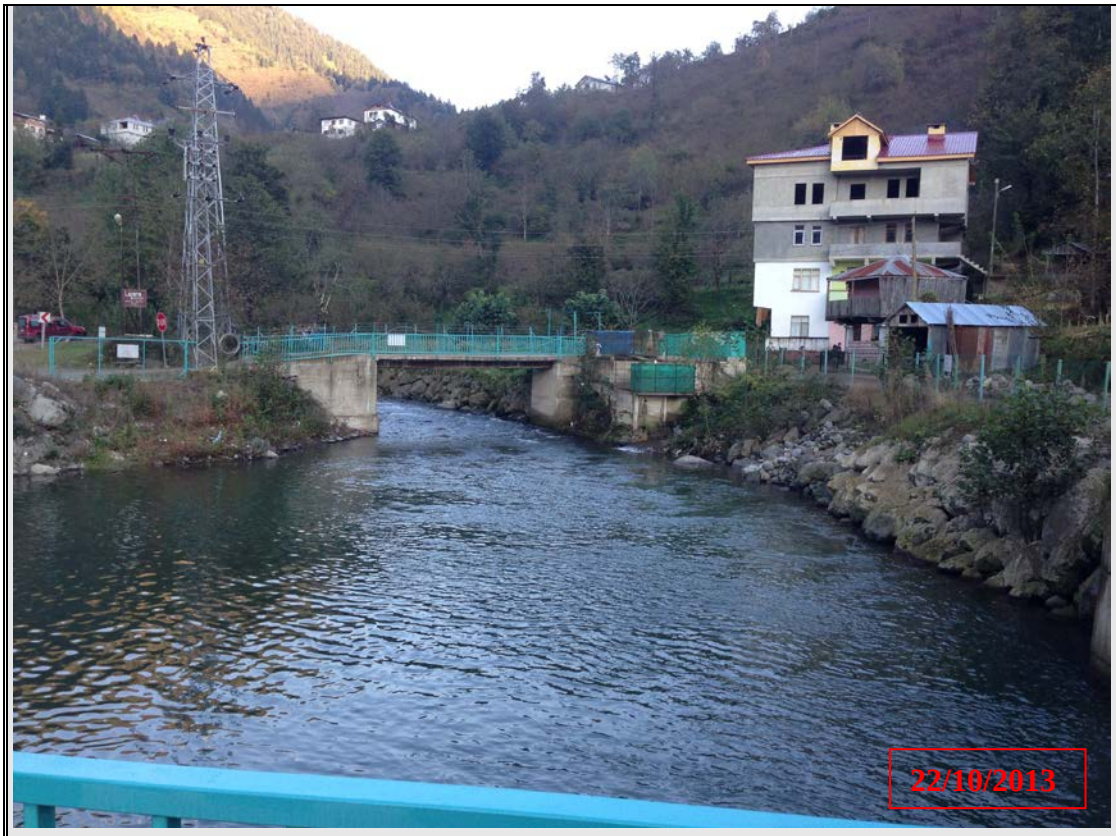

Figure 6. View of reservoir from weir body.

Project will not cause formation of a new reservoir since as shown in picture above, even at maximum level, the flooded area does not exceed existing river bed.

D.3. Implementation of sampling plan

Data and parameters above are not determined by a sampling approach.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

$BE_y = EG_{BL,y} * EF_{CO2}$

Where:

BE_y = Baseline Emissions in year y; t CO_2
$EG_{BL,y}$ = Energy baseline in year *y*; kWh
EF_{CO2} = Emission Factor in year y; t CO_2e/kWh

BE_y = 45,150 MWh x 0.562 tCO_2/MWh
BE_y = 25,374 tCO_2 (ex-ante)

Years	Estimation of Project Activity Emissions* (Tonnes of CO_{2e})	Estimation of Baseline Emissions (Tonnes of CO_{2e})	Estimation of Leakage (Tonnes of CO_{2e})	Annual estimation of emission reductions (Tonnes of CO_{2e})
2010(01/05/2010 – 31/12/2010)	0	16,916	0	16,916
2011	0	25,374	0	25,374
2012	0	25,374	0	25,374
2013	0	25,374	0	25,374
2014	0	25,374	0	25,374
2015	0	25,374	0	25,374
2016	0	25,374	0	25,374
2017 (01/01/2017-30/04/2017)		8,458		8,458
Total emission reductions (Tons of CO_2 e)	**0**	**177,618**	**0**	**177,618**

Table 7: ARALIK HEPP Baseline Emissions Estimations

Realized baseline emissions are calculated as follows:

2010

EG_{2010} = 12.148191 GWh

$EF_{grid,CM,y}$ =562 tCO_2/GWh

BE_{2010} = (12.148191 GWh) *x* (562 tCO_2/GWh) = 6827.3 tCO2e

2011

EG_{2011} = 47.936180

$EF_{grid,CM,y}$ =562 tCO_2/GWh

BE_{2011} = (47.936180 GWh) *x* (562 tCO_2/GWh) = 26,940.1 tCO_2e

2012

EG_{2012} = 41.756178 GWh

$EF_{grid,CM,y}$ =562 tCO_2/GWh

BE_{2012} = (41.756178 GWh) *x* (562 tCO_2/GWh) = 23,467.0 tCO_2e

2013

EG_{2013} = 36.879623 GWh

$EF_{grid,CM,y}$ =562 tCO_2/GWh

BE_{2013} = (36.879623 GWh) *x* (562 tCO_2/GWh) = 20,726.3 tCO_2e

Since the project is a greenfield project, $EG_{baseline}$ is considered zero

E.2. Calculation of project emissions or actual net GHG removals by sinks

The proposed project activity involves the generation of electricity by a hydroelectric power plant which does not cause any newly flooded area or formation of a new reservoir, therefore the only project emission source is considered as the emissions sourcing from diesel generator which is calculated in emission reductions excel calculation sheet.

Total working hours for the diesel generator was read on the equipment's control panel. Since there was no separate document available, working hours were taken as 57 hours which is total working hours from the start-up of the plant. Maximum hourly fuel consumption of the generator was also used for conservativeness. Manufacturer's specification sheet gives the maximum hourly consumption of the generator as 22L/h[12] and the quantity of diesel is obtained by multiplying the maximum consumption with the working hours. Emission factor coefficient of diesel was calculated by multiplying the literature values for diesel net calorific value and CO2 emission factor for diesel. Since the emission factor coefficient has units of tCO2/t, amount of consumed fuel was converted into mass units by using its density. Project emissions are then the multiplication of mass of consumed diesel and emission factor coefficient.

Total amount of consumed diesel was converted into mass units by using literature value for density of diesel; Mass of diesel = 1,254 Litres x 0.844 kg/Litres = 1,058.4 kg

Emission factor coefficient was calculated by multiplying the NCV(Net Calorific Value) and CO_2 emission factor for diesel:

41.4 Gj/t x 72.6 tCO2/Tj = 3.01 t/tCO_2

PE_y was calculated by multiplying the consumed amount of diesel with the emission factor coefficient

PE_y= 1,058.4 t x 3.01 t/tCO_2 ≈ 3.18 tCO_2e (rounded up to 4 tCO_2e as a conservative approach)

Project emissions were divided into 41 to get an average PE value for each month. Project emissions were then subtracted from each year and rounded down as a conservative approach. That is:

2010

BE2010 = 6,827.3 tCO2e

PE2010 = 4 / 41 *x 8* = 0.78 tCO2e (For eight months in 2010)

2011

BE2011= 26,940.1 tCO2e

PE2011= 4 / 41 *x 12* = 1.17 tCO2e (For twelve months in 2011)

2012

BE2012 = 23,467.0 tCO2e

PE2012 = 4 / 41 *x 12* = 1.17 tCO2e (For twelve months in 2012)

2013

BE2013 = 20,726.3 tCO2e

PE2013 = 4 / 41 *x 11* = 1.07 tCO2e (For eleven months in 2012)

[12] http://www.aksa.com.tr/Assets/pdf/DieselGenerator/177-en-GB.pdf

E.3. Calculation of leakage

The energy generating equipment is not transferred from or to another activity. Therefore leakage is considered as "0".

$$LE_y = 0$$

As a result: Total Emission Reduction is;

$$ER_y = BE_y - PE_y$$

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO_2e)
Total	77,960 (41 Months)	4	-	77,956 (41 Months)

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO_2e)	2010 (01/05-31/12) = 16,916 tCO_2 e 2011 = 25,374 tCO_2 e 2012 = 25,374 tCO_2 e 2013 (01/01–30/09) = 19,030 tCO_2 e **Total: = 86,694 tCO_2 e**	2010 (01/05-31/12) = 6,827 tCO_2 e 2011 = 26,939 tCO_2 e 2012 = 23,465 tCO_2 e 2013(01/01-30/09) = 20,725 tCO_2 e **Total: = 77,956 tCO_2 e**

E.6. Remarks on difference from estimated value in registered PDD

The value in the registered PDD is calculated ex-ante for a duration of one complete year and assuming the plant is working at optimum output rate. Since the project is an HPP, seasonal effects are significant on the monthly generation rates and minor deviations from the calculated values are acceptable. In 2011 and 2012, the realized generation has been quite in agreement with the expected amount.

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO_2e)	57,231	20,725

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Document information

Version	*Date*	*Description*
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.

Decision Class: Regulatory
Document Type: Form
Business Function: issuance
Keywords: monitoring report, performance monitoring

ANNEX-I

Monitoring of Sustainable Development Parameters:

Indicator		Air Quality
Mitigation measure		N/A
Chosen Parameters		1- SO2 emissions reductions 2- NOx emissions reductions
Description		Selected parameters refer to amount of emission reductions which would have taken place if the same amount of electricity was generated by using fossil fuels. During the current monitoring period air quality has improved parallel to the electricity generation.
Current Situation of the Parameters		Total SO_2 emission related to electricity generation is about 621.31 Gg in 2011 according to National Inventory of Turkey[13]. Considering that electricity generation in 2011 is 229,395.1 GWh[14], SO_2 emission per MWh is calculated as 2.71 kg/MWh. Total NO_x emission related to electricity generation is about 263.97 Gg in 2011 according to National Inventory of Turkey. NO_x emission per MWh is calculated as 1.15 kg. In parallel to the electricity generation, actual SO_2 emission reduction has been realized as about 375.7 tons during monitoring period. NOx emission reduction corresponding to actual electricity generation is calculated as 159.6 tons.
Future Target for Parameters		Reductions based on maximum annual output of 45 GWh/y are aimed.
Way of Monitoring	How	Electricity generated by the project activity, NO_X and SO_2 emission data from GHG inventory of Turkey will be used as reference in calculation of the emission reduction.
	When	Every Monitoring Period
	By Who	Project Developer

Indicator	Biodiversity
Mitigation measure	Building a functional fish passage. Fish passage has been designed by experienced engineering company considering river characteristics and also reviewed by Province Directorate of Agriculture's experts. The functionality of the fish passage also is monitored by the experts after commissioning.
Chosen Parameter 1.1	Impact on Aquatic Life
Description	This parameter is selected to monitor the effects of the project on the migration capability of fish species. During the current monitoring period the fish passage has been operational and did not pose any threats to the migrating fish.
Current Situation of the Parameters	Fish passage is built and operational according to the latest assessment dated July 2013.[15]
Future Target for Parameters	The project activity will remain neutral for the regional biodiversity

[13] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/tur-2013-crf-12apr.zip

[14] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/uretim%20tuketim(22-45)/23.xls

[15] Assessment Of Environmental Flow Sediment Transport And Fish Pass Efficiency Of Aralik HEPP, July 2013

Way of Monitoring	How	Monitoring free flow from the fish passage and assessment of functionality of the fish passage by an independent expert. Expert study will include site visit and refer to relevant studies and involve recommendations (if any).
	When	Continuously (for minimum flow)/ once after commissioning of the plant(fish passage functionality).
	By Who	Project Owner
Chosen Parameter 1.2		Payment made to Directorate of Forestry
Description		Parameter allows monitoring of the plantation of new trees around the project site. During the current monitoring period planted new trees were observed during the site visit and associated documents were checked.
Current Situation of the Parameters		All permissions have been issued and payments have been made for trees.
Future Target for Parameters		Minimize the affected trees and make payment for plantation of new trees
Way of Monitoring	How	Checking records for payment
	When	Once after construction is completed
	By Who	Project Owner

Indicator		DNH 8- Work Safety
Mitigation measure		Recruited people will be trained for increasing technical skills and awareness about health, safety and environmental issues.
Chosen Parameters		Number of people trained (certificates)
Description		Selected parameter allows monitoring of safety at work through acquired certificates and provided trainings. During the current monitoring period the project owner provided several trainings and relevant certificates were acquired.
Current Situation of the Parameters		All recruited technical staff is being trained for operation and maintenance of equipment and Health and safety measures. Also, staff working with high voltage equipment is being certified (also required by regulations). The trainings are renewed for new staff and existing staff when necessary. H&S equipment is distributed to technical staff. Certificates are being kept on site.
Future Target for Parameters		Technical staff trained and provided necessary H&S equipment required for their job
Way of Monitoring	How	Checking records for training and existence of equipment
	When	Yearly
	By Who	Project developer

Indicator	DNH 9- Precautionary Measures
Mitigation measure	Building fences around the weir
Chosen Parameters	Fences and security measures taken
Description	This parameter is used to minimize security risks arising from rock falls in the project site. During the current monitoring period, fences were observed and found to be operational.

Current Situation of the Parameters		Fences have been built around the short channel between weir and tunnel.
Future Target for Parameters		Fences built around the weir to prevent risk to humans or animals
Way of Monitoring	How	Site visits
	When	Yearly
	By Who	Project developer

Figure 7: Fencing precautions across the project site

Indicator	Quality of Employment
Mitigation measure	Recruited people will be trained for increasing technical skills and awareness about health, safety and environmental issues.
Chosen Parameters	Number of people trained (certificates)
Description	Selected parameter allows monitoring of qualitative employment through acquired certificates and provided trainings. During the current monitoring plan new certificates were acquired.
Current Situation of the Parameters	Existing and new staff are being continuously trained in relevant disciplines. (High voltage equipment, HSE, fire extinguishing, first aid etc.) Trainings covering several issues have been provided to the staff during this monitoring period. See Annex II for full training logs and certificates.

Future Target for Parameters		All technical staff will be provided with necessary trainings.
Way of Monitoring	How	Through evaluation of training certificates and new job opportunities created.
	When	Once for crediting period or yearly
	By Who	Project developer

Indicator		Quantitative employment and income generation
Mitigation measure		N/A
Chosen Parameters		Locally recruited staff
Description		Since there might be changes in the employment scheme, this parameter allows the regular monitoring of characteristics of recruited personnel
Current Situation of the Parameters		Currently 15 out of 17 personnel is directly employed by the project owner which were recruited from nearby settlements.
Future Target for Parameters		Local labour will be prioritized when additional work force is required.
Way of Monitoring	How	Through evaluation documents for wages paid and social security documents.
	When	Once for crediting period or yearly
	By Who	Project developer

Indicator		Balance of payments
Mitigation measure		Decrease dependency on fossil fuel through increasing use of local resources.
Chosen Parameters		Currency saving.
Description		This parameter allows monitoring of national savings
Current Situation of the Parameters		In 2011, about 22.8 bn m^3 natural gas been used[16] for about 103,916 GWh electricity generation[17] and about € 6.2 bn has been spent.[18] During monitoring period, about 30 million m^3 NG has been saved which approximately corresponds to 8.2 million €.
Future Target for Parameters		Decreasing natural gas consumption for electricity generation. Approximate consumption of 9.8 million m^3 of natural gas is expected to be avoided corresponding to € 2.5 million annually.
Way of Monitoring	How	Through comparing electricity generated by the project and natural gas that would be used to produce the same amount of electricity according to baseline scenario.
	When	Yearly
	By Who	Project developer

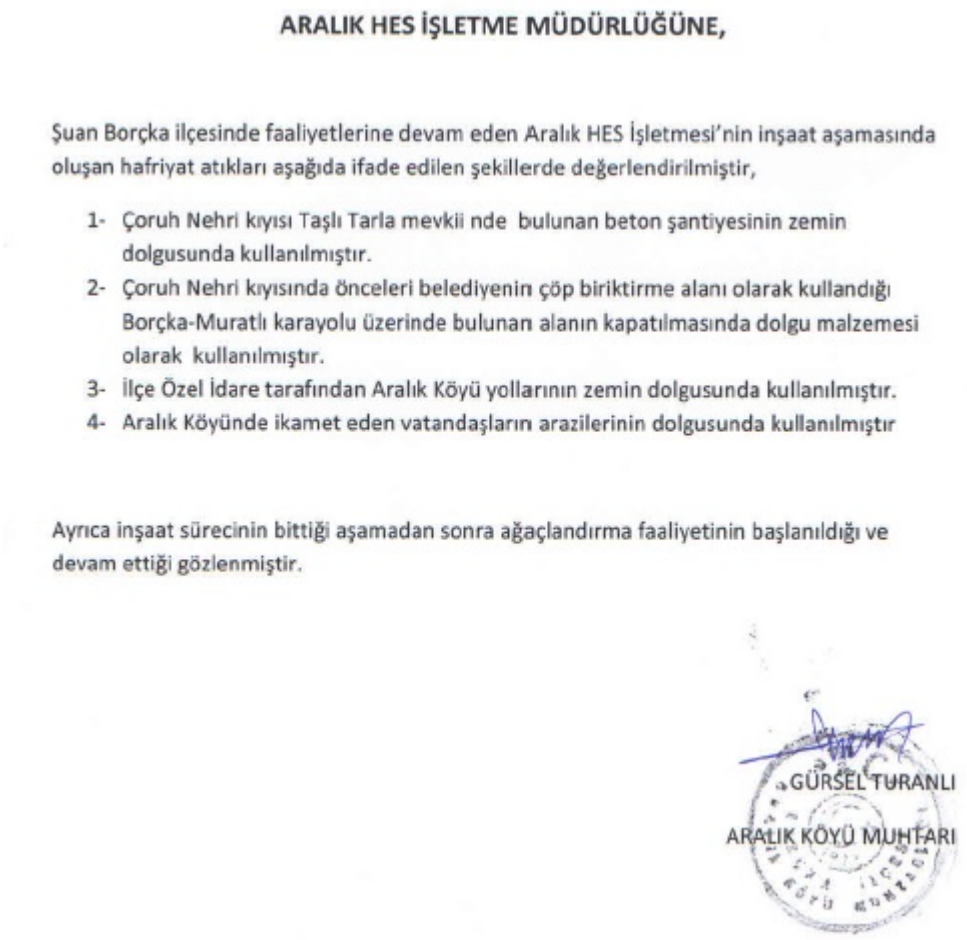
[16] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/yak%C4%B1t46-49/47.xls
[17] Tukey National Greenhouse Gas Inventory Report 1990-2011, p17
[18] http://www.igdas.com.tr/Dynamic/Individual_Natural_Gas_Price_List.aspx?MI=2&CMI=2 based on 01/01/2011 Natural Gas price

Indicator		Water Quality and quantity
Mitigation measure		Release of required minimum flow to protect aquatic life and provide access of local people to water resources.
Chosen Parameters 1.1		Flow rate of water released from the weir.
Current Situation of the Parameters		Natural flow of river course. In July 2013 An expert report with title "Assessment of Environmental Flow, Sediment Transport and Fish Pass Efficiency of ARALIK HPP" has been created by Prof. Serdar BAYARI and Prof. Aydın AKBULUT". The report did not find any conflictions about water quality and quantity.
Future Target for Parameters		Minimum 10% of last ten years average which corresponds to about 150 L/s flow[19]. Flow can be increased as per the expert report.
Way of Monitoring	How	Flow measurements from the weir and expert assessment on adequacy of flow released. The expert report will include references and data relevant to local conditions and fieldwork. Any recommendations or need for additional measures will be discussed in the report. Access of locals to water resources will also be assessed by the expert
	When	Continuously
	By Who	Project owner
Mitigation measure		Appropriate handling of waste water
Chosen Parameters 1.2		Waste water
Current Situation of the Parameters		All wastes are collected carefully as required by the local regulations. No waste water disposal occurred during the monitoring period as the number of employees is not many.
Future Target for Parameters		Disposal of wastewater as required by the relevant regulations.
Way of Monitoring	How	Checking disposal records.
	When	Continuously
	By Who	Project owner

Indicator	Soil Condition
Mitigation measure	Excavation wastes used in construction and for building access road.
Chosen Parameters1.1	Storage of excavation wastes in appropriate locations.

[19] Preliminary EIA Report, page 49

Current Situation of the Parameters		All wastes have been stored appropriately as required by the regulations. There has not been a need for disposing excavation as the materials were used back for landscaping and other construction works. There are no excavation at the project site as the construction works are over. These activities are approved by the local authorities with the statement given below. Translation is as follows; Aralık HPP excavation material has been used as follows; 1. Used for ground filling of the concrete facility located by the river Coruh in the Taslitarla region. 2. Used for covering up the area which is formerly used by the municipality as waste disposal point, located on the Borçka-Muratli road. 3. Used for road improvement within Aralık village by the District Special Directorate 4. Used for ground levelling in the lands of Aralık village locals.
Future Target for Parameters		Disposal of excavation wastes appropriately.
Way of Monitoring	How	Through site visits and continuous monitoring during construction. Permissions and records for disposal will be provided during verification.
	When	Once after construction activities are over.
	By Who	Project owner
Mitigation measure		Ensuring proper design without disrupting the sediment flow in the river
Chosen Parameters1.2		Accumulation of Sediment
Current Situation of the Parameters		Project is operational, no sediment accumulation has been observed in the river bed.
Future Target for Parameters		No accumulation at the upstream and downstream of the weir.
Way of Monitoring	How	Through site visits
	When	Yearly
	By Who	Project owner
Mitigation measure		Ensuring proper design to prevent erosion
Chosen Parameters1.3		Soil Erosion
Current Situation of the Parameters		No erosion has been observed due to project activity after implementation of the project has started.
Future Target for Parameters		No erosion due to project activities.
Way of Monitoring	How	Through site visits
	When	Yearly
	By Who	Project owner



ARALIK HES İŞLETME MÜDÜRLÜĞÜNE,

Şuan Borçka ilçesinde faaliyetlerine devam eden Aralık HES İşletmesi'nin inşaat aşamasında oluşan hafriyat atıkları aşağıda ifade edilen şekillerde değerlendirilmiştir,

1- Çoruh Nehri kıyısı Taşlı Tarla mevkii nde bulunan beton şantiyesinin zemin dolgusunda kullanılmıştır.
2- Çoruh Nehri kıyısında önceleri belediyenin çöp biriktirme alanı olarak kullandığı Borçka-Muratlı karayolu üzerinde bulunan alanın kapatılmasında dolgu malzemesi olarak kullanılmıştır.
3- İlçe Özel İdare tarafından Aralık Köyü yollarının zemin dolgusunda kullanılmıştır.
4- Aralık Köyünde ikamet eden vatandaşların arazilerinin dolgusunda kullanılmıştır

Ayrıca inşaat sürecinin bittiği aşamadan sonra ağaçlandırma faaliyetinin başlanıldığı ve devam ettiği gözlenmiştir.

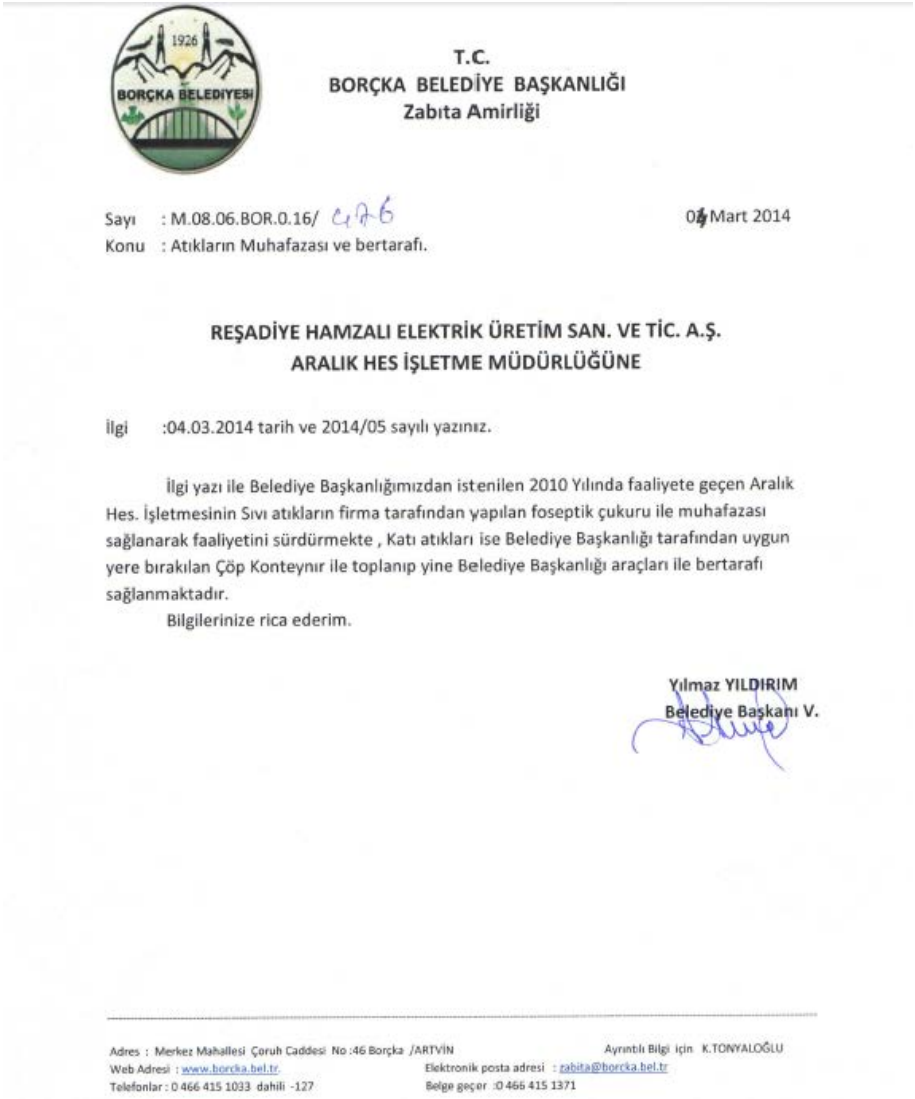
GÜRSEL TURANLI

ARALIK KÖYÜ MUHTARI

Figure 8: Handling of the Excavation material as approved by the local authorities

Indicator		Other Pollutants – Waste Oil
Mitigation measure		Collecting waste oil and disposing appropriately
Chosen Parameters		Storage and disposal of Oil and other wastes
Current Situation of the Parameters		Wastes are collected and disposed. Used oil is also stored to be disposed as per the regulations. No oil spillage or leakage was reported during the monitoring period. Waste oil is kept in a storage room. Since the amount of waste is not very high, they will be collected when the containers are full and a receipt will be kept. There is also an isolated underground oil drainage system in the project site. Project activities have been signed and approved by the municipality with the statement below. It is made publicly known that the solid wastes are collected by the municipality and liquid wastes are being stored under confined conditions within the project site until they are ready to be disposed.
Future Target for Parameters		Waste oil will be collected, stored and disposed as required by regulations. Other wastes will be collected, stored and disposed as required by local regulations.
Way of Monitoring	How	Through checking disposal records and checking whether any spillage has occurred.
	When	Continuously
	By Who	Project owner

Figure 9:Aralık HEPP Oil drainage system



T.C.
BORÇKA BELEDİYE BAŞKANLIĞI
Zabıta Amirliği

Sayı : M.08.06.BOR.0.16/ 426 05 Mart 2014
Konu : Atıkların Muhafazası ve bertarafı.

REŞADİYE HAMZALI ELEKTRİK ÜRETİM SAN. VE TİC. A.Ş.
ARALIK HES İŞLETME MÜDÜRLÜĞÜNE

İlgi :04.03.2014 tarih ve 2014/05 sayılı yazınız.

İlgi yazı ile Belediye Başkanlığımızdan istenilen 2010 Yılında faaliyete geçen Aralık Hes. İşletmesinin Sıvı atıkların firma tarafından yapılan foseptik çukuru ile muhafazası sağlanarak faaliyetini sürdürmekte , Katı atıkları ise Belediye Başkanlığı tarafından uygun yere bırakılan Çöp Konteynır ile toplanıp yine Belediye Başkanlığı araçları ile bertarafı sağlanmaktadır.

Bilgilerinize rica ederim.

Yılmaz YILDIRIM
Belediye Başkanı V.

Adres : Merkez Mahallesi Çoruh Caddesi No :46 Borçka /ARTVİN Ayrıntılı Bilgi için K.TONYALOĞLU
Web Adresi : www.borcka.bel.tr. Elektronik posta adresi : zabita@borcka.bel.tr
Telefonlar : 0 466 415 1033 dahili -127 Belge geçer :0 466 415 1371

Figure 10: Proper disposal records by the municipality

Indicator	Livelihood of the poor
Mitigation measure	No mitigation measure is required
Chosen Parameters 1.1	Voluntary contributions made
Current Situation of the Parameters	All contributions given in PDD have been realized.

Future Target for Parameters		Contributions to local community will be made during construction in terms of renovation of roads and public schools, mosques etc. Some of them are; 1. Renovation of the existing roads and paving the steep pathways with concrete, 2. Rehabilitation of the village clinic, 3. Renovation of the entrance door and roof of the village mosque, 4. Renovation of entrance door and roof of the village school, 5. Donation of construction material to the village, 6. Donating chairs and desks for the village marriage hall, 7. Donation to local NGOs in the region, 8. Renovation of cottages, roof and floor of gendarme border patrol station, 9. Contribution to renovation of social facilities building for teachers, 10. Construction of the village water reservoir, 11. Modernizing announcement and audio system of a school in Borcka, 12. Donating pipes to provide access to drinking water in Taslitarla Village, 13. Rehabilitating the Borcka municipality waste and covering up with earth fill.
Way of Monitoring	How	Statement of locals/pictures
	When	Once after the project is operational
	By Who	Project owner
Mitigation measure		Ensuring that water is available and accessible to locals after project is implemented
Chosen Parameters 1.2		Existence of natural spring
Current Situation of the Parameters		No springs have disappeared due to project activity.
Future Target for Parameters		Natural flow of springs.
Way of Monitoring	How	Interviews with locals to check whether any springs have disappeared due to project activity.
	When	Once after the project is operational
	By Who	Project owner

ANNEX-II

Other Documents Related to Sustainable Development Parameters:

Trainings:

T.C.
BORÇKA KAYMAKAMLIĞI
Toplum Sağlığı Merkezi

Sayı :B.l04.İSM.408.3008./ 367 04/07/2013
Konu : İlk Yardım Kursu

ARALIK HES İŞLETME MÜDÜRLÜĞÜNE

İlçemiz Toplum Sağlık Merkezinde aşağıda isimleri yazıl kişilere 18-21 Haziran tarihleri arasında İlk yardım eğitimi verilmiştir
Gereğini bilgilerinize rica ederim.

İlk Yardım Kursuna Katılan Personel
1 Hasan ÖZKAN
2 İzzet ÖZBAY
3 Erkan ATAN
4 Ö. Faruk GENÇTÜRK

Sezgin TUTAK
Top.Sağ.Merk.Sor.Tbb.

BABA ADI	HİKMET
DOĞUM TARİHİ	22.02.1984
KAN GRUBU	0RH+
MESLEĞİ	ELEKTRİKÇİ
İLK BELGE TARİHİ	12.09.2011
YENİLEME TARİHİ	YENİ

İMZA — Bakı ÇELİK, Eğitim Merkezi Müdürü — Muzaffer TAN, Daire Başkanı

KUVVETLİ AKIM TESİSLERİ
YUKSEK GERİLİM ALTINDA ÇALIŞMA İZİN BELGE
(ELEKTRİK KONULARINDA ÇALIŞMA İÇİN)

ADI	İZZET
SOYADI	ÖZBAY
T.C. KİMLİK NO	17944465482
BELGE NO	2011-210
BELGE VEREN KURUM	EÜAŞ GENEL MÜDÜRLÜĞ

Bu belge T.C. Enerji ve Tabii Kaynaklar Bakanlığı tarafından Şirketimize verilen yetkiye dayanılarak düzenlenen eğitimi başarıyla bitiren kişilere veril

İŞ SAĞLIĞI VE GÜVENLİĞİ EĞİTİM KATILIM FORMU

Eğitimin Adı:		Eğitimin Tarihi:	13.12.2012
Eğitimi Veren Kişi:	Sebahattin Selimi	Eğitimin Süresi:	1 Gün
Ünvanı:	Elektrik Müh.	Döküman No:	Sayfa No:
İSG Grubu:	A Gr.	İlk Yayın Tarihi:	
Sertifika No:	2009/05/0167	Revizyon Tarihi:	

EĞİTİME KATILANLAR	POSİSYONU / GÖREVİ	İMZASI
Hasan Özkan	Mak. Teknisyeni	
Yüksel AYGÜN	Elektrik Teknisyeni	
M. KEMAL ARSLAN	"	
Ö. Faruk Gençtürk	Regülatör Görevlisi	
İzzet ÖZBAY	Elektrik Teknisyeni	
Erkan Aton	Makine Teknisyeni	
Turgut ATAN	Elektrik Teknisyeni	
Fatih EFENDİOĞLU	Makina Teknisyeni	
ADSON OKUYAN	Yükleme Hazırlık Gör.	
İSMAİL TURNACI	Regülatör operatörü	
Bader GÜL	Makine Teknisyeni	
Recep ENGİN	Hizmetli	
Sırrı Özen	Regülatör	
Ahmet Gül	Elektrikli Tek.	
YAŞİN ATAN	Güvenlik Görevlisi	
YUSUF HOŞGÖR	Güvenlik Görevlisi	

Eğitimi Veren İmza: Sebahattin Selimi