300833.01
February 13, 2008

Ilisu Hydropower Project, Turkey

Sub-Committee on Environment: Final Report

First Site Visit Dec. 2-11, 2007

Report Prepared on Behalf of
Euler Hermes (Germany), OeKB (Austria) and SERV (Switzerland)

Contact:

Dr. Robert Zwahlen
CoE Chairman
e-mail ilisu-coe.eech@poyry.com

Contents

List of Tables

List of Figures

LIST OF ACRONYMS AND ABBREVIATIONS

AIDS	acquired immunodeficiency syndrome
CoE	Committee of Experts
d/s	downstream
DSI	Ministry of Water Resources
E	Environmental PIU tasks
EC	Environmental CoE tasks
ECA	Export Credit Agencies
EIA	Environmental Impact Assessment
EMMP	Environmental Monitoring and Management Plan
EMP	Environmental Management Plan
FAM	Final Assessment Meeting
HEP	Hydro electric project
HIV	human immunodeficiency virus
IC	Ilisu Consortium
m asl	meters above sea level
n/a	not applicable
PAP	Project Affected Person
PIU	Project Implementation Unite
RAP	Resettlement Action Plan
SC-CH	Sub-Committee Cultural Heritage
SC-E	Sub-Committee Environment
SC-R	Sub-Committee Resettlement
SIA	Social Impact Assessment
TOR	Terms of References

u/s	upstream
WWTP	Waste Water Treatment Plant

EXECUTIVE SUMMARY

1. Purpose of the Site Visit

The first Ilisu CoE site visit, which took place in early December 2007, had the following main purposes:

- To establish a working contact between CoE and its Sub-Committees on Resettlement, Cultural Heritage and Environment (SC-R, SC-CH, SC-E) and PIU and its respective sub-groups.
- To gain a first (at least for the international experts involved) direct impression of the project area through site visits.
- To address cross-cutting issues among the SCs.
- To check on and discuss with PIU all pending issues of high priority in relation with the implementation of FAM-TOR.
- To inform PIU and DSI on any problems encountered, and to assist in finding solutions.

These aims have been met by this firs site visit.

2. General CoE Topics

The two main points to be discussed here shortly concern PIU and the organisation of future CoE site visits.

During the site visit all three SCs came to the conclusion that PIU was not yet operating in the way that is required for a timely and smooth implementation of its numerous and not always easy tasks. The reasons for these shortcomings were identified mainly as being the following:

- Insufficient human resources and especially a lack of senior experienced staff for a number of important topics.
- Work overload especially of senior and experienced staff, who besides their obligations in Ilisu PIU still have to fulfil other duties.
- Lack of information on specific obligations, and especially on the FAM-TOR which bring some new and unfamiliar obligations to the project implementation process.
- Inadequate decision taking processes.

In view of this, one of the central recommendations to DSI is to improve the situation of the PIU in order to meet the requirements (human resources, budgetary issues, administrative structure, information flow etc.).

The CoE is grateful for the good organisation of the site visit and recognises that this was not an easy task, among other reasons due to the size of the group and due to the requirements concerning security.

In the future, most CoE site visits will probably not be missions of the entire CoE, but rather they will be organised by the different SCs, and be more focussed on their specific needs. This will make the task of organising the logistics easier. It will also be important to limit the size of the groups going to the field (accompanying non-CoE persons) to the absolute minimum required. It will also be important to hold a starting meeting in Ankara prior of going to the field, for discussing all pending matters. Furthermore, relevant information like quarterly monitoring reports, updated plans, etc.) will have to be provided to the CoE before the site visits. All these measure will make the site visits more effective.

3. Organisation of SC-E Work

The Sub-Committee on Environment (SC-E) is dealing with the Environmental Terms of Reference (E-TOR). These can roughly be grouped in two main categories, namely

- TOR dealing with waste water, waste water treatment, water quality and related issues, and
- TOR dealing with biodiversity, as well as those dealing with general environmental management, health and related aspects.

Within the SC-E, the responsibilities for these two groups are divided among the experts as per their expertise. Prof. Saatci is the responsible international expert for waste water and related issues, Dr. Zwahlen is responsible for biodiversity and the remaining aspects.

A list of all E-TOR was prepared on beforehand and sent to PIU, with a clear prioritising of the individual TOR, and mainly identifying those who need an immediate effort. The discussions with PIU concentrated then on these urgent points.

4. Waste Water and Related Topics

During the site visit, data to estimate pollution loads from the point and non-point sources was collected. Two of the main contributors of point pollution sources: Batman and Diyarbakir cities were studied.

Diyarbakir wastewater treatment plant does not remove nitrogen and actually does not even nitrify and can only remove about 40% of the carbon. It consists of primary treatment (pumps, coarse and fine screens, aerated grit chambers and preliminary clarifiers). The primary sludge is sent to anaerobic digesters. The plant suffers from grit collection problems at the entrance of the plant and was shut down for modifications during the time of visit. The Diyarbakir wastewater was being directly discharged into the Tigris River even without preliminary treatment. The tests conducted by the WWTP laboratory are inadequate to measure the pollution loads released to the Tigris River. The laboratory staff was informed about the tests required and cooperation of the WWTP laboratory with the DSI regional laboratory was established.

Batman wastewater treatment plant is at the planning stage. The feasibility reports shown to the team at the Municipality indicates that very little wastewater characterization was carried out and the process selected is the same as the Diyarbakir WWTP. Thus, if constructed as it is now planned, there will also be a significant pollution load from Batman city.

Batman Tüpraş industrial plant was also visited. Suggestions to improve the wastewater treatment plant of Tüpraş were made. The plant is not a major contributor of pollution, however some modifications in the operation of the plant are required.

Maps showing the sampling points of DSI were obtained. The sampling site selection (before and after the treatment plant or point discharges and between the non-point zones) required for this study was explained to DSI and the chemical and physical tests required were explained. The laboratory staff was informed about the tests required to estimate the pollution loads.

Visits to local departments of the Ministry of Agriculture were paid to get data on the kind and amount of fertilizers applied, and the type of crops grown in the region.

5. Biodiversity and Related Topics

Those E-TORs which were identified as being of high priority were discussed in detail with the PIU-E. They are mentioned here shortly.

TOR E-13: Terrestrial biodiversity survey: the survey needs to start in March 2008 and will have to cover a whole year cycle. Since no scope of work for this study had been prepared yet, the expert prepared a draft scope of work, which was then discussed with PIU in detail.

TOR E-16: Aquatic biodiversity survey and monitoring: here as well, no scope of work was available at the time of the site visit. The expert provided an outline of a monitoring program and discussed this with PIU.

It is important to point out clearly, as was said on the occasion of the site visit wrap-up meeting in Ankara on December 10, 2007, that a **failure to start these investigations in early March 2008 as the latest could mean that the start of construction work would need to be postponed by one year** in order to meet the FAM requirements.

By December 18, 2007, PIU submitted a draft scope of work for this study to the expert, who commented it on the same day. It is now important that this study is contracted out in January 2008, for the field work to start in March in order to meet the deadlines.

TOR E-19/20/21: Diseases: plans must be ready at the onset of the main construction work. Nothing ahs been done in this respect so far, so there is a high urgency as well. Input from external experts might be required (e.g. for the HIV/AIDS prevention plan, which is a new and potentially sensitive topic to be dealt with adequately).

TOR E-24: EMP: relevant sub-plans must be ready before the start of main construction work, which might be as early as May or June 2008. It is of high importance that this work starts as soon as possible. Draft sub-EMPs must be ready and

submitted to the SC-E before the next site visit, which is tentatively scheduled for late April or early May 2008.

6. Main Conclusions

The following are the main conclusions and recommendations concerning E-TOR (biodiversity and related aspects) resulting from the first site visit carried out in December 2007:

- PIU-E must have the required staff, budget, capacity (liberation from other duties) and competence (to make decisions) for carrying out the important work assigned to it. This is a conclusion reached for PIU-E, but equally applicable to PIU as a whole, since other experts and sub-committees have come to the same conclusion. Without a strong and capable PIU in place it is difficult to see how DSI could possibly comply to the obligations taken during the FAM-meeting. Institutional strengthening and capacity building of and within PIU must be seen as a priority measure, since the implementation of all other measures, irrespective of the subject, depend directly on it. See to this also the recommendations of the other Sub-Committees.

- Concerning water quality issues the following are the main conclusions:

    - It was not possible to visit Siirt area during this site visit. There is a need for Environmental “Water Quality” CoE to visit the Siirt area.

    - The Batman WWTP project should be reconsidered and corrected. A WWTP capable of removing C, N, and P should be constructed.

    - The Diyarbakır WWTP is one of the main point sources of pollution in the area. The treatment plant should be upgraded.

    - A proper WWTP is under construction in Siirt. The plant will remove C, N, and P and the municipality will be able to finance the operation and maintenance costs of the WWTP.

    - DSI is measuring important water quality parameters at numerous points along the Tigris River. Additional parameters such as TKN need to be measured.

    - Most of the TORs have not been accomplished.

    - It is recommended that DSI transfer the responsibility of carrying out the details of the TORs to one or more private companies. DSI should also form a group dedicated solely to the Ilısu project.

- Biodiversity surveys (TOR E-13 and E-16): it is of utmost importance that these studies start in early March 2008. With the preparation for the scope of work for these studies accomplished during the site visit and subsequently by PIU (draft submitted to and commented by the expert on December 18, 2007), timely allocation of this assignment to a suitable consulting company is possible (aim: January 2008). In this case, preparation for field work can start in February, so

that field work can actually start in early March 2008. In this way, the tight time schedule (start of surveys before start of major construction works) could still be met. **It should be noted that these studies are on the critical path of the project**.

- EMP sub-plans (TOR E-24): at lest the most critical ones related to activities on the construction sites (waste water treatment; storage and handling of hazardous substances for prevention of water pollution; solid waste management; worker's health management plan) must be ready before start of the main construction work. Here as well, the time schedule is very tight and work must start immediately. The draft plans have to be ready and sent to the CoE for comments before the next site visit of the SC-E, tentatively scheduled for April or early May 2008. **These plans are also on the critical path of the project**.

- Health related plans (TOR E-19/20/21): since some of these plans have to be in place at the start of the main construction work, this issue also has to be dealt with rapidly. It might be advisable to seek input from a qualified specialist in the field, especially for the preparation of the HIV/AIDS prevention plan.

The following two Tables summarise the situation concerning the E-TOR.

Table 1 provides a complete list of TORs with PIU and corresponding CoE tasks (both abbreviated), as well as indications on start and completion dates, and indications on tasks already completed.

Table 2 provides a list of those TOR which need immediate action at the present time.

Table 1: List of E-TORs indicating main milestones and deadlines

No.	Task PIU		Task CoE	Comment and Priority
E -1	Information on waste water treatment plants (WWTP)			E-1: Completed
		EC-1A	a) Review the information b) Check on the work progress made in constructing the WWTPs	EC-1Aa: Completed EC-1Ab:Completion before impoundment starts EC-1A: Report on completed at least 11 months before start of impoundment
		EC-1B	a) Review the performance data of WWTP obtained from the municipalities through PIU via their members on the CoE. b) Check performance of plants	EC-1B Commencement after start of operation of WWTP EC-1Ba: Annual review EC-1Bb: within 10 days of receipt of data
E-2	3-staged WWTPs in Diyarbakir, Siirt and Batman			E-2: Completion before reservoir impounding starts
E-3A E-3B	Submit an estimation of water quality Modelling of water quality and stratification of the reservoir	EC-2	Review results Assist PIU in developing mitigation measures, check on implementation of measures.	E-3A: Completed E-3B:Up to 3 Years from final commitment EC-2: Completion before final commitment
E-4A E-4B	Confirm variable water intake. of HEPP Evaluate and implement appropriate mitigation measures			E-4A: Completed E-4B: Commencement asap; Evaluation of measures within 2 months of rough estimate or modelling has shown that water quality will not be sufficient. Completion: Implementation of Measures: within 2 years from evidence (estimate or model)
E-5	Implement necessary additional mitigation measures to enhance water quality.	EC-3	Assist in developing appropriate mitigation measures; check on the progress of implementation.	E-5: Commencement immediately after evidence Completion: Report on measures to ECAs: within 2 month after information on negative water quality was identified Implementation time schedule: in agreement with ECAs and CoE EC-3:Commencement immediately after evidence and completion at the end of repayment period
E-6	Report periodically on the irrigation in the catchment area	EC-4	Review reports	**First Report by 2. quarter 2008, yearly reports during life span of project**
E-7	Best Management Practice (BMP) for agriculture are applied plan of activities to implement BMP	EC-5	Assist PIU/GAP in developing BMP Check on the progress of implementation of measures	Commencement immediately after evidence. Implementation 2 months after evidence Completion: Increase becomes known before impoundment: BMP in place before impoundment; Increase becomes known after impoundment: within 2 years after evidence.

No.	Task PIU		Task CoE	Comment and Priority
E-8	Inventory of the wild dump sites in the reservoir area; detailed implementation schedule (milestones and deadlines).	EC-6 EC-7	Assist in developing measures. Check on implementation of mitigation measures.	**E-8: Commencement asap. Inventory: commence 2 months after final commitment.** Completion: Plan 3 years before start of impoundment. Implementation: 2 years before reservoir impounding EC-6: Commencement: when inventory is completed. EC-7: Commencement: asap.
E-9	Siirt dump site is rehabilitation and replacement			Commencement asap. Implementation plan: 2 years after final commitment. Completion: before reservoir impounding
E-10	Minimal water flow of 60 m3/s during impoundment and operation	EC-8	Check the monitoring results of water flow.	Commencement: start of impoundment Completion: Through out life time of HEPP
E-11	Zero flow during impoundment not more than 3 days.	EC-9	Assist in developing measures; check on implementation	First phase of impoundment
E-12	Expert's opinion on minimal flow of 60 m^3/s and zero discharge.	EC-10	Comment.	Completed
E-13	Inventory of threatened and key species of fauna and flora.	EC-11	Review inventory	Analysis of available information completed **Start of Inventory March, 2008; Report April 2009** EC-11: Review and comment to ECAs 1 month after completion of study.
E-14	Develop adequate mitigation measures based on inventory	EC-12 EC-13	Assist in developing mitigation measures Check on work progress of measures	Commencement after inventory. Plan ready 4 years prior to start of impounding. Implementation 3 years before reservoir impounding.
E-15	Plan of completion, duration, and budget for fish survey	EC-14	Review.	Completed
E-16	Study of Tigris fish species; pre-construction, construction and operational phase	EC-15	Review	**Start of Inventory March, 2008; Report April 2009** Duration: 5 years after impoundment (with yearly reports)
E-17	Identification of appropriate sites for relocation of plants and animals and for creating new habitats.	EC-16	Assist in identifying appropriate sites and measures	Commencement during E-13 study. Completion: Identification of sites/ study: 3 years before start of impoundment
E-18	Preparation of relocation sites	EC-17	Check on progress	Commencement after study (E-17). Implementation plan: latest 3 years before start of impoundment. Completion: Acquisition: 2 years before start of impoundment

No.	Task PIU		Task CoE	Comment and Priority
E-19	Define measures and actions for assessment of water borne diseases.	EC-18	Assist	**Completion before start of main dam construction work. Start March 2008**
E-20	Assess the occurrence of malaria and other water borne diseases; develop a catalogue of measures to prevent an increase of water borne diseases in the project area	EC-19	Assist.	**Commencement of assessment: start of main dam construction. Catalogue of measures asap** Completion: Assessment : after 3 year of operation Catalogue of measures: 6 month before impoundment
E-21	Conducting a Prevention Programme for Malaria and HIV/AIDS.	EC-20	Check on the work progress	Commencement: start of main dam construction. Implementation: through out life time of HEPP
E-22	Submit a satisfactory Dam Safety Concept including emergency and evacuation plans.	EC-21	Review and comment	Completion at least 1 year before start of impoundment
E-23	Conduct a topographical study to determine the ground elevation of houses in Tepe	EC-22	Review and comment	Completion. 2 years before start of impoundment
E-24	Submit EMP/EAP a) Framework EMP for b)Detailed Sub-EMPs	EC-23	Assist in preparing an acceptable EMP/EAP (Sub-EMP)	a) completed before final commitment **b) Start : March 2008. No work/activity will commence before the respective Sub-EMP is in place.**
E-25	Submit updates of EMP when necessary	EC-24	Decide on the necessity of EMP updates.	When necessary
E-26	Implementation of Ilisu project in compliance with EMP/EAP			Start: immediately. Completion: End of repayment period
E-27	Update budget plans for the project			Completed
E-28	Monitoring of water quality	EC-25	Check the monitoring reports	Completion: Ongoing during guarantee period
E-29	Measure the water flow below dam daily.			Commencement: Start of impoundment Completion: Ongoing during guarantee period
E-30	During impoundment PIU will record the time of zero discharge			Commencement: Start of impoundment Completion: End of impoundment

No.	Task PIU		Task CoE	Comment and Priority
E-31	Monitor fauna (e.g. bird species) after commissioning			Commencement: after commissioning C: Completion: Ongoing during guarantee period
E-32	Monitor aquatic ecosystem and the fish after commissioning.			Monitoring: After start of operation of the dam Establishing Parameters: 1 year before impoundment Monitoring: end of repayment period
E-33	Monitor the development of relocated flora and fauna			Commencement: 6 months before relocation Completion: Ongoing during guarantee period
E-34	Conduct a monitoring program of malaria and other water borne diseases			Commencement: With impoundment Completion: Ongoing during guarantee period
E-35	Inform CoE on implementation of the EAP/EMP	EC-26	Check on implement	Commencement: Implementation of EAP / AMP Completion: Ongoing during guarantee period
E-36	Inform CoE on monitoring results	EC-27	Report to ECAs on work progress and implementation	Commencement with monitoring Completion: Ongoing during guarantee period

Table 2: E-TORs requiring immediate action by PIU

No.	Task PIU	Comment and Priority
E -2	3-staged WWTPs in Diyarbakir, Siirt and Batman	The raw water characteristics (BOD,COD, SS, TKN, NH_4N,TP,temperature),the effluent water quality (BOD,COD, SS, TKN, NH_4N,TP,temperature) of Diyarbakir WWTP, the upgrading required for the Diyarbakir WWTP to produce effluent that obeys the EU discharge standards for sensitive zones must be supplied before the end of October 2008. The following information must be supplied by the end of October 2008: • Feasibility studies of Batman Wastewater Treatment Plant . • Up to date information on the Siirt wastewater treatment plant which is under construction . • The wastewater quantities of Bismil & Silvan .
E-3B	Modelling of water quality and stratification of the reservoir	• Purchase of TKN equipment for the measurement of organic nitrogen and ammonia concentrations by the end of February 2008. • Grab sampling every two weeks on the sites decided with PIU by the end of March 2008. • Flow rate measurements on the sampling points by the end of March 2008. (These measurements should be as frequently as possible. At least measurements once every two weeks are required. The purpose is to find the flow rates of point pollutant sources and the Tigris River to be able to make pollutant mass balances) • A map of the zone that shows the types and areas of crops grown by the end of June 2008. • The amount of fertilizers used in each zone by the end of September 2008. • Run-off estimation for each of the area under study by the end of June 2008. • The number of metered costumers and the water tarrifs of the above mentioned cities by the end of June 2008. • The amount of water “unaccounted for” and amount of water pumped to the city by the end of June 2008. • The cost of water treatment (if any) and distribution by the end of August 2008. • The Number and cost of personnel related to water services. by the end of June 2008.
E-6	Report periodically on the irrigation in the catchment area	**First Report by 2. quarter 2008, yearly reports during life span of project**
E-8	Inventory of the wild dump sites in the reservoir area; detailed implementation schedule (milestones and deadlines).	**Commencement asap. Inventory: commence 2 months after final commitment.** Completion: Plan 3 years before start of impoundment. Implementation: 2 years before reservoir impounding
E-9	Siirt dump site is rehabilitation and replacement	**Commencement asap.** Implementation plan: 2 years after final commitment. Completion: before reservoir impounding

E-13	Inventory of threatened and key species of fauna and flora.	Analysis of available information completed **Start of Inventory March, 2008; Report April 2009**.
E-16	Study of Tigris fish species; pre-construction, construction and operational phase	**Start of Inventory March, 2008; Report April 2009** Duration: 5 years after impoundment (with yearly reports)
E-19	Define measures and actions for assessment of water borne diseases.	**Completion before start of main dam construction work. Start March 2008**
E-20	Assess the occurrence of malaria and other water borne diseases; develop a catalogue of measures to prevent an increase of water borne diseases in the project area	**Commencement of assessment: start of main dam construction. Catalogue of measures asap** Completion: Assessment : after 3 year of operation Catalogue of measures: 6 month before impoundment
E-24	Submit EMP/EAP a) Framework EMP for b)Detailed Sub-EMPs	a) completed before final commitment **b) Start : March 2008. No work/activity will commence before the respective Sub-EMP is in place.**

1 GENERAL COE ISSUES

1.1 Introduction

This first part of the Report covers a few issues concerning not the SC-E, but the CoE as a whole. Some points mentioned here might be also dealt with in the Reports of the other two Sub-Committees (SC-R and SC-CH).

1.2 PIU

The PIU was constituted in autumn of 2007; it was present at the October meeting held in Zurich. However, a number of persons who participated in Zurich were no longer involved in PIU activities in December, which is one indication of the fact that the PIU was – or still is – in the process of being institutionalised.

During the site visit all three SCs came to the conclusion that PIU was not yet operating in the way that is required for a timely and smooth implementation of its numerous and not always easy tasks. The reasons for these shortcomings were identified mainly as being the following:

- Insufficient human resources, and especially a lack of senior experienced staff for a number of important topics.
- Work overload especially of senior and experienced staff, who besides their obligations in Ilisu PIU still have to fulfil other duties.
- Lack of information on specific obligations, and especially on the FAM-TOR which bring some new and unfamiliar obligations to the project implementation process.
- Inadequate decision taking processes.

In view of this, one of the central recommendations to DSI is to improve the situation of the PIU in order to meet the requirements (human resources, budgetary issues, administrative structure, information flow etc.).

Like other issues, this report was also raised and discussed during the site visit wrap-up meeting in Ankara, of December 10, 2007. PIU accepted these points and made a commitment for increased efforts in this respect.

1.3 Site Visit and Lessons Learned for Future Site Visits

The first site visit took place in early December 2007, a number of attempts for carrying out earlier site visits having failed for different reasons (related to delays in finalising the main contracts for the Ilisu HEP Project).

The CoE highly appreciates the efforts made by DSI and PIU for making this site visit possible, and is aware of the problems that had to be overcome. In the light of this entire situation, the site visit certainly was a success. Nevertheless, a number of issues have

been observed that have to be discussed in order to improve the performance of future site visits. These points are listed and discussed briefly as follows:

- The first site visit, for a number of reasons, was carried out by the entire CoE (all three SCs) simultaneously. This was certainly good for allowing an exchange between the different groups, for covering and discussing cross-cutting issues, and for getting some insight in the concerns of the other SCs. The disadvantage of this was the size of the group. This caused some logistic problems (which were all solved to perfection thanks to the organisers from PIU and their supporting staff from the Consortium), and it reduced the effectiveness of the field visits (an effect which was exacerbated by the security situation and the need to be accompanied, at least in some parts of the project area, by a military escort). In the future, the SCs will most probably organise individual site visits according to their specific agendas and needs. This will make the organisation of such a visit easier and will hopefully lead to more flexibility in the field. Still, a few site visits of the entire CoE might still be required; this could be, for instance, one site visit every second year.

- The group size was a problem still in another way: the entire party numbered approximately 60 persons, 15 of which were CoE (including one representative of the ECAs). For the first meeting of the SC-E with its PIU counterparts alone, 22 persons were present. In future site visits, this group size should be reduced considerably. It will probably be better and more efficient for each SC to have a first PIU meeting in Ankara for being briefed on recent developments, where all persons involved will be able to participate, and then to go to the field as a small group, which would be restricted to the experts themselves and a few representatives of the PIU (and, potentially, of other entities as e.g. the Contractor, but in any case limited in number). The needs of the respective SCs will have to be taken into consideration for the decision on the composition of this group.

- A number of official meetings were held during the site visit (with district governors and town majors). While this is certainly important, not at least for achieving a transparent process including stakeholder participation, here again on future occasions it will probably be more effective and efficient to carry out such meetings with a much smaller group of participants.

- The problem of group size became apparent especially on one occasion: for the site visit to the dam site CoE was informed that “there were 10 seats in the vehicles, 6 of which were already occupied, leaving room for four CoE members”. The CoE (in this case SC-E and SC-CH) had then to insist that CoE experts must have priority on this occasion. Taking these experiences into account will certainly help in making future site visits not only easier from a logistic point of view but also more effective.

2 SUB-COMMITTEE ON ENVIRONMENT (SC-E)

2.1 Main Topics and Structure of the Report

The main objective of the work of the CoE is to supervise the implementation of the Ilisu HEP in order to make sure that it is made in accordance with the Terms of Reference as agreed during the Final Assessment Meeting (the so-called FAM-TOR), which cover the aspects of Resettlement, Cultural Heritage and Environment.

The Sub-Committee on Environment (SC-E) is dealing with the Environmental Terms of Reference (E-TOR). These can roughly be grouped in two main categories, namely

- TOR dealing with waste water, waste water treatment, water quality and related issues, and
- TOR dealing with biodiversity, as well as those dealing with general environmental management, health and related aspects.

Within the SC-E, the responsibilities for these two groups are divided among the experts as per their expertise. Prof. Saatci is the responsible international expert for waste water and related issues, Dr. Zwahlen is responsible for biodiversity and the remaining aspects.

When looking at the TOR, it is quite evident that not all are of the same urgency and have the same priority. So e.g. some will have to be implemented at the time of the first filling of the reservoir, which is still about 7 years in the future. Others will have to be dealt with during the construction phase, and there is ample time to address these topics. A few, however, need to be done or at least started, with some considerable immediate input, before the start of the main construction work, and these are the E-TOR with very high priority. In order to make the site visit as effective as possible, a list of all E-TOR was prepared on beforehand and sent to PIU, with a clear prioritising of the individual TOR, and mainly identifying those who need an immediate effort. The discussions with PIU concentrated then on these urgent points. The list of TOR with comments on urgency and indicating the responsible expert is provided in Annex A2.2.

The Report is structured according to the main groups as mentioned above, i.e. Water and Biodiversity.

2.2 Site Visits

2.2.1 Schedule of the First Site Visit

For the SC-E, the first site visit lasted from Dec. 2 to 11, 2007, according to the schedule as shown in the following Table.

Table 2-1: Schedule of the SC-E site visit

Date	Day	Activity
2-Dec-07	Sunday	Arrival in Ankara, Accommodation in Ankara at Hotel Ankara Hilton
3-Dec-07	Monday	Travelling to Batman, accommodation in Batman. 18:00 - 22:00 / Meeting in Batman at Hotel Asko / Common Dinner
4-Dec-07	Tuesday	09:30 - 12:00 / PIU/DSİ-CoE-ECA Meeting in Batman (separate meetings of SCs with the respective PIU groups). 14:00 - 16:30 / Meeting with Batman Governor and Mayor. Accommodation in Batman.
5-Dec-07	Wednesday	Full day: Yanarsu – Garzan, Reservoir Area (SC-R, SC-CH and SC-E, Biodiversity). Batman WWTP (SC-E, Waste Water). Accommodation in Batman.
6-Dec-07	Thursday	Full Day / Hasankeyf (all SCs); site visit and meetings with Governor, Mayor and Mufti). Accommodation in Batman.
7-Dec-07	Friday	SC-E (Waste Water) and PIU-E: Dicle University (Diyarbakır) and Diyarbakır WWTP. SC-E (Biodiversity): Dam area and surroundings. Accommodation in Batman.
8-Dec-07	Saturday	Visit of reservoir area between Batman and Bismil. Travelling to Diyarbakir and onwards to Ankara. Accommodation in Ankara at Hotel Ankara Hilton.
9-Dec-07	Sunday	Preparation of DSI-ECA Common Meeting.
10-Dec-07	Monday	Full day: Evaluation Meeting / PIU/DSI-ECA-CoE-IC-ECS; morning session: providing a short overview of main points, observations, identified problems and urgent activities to be taken, by SC chairpersons; afternoon session: detailed discussion of points raised in the morning, definition of actions to be taken.
11-Dec-07	Tuesday	Discussion with PIU-E: definition of scope of work of biodiversity studies to be started urgently. Travelling back to Zurich.

The following Figure provides an overview of the project area, indicating the main localities. Note that Ilisu village (as all of the small villages in this area) is not indicated on this map. This village, and the dam site, is accessible by a dirt road from the village called Dargeçit.

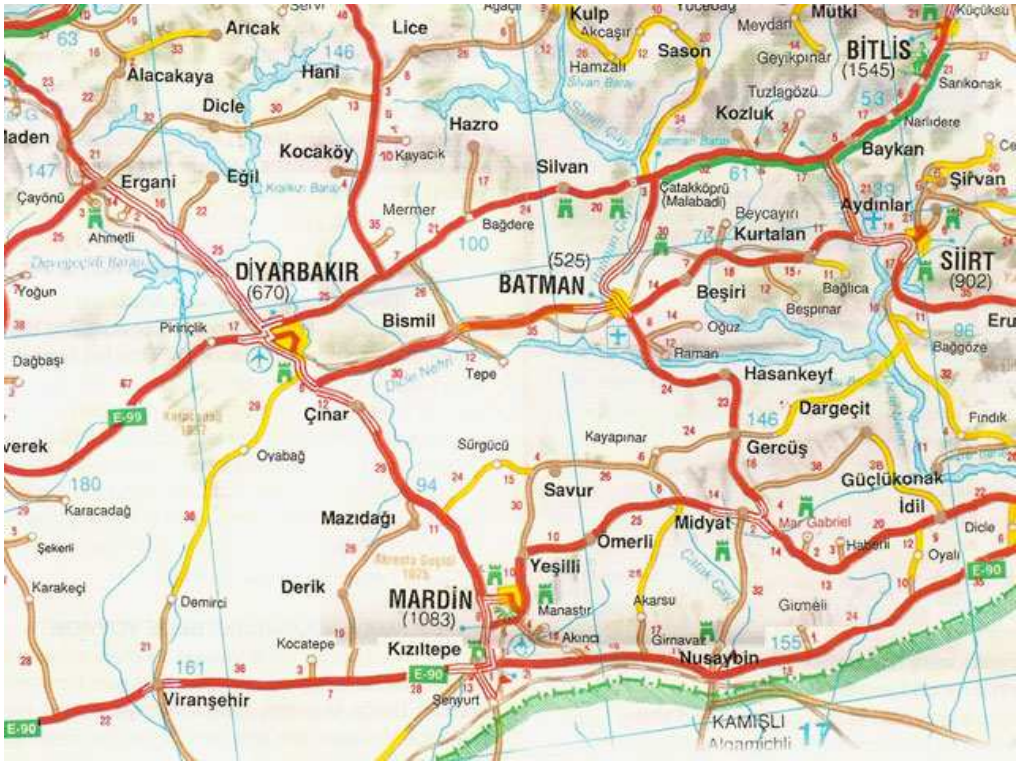


Figure 1-1: Map of the project area

3 WATER QUALTIY AND WASTE WATER

3.1 Priorities

The following were the main objectives of this visit:

1. To collect information on point sources of pollution
2. To collect information on non-point sources of pollution
3. To assess the existing wastewater treatment plants in the region.
4. To gather information about the wastewater treatment plants to be constructed in the future
5. To visit and inspect the Ilısu Project region.

3.2 The Site Visit

Table 3-2: The activities of the Water Quality Group are summarized in the following table.

Date	Activity
03.12.2007	Site visit: travelling to Batman, CoE/PIU meeting
04.12.2007	CoE meeting (review of TORs, general progress evaluation)
05.12.2007	Field trip to Garzan; meeting with Batman municipality (engineering staff); meeting with Batman office of Ministry of Agriculture
06.12.2007	Field trip to Hasankeyf; field trip to Bismil and Silvan (Diyarbakır); meetings with municipalities of Bismil and Silvan; meeting with Bismil Branch of Ministry of Agriculture; CoE meeting
07.12.2007	Field trip to TÜPRAŞ WWTP, meeting with technical staff at TÜPRAŞ; Meetings with Staff of DSI headquarters in Diyarbakır, Staff of the local Office of the Ministry of Agriculture of Diyarbakır, and Environment/Water Quality Group
08.12.2007	Diyarbakır WWTP visit; meeting with staff of Diyarbakır municipality; site visit to Dicle river to observe wastewater discharge points.

3.2.1 Information Obtained

Information regarding the following was sought before and during the site visit:

1. Agricultural activities in the region, including the types of crops, types and quantities of fertilizers used, types of insecticides, pesticides, herbicides and other agricultural chemicals used in the watershed zone.

2. Point sources of pollution: wastewater collection systems, wastewater discharge points, flow rates and wastewater characteristics in Batman, Diyarbakır, and Siirt regions.

3. Existing wastewater treatment plants (WWTPs), treatment processes used, analysis of raw and treated wastewaters, flow rates. Information regarding the Diyarbakır WWTP was obtained during the site visit.

4. Wastewater treatment plants planned for the future: Processes considered and/or selected, planned capacities, degrees of treatment. Documents regarding Siirt and Batman WWT plants were received before the site visit. Further information about Batman WWTP project was gathered during the visit to Batman. The Batman WWTP has not yet been constructed, whereas the Siirt plant is under construction.

3.2.2 Contacts with PIU

Several meetings were conducted with the following PIU members.

Table 3-3: PIU members

Name	Organization	Function in Project
Özlem Akyel	Ministry of Env. & Forestery	PIU-E
Veysi Kanat	DSİ	PIU-E
Meral Elverdi	Ministiry of Agriculture	PIU-E
Fikriye Baltacı	DSİ	PIU-E
Ercan Direkçi	DSİ	PIU-E
Ersin Biltekin	Ministry of Env. & Forestery	PIU-E
Ramazan Kılıç	DSİ	PIU-E
Cahit Şener	DSİ	PIU-E
Abdurrahim Kartal	DSİ	PIU-E
M.Sait Tahmiscioğlu	DSİ	PIU-E
S.Pelin Celtemen	DSİ	PIU-E
Nermin Anul	DSİ	PIU-E
Dilek Güler	DSİ	PIU-E
M.Suphi Özer	GAP-BKİ	PIU-E
Seyfi Parlak	DSİ	PIU-E

These PIU members were divided into two groups, one group on biodiversity, and the other on water quality & pollution sources. TORs were reviewed and the state of progress made so far was assessed in the first meeting. The water quality group was organized into three study groups. The following were selected as group leaders for the purpose of collecting information and establishing communication with the CoE:

1. Meral Alverdi (agricultural activities; non-point sources)

2. Özlem Akyel (point sources and wastewaters)

3. Ersin Biltekin (solid waste disposal sites and sources of leachate)

Using Simple Nutrient Balances to Estimate the Nutrients Discharged into the Tigris River

The following were discussed and ascertained during meetings with the PIU:

Sampling:

DSI has been measuring some water quality parameters around the Dicle (Tigris) River Site. These parameters are:

pH
SO_4: Sulfate
SS: Suspended Solids
Total Hardness
T: Turbidity
Ca: Calcium
Cl: Chloride
Col: Coliforms
EC: Electrical Conductivity
K: Potassium
M-Al: Methyl Orange Alkalinity
Mg: Magnesium
Na: Sodium
NH_4-N: Ammonia Nitrogen
NO_2-N: Nitrite Nitrogen
NO_3-N: Nitrate Nitrogen
P-Al: Phenol Phtalein Alkalinity
Fe: Iron

In some of the wells and drinking water resources: COD, E-Coli, Total Coli, As, Cd, Cr, Cu, Hg, Pb, Zn, and Total Pesticides were measured twice a year.

Unfortunately, among the parameters measured on the Tigris stations, some of the pollution indicators such as: BOD_5, COD organic Nitrogen, Polyphosphates and Total Phosphorous were not included and they were not measured at the points required.

During the meetings, the following parameters were requested from DSI:

Physical Parameters:

Flowrate, m^3/s
Temperature
Turbidity
Color
SS: Suspended Solids

Chemical Parameters:

Fe: Iron
Mn: Manganese

Carbon

BOD_5: Biochemical Oxygen Demand
COD: Chemical Oxygen Demand

Nitrogen

NH_4-N: Ammonium Nitrogen
Org-N: Organic Nitrogen
NO_3-N: Nitrate Nitrogen

Phosphorous

TP: Total Phosphorous
P_2O_5: Polyphosphates

Biological Parameters:

Faecal Coliform
Total Coliform

The main point sources that contribute to the Tigris River are indicated in Figure 3-1

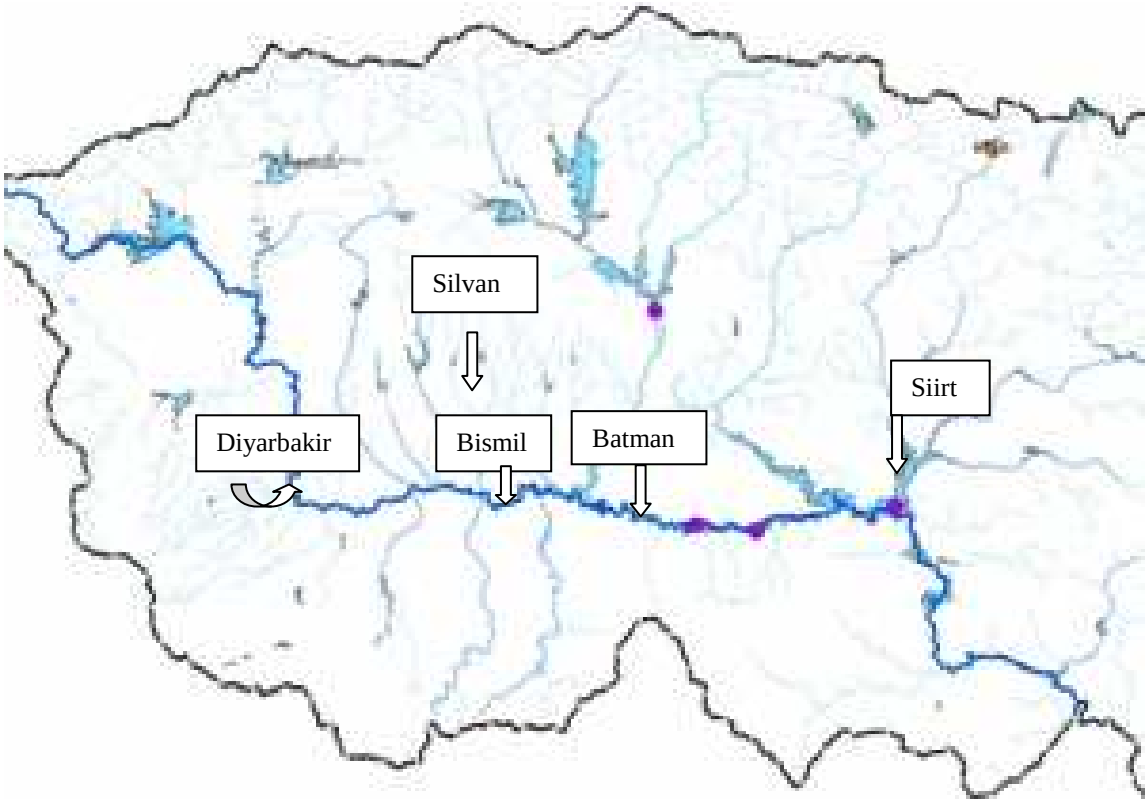


Figure 3-1: The main point sources that contribute to the pollution of the Tigris River

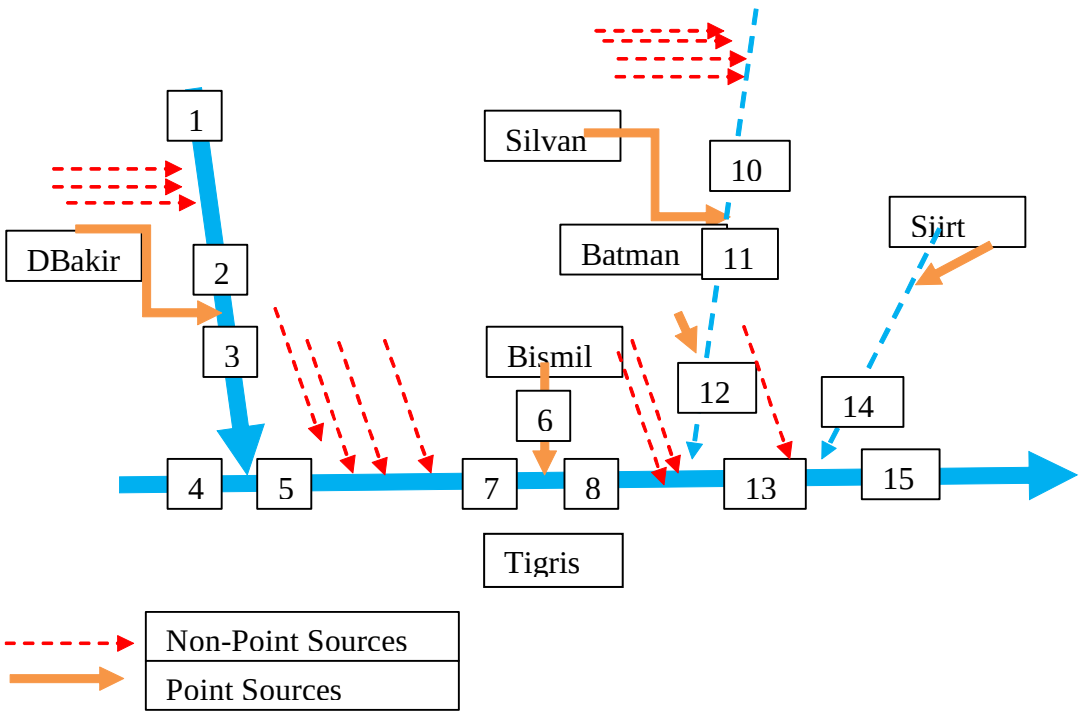


Figure 3-2: **Simplified sampling sites model for calculating point and non-point sources**

The "critical sampling stations" are the stations that will give an idea about the non-point and point pollution sources. Some examples of these water sampling stations are shown in Figure 3-2.

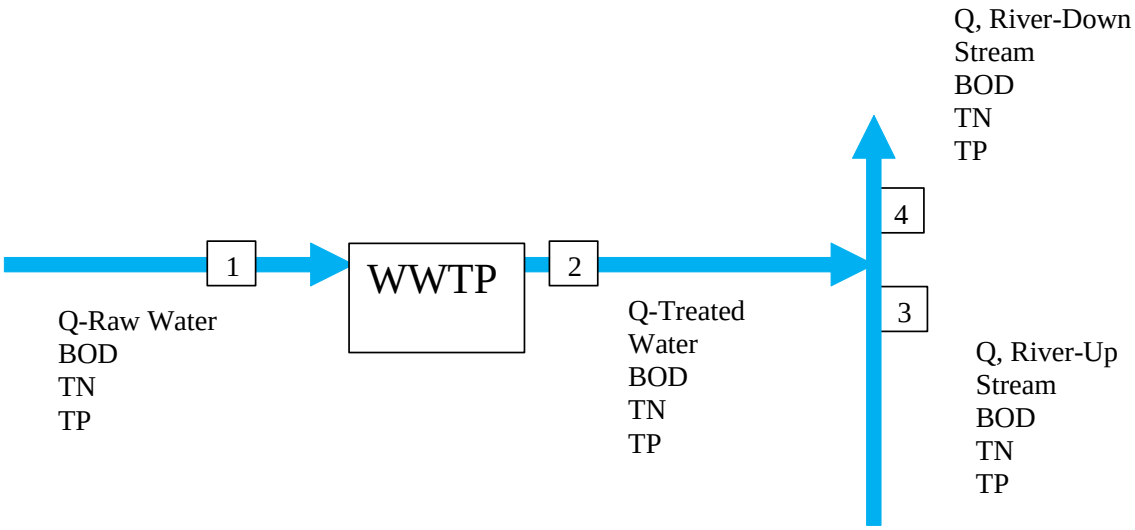


Figure 3-3: **Simple mass balance of nutrients from a point source**

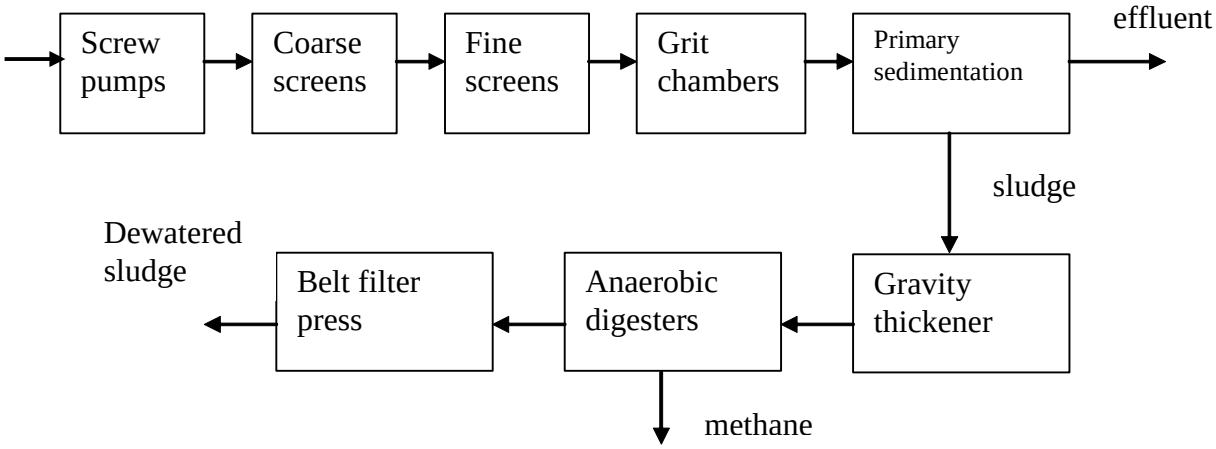
Figures 3-2 and 3-3 show how the mentioned measurements will be used to obtain an idea about point and non-point sources. Points 1 and 2 in Figure 3-3 will the performance of the WWT plants. Points 3 and 4 in Figure 3-3 will indicate the pollution contribution of the WWTP effluent. Any change in water quality parameters between points sources (e.g. from point 5 to 7 in Figure 3-2) will give information about the contribution of non-point sources. This methodology was explained to the PIU during our numerous contacts with them during the site visit. The PIU was also advised to

carry out ditch experiments to study the pollutional effects of agricultural activities (non-point sources).

3.2.3 Field Observations

1. Observations at the Diyarbakır WWTP

The WWTP in Diyarbakır aims the preliminary/primary treatment of the municipal wastewater of Diyarbakır and the production of energy in the form of methane gas from the settled sludge. This plant was built with the funding supplied by KfW and was unfortunately based on an incorrect process choice. The plant removes only about %40 of suspended solids and BOD (biochemical oxygen demand) of the wastewater and the effluent is not of sufficient quality, not even satisfying the secondary treatment standards. The flow diagram of the WWTP is given in the following figure.



The Diyarbakır WWTP consists of the following unit operations and processes: Screw pumps to raise the wastewater up to 6 m; coarse screens (with 6 cm openings) for the removal of large objects; fine screens (with 6 mm openings) for the removal of finer objects; four grit removal tanks for the removal of heavy inorganic solids; four primary sedimentation tanks for the partial removal of organic solids. The wastewater from the sedimentation tanks is discharged into the Dicle river without any further treatment. The settled sludge from the primary sedimentation tanks is pumped to two gravity thickeners to decrease the water content of the sludge. The thickened sludge is then pumped to two anaerobic digesters wherein the sludge is decomposed by anaerobic bacteria and methane is generated. The sludge age in the digesters is about 34 days. The methane generated is stored in a 3350 m^3 storage tank. Any methane in excess of the storage capacity is burned. The digested sludge is further treated with two belt filter press units to obtain %20 solids concentration. This dewatered sludge is stored in sludge drying beds, subsequently to be hauled to land disposal sites via trucks.

This treatment plant must be upgraded by the addition of aeration, biological phosphorus removal, and final clarifier units followed by a disinfection facility. Ultraviolet (UV) disinfection will appropriate for such a wastewater treatment plant. Current, none of the primary pollutants carbon, nitrogen, and phosphorus (C, N, P) are reduced to acceptable levels. Upgrades are necessary for effective removal of these pollutants. The upgrade alternatives can be summarized as follows:

1. Carbon removal can be achieved by adding aeration tanks and final clarifiers. In this way, suspended solids and BOD will reduced to satisfy secondary treatment requirements, but not the requirements of discharge to sensitive zones (P < 1 mg/L and N < 10 mg/L; see the table labelled "Table 36" pasted below). This is because P and N will not be removed sufficiently.

2. Addition of a biological phosphorus unit after the existing primary sedimentation tanks, followed by aeration and final clarifier units for the removal of suspended solids and BOD (carbon content) of the wastewater. The anaerobic biophosphorus removal tanks should have a hydraulic detention time of about 30 to 45 minutes. While this option is better that the first option mentioned above, denitrification cannot be achieved in this way.

3. Addition of a biological phosphorus unit after the existing primary sedimentation tanks, followed by aeration and final clarifier units for the removal of suspended solids and BOD of the wastewater. De-nitrification can also be achieved by building larger aeration tanks and keeping a portion of these tanks in anoxic (devoid of oxygen) conditions. In this way, the treatment plant will have been converted to the A2O process for the removal of carbon, nitrogen, and phosphorus. This process will yield a sufficiently treated wastewater that can be discharged into sensitive receiving water bodies.

It should be noted that denitrification requires carbon. A significant portion of the carbon in the raw wastewater, however, is removed in the primary sedimentation tanks for the production of methane gas. For successful nitrogen removal, some or all methane production will have to be ceased so that the carbon in the wastewater is available for denitrification. Currently, the methane produced is used only to heat the digesters and to heat the administration buildings in the plant. There is no electricity generation from methane in the plant.

About 50% of the operational cost of a WWTP plant is due to aeration. This means that the operational costs of the Diyarbakır WWTP plant will increase any one of the options explained above is implemented.

Table 3-4: Requirements for discharge from Urban Wastewater Treatment Plants

Table 36 - Requirements for Discharges from Urban Wastewater Treatment Plants to Sensitive Areas Subject to Eutrophication as Identified in Annex II.A(a).

One or both parameters may be applied depending on the local situation. The values for concentration or for the percentage of reduction shall apply (UWTD, 1991).

Parameters	Concentration	Minimum percentage of reduction (1)	Reference method of measurement
Total phosphorus	2 mg/l (10 000 - 100 000 p. e.) 1 mg/l (more than 100 000 p. e.)	80	Molecular absorption spectrophotometry
Total nitrogen (2)	15 mg/l (10 000 - 100 000 p. e.) (3) 10 mg/l (more than 100 000 p. e.) (3)	70-80	Molecular absorption spectrophotometry

(1) Reduction in relation to the load of the influent.
(2) Total nitrogen means: the sum of total Kjeldahl-nitrogen (organic and ammonia nitrogen), nitrate-nitrogen and nitrite-nitrogen.
(3) These values for concentration are annual means as referred to in Annex I, paragraph D.4(c). However, the requirements for nitrogen may be checked using daily averages when it is proved, in accordance with annex I, paragraph D.1, that the same level of protection is obtained. In this case, the daily average must not exceed 20 mg/l of total nitrogen for all the samples when the temperature from the effluent in the biological reactor is superior or equal to 12ºC. The conditions concerning the temperature could be replaced by a limitation on the time of operation to take account of regional climatic conditions.

During the site visit to Diyarbakır, it was observed that untreated wastewater was being discharged into the Dicle river at one point (the rest of the wastewater being collected and sent to the WWTP). Two pictures showing this discharge are Photo 5 and Photo 6. All such discharges must be terminated to prevent pollution in the dam area.

Furthermore, the WWTP was shut down for maintenance during the site visit. This means that all the collected wastewater was bypassing the treatment plant and was being discharged without any treatment. The reason for the shutdown was a plant modification to solve a problem regarding excessive grit accumulation at the head of the screw pumps during rainy days. The mentioned problem was reported to have caused plant shutdowns (and accompanying discharge of raw wastewaters without treatment) for a few months every year. With the modification that is underway, it is expected that such bypassing will be eliminated. This issue will require monitoring and follow-up.

The following is an overall outline of the problems observed during the site visit.

1. **Grit collection in the wetwell before the Archimedes pumps:**

   The sewage contains high amounts of grit and the grit settles in the wet well before the Archimedes (Screw) pumps (Photos 1 and 8). The Archimedes pumps can not lift the grit and due to excess grit accumulation the plant has to be stopped and the settled grit has to be cleaned. Unfortunately, the only by-pass availability is from the sewer trunkline before the plant. The plant was by-passing from this point to the Tigris River when the team visited the site.

2. **Clogging of grit conveyor pipes:**

   The grit collection pipes were kept too long and frequent clogging of the pipes was experienced. The lines were shortened by the operator.

3. **Sludge Withdrawal System Clogging**:

   The sludge withdrawal from the primary sedimentation tank fails. The operators are trying to solve this problem. The primary sludge line needs extensive attention since many fatal accidents happens due to H_2S leak from these pipes. The operators were warned about this danger. The valve chamber of the primary sludge line has to be well aerated and equipped with H_2S detectors and alarms. If possible it should be lifted above the ground to an open zone with a simple shelter.

4. **Grit accumulation at the bottom of the digester:**

   The digesters can generate enough gas to heat the digesters and to supply heat to the office building. There is no intension of generating electricity from the methane gas in the future. The generated gas may not be enough for this purpose. Also as explained earlier, the primary sedimentation may remove a part of the carbon necessary for the denitrification process. No study was conducted for this purpose.

5. **Pollution Parameter Measurements:**

   There is an urgent need to measure the nitrogen parameters (organic Nitrogen, Ammonia and Nitrate) and top compare with the available carbon in the raw wastewater to evaluate whether enough carbon (BOD5) will remain after the primary sedimentation tanks for denitrification. DSI team has undertaken the analysis of the nitrogen compounds for the plant. DSI will supply the local DSI laboratory with a Kjeldahl Apparatus to make the required measurements. The samples will be collected and sent to the local DSI laboratory by the Diyarbakır Municipality.

6. **Information of PIU:**

   M. Sait Tahmiscioğlu, the leader of the Environmental group of DSI/PIU accompanied us during the Diyarbakir WWTP visit. The problems identified

were explained to the DSI group. They were fully informed of the requirements of the WWTPs and their consequences.

7. Plans for Diyarbakir WWTP:

There are no near future plans to extend the Diyarbakır WWTP to remove nitrogen and Phosphorous. No feasibility or a preliminary design was made in this respect.

2. Observations at the TÜPRAŞ WWTP

There are two separate parts of the WWTP in TÜPRAŞ: One smaller part (maximum 30 m^3/hr) is for the treatment of domestic wastewater generated within the plant (wastewaters from bathrooms, kitchens, showers, etc), and a larger section for the treatment of the industrial wastewater (maximum 190 m^3/hr) from the oil refinery process. The total plant flow is currently about 70 m^3/hr, i.e. below the maximum capacity. Furthermore, the management is planning to recycle treated wastewater to be used in cooling towers. As a result, the plant discharge is expected to further decrease in the future.

The domestic wastewater treatment section consists of aeration followed by a clarifier to remove suspended solids and organic matter. The industrial wastewater treatment section contains oil and grease removal units (API separators), equalization basin where pH adjustments are made, followed by dissolved air flotation (DAF), and finally and activated sludge system consisting of aeration and final clarifier. Surface aerators are used in both sections of the WWTP. The sludge from the final clarifiers is sent to a thickener, the thickened sludge is then sent to centrifuges for dewatering. The sludge obtained is about 25% solids and is sent to cement factories for incineration.

The following operational mistakes were observed during the site visit:

1. The domestic WWTP was not being operated properly. The main problem was that sludge was not settled and recycled back to the aeration tank. It was observed that a significant portion of the wastewater entering the final clarifier was being recycled back to the aeration tank, instead of recycling only the settled sludge from the clarifier. As a result, a sufficient population of microorganisms in the aeration tank was not maintained.

2. The DAF unit of the industrial WWTP was not operated properly. The water with dissolved compressed air was being injected into a mixing tank ahead of the DAF unit; this stream must be injected into the DAF unit to achieve flotation and removal of suspended solids.

3. The effluent weirs of the final clarifiers of the industrial WWTP must be adjusted to achieve uniform and effective removal of clarified wastewater.

During the site visit, instructions and a brief training were given to the WWTP operators for the correction of these mistakes. In principle, both the domestic and industrial WWT plants are adequate for the reduction of suspended solids, biochemical oxygen demand, and oil and grease content of TÜPRAŞ's wastewaters. Additionally, the total wastewater discharge is very small compared to those of the domestic wastewaters

generated by the various municipalities discharging into the dam area. It can be concluded that, if the WWTP is operated correctly, the treated wastewater discharge from TÜPRAŞ will not pose a significant pollution threat to the Ilısu Dam area.

3. Observations regarding the WWTP planned for Batman

Currently a municipal WWTP does not exist in Batman and the municipal wastewater is discharged to the Dicle river without any treatment. The municipality is planning to construct a WWTP with funding supplied by KfW (German credit corporation). The planned WWTP is very similar to that already in operation in Diyarbakır. This plant, if constructed as planned so far, will carry out only a preliminary/primary treatment of the municipal wastewater of Batman. The plant will also generate methane gas from the settled sludge.

The effluent of the wastewater from this plant will not satisfy the requirements of the Ilısu Project. The plant may be expected to remove only about %40 of suspended solids and BOD (biochemical oxygen demand) of the wastewater and the effluent will not be of sufficient quality, not even satisfying the secondary treatment standards.

It is estimated that a wastewater treatment plant achieving effective C, N, and P removal and satisfying the EU wastewater effluent standards regarding discharges to sensitive areas can be constructed with approximately the same capital cost as the planned treatment plant, although the operational costs of such a plant will naturally be higher.

One problem with the currently planned WWTP is that the expensive methane production units (digesters) will probably be useless when additional units for C, P, and N removal are erected at a later stage. This is because the carbon removed in primary sedimentation and sent to the digesters for methane production is expected to be needed in the denitrification process. To achieve denitrification, the digesters will probably be operated much below their design capacity, rendering the investment in them a largely wasted resource.

Table 3-5: Wastewater Treatment Plants

City	WWTP capacity	Start of operation	Capital costs, €
Diyarbakır	135,000 m^3/day	2005	(?)
Siirt	18,780 m^3/day	2008 (estimated)	9,354,000
Batman	65,000 m^3/day	2011 (estimated)	12,500,000

The Operating Costs of Biological Nutrient Removal (BNR) Plant

Batman Sewage Collection and Wastewater Treatment Plants Funds:

The amount of funds available for the Batman Wastewater Treatment Plant and the sewerage network is 40 million €. 50% of these funds will be supplied by the Batman Municipality and 50% will be supplied by European Investment Bank (EIB). The Turkish Treasury will guarantee the EIB funds.

Batman WWTP Design Parameters:

The wastewater characteristics of Batman were not properly measured. In the feasibility report there are few measurements and they were not done throughout the year.

Qdesign= 61 000 m^3/d
Population Equivalents= 320 000
Qwwf: Wet weather flow=5 000 m^3/h (120 000 m^3/d)

BOD_5 = 262.3 mg/L
COD= 688.5 mg/L
SS= 327.9 mg/L
NH_4N= 29.3 mg/L

Unfortunately, the above pollution parameters do not depend on real measurements but on the assumptions presented in Table 1:

Table 3-6: The Specific Loads Assumed in Batman WWTP Design

Parameter	Specific Load, g/per/d	Concentrations, g/m^3
BOD_5	50	262.3
TKN	7.44	39
NH_4N	5.58	29.3
orgN	7.44-5.58 = 1.86	9.7

This is why the BOD values presented are not round numbers such as BOD5=262.3 mg/L:

BOD Load= 320 000 pe * 50 g/per/d = 16 000 kg/d
BOD_5= 16 000 kg/d/ 61 000 m^3/d = 262.3 g/m^3

TKN= 320 000 pe* 7.44= 2 380 kg/d
TKN= 2 380 kg/d/ 61 000 m3/d = 39 g/m^3

NH_4N= 320 000 pe* 5.58 = 1 785 kg/d
NH_4N = 1 785 kg/d/ 61 000 m^3/d = 29.3 g/m^3

Thus, orgN = 320 000 pe* (7.44-5.58) = 595 kg/d
orgN= 595 kg/d/ 61 000 m^3/d = 9.7 g/m^3

During the visit to the Batman Municipality, it was agreed with the Municipality engineers that they will do sampling from the wastewater and DSI laboratory of the region will perform the: BOD, COD, SS, TKN (Ammonia and Organic Nitrogen), Total Phosphorous, and faecal coliform analysis. Physical parameters such the yearly change of the wastewater temperature (which influences the design remarkably) will be measured by the Municipality.

The Capital Cost of the Batman WWTP

In our meetings with the Batman Municipality staff (Engineer Ahmet Bozan), the amount of funds allocated for the construction of the Batman WWTP was learned to be about 12 million €. The sufficiency of this amount to construct Biological Nutrient Removal (BNR) plant that will produce effluent that complies with the European Discharge Standards to sensitive zones can be understood by comparing it with plants of similar sizes. Recently, the second Paşaköy WWTP bid resulted in 27 million €. The plant's capacity is 100 000 m^3/d and has drying equipment and electricity generators of turbine type that will not be a part of the Batman plant and which amounts to 8 million €. Thus, the amount for the construction of the BNR plant is= 27 – 8 = 19 million €. It should also be noted that the BOD of this plant (300 mg/L) and the Total Kjeldahl Nitrogen (TKN= orgN+NH_4N= 60 mg/L) are more than the Batman values (262 mg/L and 39 mg/L, respectively). The design of the plant (the size of the aeration tanks and equipment) is very sensitive to these two parameters. The capital and operational costs of a plant with higher values are much higher.

Thus, the flow specific cost of the Paşaköy II WWTP is 19 000 000 € / 100 000 m^3/d = 190 € / (m^3/d). This is an expected value when the other recent bids of Ataköy WWTP (400 000 m^3/d capacity) and the Ambarlı WWTP (390 000 m^3/d) capacity are considered.

Taking the unit cost 190 €/ (m^3/d) as basis for the capital cost:

61 000 m^3/d * 190 € / m^3/d = 11.6 mill € capital cost is the expected cost of the Batman WWTP.

The capital costs of the Siirt WWTP will not be used as a basis since it has much less flow rate and the capital costs per m^3/d are much higher for smaller plants. Also, the interviews with two companies that entered the bid indicated that the large drying beds, stainless steel part requirements increased the bid price. For a capacity of 18 780 m^3/d, the winning cost was 9 354 000 € giving a unit cost of 498 €/m^3/d, more than twice the unit cost of Istanbul WWTP capital costs.

The Expected Operational Cost of Batman WWTP

The contacts with the Batman Municipality designate that the operational costs of the WWTP is of main concern. The process selected for Batman is the same process chosen for Diyarbakir. Essentially, the treatment process consists of preliminary treatment (coarse and fine screens and grit removal) and primary sedimentation tank which removes about 40% of the BOD. The primary sludge is usually a problematic sludge. The Municipality was warned against the dangers of the H_2S gas that has caused a lethal accident in Istanbul-Tuzla WWTP. The valve chambers that are under the ground needs to be ventilated and equipped with H_2S detectors and alarms. It is very probable that the problems associated with the Diyarbakir WWTP (explained earlier), such as the grit accumulation before the screw pumps will be seen in Batman WWTP as well.

Similar to the capital costs the operational costs of the Istanbul WWT Plants that denitrify and have biological phosphorous removal will be used as a basis of calculations:

The power requirements for the 100 000 m^3/d (BOD= 300mg/L and TKN = 60 mg/L) Paşaköy WWTP II is 2.5 MW.

The daily operational electricity cost is:

2500 kW* 24 h/d * 0.08 €/kW = 4 800 €/d. Most of this cost is spend for the aeration. Aeration costs are about 50 -60 % of the total operational costs.

The staff, workers' and maintenance costs are about 5 000 €/d in Paşaköy. Therefore, the expected daily operational cost of operating a BNR plant of 100 000 m^3/d capacity is about 10 000 €/day.

As a result, the unit cost of treating 1 m^3/d wastewater to the European discharge standards for sensitive zones is: 10 €-cents.

The water to Istanbul is pumped through long distances. The pumping costs are about 0.15 YTL (9 €-cents) / m^3. The water treatment costs (chemical, maintenance, electricity) is also about 9 €-cents/m^3 adding up to 18 €-cents/m^3. The costs for amortizing are not included in the above costs.

The approximate average cost of a m^3 of water is 1.2 € in Istanbul. The industrial rate may go up to 3 €/(m^3/d). Even if the Batman Municipality sells the water at prices less than the half of average price of 1.2 €, the operational costs of the WWTP can still be met without any difficulty. The dilemma is collecting water fees. A great portion of the population in Batman and Diyarbakır are not registered customers and do not pay for the water they are consuming.

Siirt Municipality should be taken as an example for the renewal of the water network, water meters, the collection of the water fees and their decision in selecting a plant that will not only remove carbon but also nitrogen as well.

Siirt Water Collection Data:

Siirt has a recent population of about 108 000 people. About 85 % of the water consumers are registered and pay. Most of the water meters are newly installed and average water price is 0.960 YTL/m^3. The industry and the army is charged at a higher rate. With the specific water consumption rate of 250 LCD, the daily income from water will be around 13 000 €/day (390 000 €/mo). The capacity of the Siirt WWTP is 18 780 m^3/d, Assuming a linear relation in the operational costs of the WWTPs, the operational cost of Siirt WWTP is expected to be around:

18 780/100 000 m^3/d * 10 000 €/day = 1878 €/day.

This is about 14-15 % of the water income. Thus, the Siirt Municipality should be easily be able to the operational costs of their BNR plant.

3.2.4 Stakeholder Contacts

Meetings were conducted with the following:

1. Mayor of Batman municipality.

2. Governor of Batman.
3. Engineering staff of Batman municipality.
4. Batman office of Ministry of Agriculture.
5. Mayor of Bismil.
6. Engineering staff of Bismil municipality.
7. Bismil office of Ministry of Agriculture.
8. Engineering staff of Silvan municipality.
9. Silvan office of Ministry of Agriculture.
10. The management and engineering staff of TÜPRAŞ (Turkish Petroleum and Refinery Inc. in Batman).
11. Engineering staff at Diyarbakır WWTP.

3.3 Comments by TOR

Table 3-7: "Checklist" of TOR

No.	Task	Comments
E -1	The PIU will submit detailed information on the 3-staged waste water treatment plants (WWTP) to be built in the project area. This includes: Name of city; capacity of the plant; start and end of construction period; start of operation; effluent characteristics; capital costs of plant; sponsor of plant; operational cost	Completed
E-2	PIU will secure that the 3-staged WWTPs in Diyarbakir, Siirt and Batman are in operation, fully functional and meeting the designed effluent values before reservoir impounding starts. Construction of the WWTP will be completed 1 year before impoundment starts.	Incomplete
E-3A	The PIU will submit an estimation of water quality (based on simple mass balance) taking into account the 3-staged WWTP in Diyarbakir, Siirt and Batman, growth of population and future developments in irrigation (e.g. increase in irrigated area) in the project area	Completed
E-3B	The PIU will submit the results of a modelling of future water quality and stratification of the reservoir taking into account the 3-staged WWTP in Diyarbakir, Siirt and Batman, growth of population and future developments in irrigation (e.g. increase in irrigated area) in the project area.	
E-4A	PIU will provide confirmation that final design of the HEPP will include variable water intake.	Completed
E-4B	PIU will evaluate and implement appropriate mitigation measures, in case the rough estimate or the modelling of future water quality and stratification of the reservoir (ref. 3A and 3B) shows that water quality is not acceptable even with the 3 WWTP planned.	
E-5	PIU will ensure the implementation of the necessary additional mitigation measures to enhance water quality, in case of negative, trophic situation in the reservoir after commissioning.	n/a
E-6	The PIU will report periodically on the irrigation in the catchment area of Ilisu reservoir, especially on any plans to extend the current irrigation area of 64.000 ha.	n/a
E-7	The PIU will make sure that Best Management Practice (BMP) for agriculture as described on pages 16-22 in the „Answers to the ECAs matrix concerning	n/a

	UEIAR and EAP“ are applied in irrigation and manuring in the project area in case of an increase in irrigated area. PIU will provide a plan of activities foreseen to implement BMP and a detailed implementation schedule (milestones and deadlines).	
E-8	PIU will submit an inventory of the wild dump sites in the reservoir area and its periphery and provide a plan of ecologically meaningful and economically viable measures to prevent that leachate or waste from such dumps enter Tigris, its tributaries or the reservoir and implement such measures. PIU will provide a detailed implementation schedule (milestones and deadlines).	Incomplete
E-9	PIU will ensure in cooperation with the Ministry of Environment that Siirt dump site is rehabilitated and replaced by a new one complying with Turkish Standards.	Incomplete
E-24	The PIU will submit an acceptable EMP/EAP covering the construction and the operational phase. This EMP/EAP will clearly identify the impacts of the project, necessary actions and mitigation measures to be taken, time schedule for measures and the entities responsible for their implementation as well as the required budgets. For measures that are outside the scope or the competence of the PIU, PIU will provide commitments of the responsible institutions. (a) Framework EMP for construction and operational phase defining parts of overall project (works, activities etc.) for which Sub-EMPs will be provided, date of providing Sub-EMP, date of respective works/activities to start etc. (b) Detailed Sub-EMPs (details as described under task)	Incomplete
E-25	PIU will submit updates of EMP when necessary (to be decided by CoE) or when there are substantial changes in the EMP.	n/a
E-26	PIU will implement the Ilısu project in compliance with the EMP/EAP (Sub-EMPs) and the time schedules given in the EMP/EAP. PIU will immediately inform CoE in case of deviation from or incompliance with EAP/EMP or any incompliance with TORs	n/a
E-27	PIU will update the budget plans for the project to include all tasks described in the TORs of PIU and CoE.	n/a
E-28	The PIU will conduct a monitoring program of water quality in Tigris and its tributaries and in the reservoir. Parameters to measure, points of measuring, frequency to be determined in cooperation with CoE.	Partially made, needs improvement as explained earlier
E-35	PIU will regularly inform the CoE on the implementation of the EAP/EMP, especially on the work progress/implementation of: • construction of WWTP • measures to implement BMP in irrigation and manuring • additional mitigation measures to enhance water quality, in case of negative, trophic situation in the reservoir after commissioning • Rehabilitation of dump sites in project area, mitigation measures to reduce risk from dump sites, rehabilitation of Siirt dump site and implementation of new dump site according to Turkish standards. • measures to prevent increase of water borne diseases and the Prevention Program for HIV/AIDS PIU will immediately inform CoE on any deviation from plans or incompliance.	Incomplete
E-36	PIU will regularly inform the CoE on the monitoring results of: • water quality in Tigris, its tributaries and in the reservoir • water flow • Monitoring of fauna/eg. bird species after commissioning	n/a

	• aquatic ecosystem and the fish population after commissioning • development of relocated flora and fauna species in their new habitats • malaria and other water borne diseases in the project area. PIU will immediately inform CoE on any deviation from plans or incompliance.	

3.4 Conclusions and Recommendations

- It was not possible to visit Siirt area during this site visit. There is a need for Environmental "Water Quality" CoE to visit the Siirt area.

- The Batman WWTP project should be reconsidered and corrected. A WWTP capable of removing C, N, and P should be constructed.

- The Diyarbakır WWTP is one of the main point sources of pollution in the area. The treatment plant should be upgraded.

- A proper WWTP is under construction in Siirt. The plant will remove C, N, and P and the municipality will be able to finance the operation and maintenance costs of the WWTP.

- DSI is measuring important water quality parameters at numerous points along the Tigris River. Additional parameters such as TKN need to be measured.

- Most of the TORs have not been accomplished.

- It is recommended that DSI transfer the responsibility of carrying out the details of the TORs to one or more private companies. DSI should also form a group dedicated solely to the Ilısu project.

4 BIODIVERSITY AND RELATED ASPECTS

4.1 Priorities

For the SC-E Biodiversity, the priorities were clearly two-fold, namely:

- having discussions with PIU-E on the relevant TOR, and especially on the implementation of the ones previously identified as urgent; and
- getting a first direct impression of the project area by means of field visits, this mainly in view of being better able to understand potential impacts on biodiversity and the related mitigation measures.

Both of these main aims were accomplished, in spite of the fact that the season (December) was probably the least suitable one for the second point, namely the insight into habitats of the project area. Still, as a first site visit, and with the reservations made above, it can be said that it was very useful, and important to do.

4.2 The Site Visit

4.2.1 Information Obtained

The Experts understand that PIU was – or still is – in the process of being set up and starting to function, and that at the moment of the site visit and in the time before this visit there was not yet a really functioning PIU in place. This also explains the fact that no information was obtained on beforehand, despite of the fact that on the occasion of the Zurich meeting held in October 2007 it had been agreed that specific information, mainly the draft scope of work for the biodiversity studies, would be submitted to the Expert before the December site visit.

4.2.2 Contacts with PIU

Several meetings were held during the site visit with the PIU-E, and specifically with the specialists within this group dealing with biodiversity issues, and a number of topics were discussed during the field visits to different parts of the project area.

4.2.3 Field Observations

As mentioned above, the season was not ideal for making any biodiversity related field observations. On the other hand, is also has to be pointed out clearly that the purpose of this visit was merely to get a first own impression, and not to carry out any biological field work; for this, the time spent in the field would have been too short in any case, and besides this is clearly not the obligation of the CoE.

Nevertheless, the site visit was very useful. It allowed to confirm the following:

- The most important habitat types within the reservoir area are riverine habitats on the one hand (wetlands and floodplains associated with the river, sand and

gravel banks in river meanders, floodplain vegetation including all areas covered by, usually small, stands of bushland and forest) and the rocks and cliffs along the river, which can provide breeding sites for a number of species).

- The largest parts of the future reservoir are agricultural areas; while biologically much less diverse than the more or less natural habitats mentioned, they can still provide suitable habitats for certain key species.

- Overall, the biodiversity value of the reservoir area is not made up by specific habitat types to be found within this area, but by the fact that this is a rather long stretch of a naturally flowing river, with its associated aquatic, semi-aquatic and terrestrial habitats, which shows little influence by human activities (no river training, fortified shorelines, straightening of meanders, etc.).

The biodiversity studies to be carried out will have to take these considerations into account.

One important fact could be verified on the occasion of the visit to the dam construction site (Ilisu Village and surroundings). Near this village, DSI has a small camp with one barrack with offices for the Ilisu construction work. So far, **no other work has been physically carried out on the ground for the construction of Ilisu dam as yet** (see Photos 3-5).

4.3 Comments by TOR

As has been said, all E-TORs were commented, and grouped according to the priorities. This list is provided in Annex A2.2.

In a first meeting with PIU-E, all the "biodiversity"-TOR were addressed and discussed briefly; however, only those identified as requiring urgent action were then discussed in detail. These priority TOR and the discussions held are described in some more detail in the following paragraphs.

4.4 Priority TORs

Those E-TORs which were identified as being of high priority were discussed in detail with the PIU-E. They, along with the results of these discussions, the conclusions reached and the recommendations made are dealt with hereunder.

4.4.1 TOR E-13: Terrestrial Biodiversity Survey

A survey of key species of terrestrial fauna and flora has to be carried out as part of the obligations taken by DSI during the FAM meeting.

In order to fulfil this task, the study must cover an entire year cycle for being able to detect all the key species. The most important season is spring and early summer (flowering phase of many plants, breeding season of most animal species). The other seasons must be covered as well, since otherwise some potentially important species (plants flowering at other seasons of the year, migrating animal species) might go undetected.

Since the study should also provide at least some information on the pre-construction conditions, field work needs to start in March 2008 in order to cover the last pre-construction spring (main works being scheduled to start in October 2008, or possibly as early as May 2008). This is important for the dam site and its immediate surroundings, while impacts on terrestrial habitats in the remaining parts of the reservoir area will start to be felt only at a later stage.

DSI has decided (and this was discussed already during the October 2007 meeting in Zurich) to mandate a private consulting company with carrying out this study. Given the time constraints mentioned above, it is clear that a corresponding contract has to be awarded in January 2008, in order to give this company at least a little bit of time for preparing the field work, which has to start in early March 2008. At the start of the site visit, no scope of work was available yet for this study. In an attempt to still make it happen on time, it was agreed that the biodiversity expert would provide input for this topic, to be discussed during the site visit. The draft scope of work prepared by the expert and handed over to and discussed in detail with PIU-E on December 11 is given in Annex A4.

It was agreed with PIU-E that based on this input and discussion they would prepare their scope of work for this study in December, for being able to negotiate a corresponding contract in January 2008.

Accordingly, a Draft Scope of Work, integrating the terrestrial fauna and flora survey with the fish survey (see below) was received from PIU on December 18, 2007, and commented by the expert for finalisation.

4.4.2 TOR E-16: Aquatic Biodiversity Survey and Monitoring

As for the terrestrial fauna and flora, a survey of the aquatic biodiversity has to be carried out. However, in comparison to TOR E-13 there are two very important differences where this aquatic survey is concerned:

- It is not only a survey, but contains a monitoring component, which will have to be carried out during the entire construction period and will be extended into the starting phase of the operation period.

- The TOR specifies that the monitoring must cover the pre-construction, construction and operation phase.

These differences are justified by the fact that at the start of the main construction work, changes may happen in the river which have to be covered by the monitoring program. The PoE was informed that the intention is to start work on the diversion tunnels in May or June 2008. Since this requires, first of all, protective dams in front of the tunnel entrances, this has to be considered as the start of major work potentially influencing the river. In order to have at least some baseline information, it is therefore absolutely required that at least this last spring of 2008 is being covered by the monitoring program, which must comprise a biological (fish species present) and a water quality (frequent, and if possible online, measurement of a few relevant water quality indicators upstream and downstream of the construction site) component.

It is important to point out clearly, as was said on the occasion of the site visit wrap-up meeting in Ankara on December 10, 2007, that a **failure to start these investigations in early March 2008 as the latest could mean that the start of construction work would need to be postponed by one year** in order to meet the FAM requirements. This makes it clear that **the aquatic biodiversity survey is on the critical path for the entire project**.

Since here again no concept for this study and monitoring program had been prepared on beforehand by PIU, it was again agreed that the biodiversity expert would provide input by drafting a monitoring program. This was also handed over to and discussed with PIU on December 11, 2007 (see Annex A4).

As mentioned above, the scope of work as submitted to the expert for comments on December 18, 2007, integrates terrestrial and aquatic survey into one contract. This is feasible as long as it is made clear to the contractor of this study that the two programs have to run in parallel, and that especially the aquatic monitoring program has to start early.

4.4.3 TOR E-19/20/21: Diseases

The subjects covered here are risk of waterborne diseases (E-19), malaria in the wider project area (E-20) and prevention programs for malaria and HIV/AIDS. Concepts and plans for coping with these TOR must be defined before the start of major works.

At the time of the site visit, no preparation for these plans etc. had been made yet.

Work on these topics must start soon in order to have the relevant plans in place before the start of major works. Input from external experts might be required (e.g. for the HIV/AIDS prevention plan, which is a new and potentially sensitive topic to be dealt with adequately).

4.4.4 TOR E-24: EMP

According to this TOR, required sub-EMPs must be ready **"not less than 3 months before actual work starts"**. From this condition, it is clear that this is a high priority issue, since actual work is scheduled to start in May or June and no additional work has been done on these plans so far.

It is of high importance that this work starts as soon as possible. Draft sub-EMPs must be ready and submitted to the SC-E before the next site visit, which is tentatively scheduled for late April or early May 2008.

4.5 Conclusions and Recommendations

The following are the main conclusions and recommendations concerning E-TOR (biodiversity and related aspects) resulting from the first site visit carried out in December 2007:

- PIU-E must have the required staff, budget, capacity (liberation from other duties) and competence (to make decisions) for carrying out the important work

assigned to it. This is a conclusion reached for PIU-E, but equally applicable to PIU as a whole, since other experts and sub-committees have come to the same conclusion. Without a strong and capable PIU in place it is difficult to see how DSI could possibly comply with the obligations taken during the FAM-meeting. Institutional strengthening and capacity building of and within PIU must be seen as a priority measure, since the implementation of all other measures, irrespective of the subject, depend directly on it. See to this also the recommendations of the other Sub-Committees.

- Biodiversity surveys (TOR E-13 and E-16): it is of utmost importance that these studies start in early March 2008. With the preparation for the scope of work for these studies accomplished during the site visit and subsequently by PIU (draft submitted to and commented by the expert on December 18, 2007), timely allocation of this assignment to a suitable consulting company is possible (aim: January 2008). In this case, preparation for field work can start in February, so that field work can actually start in early March 2008. In this way, the tight time schedule (start of surveys before start of major construction works) can still be met. **It should be noted that these studies are on the critical path of the project**.

- EMP sub-plans (TOR E-24): at lest the most critical ones related to activities on the construction sites (waste water treatment; storage and handling of hazardous substances for prevention of water pollution; solid waste management; worker's health management plan) must be ready before start of the main construction work. Here as well, the time schedule is very tight and work must start immediately. The draft plans have to be ready and sent to the CoE for comments before the next site visit of the SC-E, tentatively scheduled for April or early May 2008. **These plans are also on the critical path of the project**.

- Health related plans (TOR E-19/20/21): since some of these plans have to be in place at the start of the main construction work, this issue also has to be dealt with rapidly. It might be advisable to seek input from a qualified specialist in the field, especially for the preparation of the HIV/AIDS prevention plan.

4.6 Additional Observations Based on Field Visit

During the site visits, the SC-E experts had the occasion to obtain a first direct impression from the project area. A few topics which were observed during these visits are mentioned here, without (at least for now) directly deriving recommendations from them.

- Topsoil: the reservoir area is mostly used for agriculture. In some areas, topsoil layers seem to be rather thin and stony, but in many places topsoil layers are very thick and the soils seem to be very fertile (see Photo 20). For resettlement purposes, especially if terraced fields should be prepared at elevations above the future reservoir level, it might be worthwhile to investigate the feasibility of transporting fertile topsoil from fields which will be submerged to such newly created fields.

- Hasankeyf caves as shelters for bats: one characteristic feature of Hasankeyf are the very numerous caves within and near the city (see Photos 10-15). To a great extent they originally served as living spaces for inhabitants of the area. Today, only very few of them are still inhabited (see Photo 12), many serve as storage rooms. A high percentage of these caves will be submerged by the reservoir impoundment. There is concern that through this impoundment important roosting places for several bat species, or even entire bat colonies, might be wiped out. During the site visit, a number of such caves were visited, and it became clear that most of those caves which were excavated artificially and served as human habitation are not suitable for bats, since they are generally not deep enough, the walls are too smooth, and there are no hiding places for bats (see Photo 13). However, this was by no means a systematic search, and it is probable that there is a number of places which provide suitable conditions for bats. This could also include some rare and endangered species. A more thorough investigation should be made as part of the fauna survey.

- Project-induced environmental effects not considered so far: for security reasons, a number of military positions are being built in the vicinity of the dam construction site (see Photo 8). According to information obtained, the aim is to have the construction site surrounded by such positions in order to protect it. These installations have not been mentioned in the studies (EIA) carried out until now, and most probably they were not part of the project. However, if they are really directly caused by and implemented for the project, they should be considered as part of the project, and their impact should be assessed.

- One general observation made throughout the project area, is the fact that waste is being deposited in an unorganised manner everywhere, especially near houses (see Photo 2). In order to prevent massive water pollution at the moment of reservoir impoundment, waste management in the area should be organised and improved. This should be coupled with an environmental awareness program for reducing indiscriminate littering.

ANNEXES

A1 COE ISSUES

No entries on this page

A2 SC-E

A2.1 List of Participants, SC-E

Name	Organisation	Position in Project
Özlem Akyel	Çev.Or. Bak.	PIU-E
Veysi Kanat	DSİ	PIU-E
Reyhan Eyrice	NC	Consortium
Meral Elverdi	TKB	PIU-E
Fikriye Baltacı	DSİ	PIU-E
Ercan Direkçi	DSİ	PIU-E
Ersin Biltekin	Çev.Or. Bak.	PIU-E
Ramazan Kılıç	DSİ	PIU-E
Cahit Şener	DSİ	PIU-E
Abdurrahim Kartal	DSİ X. Bölge	PIU-E
Ömer Akgiray	Marmara Uni.	CoE-E
Ahmet Samsunlu	İTÜ	CoE-E
M. Sait Tahmiscioğlu	DSİ	PIU-E Chairman
A. Mete Saatçi	Marmara Uni.	CoE-E Chairman
Robert Zwahlen	Pöyry	CoE Chairman
S. Pelin Celtemen	DSİ	PIU-E
Nermin Anul	DSİ	PIU-E
Dilek Güler	DSİ	PIU-E
M. Suphi Özer	GAP-BKİ	PIU-E
Seyfi Parlak	DSİ X. Bölge	PIU-E
İzzet Karacagil	Dolsar	Consortium
Cihan Özcan	Rast Müh.	Consortium
Britta Lammers	Pöyry Energy Ltd.	CoE-E

A2.2 Meetings Held

Table A2-1: Short accounts of meetings

Date	Persons met	Venue	Met by	Main Topics / Observations
03.12.2007	General Meeting of All Groups	Hotel Asko	General Groups Meeting	Introduction & General Evaluation
04.12.2007	Meeting with PIU and National Experts	Hotel Asko	Environment /Water Quality Group	Review of the ToR. Explanation of the water group items to PIU; separate meeting for biodiversity issues.
04.12.2007	Meeting with the Governor of Batman: Recep Kızılcık	Governor's Office	All Groups	Review & information exchange on the Ilısu Project
04.12.2007	Meeting with the Mayor of Batman: Hüseyin Kalkan	Mayor's Office	All Groups	Review & information exchange on the Ilısu Project
05.12.2007	Visit Garzan Zone	N/A	All Groups	Investigated the sites that will be flooded by the Dam and the crop types
05.12.2207	Chief Engineer of Batman Municipality	Batman Municipality Office	Environment /Water Quality Group	Went through the feasibility and reports of the design of Batman's WWTP
05.12.2007	Staff of the Ministry of Agriculture: Cemal Tüzün	Local Office of the Ministry of Agriculture	Environment /Water Quality Group	Collected data on the types of crops , fertilizer types and sites irrigated applied in the region
06.12.2007	Hasankeyf Site visit	N/A	All Groups	Observed sites that will be evacuated and flooded

Date	Persons met	Venue	Met by	Main Topics / Observations
06.12.2007	Mufti of Hasankeyf	Hasankeyf	CoE/PIU delegation	Discussed project and importance for the region.
06.12.2007	Mayor of Hasankeyf	Mayor's Office, Hasankeyf	CoE/PIU delegation	Discussed project and importance for the region.
06.12.2007	Bismil Municipality: Mayor Şükran Aydın and Municipalities chief Engineer: İrfan Aydın	Bismil Municipality	Enviroment/Water Quality Group	Collected data on the population, wastewater disposal and solid waste disposal.
06.12.2007	Staff of the local Office of the Ministry of Agriculture: Savaş Özgül	Local Office of the Ministry of Agriculture	Environment/Water Quality Group	Collected data on crop types grown, irrigated sites and the type of fertilizers used.
06.12.2007	Silvan Municipality Visit	Silvan Municipality	Enviroment/Water Quality Group met with Technical Staff : İbrahim Baykara	Collected data on the population, wastewater disposal and solid waste disposal
06.12.2007	Staff of the local Office of the Ministry of Agriculture of Silvan: Sait Güzel	Local Office of the Ministry of Agriculture of Silvan	Environment/Water Quality Group	Collected data on crop types grown, irrigated sites and the type of fertilizers used.
06.12.2007	Environment/Water Quality Group	Hotel Asko	Environment/Water Quality Group	Summarized the results of the visits

Date	Persons met	Venue	Met by	Main Topics / Observations
07.12.2007	Tupraş Petroleum Refinery Plant WWTP engineering staff: Mehmet Ali Ucuz	Tüpraş Petroleum Refinery Plant WWTP	Environment/Water Quality Group	The two WWTPs were visited and the effluent quality values were checked.
07.12.2007	Staff of DSI headquarters in Diyarbakır	DSI headquarters in Diyarbakır	Environment/Water Quality Group	The water sampling stations of DSI in the region and other data were obtained
07.12.2007	Staff of the local Office of the Ministry of Agriculture of Diyarbakır	Office of the Ministry of Agriculture of Diyarbakır	Environment/Water Quality Group	Data on irrigation zones types of crops, and the amount of fertilizers used were obtained.
07.12.2007	Environment/Water Quality Group	Hotel Asko	Environment/Water Quality Group	Evaluation of the visits made
08.12.2007	Environment/Water Quality Group	Diyarbakir WWTP	Diyarbakır WWTP engineers	Data was obtained on the operation and design of the Diyarbakir WWTP.
10.12.2007	Site visit evaluation meeting; representatives of DSI and involved Ministries, ECAs, and of the embassies of Switzerland, Austria and Germany	DSI	Entire CoE	Morning session: presentation of main findings of site visit Afternoon session: detailed discussion of pending issues
11.12.2007	PIU-E, Biodiversity group	DSI	SC-E, biodiversity expert	Presentation and discussion of draft biodiversity study scope of work

A2.2 E-TOR: Commented List

No.	Task PIU		Task CoE	CoE	Comment and Priority[1]
E -1	The PIU will submit detailed information on the 3-staged waste water treatment plants (WWTP) to be built in the project area. This includes: Name of city; capacity of the plant; start and end of construction period; start of operation; effluent characteristics; capital costs of plant; sponsor of plant; operational cost	EC-1A	A) CoE will review the information of PIU on the process selection and construction of waste water treatment plants (WWTP). B) CoE will regularly check on the work progress made in constructing the WWTPs and whether the project is in compliance with the time schedule provided by PIU.	Saatci	E-1: Completion before final commitment EC-1AA: Completion before final commitment EC-1AB:Completion before impoundment starts EC-1A: Report on completed construction at latest 1 month after completion and at least 11 month before start of impoundment
		EC-1B	a) CoE will regularly review the performance data of WWTP obtained from the municipalities through PIU via their members on the CoE. b) When WWTP operators deem their WWTP to be operational and fully functional, CoE will check performance of plants (effluent quality) and will signal to ECAs and PIU if compliance with required effluent values has been achieved.		EC-1B Commencement after start of operation of WWTP EC-1BA: Annual review EC-1BB: Confirmation of performance status: within 10 days of receipt of data
E-2	PIU will secure that the 3-staged WWTPs in Diyarbakir, Siirt and Batman are in operation, fully functional and meeting the designed effluent values before reservoir impounding starts. Construction of the WWTP will be completed 1 year before impoundment starts.			Saatci	E-2: Construction completed 1 year before impoundment starts; Completion before reservoir impounding starts
E-3A E-3B	The PIU will submit an estimation of water quality (based on simple mass balance) taking into account the 3-staged WWTP in Diyarbakir, Siirt and Batman, growth of population and future developments in irrigation (e.g. increase in irrigated area) in the project area The PIU will submit the results of a modelling of future water quality and stratification of the reservoir taking into account the 3-staged WWTP in Diyarbakir, Siirt and Batman, growth of population and future developments in irrigation (e.g. increase in irrigated area) in the project area.	EC-2	CoE will review the rough estimates and the results of modelling of water quality in the reservoir submitted by PIU at different stages of the development of the model (calibration, verification, and prediction). If modelling of future water quality and stratification of the reservoir shows that water quality is not acceptable even with the 3 WWTP planned, the CoE will assist PIU in developing appropriate mitigation measures. CoE will regularly check on the progress of implementation of measures.	Saatci	E-3A: Completion before final commitment E-3B:Up to 3 Years from final commitment EC-2: Completion before final commitment

No.	Task PIU		Task CoE	CoE	Comment and Priority[1]
E-4A E-4B	PIU will provide confirmation that final design of the HEPP will include variable water intake. PIU will evaluate and implement appropriate mitigation measures, in case the rough estimate or the modelling of future water quality and stratification of the reservoir (ref. 3A and 3B) shows that water quality is not acceptable even with the 3 WWTP planned.			Saatci	E-4A: Completion before final commitment E-4B: Commencement asap; Evaluation of measures within 2 months of rough estimate or modelling has shown that water quality will not be sufficient. Completion: Implementation of Measures: within 2 years from evidence (estimate or model)
E-5	PIU will ensure the implementation of the necessary additional mitigation measures to enhance water quality, in case of negative, trophic situation in the reservoir after commissioning.	EC-3	In case of negative, trophic situation in the reservoir after commissioning, the CoE will assist PIU in developing appropriate mitigation measures. CoE will regularly check on the progress of implementation of measures and whether the project is in compliance with the implementation schedule provided by PIU.	Saatci	E-5: Commencement immediately after evidence Completion: Report on measures to ECAs: within 2 month after information on negative water quality was identified Implementation time schedule: in agreement with ECAs and CoE EC-3:Commencement immediately after evidence and completion at the end of repayment period
E-6	The PIU will report periodically on the irrigation in the catchment area of Ilisu reservoir, especially on any plans to extend the current irrigation area of 64.000 ha.	EC-4	CoE will review reports from PIU on irrigation in catchment area of the Ilisu Project and immediately inform ECAs in case of extension of irrigation area.	Saatci	**E-6 / EC-4: First Report by 2. quarter 2008, yearly reports during life span of project**
E-7	The PIU will make sure that Best Management Practice (BMP) for agriculture as described on pages 16-22 in the „Answers to the ECAs matrix concerning UEIAR and EAP“ are applied in irrigation and manuring in the project area in case of an increase in irrigated area. PIU will provide a plan of activities foreseen to implement BMP and a detailed implementation schedule (milestones and deadlines).	EC-5	CoE will assist PIU/GAP in developing Best Management Practice (BMP) for agriculture, in case of increased irrigation in project area. CoE will regularly check on the progress of implementation of measures and whether the project is in compliance with the implementation schedule provided by PIU.	Saatci	E-7 / EC-5: Commencement immediately after evidence. Implementation schedule 2 months after evidence of increase of irrigation area. Completion: Increase becomes known before impoundment: BMP in place before impoundment; Increase becomes known after impoundment: within 2 years after evidence.

No.	Task PIU		Task CoE	CoE	Comment and Priority[1]
E-8	PIU will submit an inventory of the wild dump sites in the reservoir area and its periphery and provide a plan of ecologically meaningful and economically viable measures to prevent that leachate or waste from such dumps enter Tigris, its tributaries or the reservoir and implement such measures. PIU will provide a detailed implementation schedule (milestones and deadlines).	EC-6 EC-7	The CoE will assist PIU in developing measures to prevent that leachate from waste dumps enter Tigris, its tributaries or the reservoir. CoE will regularly check on the work progress made in implementing the mitigation measures under Item 6, the rehabilitation of Siirt dump site and whether the project is in compliance with the time schedule provided by PIU.	Saatci	**E-8: Commencement asap. Inventory: commence 2 months after final commitment.** Completion: Plan of measures (incl. implementation schedule): 3 years before start of impoundment. Implementation: 2 years before reservoir impounding starts EC-6: Commencement: when inventory is completed. Plan of measures: 3 years before start of impoundment Completion: Implementation of measures: 2 years before reservoir impounding starts. EC-7: Commencement: asap. Completion: 3 months after provision of documents by PIU
E-9	PIU will ensure in cooperation with the Ministry of Environment that Siirt dump site is rehabilitated and replaced by a new one complying with Turkish Standards.			Saatci	E-9: Commencement asap. Implementation plan: 2 years after final commitment. Completion: before reservoir impounding starts
E-10	The PIU will ensure that the minimal water flow (measured at a suitable point at close distance to the power plant) of 60 m3/s during impoundment and operation phase is maintained at all times (not only during operation of the turbines). When the responsibility of operating the plant is transferred to EUAS (or any other entity designated to operate the plant) PIU will ensure by suitable contracts, treaties or similar that this obligation is passed on to this entity	EC-8	CoE will regularly check the monitoring results of water flow.	Zwahlen	C: E-10: Commencement: start of impoundment C: Completion: Through out life time of HEPP C: EC-8: Commencement: start of impoundment. C: Completion : End of repayment period

No.	Task PIU		Task CoE	CoE	Comment and Priority[1]
E-11	The PIU will ensure that the time of zero flow during impoundment is kept to a minimum and not more than 3 days. Start of impoundment will not be done in dry season. If start of impoundment is planned during dry season, PIU will install diversion pipe (or other appropriate measures) necessary to keep zero flow to not more than 3 days.	EC-9	The CoE will assist PIU in developing measures that are necessary to keep the time of zero flow during impoundment to a minimum, but not more than 3 days. CoE will check regularly on the work progress and implementation of measures.	Zwahlen	C: E-11: Commencement star of impoundment, in case measures need to be installed, before start of impoundment. C: Completion as soon as the reservoir reaches spilling level through bottom outlet C: EC-9: Commencement asap. C: Completion: End of impoundment
E-12	PIU will provide a comprehensible explanation or an expert's opinion that (a) the minimal flow of 60 m³/s over a longer period and (b) the phase of zero discharge during impoundment do not have severe downstream impacts on ecosystems and riparians.	EC-10	CoE will comment on PIU's explanation or expert's opinion that (a) the minimal flow of 60 m³/s over a longer period and (b) the phase of zero discharge during impoundment do not have severe downstream impacts on ecosystems and riparians.	Zwahlen	E-12 / EC-10: Completion before final commitment
E-13	PIU will submit an inventory of threatened and key species indicating: (i) exact distribution (in and around reservoir area), (ii) what the abundance is (i.e. importance for local or global population), (iii) what the habitat conditions at these precise sites are, (iv) what portion and parts of the habitat will be lost due to Ilisu dam and (v) if these species also live in nearby areas in a sufficient number as to guarantee the survival of the local population to ECAs and CoE.	EC-11	CoE will review PIU's inventory of threatened and key species and comment on the results (including information on distribution in and around reservoir area, importance for local or global population, habitat conditions, portion of the habitat lost due to Ilisu dam and survival of local population).	Zwahlen	A: **E-13: Commencement asap.** Completion: Comparative analysis of available, contradictory information: before final commitment A: **Inventory based on field survey: Start of Inventory March, 2008** A: EC-11: Review and comment to ECAs 1 month after completion of study. This mission: define scope of work

No.	Task PIU		Task CoE	CoE	Comment and Priority[1]
E-14	PIU will develop adequate mitigation measures (such as relocation, creation of new habitats, nesting and spawning areas etc.), based on conclusions of the inventory of threatened and key species. PIU will ensure that these measures are in place before reservoir impounding starts. PIU will provide a detailed implementation schedule (milestones and deadlines).	EC-12 EC-13	CoE will assist PIU in developing adequate mitigation measures (such as relocation, creation of new habitats, nesting and spawning areas etc.) based on conclusions of the inventory of threatened and key species. CoE will regularly check on the work progress of measures under EC – 12 (above) and whether the project is in compliance with the time schedule provided by PIU.	Zwahlen	C: E-14: Commencement after inventory. Mitigation measures and implementation plan to be developed 4 years prior to start of impounding. C: Completion: Implementation 3 years before reservoir impounding starts. Measures requiring the stable reservoir: implementation after the creation of stable reservoir C: EC-12: Development of mitigation measures 4 years before impoundment starts. C: EC-13: Completion of implementation
E-15	The PIU will submit the time of completion, duration, and budget plan for the survey on fish species.	EC-14	CoE will review and comment on time schedule and budget plan for the survey on fish species.	Zwahlen	E-15/ EC-14: Completion before final commitment

No.	Task PIU		Task CoE	CoE	Comment and Priority[1]
E-16	PIU will provide an intensive study as referenced in E-15 (e.g. under responsibility of the Dicle University) on the existing conditions of the Tigris fish species (including Cobitis Kellei) and the soft shelled turtle, a prediction of potential negative impacts and a documentation of the development of the aquatic ecosystem and the fish population after commissioning. The study will include mitigation and compensation measures in case of predicted severe decline. This study will deal with pre-construction, construction and operational phase	EC-15	CoE will review and comment on PIU's study (REF: E-16) on Tigris fish species and soft shell turtle dealing with current situation (baseline), prediction of impacts, developments in aquatic ecosystem and fish/turtle population and necessary mitigation measures.	Zwahlen	B: **E-16: Commencement asap.** B: **Completion: parts of the study dealing with current situation and the first prediction of impacts, and the necessary mitigation measures: 1 year after final commitment.** A: **This Mission: define scope of work** C: Rest: 5 years after impoundment (with yearly reports) C: EC-15: Commencement after completion of study. C: Completion: Review of/ comments on parts of the study dealing with current situation, first prediction of impacts and necessary mitigation measures: 3 months after completion of study. C: Rest: 5 years after impoundment, yearly 2 months after reports by DSI
E-17	PIU will submit a specific study to identify the most appropriate sites around the reservoir for relocation of plants and animals and for creating new habitats. Modification of already existing valuable habitats will be avoided.	EC-16	The CoE will assist PIU in identifying appropriate sites and measures for relocation of plants and animals and for creating new habitats and with the implementation of such measures. Note requires results from PIU TOR E-13	Zwahlen	C: E-17: Commencement asap. Completion: Identification of sites/ study: 3 years before start of impoundment C: EC-16: Commencement asap. Completion: Identification of sites/ study: 3 years before start of impoundment; Measures: 1 year before start of impoundment

No.	Task PIU		Task CoE	CoE	Comment and Priority[1]
E-18	Acquisition of such sites and implementation of protection measures will be done by PIU. PIU will ensure that sites are available and measures are in place before reservoir impounding starts. PIU will provide a detailed implementation schedule (milestones and deadlines).	EC-17	CoE will regularly check on the work progress made in acquisition of such sites and implementation of protection measures and whether the project is in compliance with the time schedule provided by PIU.	Zwahlen	C: E-18: Commencement after study (E-17). Implementation plan: latest 3 years before start of impoundment. Completion: Acquisition: 2 years before start of impoundment C: Measures: 1 year before start of impoundment. C: EC-17: Upon completion of implementation of measures, at latest 1 year before start of impoundment.
E-19	PIU will define measures and actions necessary for the assessment of water borne diseases.	EC-18	CoE will assist PIU in defining the measures and actions necessary for assessing the relation of malaria and other waterborne diseases in the project area.	Zwahlen	**E-19 / EC-18: Completion before start of main dam construction work. Start March 2008**
E-20	PIU will assess the occurrence of malaria and other water borne diseases in the project area in relation to the HEPP and provide information to the regional Health Authorities on the relevant findings. PIU will develop a catalogue of measures (prevention, education, health service etc.) to prevent an increase of water borne diseases in the project area before reservoir impounding starts.	EC-19	CoE will assist PIU developing measures (prevention, education, health service etc.) to prevent an increase of water borne diseases and HIV/AIDS in the project area.	Zwahlen	**E-20: Commencement: Assessment: start of main dam construction. Catalogue of measures asap** Completion: Assessment : after 3 year of operation Catalogue of measures: 6 month before impoundment **EC-19: before start of main dam construction**
E-21	Conducting a Prevention Programme for Malaria and HIV/AIDS.	EC-20	CoE will regularly check on the work progress of the Prevention Programme for Malaria and HIV/AIDS.	Zwahlen	A: E-21: Commencement: start of main dam construction. Completion: Through out life time of HEPP A: EC20: Commencement: Start of Prevention Programme Completion: End of repayment period
E-22	PIU will submit an updated Final Design Studies and a satisfactory Dam Safety Concept including emergency and evacuation plans.	EC-21	CoE will review and comment on the updated Final Design Studies and the Dam Safety Concept including emergency and evacuation plans and report to ECAs.	Zwahlen	C: E-22/EC-21: Completion at least 1 year before start of impoundment

No.	Task PIU		Task CoE	CoE	Comment and Priority[1]
E-23	PIU will conduct a topographical study to determine the ground elevation of houses in Tepe and – after consulting the affected people in Tepe - will identify necessary actions and protection measures to be implemented.	EC-22	CoE will review and comment on the topographical study on Tepe and will assist in identification of actions and protection measures to be implemented.	Zwahlen	B: E-23: Completion. 2 years before start of impoundment B: EC-22: Review and comments: 1 month after completion of study B: Identification/implementation of measures: at latest 2 years before impoundment starts. A: This mission check situation of Tepe in the field (involvement of SC-R)
E-24	The PIU will submit an acceptable EMP/EAP covering the construction and the operational phase. This EMP/EAP will clearly identify the impacts of the project, necessary actions and mitigation measures to be taken, time schedule for measures and the entities responsible for their implementation as well as the required budgets. For measures that are outside the scope or the competence of the PIU, PIU will provide commitments of the responsible institutions. (a) Framework EMP for construction and operational phase defining parts of overall project (works, activities etc.) for which Sub-EMPs will be provided, date of providing Sub-EMP, date of respective works/activities to start etc. (b) Detailed Sub-EMPs (details as described under task)	EC-23	CoE will assist PIU in preparing an acceptable EMP/EAP (Sub-EMP) covering the construction and the operational phase. This includes identifying the impacts of the project, necessary actions and mitigation measures to be taken, time schedule for measures and the entities responsible for their implementation as well as the required budgets. All mitigation measures listed in the UEIAR and in these TORs will be included in the EMP/EAP.	Zwahlen Saatci	E-24A before final commitment A: **E-24B: Start : March 2008. Sub-EMPs for individual stages of work/activities: in place not less than 3 months before actual work starts. "In place" meaning detailed EMP available, reviewed and approved by CoE. No work/activity will commence before the respective Sub-EMP is in place.** A: **EC-23: Sub-EMPs review 1 month after Sub-EMP has been provided by PIU** B: **Rest: to be updated when results of studies and measures are available.**
E-25	PIU will submit updates of EMP when necessary (to be decided by CoE) or when there are substantial changes in the EMP.	EC-24	CoE will decide on the necessity of EMP updates (except where completion of pending studies require updates in any case) and review any updates of the EMP and/or substantial changes in the EMP.	Zwahlen Saatci	B: E- 25/EC-24: When necessary B: Completion : End of repayment period of project
E-26	PIU will implement the Ilisu project in compliance with the EMP/EAP (Sub-EMPs) and the time schedules given in the EMP/EAP. PIU will immediately inform CoE in case of deviation from or incompliance with EAP/EMP or any incompliance with TORs			Zwahlen Saatci	B: E-26: Commencement: Immediately. B: Completion: End of repayment period A: This mission: discuss internal monitoring and reporting

No.	Task PIU		Task CoE	CoE	Comment and Priority[1]
E-27	PIU will update the budget plans for the project to include all tasks described in the TORs of PIU and CoE.				E-27: Completion before final commitment
E-28	The PIU will conduct a monitoring program of water quality in Tigris and its tributaries and in the reservoir. Parameters to measure, points of measuring, frequency to be determined in cooperation with CoE.	EC-25	CoE will check the monitoring reports of PIU on: ▪ water quality in Tigris and its tributaries and in the reservoir ▪ water flow ▪ time of zero discharge during impoundment ▪ fauna/eg. bird species after commissioning ▪ aquatic ecosystem and the fish population after commissioning ▪ development of relocated flora and fauna species in their new habitats ▪ malaria and other water borne diseases in the project area	Zwahlen Saatci	A: **E-28: Program definition 1st CoE site visit** Completion: Ongoing during guarantee period EC-25: Commencement : With submission of monitoring reports Completion: End of repayment period.
E-29	The PIU will measure the water flow (output at dam site or in short distance) daily.			Zwahlen	E-29: Commencement: Start of impoundment Completion: Ongoing during guarantee period
E-30	During impoundment PIU will record the time of zero discharge			Zwahlen	E-30: Commencement: Start of impoundment Completion: End of impoundment
E-31	PIU will monitor fauna (e.g. bird species) after commissioning			Zwahlen	C: E-31: Commencement: after commissioning C: Completion: Ongoing during guarantee period

No.	Task PIU		Task CoE	CoE	Comment and Priority[1]
E-32	PIU will monitor the aquatic ecosystem and the fish population after commissioning. Parameters to measure, key species, point of measuring, frequency to be determined in cooperation with CoE.			Zwahlen	C: E-32: Monitoring: After start of operation of the dam C: Completion: Establishing Parameters: 1 year before impoundment C: Monitoring: end of repayment period
E-33	PIU will monitor the development of relocated flora and fauna species in their new habitats. Monitoring period, parameters, frequency to be determined in cooperation with CoE.			Zwahlen	C: E-33: Commencement: Relocation, parameters: 6 months before relocation C: Completion: Ongoing during guarantee period
E-34	The PIU will conduct a monitoring program of malaria and other water borne diseases in the project area (ref also E- 20). Methods, parameters/indicators and frequency to be determined in cooperation with CoE.			Zwahlen	C: E-34: Commencement: With impoundment C: Completion: Ongoing during guarantee period

No.	Task PIU		Task CoE	CoE	Comment and Priority[1]
E-35	PIU will regularly inform the CoE on the implementation of the EAP/EMP, especially on the work progress/implementation of: ▪ construction of WWTP ▪ measures to implement BMP in irrigation and manuring ▪ additional mitigation measures to enhance water quality, in case of negative, trophic situation in the reservoir after commissioning ▪ Rehabilitation of dump sites in project area, mitigation measures to reduce risk from dump sites, rehabilitation of Siirt dump site and implementation of new dump site according to Turkish standards. ▪ measures to prevent increase of water borne diseases and the Prevention Program for HIV/AIDS PIU will immediately inform CoE on any deviation from plans or incompliance.	EC-26	CoE will regularly check on the implement/work progress of the Ilisu project and whether the project is in compliance with the EMP/EAP (Sub-EMPs) and the time schedules given in the EMP/EAP.	Zwahlen Saatci	B: E-35: Commencement: Implementation of EAP / AMP B: Completion: Ongoing during guarantee period B: EC-26: Commencement : Immediately after EMP/EAP (Sub-EMP) have been provided by PIU Completion: End of repayment period A: This mission: check and define internal monitoring and reporting

No.	Task PIU		Task CoE	CoE	Comment and Priority[1]
E-36	PIU will regularly inform the CoE on the monitoring results of: ▪ water quality in Tigris, its tributaries and in the reservoir ▪ water flow ▪ Monitoring of fauna/eg. bird species after commissioning ▪ aquatic ecosystem and the fish population after commissioning ▪ development of relocated flora and fauna species in their new habitats ▪ malaria and other water borne diseases in the project area. PIU will immediately inform CoE on any deviation from plans or incompliance.	EC-27	CoE will provide reports to the ECAs on work progress and implementation of mitigation measures, monitoring results (e.g. Water quality, water flow etc.), compliance with time schedules and EMP/EAP and any deviation or incompliance. Information on the different issues will be comprised in one quarterly report during construction and resettlement phase and an annual report during operation.	Zwahlen Saatci	A: E-36: Commencement with monitoring Completion: Ongoing during guarantee period A: EC-27: Commencement asap Completion: End of repayment period

[1] Priorities:

A: = high priority, to deal with during the Dec. 07 site visit
B: = medium priority, to check during the Dec.07 site visit
C: = low priority: no action to be taken now

A3 WATER QUALITY AND WASTE WATER

No entries on this page

A4 BIODOVERSITY AND RELATED ASPECTS

A4.1 Terrestrial Biodiversity (TOR E-13)

The following is a proposed draft Scope of work for the terrestrial biodiversity survey which has to be carried out according to TOR E-13, focussing on threatened and key species. TOR E-13 is and remains the main benchmark for this study.

1. Basis

The core obligation of the study is the field work to be carried out, since this type of site specific information is not available until now. Nevertheless, existing information has to be taken into account; this refers mainly to the GAP biodiversity reports and data base, but also to other institutions who might have relevant information (universities, NGOs like Doga Dernegi, etc.). However, it is crucial that field work will be carried out.

2. Timing

Basically, the study has to cover an entire yearly cycle, since some species are not present or not visible during all parts of the year (like migrating birds, plant species with short vegetation period, etc.).

Spring is the most important time for different reasons (suitable weather conditions, breeding season of many species). In order to cover at least one spring season before the start of major works, it is absolutely crucial for the field work for the study to start in early March 2008. Missing this could mean to lose a year.

3. Area

The study must cover the entire reservoir area and its surroundings. It is proposed that a strip of approximately 5 km around the reservoir is being covered; this can locally be narrowed or widened to some extent, taking into account the topography (immediate catchment area of the reservoir, presence of important habitats, etc.).

The area must be clearly identified and shown on a map of suitable scale.

4. Objects of the Survey

The TOR mention "threatened and key species" as the target of the survey. In order to do so, work is required in two directions, namely (i) focussing on key habitats and (ii) focussing on species.

4.1 Habitats

Key species can only live or survive in an area where their habitats are in the required conditions. For this reason, it is important to first identify and then provide information on key habitats. Such habitats are e.g. wetlands and floodplains (related to and influenced by the river, especially in wider parts of the valley, where the river forms several arms), rock faces (as nesting places for certain species), areas covered with forest or at least with higher tree density, etc. This is a provisional list and should be no

means be taken as final or comprehensive. It will be one objective of the survey to identify such habitats. The EIAR and other reports can be taken as a basis, the use of suitable satellite pictures is recommended. In view of the later need to specify compensatory measures it is important that information is available also on such habitats which will not be lost due to reservoir impoundment.

4.2 Species

It is clearly not possible to make an inventory of the entire fauna and flora, whence the limitation on threatened and key species. A definition for threatened species can be taken from the relevant red lists; key species need to be defined, and this should be done on the basis of existing information (see above). As a general definition, key species can be seen as species which are not necessarily threatened, but which are (i) indicator species for the condition of certain important habitats, (ii) especially abundant in the area of the study, without being ubiquitous, or (iii) have been discussed controversially in the context of Ilisu Project.

It is recommended to focus on the following groups, from which to identify threatened and key species:

- Birds (including resident as well as migrant species).
- Mammals (concentrating on larger species and potentially bats).
- Reptiles (coordination with survey of aquatic biodiversity required, e.g. for the case of *Rafetus euphraticus*, the soft-shelled turtle).
- Amphibians.
- Flowering plants.

Above, the importance of key habitats was mentioned, and the survey should focus on these. However, the rest of the study area, mainly agricultural land, should not be left out completely, since this can potentially be the habitat of important key species (e.g. *Otis tarda*, the Great Bustard).

5. Main Questions

The following main questions have to be answered by field work for the identified key species and their habitats:

- Distribution within the reservoir area and its surroundings.
- Frequency, numbers.
- Importance of study area (breeding habitat, feeding habitat, used shortly during migration, etc.).

6. Analysis of Findings

The analysis of the filed data will concentrate on the following questions:

- Importance of the study area for the species as such (marginal, core habitat, endemic species; in case of the use of the term "endemic" it should be pointed out clearly as to endemic to what this species is: to Turkey, to Anatolia, to the Tigris basin, to the Study Area, …).

- Importance of the affected population for the survival of the species, regionally and globally.

- Importance of mitigation measures.

Note that this list is not necessarily exhaustive.

7. Conclusions

Evaluation of the results has to been given for the following points:

- Severity of the impact.

- Need and possibility for mitigation and compensation measures (in general terms; detailed planning of these measures will be done in the next phase).

- Required monitoring (in general terms again).

8. Schedule and Manning

As mentioned above, the study needs to cover an entire year cycle. **It is important that field work starts in early March 2008.** If carried out and managed properly, data analysis and reporting can be done in parallel to the field work to a large extent, so that the report can be submitted about 2 months after the end of the field work (target date: end of April 2009).

Field work must be carried out by recognised specialists in their field. It is highly recommended that wherever possible local specialists (e.g. from universities in the area) should be included in the study.

A4.2 Aquatic Biodiversity (TOR E-16)

A draft proposal for monitoring of the aquatic ecosystem was discussed in Ankara on Dec. 11, 2007, according to the outline given below.

For monitoring fish species and their habitat, the following program is proposed:

The following transects are being monitored:

- a short stretch upstream of dam site

- a short stretch downstream of dam site

The following items are shall be monitored:

- Water quality: N, P, TSS, HC

- Primary production (Chlorophyll A)
- Macro-invertebrates
- Micro-invertebrates (plankton)
- Aquatic plants (also in wetlands)
- Fish biodiversity (species, abundance)
- Socio-economy (related to fishing, if of relevance)

Fish catch, in addition to this program, can also being monitored by interviewing fishermen on a regular basis (asking them about catch in species and numbers, weighing catch). This activity depends on the readiness of the fishermen to participate and provided there are people in the area for whom fishing is a relevant part of the income.

The purpose of this program is to monitor changes during and after construction. The surveys at the selected sites should be carried out quarterly.

The survey program must start before the beginning of the main construction work and must be carried on during the entire construction period.

Water Quality Monitoring

In addition to this quarterly survey program, a specific water quality monitoring is being proposed as follows:

- Monitoring of two sites (1 upstream of the site, 1 downstream of the site, a short stretch d/s of the lower coffer dam.
- Monitoring of profiles across the river at these two sites.
- Monitoring carried out on 4 days per week.
- Parameters monitored: TSS, DO, T (°C), conductivity, pH.

A5 PHOTOS

All the pictures on the following pages show the situation as of early December 2007.

Photo 1: Dam site with Ilisu village

The village is located on the right bank of Dicle (Tigris) river and almost exactly on the dam axis. The arrow indicates the left bank dam crown abutment.

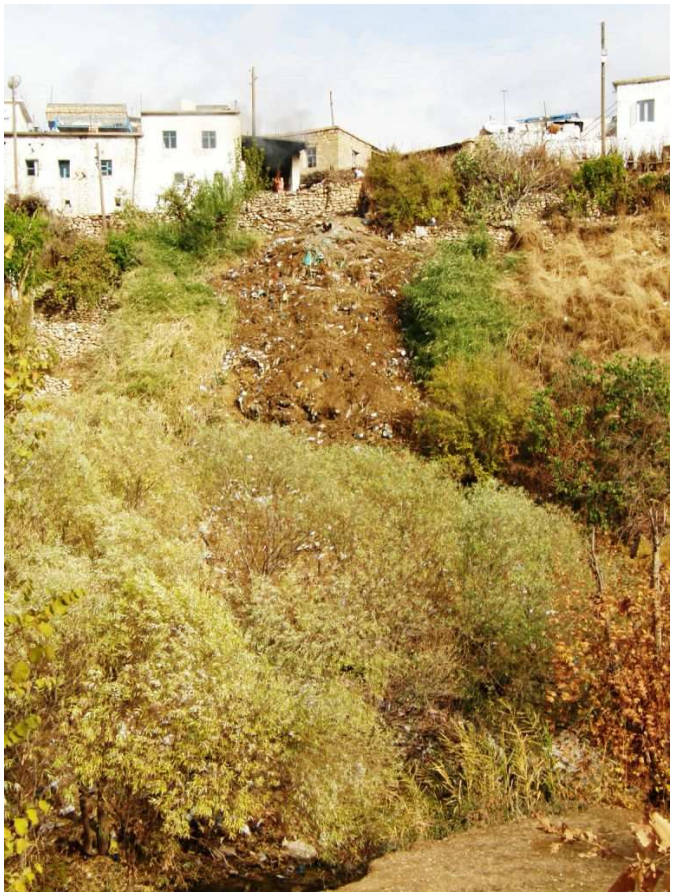


Photo 2: Ilisu village

As everywhere in the project area, waste disposal is a problem, which has become more severe with the increased use of plastic and other not easily degradable material.

Photo 3: Ilisu dam site
Seen from a short stretch downstream of the future dam. The arrow indicates the left bank dam crown abutment. No work on the site has started as yet.

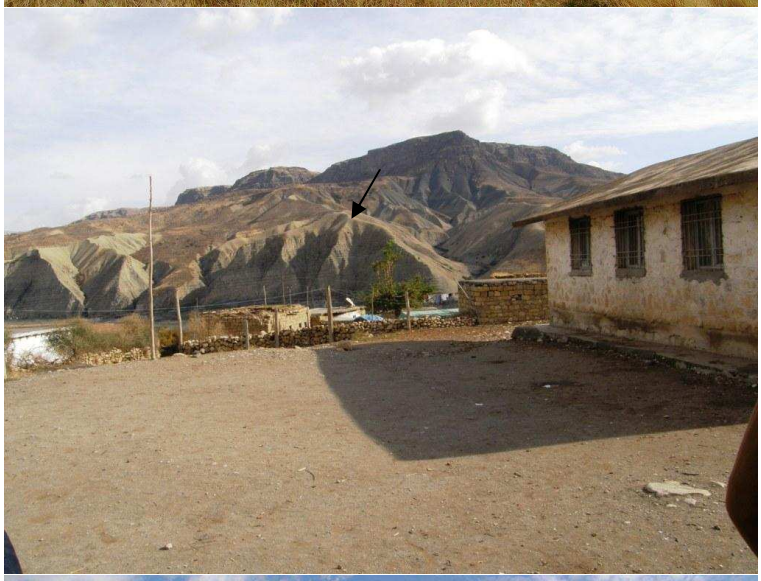


Photo 4: Ilisu dam site
Dam axis seen from the school yard of Ilisu village, which is located on the dam axis. The arrow indicates the left bank dam crown abutment.

Photo 5: Ilisu construction site
The first office barrack with the information sign post, located a short distance downstream of Ilisu village, so far is the only visible indication of the work starting on site. The arrow indicates the left bank dam crown abutment.

Photo 6: Oak grove near Ilisu

In the entire project area, forests are virtually absent and stands of trees, as this oak (*Quercus cf. ilex*) grove a few hundred meters downstream of the dam site are rare. They are ecologically important. That these trees have not been cut might be related to the fact that the grove is used as cemetery.

Photo 7: Gorge downstream of dam site

A short stretch downstream of the dam site the river enters a gorge. At the time when this picture was taken, about 400 m^3/s of water were flowing in the river. This shows that the 60 m^3/s defined as minimum flow during impoundment and operation will have to be strictly observed.

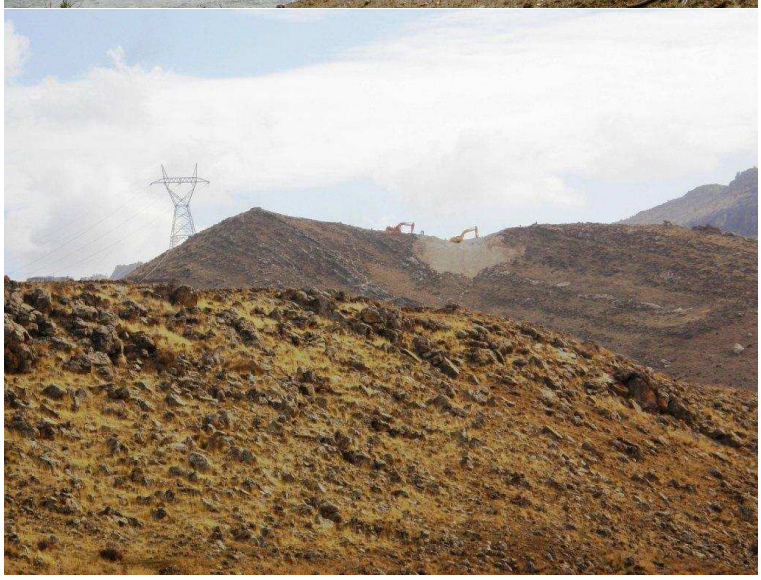


Photo 8: Project induced activities

In the surroundings of the future dam construction site, military posts are being built with the aim of providing protection to the construction site.

Photo 9: Hasankeyf
Seen from the left bank of Dicle River. The full supply level of the reservoir will reach to within a few meters of the top of the nearer minaret.

Photo 10: Hasnkeyf
Seen from the old city castle. The caves on the left river bank are mainly being used as "summer houses".

Photo 11: Hasankeyf caves
Looking away from the river.

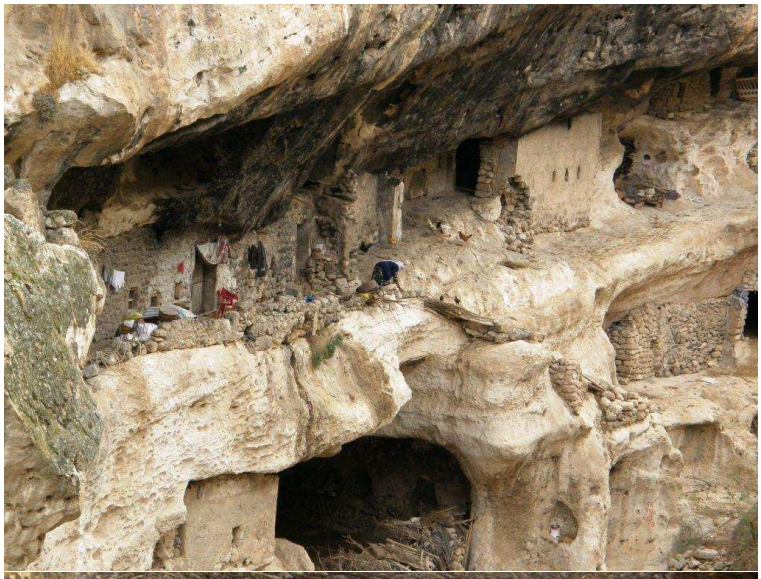


Photo 12: Hasankeyf caves
Only few of the caves are still inhabited today, as the one on this picture.

Photo 13: Hasankeyf caves
This cave was inhabited by a family of about 10 until about 10 years ago. As is the case for other man- made caves, the walls are smooth and do not show any cracks etc. that could be used by bats.

Photo 14: Hasankeyf caves
Recently, some of the caves (fortunately no longer inhabited at that time) have collapsed.

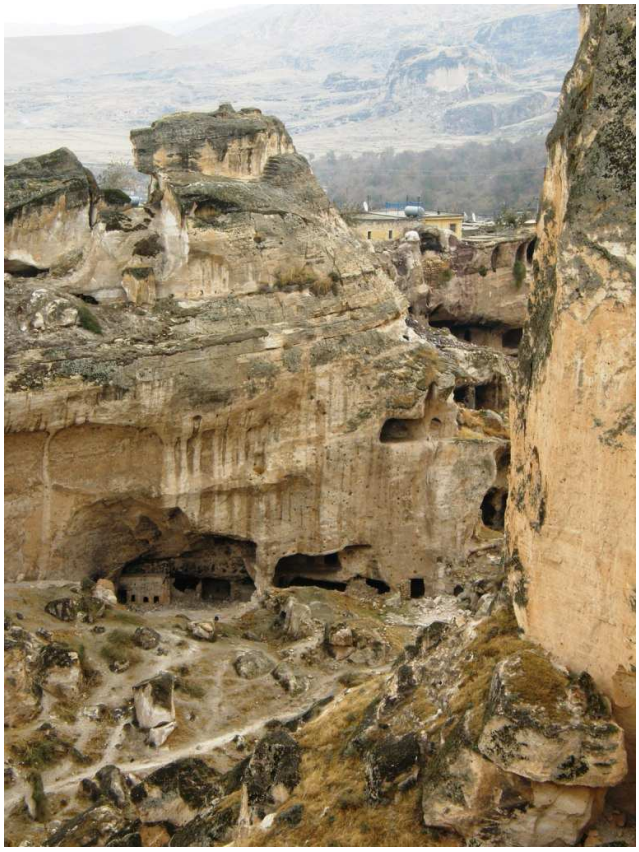


Photo 15: Hasankeyf caves

While no longer inhabited, many of the caves are still being used as storage rooms or as shelter for animals.

Photo 16: Ancient cave church, Öymatas

This cave in Öymatas village, on Dicle river between Batman and Bismil, was originally excavated as a church. Today, it is still used as a storage room.

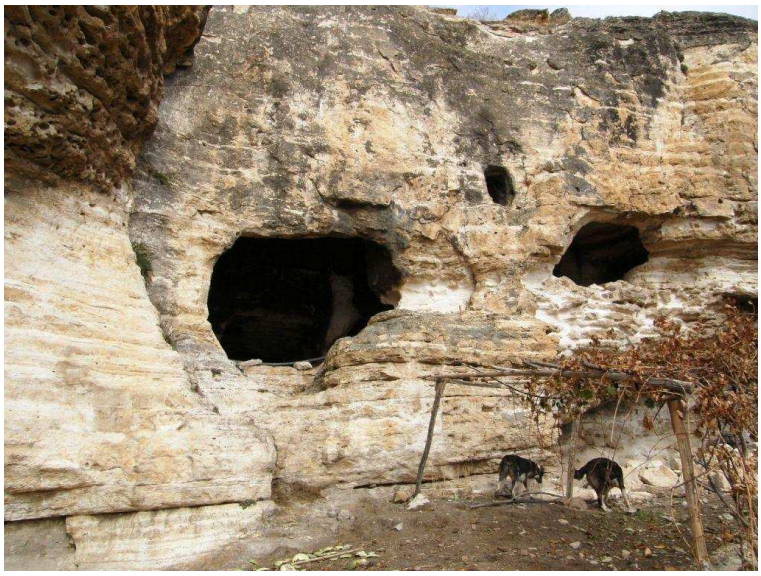


Photo 17: Ancient cave church, Öymatas

Small ancient cave church (see Photo 16 for a view of the interior) in Öymatas village.

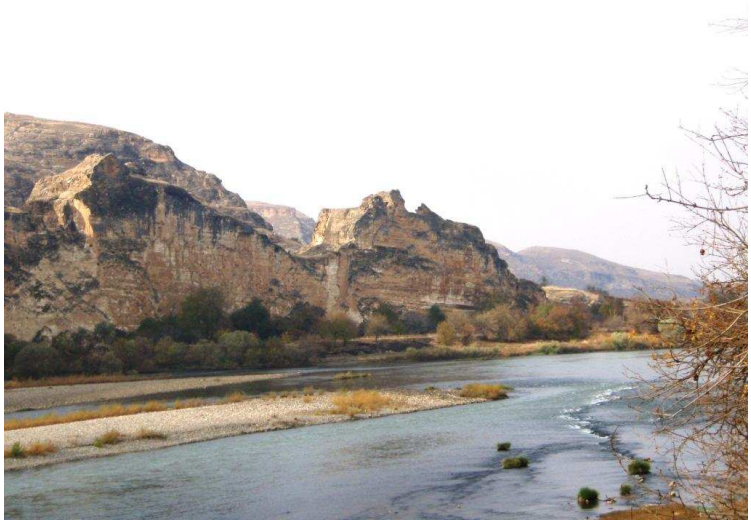


Photo 18: Important habitats

Two of the potentially important habitat types within the project area, namely rock cliffs and floodplain habitats, are shown here, immediately upstream of Hasankeyf town.

Photo 19: Dicle river near Bismil

The tailwater of the Ilisu reservoir will reach approximately up to this point.

Photo 20: Agriculture

Thick and fertile soils can be found in many places within the reservoir area, as here near Ilisu village immediately upstream of the dam axis. It might be worthwhile considering the possibility for using some of such soils for improving agriculture in resettlement areas neat the reservoir.

Photo 21: Diyabakır WWTP:

Screw pumps.

Photo 22: Diyabakır WWTP:

Sludge thickeners.

Photo 23: Diyabakır WWTP:

Primary sedimentation.

Photo 24: Diyabakır WWTP:

Sludge digesters**.**

Photo 25: Untreated wastewater discharge to the Dicle river in Diyarbakır

Photo 26: Untreated wastewater discharge to the Dicle river in Diyarbakır

Photo 27: Garzan creek in Batman.

Non-point sources (agricultural activity) contribute to pollution.

Photo 28: Archimedes (Screw) Pumps of Diyarbakir WWTP

Photo 29: Diyarbakir WWTP:

Grit Collection at the entrance of the wet well before the Archimedes pumps.

Photo 30: Diyarbakir WWTP:

Grit Collection at the entrance of the wet well before the Archimedes pumps.

Photo 31: Diyarbakir WWTP:

By-Pass to divert the water to the Tigris River to be able to clean the grit

Photo 32: Diyarbakir WWTP:

Grit Chambers

Photo 33: Diyarbakir WWTP:

Primary Sedimentation Tanks

Photo 34: Diyarbakir WWTP:

Digesters