

**BUJAGALI HYDROPOWER & INTERCONNECTION
PROJECT**

Uganda

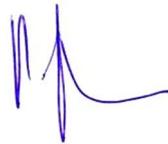
10th Site Visit August 29 to September 1, 2012

September 7, 2012

PANEL OF ENVIRONMENTAL AND SOCIAL EXPERTS

Dr. Robert Zwahlen

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Dr. Robert Zwahlen

Contents

1	SCOPE.....	1
2	SITE RESTORATION	2
2.1	Situation.....	2
2.2	Specific Observations.....	2
2.3	Problem Caused by Street Lighting	2
2.4	Recommendations.....	4
3	FISH AND FISHERIES MONITORING	5
3.1	Situation.....	5
3.2	Observations	5
3.3	Recommendations.....	6
4	RESERVOIR.....	7
5	FINAL STEPS.....	8

List of Abbreviations

BEL	Bujagali Energy Limited
d/s	downstream
EH&S	Environment, Health and Safety
NaFIRRI	National Fisheries Resources Research Institute
NEMA	National Environment Management Authority
POE	Panel of Experts
u/s	upstream
UWA	Uganda Wildlife Authority

1 SCOPE

The 10th site visit of the Environmental Expert of the Bujagali POE of Environmental and Social Experts was scheduled for end of August 2012 on rather short notice. It was agreed that this should be a short visit of about 2 days on site (plus travelling time). The focus of this visit was clearly on site restoration. Accordingly, this is a short report focussing on the few issues that were addressed during this visit.

Schedule of the Site Visit:

Date	Activity
Wednesday, August 29	Arrival in Entebbe (14.00 h), transfer to Jinja.
Thursday, August 30	Day on site. Main activities: <ul style="list-style-type: none">• Meeting with Dr. Emmy Beraho and Salini personnel for discussing site restoration.• Inspection of sites on left bank, u/s of the dam (sludge disposal sites, quarry, batching and crushing plant sites, stockpile area).• Meeting with NaFIRRI for discussing of latest report (from April 2012) and ongoing monitoring.
Friday, August 31	Day on site. Main activities: <ul style="list-style-type: none">• Inspection of remaining places within the construction site (switchyard and surroundings, right bank).• Dam and reservoir.• Participation in ceremony for handing over the newly built and equipped clinic to the community.• Boat trip on the reservoir for checking conditions of shoreline (with representative of NEMA).• Wrap-up meeting with MM. Bill Groth and Emmy Beraho.
Saturday, September 1	Early morning: left Jinja for Entebbe.

2 SITE RESTORATION

2.1 Situation

At the time of the site visit, work on the construction site was almost finished and largely limited to the removal of structures and site restoration. Some buildings and structures had already been removed and sites restored (or were in the process of being restored), others were being taken down.

The sites were visited shortly in company of Salini and BEL personnel (see schedule of visit).

2.2 Specific Observations

Some specific observations were made as follows:

- In general, the restoration work is progressing well and is done in an appropriate manner. It certainly can also be said that in most places the challenge is not very big, since vegetation will develop rapidly if the soil conditions are appropriate.
- The main quarry is under water (part of the reservoir), so no site restoration measures were necessary there.
- The stockpile with leftover rock, stone and gravel material is left in place; this is as was agreed (and recommended) during the last visit, since this is valuable material which still can be used for other purposes. An access road from the main road is being constructed, since access for third parties using this material through the power plant site will not be possible.
- One main challenge will be to keep the required strip of land (of about 100 m) along the shoreline free from cultivation, i.e. free from encroachment by local farmers. BEL intends to plant trees (local species) at least on part of this land. One other option that was proposed is to use only limited amounts of topsoil on this part of land to be recultivated, since soils with a high amount of stone material will be less attractive for farmers; natural vegetation will still develop on these sites, although perhaps somewhat slower. It will still be necessary to enforce the protection of this land, i.e. not to admit access for farming.
- On the other hand, it is important to place topsoil in sufficient amount (about 0.5 m) on sites which will be used for agriculture in the future. This means that before restoration of each site the future use of the site should be clear.
- Two disposal sites for disposal of concrete debris are still open. In both of them, there are considerable quantities of boulders, i.e. inert rock material which would not need to be disposed of. It was recommended to place this material on the stockpile site for possible use in the future.

2.3 Problem Caused by Street Lighting

The access road to the dam and powerhouse site and the road on the dam crest are equipped with street lighting. At the foot of each lantern, there is a concrete slab covering the electric wiring.

Each of these slabs shows one (the smaller ones) or two (the larger ones) hollows with a metal hook which allows to remove them (see picture below). Each of these hollows, at

the time of the site visit was filled with water, and most of them were inhabited by mosquito larvae.

This means that the street lighting provides a very good breeding habitat for mosquitos, at least during the rainy season.



Figure 2-1: Slab with hollows filled with water (upper picture), mosquito larvae (lower picture, two larvae indicated by arrows)

One rather simple way to prevent this would be to cut a "drainage channel" from each of these hollows to the nearest edge of the slab, in order to prevent water from accumulating there.

2.4 Recommendations

The main recommendation is basically the one made during the last site visit in October 2012: it is essential that in the end there will be an "as built" plan which does not only show the final situation, but which needs to include the following items:

- A layout plan clearly identifying all sites where any activities related to construction have taken place.
- An accompanying report which provides a description of each site with the following details:
 - type of use of the site during construction;
 - where applicable: type and quantity of materials disposed of at the specific site;
 - rehabilitation measures indicating amount of soil and topsoil used to cover site, planting if any, and any other rehabilitation measure that might have been applied.

It is of special importance that this plan contains all relevant information (exact location, type and amount of material disposed of) for all disposal sites. It has to be seen clearly that now it is very easy to do so, since all the information is available on site (so e.g. there are plans indicating exactly, with precise coordinates, all disposal areas). This information must be kept available for any possible future use of these sites. If no such plan is there, it will, already in a few years' time, be very difficult to identify these sites and to know (without having to dig it up) what kind of activity had taken place there.

An additional point to be mentioned is EH&S management on site. According to information received, the contract of Mr. Emmy Beraho, BEL's EH&S Manager, will run out by the end of September 2012. However, it is important that all issues which are related to EH&S, also during the site restoration, are properly managed, and this required the presence of qualified personnel throughout the process. It should also be assured that there is a handing over of these aspects to the person who will be in charge of EH&S during plant operation. According to Mr. Bill Groth, Site Manager, BEL is aware of this, and corresponding measures are being taken.

3 FISH AND FISHERIES MONITORING

3.1 Situation

The latest Monitoring Report prepared by NaFIRRI (Aquatic Ecology Monitoring: Water quality, fish, fish catch, sanitation and disease vectors; Monitoring No. 10 and Reservoir Baseline, April 23 to 30, 2012; Report dated June 2012) had been handed over to the Expert prior to the site visit. This report reflects the situation about 6 months after impoundment, i.e. the first assessment of the situation in the newly created reservoir.

Some issues concerning preparation of the report and interpretation of the results were discussed with the NaFIRRI staff responsible for the monitoring program and for reporting.

3.2 Observations

The main observation was that obviously it was not clear for NaFIRRI staff what exactly happened during impoundment, i.e. what the term "reservoir" exactly means. In the monitoring campaign, a third monitoring site called "reservoir" was chosen, unfortunately without really pointing this out in the report and without identifying this site. It was pointed out to NaFIRRI that the monitoring site upstream of the dam is now located within the reservoir. NaFIRRI was invited to join the boat trip on the reservoir in order to see on site how far upstream the reservoir is reaching (almost up to Owen Falls dam, and in any case far beyond the u/s monitoring site); unfortunately, they were not able to participate in this excursion.

Some additional points which were raised in the discussion with NaFIRRI:

- There should be a description of what has physically changed at the sites after reservoir impoundment (presumably not much if anything at the d/s site, but a considerable change in water level and water level fluctuation in the u/s site and in the newly chosen site called "reservoir").
- Future reports (and the Final Report, see below) need to concentrate on a comparison of the present with the pre-impoundment situation.
- The report mentions the problem of overfishing. This is a very relevant issue, since it has to be kept in mind that the construction of Bujagali dam is not the only parameter which has changed in that area. Population continued to grow, and so does pressure on fish resources.
- One specific point is schistosomiasis. The report mentions the fact that over the monitoring period the prevalence of schistosomiasis in the project area has been reduced very considerably, and it points out that this is due to the fact that BEL has carried out mass treatment of the population over the past years. This is certainly a great success for BEL. On the other hand, the report also mentions the fact that already now the number of *Bulinus*, i.e. the snail which is the intermediate host of the parasite causing schistosomiasis, has increased. This means that there is a risk that within a short period of time the trend in prevalence of the disease could be reverted, and that in the end might be higher than it was originally, unless appropriate measures are being taken. It is therefore important that whoever takes over from BEL, presumably the district

health services, be made aware of that situation in order to be able to take the necessary measures.

3.3 Recommendations

The following main recommendations were made concerning the aquatic ecology monitoring program:

- It is essential that NaFIRRI is provided with a map of the reservoir which clearly indicates how far upstream the reservoir is reaching, and if possible with a description and/or explanation of the hydraulic consequences of dam and power plant in the reservoir and the downstream area. The final report will need to contain such a description, and the discussion of effects of the dam on aquatic ecology must be made on the basis of a good understanding of these effects.
- In the future monitoring the originally chosen sites (one upstream of the dam and now in the reservoir, the other downstream of the dam) must be maintained. If the additional site called "reservoir" is included in the program, this must be identified clearly on the map and a description of the site must be provided. This third site is not essential for the monitoring, but it would provide some additional information on the situation within the reservoir.
- During the last site visit in October 2011 it was recommended that oxygen content and pH of the water in the deeper parts of the reservoir should be monitored over the entire water column (i.e. from the top down to the bottom of the reservoir, which is approximately 30 m deep in its deepest parts). This apparently has not been done; oxygen and pH have been measured in the reservoir, but presumably only at the surface. Measuring this in the deeper water would serve the purpose of verifying if there is really no oxygen depletion due to decomposing vegetation. It is still recommended to do this.
- The monitoring should be continued. In the very least, the next sampling should be carried out in September 2012 (i.e. almost one year after impoundment), and then another one in April 2013; it is recommended in any case to maintain the rhythm chosen earlier, i.e. September and April, and not to change this. Depending on the results of these monitoring campaigns it should then be decided whether the monitoring can be ended, or whether yet another campaign should be added. This decision should be taken in accordance with NEMA.
- Finally the main recommendation is the one already made on the occasion of earlier site visits: it is essential that in the end all the results of the monitoring program will be compiled and thoroughly analysed in a comprehensive Final Report. This should contain a description of the physical situation (before and after impoundment), all the results of the monitoring campaigns, a comparison of the before and after situation, and if required recommendations for fisheries management in the reservoir.

4 RESERVOIR

A boat tour of the reservoir was organised by BEL. A representative of NEMA was present on this tour, so that NEMA's concerns (manly reservoir slope stability) could be seen and discussed on site.

The main observations are summarised here shortly:

- It became evident that the pre-impoundment reservoir area clearing was done in a very effective manner. This is documented by the fact that there are almost no dead trees standing in the water along the shoreline (with the exception of trees which were growing on small and now submerged islands, where it was agreed that no pre-impoundment clearing should be carried out), and also by the fact that there is no cleared strip of land above the waterline, which would indicate that clearing would have been done too far up.
- The success of the pre-impoundment clearing is also emphasised by the result of the wildlife rescuing during impoundment (UWA, 23rd November 2011: Report on Wildlife Rescue at Bujagali Hydro Power Project; the report was made available to the expert during the site visit). Overall, very few animals had to be rescued, which shows that the pre-impoundment clearing was effective in making any animals which might have lived in the area to be submerged to move out prior to impoundment. Still, the fact that 25 red tailed monkeys were rescued shows that the rescue mission was required, presumably especially on islands; unfortunately, the UWA report does not indicate the sites from which the animals were rescued.
- Almost a year after impoundment there are very few signs of shoreline erosion, and the few that there are all are very small. There seems to be no big risk of major shore area erosion along the reservoir which would be due to impoundment.
- One problem that remains, but which is out of control of BEL, is the fact that in many places the land adjoining the reservoir is being cultivated right down to the water line. This can be seen mainly (but not exclusively) on the right bank, and in places rather steep slopes are cultivated. This leads to sheet erosion on the areas where vegetation was removed, and thus to input of a considerable amount of sediment into the reservoir.
- Water hyacinths (*Eichhornia crassipes*) have started to develop in the reservoir, already forming floating mats of considerable size in some places. Measures (physical removal, especially from behind the boons near the dam), have started.

5 FINAL STEPS

Two points remain for which the involvement of the Environmental Expert of the POE might be required, namely:

- A final site visit after the end of all site restoration work, in order to evaluate the "as built" situation; this would have to include a check of the final "as built" plan mentioned in Section 2.
- Support to BEL and NaFIRRI for editing and finalising the Final Report on the aquatic monitoring program (see Section 3).

It will have to be decided by BEL or the Lenders whether this involvement is considered as required.