Environment Protection of Upper Kotmale Hydropower Project

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Abstract: Environment Protection was a mandatory responsibility of the Upper Kotmale Hydropower Project. Implementation of the Project was objected mostly by environment organizations. Even after the approval was granted by the Secretary, Ministry of Transport, Environment and Women Affairs (MTA &WA) for the Project to proceed, Environmental Foundation Ltd (EFL) filed an application in the Court of Appeal challenging the decision of the Secretary, MTE &WA. After a special hearing with the EFL as directed by the Court of Appeal, the Secretary, MTE &WA granted the final approval for the Project subject to implementation of environmental impact mitigation measures and Watershed Management Plan. It is worthwhile to mention here some important observations made by the Secretary, in his elaborated approval.

"It is vital that Sri Lanka attempts to develop the full potential of hydropower with the least cost to the economy whilst striving to minimize any environmental impact."

"I trust that the CEB will act in a responsible manner to undertake the Project as an example to prove how environment and development can be integrated."

In pursuant to the environmental clearance given by the Secretary, MTE & WA for the Project, the Minister of Environment and Natural Resources gazetted the environmental regulations. These regulations were implemented by the Project with utmost care and responsibility. Different programmes launched in this respect are explained in the main text of the report.

Keywords: Environment, Solid waste disposal, Water shed management

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1. Introduction

The Upper Kotmale Hydropower Project was implemented amidst severe protests by various parties such as politicians, environmentalists, civil society organizations, clergy and interested groups etc. Environmentalists and environmental organizations were the most vehement protestors for the Project.

On October 11, 1994 the Ceylon Electricity Board (CEB) requested the approval and environmental clearance for implementation of Upper Kotmale Hydropower Project (UKHP) under the National Environmental ACT No. 47 of 1980 from the Ministry of Irrigation, Power and Energy, being the Project Approving Agency (PAA). The Secretary, Ministry of Irrigation, Power and Energy (MIPE) approved the project and sought the concurrence of the Central Environmental Authority (CEA) by his letter dated February 17, 1995. The concurrence was denied by the Chairman, CEA by his letter dated February 23, 1995. On March 22, 1995 the CEB made an appeal to the Secretary, Ministry of Transport, Environment and Women's Affairs (MTE & WA) against the decision of the CEA. The appeal was dismissed by the Secretary, MTE & WA on August 04, 1995 and advised to seek approval for the Project along with an Environmental Impact Assessment Report that addresses the omissions of the Original EAR. In keeping with this directive the CEB submitted an addendum to the original EIAR on July 12, 1996 to the Secretary, MIPE.

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The Secretary, MIPE in turn forwarded the addendum to the CEA on July 27, 1996 for environmental clearance. This appeal was also declined by the Chairman, CEA by his letter dated December 11, 1996.

The CEB made an appeal against the decision of the CEA, to the Secretary, MTE & WA on January 15, 1997 and the Secretary after obtaining clearance of the Attorney General on the legality of entertaining another appeal on the same project, decided to hear the appeal on June 15, 1998. At the conclusion of hearing of appeal, Secretary, Ministry of MTE & WA allowed the appeal for implementation of the Project and it was a historic decision. The Environmental Foundations Ltd (EFL) filed an application in the Court of Appeal seeking a writ certiorari to quash the decision of the Secretary, MTE & WA. This case was settled on July 1999 subjected to a condition that the Secretary, MTE & WA shall give a further hearing to EFL. Accordingly, Secretary, MTE & WA gave a hearing to EFL on October 05, 1999. Central Environmental Authority and the Ceylon Electricity Board were requested to be present at the hearing. After listening to all the above parties the Secretary MTE & WA made his final decision allowing the Project to proceed subjected to implementation of a Watershed Management Plan for Upper Kotmale catchment to avoid possible environmental problems such as landslides. The Minister of Environment and Natural Resources by Gazette (Extraordinary) No. 1283/19 dated April 10, 2003 published the regulations (Upper Kotmale Hydropower Project - Monitoring Regulation No. 1 of 2003) on environmental monitoring duties in the form of mitigation measures to be adhered to by the Project. According to the Regulation No. 2 of the Gazette it is mandatory for the Project to ensure the following measures.

1. Waterfalls and Stream Flow
2. Watershed Management
3. Biodiversity
4. Water-table
5. Landslide Mitigation
6. Excavated Materials
7. Social Responsibility

During the construction of the UKHP, the Environment Management Division which consisted of three parties Client, Consultant and the Contractor has carried out daily, weekly and monthly environmental and safety patrol/ inspection in all construction sites and all project lots such as 1, 2, 3, 4 & 5 and held progress meetings once a month with the participation of all three parties chaired by the Project Director.

1.1 Project History

The Upper Kotmale Hydropower Project (UKHP) was conceived with the preparation of a master plan for hydro electric development in the Mahaweli Basin in 1968. The concepts in the master plan were further studied in 1985-1987 when the Government of Japan funded a feasibility study to examine Hydropower options in the Upper reaches of Kotmale Oya (Stream). Five sites and eight alternative development schemes were examined in the feasibility study and the report concluded that the development of two sites were technically and economically feasible. The two sites where a reservoir type development at Caledonia and a run off river project at Talawakelle. The project at Caledonia involved the displacement of 2700 families and inundation of large area of tea lands.

The Government of Japan then provided further funding for the Engineering Service Study, which included the review of the feasibility study, selection of the optimal development plan, the development of the detailed design and preparation of Tender Documents and an Environmental Impact Assessment Report (EIAR). The EIAR was issued in September 1994. The Final Design Report was completed in March 1995. The Environmental Impact Assessment identified key issues associated with the UKHP as, impacts on water fall aesthetics due to stream flow reductions, social impacts due to resettlement of affected people, possible effects on ground water due to tunneling, impacts due to de-watering of streams on down stream water uses and impacts on bio-diversity.

Further detailed studies on alternatives were completed in 1996 and the Secretary of the Ministry of Forestry and Environment granted approval for the project under the National Environment Act in July 1998 subject to strict adoption of proposed mitigation measures to

minimize possible environmental impacts, which included the development of a watershed management plan, maintenance of daytime flows over the waterfalls, monitoring of groundwater levels, an assessment of biodiversity, management of tunnel waste and a resettlement program. This decision was challenged in the Court of Appeal in October 1998. The Secretary of the Ministry of Forestry and Environment has given the final order in March 2000, subsequent to the settlement of the appeal.

The Government of Sri Lanka secured financial support in March 2002 from the Government of Japan to implement the project, signing of Loan Agreement SL-P74 in March 28, 2002.

The decision of the Secretary in March 2000 was further strengthened with the Gazetting of the National Environmental (Upper Kotmale Hydropower Project – Monitoring) Regulations No. 1, 2003.

2. Statutory Requirement

2.1 Waterfalls and Stream Flow

2.2 Watershed Management

2.3 Biodiversity

2.4 Water Table

2.5 Land Slide Mitigation

2.6 Excavated Materials

2.7 Social Responsibility

2.1 Waterfalls and Stream Flow

In order to maintain continuous flow of the water fall, a total volume of 47,250m^3 of water is being released during 10 half hour period daily between sunrise and sunset. This decision was arrived at after conducting continuous standardized photographic records of the St Clair waterfall. Further the project has constructed a viewing gallery for the spectators to stay and observe the visual appearance of waterfall, leisurely.

Figure 1 - St. Clair Waterfall

Figure 2- St. Clair Viewing Gallery

2.2 Watershed Management Plan

A Watershed Management Plan was prepared by Natural Resources Management Service as per the requirement stipulated in the gazette notification and the Project started to implement it from January, 2004 to date under 10 sub - components.

2.3 Biodiversity

CEB has carried out pre-biodiversity assessment in the streams impacted by the project and identified endemic, endangered snail species named *Ravana politicima* and conducted a trance relocation programme in order to protect them in a similar ecosystem. This total pre-survey was conducted by International Union for Conservation of Nature (IUCN) of Sri Lanka. Also the project has taken measures to conduct a post-biodiversity survey at all project locations including the place of translocation of *Ravana politicima* and areas under inundation to identify further biodiversity issues.

2.4 Water Table

As mentioned in the gazette notification the Central Engineering Consultancy Bureau (CECB) has selected eight streams which flow in different locations along the tunnel route and two locations to dig deep wells at Holyrood Estate very close to Talawakelle intake and conducted stream flow measurements during the construction of 12.9km long tunnel and in impounding and dewatering of it monthly. No significant change in the water table under normal weather pattern was detected.

2.5 Land Slide Mitigation

As per the requirement of gazette notification, the Project has taken measures to conduct pre-survey to identify landslide areas and mitigatory measures to minimize environmental hazards with the assistance of National Building Research Organization (NBRO) and Geological Survey and Mines Bureau (GSMB). This survey was conducted in each project location such as B 412 road, all resettlement housing schemes, dam construction area, switch yard area, officers quarters areas and transmission line. Further, the project has taken measures to mitigate the identified impacts through the contractor.

2.6 Excavated Materials

Excavated materials such as tunnel muck and soil have been used for filling purposes, used as aggregates for concretes or kept in spoil banks for further use. The tunnel muck not used for the above purposes was disposed of in a manner that no harm is done to the environment, under strict supervision by CEA.

2.7 Social Responsibility

CEB has taken measures to make available the reservoir for day-to-day community needs, tourism, and inland fisheries. The project has conducted an investigation with the help of NARA to identify suitable fish species to be released to the reservoir

3. Meeting the Statutory Requirement

It was mandatory for the CEB, being the project proponent to prepare two main documents relevant to the UKHP to fulfill statuary requirements related to environment.

- Preparation of Environment Management Plan (EMP)

- Preparation of Watershed Management Plan (WSMP)

Environment Work Method Statements (EWMS) for each construction site were prepared based on EMP of UKHP to meet the following requirements.

(a) Comply with the national environmental policies, regulations, standards and guidelines in all supplementary activities associated with the project including all supporting activities.

(b) Achieve safety and health conditions of workers and the public during construction.

(c) Minimize risk to the people, property, natural and built environment in the process of carrying out project.

3.1 Environment Management Plan (EMP)

The EMP was prepared by the relevant contractors for each Lot specifically for Lot 1, 2 & 5. EMP consists of following sub-components. All construction activities were carried out strictly in compliance with the EMP by the Project.

3.2 Earth and Soil Conservation

The contractors followed the guide lines of EMP when the construction was in a progress and took adequate mitigation measures to reduce soil erosion in their construction sites.

3.3 Slope Protection

All slopes exposed during construction activities were protected by vegetation cover and structure of appropriate drains, gullies and catch pits.

3.4 Water Quality Monitoring

Waste water generated from tunnel and other underground excavations, concrete batching plants were diverted through properly designed sedimentation pits, where all solid particles were trapped before discharging into natural streams. Also, water quality monitoring was observed at seven locations in Kotmale Oya during the constructions period. This was attended to by Central Environment Authority, Polgolla. They have observed pH, BOD, COD, Turbidity and Nutrient levels of the water samples.

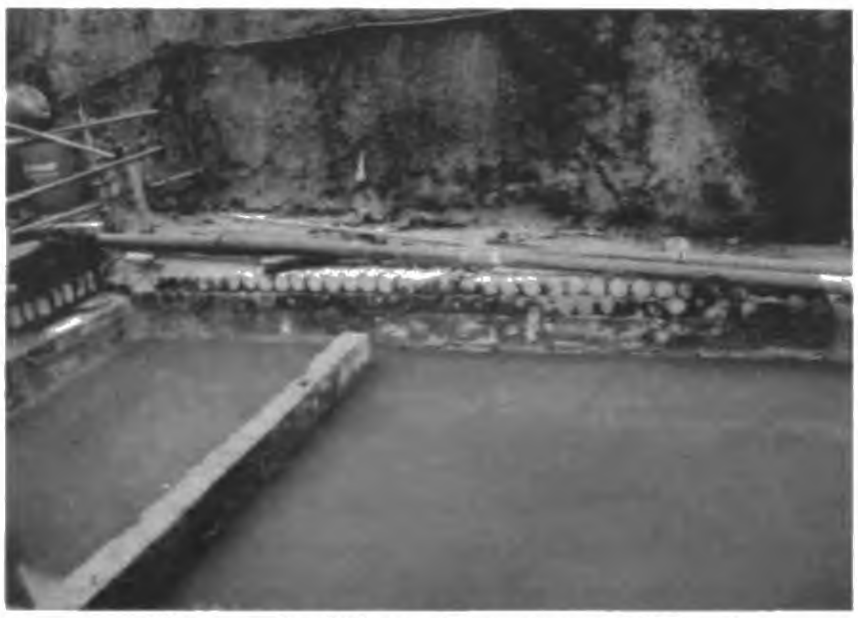

Figure 3 - Water Treatment Plant

Figure 4 - Water Quality Monitoring at Kotmale Oya by CEA Officers

3.5 Air Quality Monitoring

During excavation and construction work of underground tunnel, power cavern, roads and houses, air quality in confined spaces and emanated in open areas were measured in accordance with occupational health requirements and necessary measures were taken to enhance air circulation.

Figure 5 - Air Quality Monitoring Inside the Tunnel by NBRO Officers

3.5.1 Noise & Vibration

It was mandatory on the apart of the contractor to follow guidelines of EMP when the construction was in progress. Contractor had to maintain Noise & Vibration at a minimum rate stipulated by CEA and had to take adequate mitigation measures to control when required level was high in their construction sites.

3.5.2 Flora & Fauna

The contractor had to follow the guidelines when the construction was in progress in their work sites to minimize damages to fauna and flora.

3.5.3 Land Slide Mitigation

The contractor was mandated to follow guide lines of EMP when the construction was in progress. Contractor has attended to suitable measures to mitigate land slide problems.

4. Watershed Management Plan (WSMP)

4.1 What is Watershed?

A watershed can be defined as the drainage basin or catchment area of a particular stream or river simply put; it refers to the area from where the water to a particular drainage system, like a river or stream, comes from. (Protection of watersheds –monthly bulletin – UWMP)

4.2 Watershed Management

Watershed Management consists of those coordinated human activities aimed at controlling enhancing or restoring watershed functions. In the past, watershed management in almost every country was viewed largely as the responsibility of government agencies and conservancy districts and was focused primarily on controlling the flow of water through the construction of dams and levees to protect human communities from flooding, store water for times of drought, and provide opportunities for water related recreations. This emphasis on structural solutions to water storage and flooding problems given way to a new approach that recognized the multitude of functions watershed provide and the need to meet multiple objectives such as flood prevention, erosion control, wild life habitat and provision of recreation. There has also been increasing awareness that watershed management is not solely the responsibility of government agencies and conservancy districts. (Exhibition guide UWMP 2004).

4.3 UKHP Watershed Management Plan

A watershed Management Plan was prepared by Natural Resources Management Service as per the requirement of gazette notification and started to implement from January 1, 2004 to date under ten (10) sub-components.

4.3.1 Conservation Oriented Agriculture

This is mainly concerned about farm soil conservation in the upcountry vegetable lands which are owned by private farmers in 310km^2 watershed area of UKHP along the Nanu Oya, Agra Oya and Kotmale Oya. The Project identified the conservation measures such as biological and mechanical methods and conducted awareness progarmmes for individual farmers at the Mahaweli Training Centre at Doragala and at the Model Conservation Farm at Gannoruwa.

4.3.2 Increase Tree Cover/Aforestation

The Project launched a programme to improve tree cover of the watershed area which covers large extent of estate lands managed by different plantation companies such as Talawakelle Plantations PLC, Maskeliya Plantation PLC, Agarapathana Platation PLC. Discussions were held with the management of the above plantations companies to solicit their cooperation and involvement in the tree planting programme. They readily agreed to involve in the programme as they already possessed the necessary resources such as land and labour. The Project and the estate management worked hand in hand to make this progarmme a success.

4.3.2.1 Distribution of Bamboo Shoots

The Project distributed 400,000 bamboo shoots among the aforesaid estates, received from a nursery maintain by the Mahaweli Authority of Sri Lanka (MASL). The estate management has planted these bamboo shoots with a greater interest and now we can see a healthy bamboo plantations in many locations of the above estates.

Figure 6 - Bamboo Plants Monitoring by Mahaweli Officer

4.3.2.2 Distribution of Native species and Eucalyptus Species

The Project has distributed 100,000 native species of plants and eucalyptus species among the aforesaid plantation companies to grow in their estate land. Among the native species Jak, Pihibiya, Domba, Kumbuk, Kohomba, Hawarinuga and Ehala are more conducive to the climatic conditions of the area. Four species of Eucalyptus i.e. Eucalyptus Grandis, Eucalyptus Micoprorosis, Salkina species and Tuna species were also distributed among the plantation companies.

4.3.2.3 Planting of Trees in Homeland Garden

The Project as a part of its tree planting programme distributed fruit plants (pears and mandarin) among 430 already resettled families. An awareness programme was conducted to educate the households on nurturing these fruit plants and they have shown a keen interest in keeping them healthy. More families will be covered under this programme once they are resettled.

Figure - 7 Distribution of Fruit Plants Among Households

4.3.2.4 Special Forestry Programme

A special forestry programme was embarked on in collaboration with the Departmetn of Forest. Under this programme, a Algin Forest Plantation in extent of 5ha has been developed by the Forest Department. In addition, the Forest Department undertook an Urban Forestry Project within the resettlement sites.

Figure 8 - Algin Forest Reserve

Figure 9 -Urban forest at Talawakelle Resettlement site

4.3.2.5 Crop Cultivation Under 220kV Line

Path of the 220KV transmission line had to be cleared for erection of the towers. The action has been initiated by the Project to cover the path of the transmission line with crops which will not grow beyond the transmission line. The crops identified are mainly tea, pepper and coffee. The Tea Small Holding Authority and Department of Export Agriculture will be requested to provide extension services and monitor the cultivation programme. Willing farmers (owners of the lands) will be informed to enter into an agreement with the CEB to stick to planting of the crops that will not grow upto the transmission line and above.

4.3.2.6 Other Tree Planting Programme

The Project has organized special tree planting programmes in parallel with the government tree planting campaign to mark the World Environment Day which falls on June 5 and the

National Tree Planting Campaign held in October each year.

The following Table shows the distribution of plants under different programmes.

No	Program	Total no of plants (roughly about)
1	Bamboo shoots	400,000
2	Native/Eucalyptus species	100,000
3	Urban Forest	5,000
4	Algin Forest	7,500
5	Other Special Programmes	1,000
6	Home Garden	860
	Total	514,360

Table 1 - Distribution of Plants in the Watershed Area

Figure 10– Tree Plating at Talawakelle Estate, National Tree Planting Day - October 2012

Figure 11– Tree Planting at Wattagoda Estate - World Environment Day June 5, 2010

Figure 12–Tree Planting at Sumana Maha Vidyalaya, World Environment Day June 5, 2012

4.4 Gully Conservation

To minimize siltation of the reservoir, the project started a gully conservation programme in collaboration with the Agrarian Development Department, N'Eliya. The programme covered the following tasks.

i. Identify the major gullies located in the immediate catchment of the reservoir.

ii. Application of mechanical conservation measures with the help of farmer organizations attached to the Agrarian Service Centre at Lindula.

The UKHP met the expenses on application of mechanical measures as per priorities agreed with the Agrarian Development Department.

4.5 Improvement of Poorly Managed Tea Lands

The Project took some measures with plantation companies to improve poorly managed tea lands. An awareness programme was conducted for the Managers of the aforesaid estates in this regard.

4 .6 Protection of Landslide Prone Areas

Construction of the Main Civil Work was entrusted with the responsibility of protection of landslide prone area, in carrying out construction work. The Contractor carried out construction work in such a manner that no threat of landslide occurred in the area.

4.7 Fire Protection

Occurrence of wild fire during the dry weather periods has been a serious environmental issue that affects the flora and fauna of the area. The Project took serious notice of this disastrous situation and conducted an awareness programme among the management and the workers. The Estate Managers were requested to apply fire belt systems and to grow fire resistant plants where necessary, in consultation with NRMS.

4.8 Conservation of Roads, Road Drains and Road Sides

Under this activity the project has completed construction of a storm water collection system at Sumana Maha Vidyalaya at Talawakelle.

Figure 13 - Construction of a Drainage System at Sumana Maha Vidyalaya Talawakelle

4.9 Proper Disposal of Garbage/Solid Waste

The Project has taken measures to minimize solid waste related issues in all watershed areas including Talawakelle Lindula Urban Council area. This helps preventing solid waste coming into the reservoir. The project has taken following measures to overcome solid waste problem.

- Supply of compost bins for each family resettled by the project
- Donation of a Tractor & Trailer to the UC to collect non - degradable waste material to deposit in sanitary the landfill area.
- Donation of a Gully Sucker to the UC to remove septage in a sanitary manner
- Donation a Bob Cat Machine to be used for compaction of non-degradable solid waste.
- Handing over of a building and a sanitary land fill area for the use of solid waste management activity.
- Distribution of empty barrels for the estates located in immediate catchment to sort and collect solid waste generated inside their estates.
- Conduct of awareness programmes on solid waste management for estate community, resettlers, school children and teachers with the help of the CEA.

Figure 14 - Awareness Session on Solid Waste Management for School Children & Teachers

Figure 15 – Distribution of Compost Bins

Figure 16–Donation of a Tractor & Trailer to the Urban Council, Talawakelle

Figure 17 – Gully Sucker Donated to Urban Council

Figure 18 - Handing Over of a Bobcat Machine to Urban Council, Talawakelle

Figure 19 - Barrels Distributed to Estates for Solid Waste Management

4.10 Monitoring and Evaluation of Watershed Hydrology

The Project took action to measure the stream flow in 8 locations to find out deviations of the water table when construction of 13km long tunnel and to a measure watering and dewatering along the tunnel route.

Also, the project measured Total Suspended Solid (TSS) in four locations of Kotmale Oya for a period of one year. This task was entrusted to Lanka Hydraulic Institution (LHI)`1.

Figure 20 - Surface Water /Stream Flow Monitoring

4.11 Training and Awareness

Training and Awareness Programme was conducted to impart knowledge to the school teachers and students of selected schools about conservation of soil, water, pollution and environment. Under this programme, a group of teachers from 12 selected schools located in the catchment area of UKHP were given training as Trainers of Training. Also, four day training programme was conducted for a group of students form selected schools of the area on conservation of soil, water and environment.

Figure 21 – School Children Evaluation at Great Western Tamil School

Figure 22 - Awareness Programme for Children on Soil & Water Conservation

Figure 23 – Awareness Programme for Teachers on Soil & Water Conservation (TOT) at Talawakelle Tamil Maha Vidyalaya

Figure 24 – Radio Quiz Programme at Sumana Maha Vidyalaya

5. Conclusion

Environmental protection of the Upper Kotmale Hydropower Project had been a monumental task. Implementation of environmental protection measures stipulated by the Minister of Environment and Natural Resource in his Gazette (Extraordinary) No. 1289/19 of April 10, 2003 had to be carried out in extreme care and vigil. Since there were several parties vigilant on the project activities including environmental protection measures, the project could not leave room for suspicion and criticism. Therefore, the Project took every step to ensure efficient implementation of environmental protection measures mandated by the Minister of Environment and Natural Resources. The Project is proud to note that it could contribute in a big ways to preserve the natural environment of the area.

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Ceremonial First Blast at Power Cavern on April 9,2007

I E S L

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