Monitoring the construction stage of the H P Toro hydroelectric project

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ABSTRACT

The Toro Hydroelectric Project (H. P.) is located in a very valuable zone surrounded by protected areas with high tourist potential and this aspect was very important in the assessment.

The stages of the environmental management of the hydroelectric project are as follows:

- environmental impact assessment;
- environmental monitoring in the construction stage;
- environmental monitoring in the operation stage; and
- the final operation of the project.

The construction stage is where the more severe impacts will be produced though most of the time these are short term impacts – generally when the work is finished the impacts also finish. In this stage the immediate impacts become obvious and steps can quickly be put into place to mitigate the negative effects on the environment.

INTRODUCTION

Studies of environmental impact have a growing importance in the planning of development projects. The interest in these types of studies is due to a more critical understanding of the impact of big infrastructures on society and the social environment, and the relationship of these. It comes back to the need for ever increasing efforts to ensure that environmental considerations form an integral part of the strategic planning for developments.

THE ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

In developing the EIA Hydroelectric Project the Costa Rica Institute of Electricity (ICE) made a contract with the Centro Cientifico Tropical (CCT) in 1988. This organization has on a number of occasions undertaken environmental and ecological studies of hydroelectric projects.

See Topic 7

UNEP EIA Training Resource Manual

Mitigation and impact management

METHODOLOGY

The EIA was directed by the Ministerio de Recursos Naturales de Energia y Minas de Costa Rica for energy projects. A multidisciplinary team composed of 15 specialists in hydrology, biology, vulcanology, ecology, wildlife and tourism participated in the assessment. A simulation of the project was designed to evaluate the predicable impacts for the construction and operation of the project. The evaluation used a double valuation Leopold Matrix, assigning values from 1 to 10 in upward order in accordance with the magnitude and importance of the assessed impact. The EIA determined the feasibility of the project from the environmental point of view.

CONCLUSIONS AND RECOMMENDATIONS FOR THE EIA

General conclusions

The multidisciplinary team that participated in the EIA of H.P. Toro concluded:

- The Toro Hydroelectric project is possible from the environmental point of view.
- Development will cause a moderate impact in the construction stage that will strongly affect the landscape.
- There are long term permanent impacts for which it is important to have adequate guidelines and recommendations.
- Other possible environmental impacts on the project were identified, principally for volcanic activity.

Specific recommendations

The main recommendations of the CCT were.

- Attempt to dig the pipeline in such a way as to eliminate negative impacts on the landscape.
- Carefully manage the main disposal area.
- Restore the provision of water to those inhabitants affected by the project construction.
- Make a minor archeological 'rescue' during the preconstruction phase.
- Research the changes in the environmental acids to select the material types and the paint used in the different construction of the project (pipeline and power plant).
- Check the workers periodically to determine possible evidence of disease or other health hazards.

- Install a seismologic net to continue the research into the seismicity of the Toro Basin.
- Maintain a monitoring net for control of the river to detect the potential for landslides.
- Establish a system to measure of inflow and a photographic register to evaluate the reduction of the visual impact of waterfalls.
- Reafforest the surround area of the reservoir.
- Clean the whole vegetation area of the reservoir.
- Take care in building the tunnel route under the Agrio river.
- Check the acids of fog products on the river and warn people coming to watch the H.P. Toro project by the waterfall of Toro.
- Release 2.0m^3 in the Toro river and 0.4m^3 in the Gata river to maintain the inflow equivalent on the minor monthly average in both cases, in the periods of main tourist activity on Saturdays and Sundays.
- Develop an environmental educational plan.
- Inform the inhabitants of the zone of the project and possible concern about it.
- Promote the preparation and execution of the management plan for the Toro upper basin.

Environmental monitoring

The environmental monitoring of H.P. Toro was undertaken in two different stages. The first was to establish recommendations of the EIA to mitigate the environmental impacts that the different projects would cause. The second concerned the construction of the road to the power plant of Toro II giving special emphasis to the landscaping and rehabilitation of land cover for stability and aesthetic effect.

A monitoring environmental programme was designed for the construction stages and operations of the utility. This programme had been modified to adapt to the needs of the project.

MONITORING ACTION IN THE TORO PROJECT

Location of the disposal areas

Four areas were designated for disposal of materials extracted from the different construction activities of the project. The total volume of the excavation of the project construction was calculated as 596.569m^3 and the four deposits as having a capacity of 640.00m^3.

The reduction of inflow of the Toro River waterfall

A photographic register of the construction process was kept between January and December 1992 together with an inflow register that corresponded to the days these pictures were taken.

Camouflage of the pipeline

There is a possibility that the pipeline could be located underground. This can be better assessed when the pipeline construction has progressed and the visual impact has been analyzed to consider the best options.

Acids control of the fog of the Toro River waterfall

A programme for acid control commenced in April 1992 and ended in March 1993. An instrument was constructed to catch the waterfall fog.

The rain control of the pH of the zone

From the beginning of 1990 to the end of 1995 rain samples for the acids analysis work were collected.

Clearing of vegetation in the reservoir area

The clearing of the area of the reservoir will be undertaken during the construction stage.

Archeological rescue

No materials of archeological significance were found.

Management of the Basin

Points related with the Upper Basin protection, environmental education and the provision of information to the inhabitants were included as part of the management plan of Toro River Basin. In 1990 the Departamento Ambiente y Energia Alterna undertook a preliminary project to manage the plan of Toro River Basin.

The environmental education of the inhabitants has been undertaken at the formal level with schools in Bajos del Toro and Colonia Toro and will continue to be implemented in the environmental educational plan del Ministerio de Recursos Naturales Energia y Minas (today MINAE). As part of the management planning of the Basin there is a proposal for a tourist local circuit.

A socioeconomic diagnosis was performed and identified the need for a specific programme for women in the area. Advice on this programme has come from the MINAE and the ONG and CEFEMINA.

There have been cultural activities to integrate the communities of Colonia Toro and Bajos del Toro. Approximately 315 people participated in the popular festivities of the Bajos del Toro community with the first Environmental Exposition of the ICE 'Development in harmony with nature.'

Medical care for the workers

This recommendation is to be accomplished by five supervision programmes; labour groups control of hygiene and health, preventive medicine campaigns, training monthly inspectors, first aid dispensaries and medicare. There is a full time dispensary in the project central building for the tunnel and excavation workers. There are also full time security and hygiene staff.

Installing a vigilance control system on the slopes of the river to detect landslides

A programme has been planned to investigate which of the slopes present higher risks of landslides. Once these are identified we can proceed to build a data base using the Geographic Information System (GIS), to determine the more susceptible landslide and erosion areas.

Access road to the power plant

A road is needed to the power plant house Toro II which is located at the bottom of the canyon of the Toro River with a level difference of approximately 300m between the t op of the s lope and the base. At the feasibility stage the ICE decided that there should be adequate access to this point and the best alternative was to build a margin road to the left of the Toro River.

Monitoring road construction for the Toro Power Plant

Part of the road (4km) is to go through the South East sector of N.P. Juan Castro Blanco and it is necessary to have permission for construction of this road. In the construction stage 80 per cent of the natural rain forest was destroyed, and there is a need for a forest rehabilitation plan.

There as also a recommendation to keep the necessary inflow to maintain the waterfalls as a tourist attraction of the Toro and Gata River*s.*

LIST OF RELEVANT PUBLISHED PAPERS AND OTHER SOURCE MATERIALS

C.C.T. Estudio de Impacto Ambiental Proyecto Hidroelectrico Toro ICE 1989.
ICE Plan de servicios medicos y de salud ocupacional del P.H. Toro .

ICE Proyecto pare la elaboracion del plan de manejo de la cuenca del rio Toro, 1990.

ICE Desarrollo Hidroelectrico del rio Toro .

Silva, Jorge X. 1987, Semantica Ambiental.Uma contribucao Geografica, II Congresso Brasileiro de Defesa do Meio Ambiente, pp 18-25 R.J. 1987.

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Key words

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