

Wetland conservation: institutional constraints and community awareness

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ABSTRACT

The state of the environment in Uganda's Pre-independence period was probably the most ideal in the whole of the African region. Once described as the 'Pearl of Africa' by Winston Churchill, the tiny country that lies between 4° 12' and 10° 29' N latitude and between 29° 34' and 35° 00' E longitude with an altitude above sea level of between 620 to 5110 metres enjoyed an ideal weather pattern suitable for agricultural production. This essentially forms the country's economic backbone, without destabilizing the ecosystem. Increases in population, which now stands at 22 000 000 people, have had very negative implications on land usage, mainly for agricultural and shelter purposes.

INTRODUCTION

Uganda covers a total surface area of 241,038 km² of which 43,941 km² is open water and swamps. Kampala city, Uganda's Capital and industrial centre covers a total surface area of 195 km² of which 31 km² (15 per cent) is wetlands.

The gradual and steady increase in population means that sanitation facilities have to expand and with more development projects land, which is ideal only in limited locations, is used up. This has ended up infringing on wetlands as well.

Since the NRM Government came to power, revamping the economic sector and diversifying economic production which solely hinged on agriculture between 1960-1985 has been a major concern. The establishment of the Uganda Investment Authority (UIA) in 1991 saw an increased number of industrial establishments. Kampala City has the majority share of large industrial investments a number of which have encroached on the wetlands. Kinawataka and Nakivubo swamps in particular have become major targets for development because of their location and in order to achieve economies of scale.

In Uganda, Environment Impact Assessment is a new phenomenon. Although now being appreciated, it will require concerted efforts of all sectors in our society if we are to reap its benefits. Statute No.4 of 1995 of the

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Public involvement

Republic of Uganda brought into existence the National Environment Management Authority (NEMA) with power to ensure that, amongst other things, wetlands as integral parts of the ecosystems are protected from negative impacts resulting from human activities. In conjunction with other lead agencies such as Kampala (KCC), NGOs (e.g. IUCN) etc. NEMA strives to protect the environment and threatened species. As pointed out, EIA is a new requirement and its adaptation is still regarded as an ordeal by most industrialists, since they consider it expensive and unnecessary.

BACKGROUND

Kinawadata and Nakivubo swamps lie on the eastern part of the city. They both open into Lake Victoria, a natural reservoir of water supply to the city's residents. Besides serving as flood controls, these wetlands are used mainly for effluent filtration and water purification before discharge into Lake Victoria.

Lack of information flow to various institutions involved in the processing, establishment and construction of processing industries accounts largely for the destruction of wetlands, in the Uganda case in urban centres.

NATURE OF PROBLEM AND SOCIAL RESPONSE

Following an appeal by the State in both local and international media, a number of investors have been trying to construct heavy processing plants in Kampala in particular, because it is well linked to a hydro power dam whose output is sufficient to run heavy industries. The Kinawata and Nakivubo swamps lie along the power supply route and hence are vulnerable.

Large plants like Coca-Cola and Pepsi cola employ a reasonable workforce and generate a substantial amount of revenue to the State. Their existence is of national importance.

The area particularly around Kinawata was zoned in 1972 for industrial establishments and impact assessment (EIA) was put in place as a prerequisite for establishment of any project as recently as 1995. The National Environment Policy came into existence only four years ago. The creation of NEMA is just as recent.

Establishments like Pepsi cola and Coca-Cola were built before NEMA came into existence; at the time EIA was not that crucial. Perhaps in an attempt to minimize costs, no proper drainage facilities were initially put in place. It has been noted in the past that one of the beverages plants was discharging its effluents onto open ground and the grass was beginning to wither. In an attempt to mitigate this sad scenario, it is believed that underground tunnels have been constructed to remove the effluent which is now likely to end up in Lake Victoria causing pollution and destroying the zooplankton. What is not known however is whether both Pepsi cola and Coca-Cola have in the

past been meeting minimum standards before disposing of any effluent into the swamps; this is very important since the swamp leads into Lake Victoria which supplies the city's water for industrial and home use, as well as being the habitat for rare species like the Crowned Crane (*Balearica pavonina*), the Shoebill (*Baleariceps rex*) and fish.

SOCIAL INPUT AND PUBLIC AWARENESS

Repeated flooding in the city is largely blamed on the destruction of swamps, which act as natural drainage channels. Besides, in Kampala, they are useful for stripping sediments' nutrient and retention of toxins. As well, they have been natural habitats for rare fauna species e.g. the Shoebill and the Crested Crane. The continued construction of warehouses and industries in the swamps sparked off public outrage. In February 1999 angry residents near the affected swamp wrote to Kampala Town Clerk complaining about the infringement on the swamps. The developers were ordered to halt construction until drainage channels were constructed to prevent floods and an EIA report submitted to NEMA. Surprisingly, although when the site was visited one developer had not stopped construction, most other developers had complied.

In a related incident, an international school has been a point of contention following its construction in Nakivubo swamp. This swamp is of vital importance to city residents because it filters all the semi-treated sewerage and untreated industrial wastes. Tampering with it means that the effluent will go into Lake Victoria which is close to Kampala's water works. Officials from the Inspector General of Government (IGG) and the Kampala City Council (KCC), the National Environment Management Authority (NEMA) and National Wetlands Programme were irked by this infringement prompting an inquiry into this scenario. This did not yield any positive results since in most cases permission is granted by State technocrats without demanding strict adherence to the EIA standards.

EIA PROCESS AND TIME FRAME

It is now a requirement for project developers to submit an EIS/EIA to NEMA before a project is undertaken. NEMA studies the report and, after ensuring that all measures have been put in place to comply with NEMA standards, a certificate is issued for work to commence. Where the project is likely to arouse public concern, as was the case in the recent proposed construction of a hydroelectric power dam, the public and all stake holders are invited to a public hearing. Views from all parties concerned are heard and, depending on the social response, the issue may be deferred until compromise is reached. When the Environment Policy came into being in 1995 with the establishment of NEMA, most of the developments in wetlands were either already started or completed. Developers cannot easily appreciate the value of an environmental audit report.

NENM, NGOs and all other leading government agencies will have to play a leading role in sensitizing the entire cross-section of the population to the mandatory EIA requirement. This has to be done over time. One KCC senior official observed that 'Although EIA is mandatory for industrialists, few submit the EIA/EIS to the relevant authorities'. This is because, as pointed out earlier, this is a new requirement, and developers regard it as an expensive exercise. It should be emphasized that at times compromise is difficult to reach, especially on big investments, as the government is trying to attract as many investors as possible.

A case in point is the Nainanve Industrial Park, a big land/forest reserve that has been opened for industrial development. The wetland will be destroyed and the forest reserve lost. In effect, this will cause water pollution of Lake Victoria and flooding of the Jinja Road highway.

MONITORING AND EVALUATION

NEMA undertakes monitoring as a government agency. Other institutions, like Makerere University Institute of Environment, also undertake studies as do various other independent institutions, and the press.

Since NEMA is the government's watchdog on environmental management its decision and ruling is final. But because of the large number of projects in diverse areas of our country, and given the limited resources necessary to traverse the entire nation so as to maintain EIA standards, sometimes it is very hard to ensure that the EIA process is followed at all times and all places. The Kinawataka and Nakivubo case for instance was brought to the attention of the public by residents living near the swamp. NEMA in turn intervened, halting the construction, and KCC, acting as a lead agency on behalf of NENM, enforced the ban on construction. Residents though are still suspicious because they don't have access to these closed-down establishments and cannot ensure that ameliorative measures have been put in place.

CONCLUDING REMARKS

The relevance and importance of EIA at this stage of human development cannot be questioned. As more and more developmental projects are carried out, the state of environment in any part of the world has to be closely monitored. The need for capacity building and the Government's unreserved commitment and political will have to be at the forefront if the ecosystem is to remain stabilized.

Judging from the past experience, it appears that the NEMA, the Government's top watchdog, is in most cases caught off guard and steps in only to carry out environmental audit. It is, however, very evident that the press and the public and NGOs have been acting as effective partners and good watch dogs.

Some heavy industry plants at times are not subjected to a rigorous EIA process for fear that the developer may be concerned about the heavy expenses involved in mitigation measures and in turn shift the plant to another country, consequently denying the State revenue. If there is going to be a way forward the ground has to be leveled so that all developers, big and small, are subjected to the same strict EIA process.

NAME	AREA (km ²)	TYPE	LANDUSE	THREATS
Kasanga	4.72	P>S Papyrus	Subsistence agriculture And hunting	Drainage
Kinawataka-Kawoya	1.5	P Papyrus	Industrial development Subsistence agriculture And papyrus harvesting	Drainage and permanent conversion
Kirombe-Kachanga	2.44	P Papyrus	Mining of sand	Fire
Kiwembo-Kawaga	1.27	P Miscanthus Papyrus	Papyrus harvesting And hunting	None significant
Kyetinda	2.06	P Papyrus	Subsistence agriculture And papyrus harvesting	Drainage
Lubigi	2.85	P Papyrus	Harvesting Papyrus	Over-harvesting
Mayanja River	0.81	S	Subsistence agriculture	Drainage
Nabisasiro	1.98	S	Subsistence agriculture	None significant
Nakivubo	5.29	P Papyrus	Effluent treatment Subsistence agriculture Papyrus harvesting Settlement	Drainage Noxious weeds Over-harvesting
Nalukolongo	*	S	Settlement Industrial development subsistence agriculture	Drainage
Nsooba-Bulyera-Kiyanja	4.61	S	Settlement Subsistence agriculture Waste disposal Brickmaking	Drainage and Permanent conversion
Walufumbe-Nalubaga	2.52	S	None	None

P – permanent
S – seasonal

LIST OF RELEVANT PUBLISHED PAPERS AND OTHER SOURCE MATERIAL

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Key words

community
participation
environmental
impact
environmental
audit

Selecting development options through environment-based planning approaches

A Case Study of the Colombo-Katunayake Expressway Project in Sri Lanka

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INTRODUCTION

Colombo is the capital city of Sri Lanka, situated on the West Coast of the country. The proposed high-speed road link is between Colombo City and Katunayake, the location of the international airport, which is situated about 25 km north of Colombo. The project would fulfil a long-felt need not only to facilitate passenger and freight movements between the two points, but also to ease the traffic from and to the northern part of the country.

At present the time taken to travel between the two points is between 45 minutes and one hour depending on the traffic. Travel between the Airport and City of Colombo is also hampered by the passenger and goods transport to and from Colombo and the northern part of the country. The inadequacy of the present facility will be a serious impediment to economic growth in the area and the country, as a whole.

The proposed alignment of the expressway would be 24.6 km in length with four lanes (expansion to six) each lane having a width of 3.5m. The design speed is 100 km/hr. The preferred and acceptable alignment (Western Trace) has been selected as the best option based on four primary options along with a 'No Action' Option.

The Colombo Katunayake Expressway (CKE) would pass through mostly marshy land, as well as built up land and the Negombo lagoon. Marshy areas having soft ground would undergo consolidation settlement which is a critical phase of the project. Soil movement, construction of embankments, filling of 1.9 km of the canal along with the canal deviation will be carried out. In addition, work on asphalt concrete pavement, construction of base course and sub-base course and construction of bridges over Dandugam Oya and Jaela will also be carried out.

Pre-construction activities include the construction/acquisition of offices and housing, workshops, repair facilities, warehouses/stockpiling areas, quarry sites/crushing plants, concrete batching and mixer plant, asphalt mixing plant, power and water supply, major construction equipment and a site laboratory. Sand required for the sand blanket would be obtained from offshore dredging, pumping and stockpiling at identified locations.

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Screening

The concept of an expressway was first formulated in 1989 by the Road Development Authority (RDA) and many of the earlier parameters have now changed including land use and socio-economic factors. The traffic on the existing primary road between Colombo and Katunayake (A3) increased by almost 250 per cent within the decade from 1981 to 1990 and in 1995 certain sections of the road were carrying around 40,000 vehicles per day. Taking into consideration all these factors, a new trace has been proposed. The new proposal is to construct an alternate highway between Colombo and Bandaranayake International Airport (BIA). This proposal was approved by the Cabinet of Ministers in August 1995 subject to an acceptable financing arrangement.

Several primary options which would enable high-speed transport of sufficient capacity have been evaluated to find the best option. The primary alternatives considered in the process were:

- Alternative 1 Western Trace
- Alternative 2 Eastern Trace
- Alternative 3 Improvement to existing road, A3
- Alternative 4 Improvement to the railway inter model option
- Alternative 5 'No action' option

The basic social and environmental setting for this EIA case study is as follows.

Socio-cultural environment

The socio-cultural environment of the project setting includes the people living in the alignment of the CKE, the community living in the sides of the north of CKE and the daily traffic that will use the CKE when it is in operation. There were 130 houses and small shops in the path of CKE and these have to be demolished and relocated.

There were another sixty families who lived in the road reservation area of the CKE and this reservation area will be acquired by the Road Development Authority (RDA). This community will be allowed to stay, but they will have to tolerate the ill effects even after the construction.

The CKE runs along highly populated areas and this will cause several problems to the community who will be separated by the path of the CKE. Certain sections of the existing A3 road were used by around 40,000 vehicles per day in 1995.

Physical features

The physical features of the project area includes an expanse of marshland (133 ha of Muthurajawela marsh wetland), paddy lands, agricultural land, coconut land, homestead, residential areas and the Negombo lagoon area. The CKE links Colombo, the Capital of Sri Lanka with Bandaranaike

International Airport, the only International airport of the nation and it travels through highly urbanized/industrialized areas with several key national social organizations in the vicinity.

Biotic environment

The biotic environment includes faunal species such as many different species of mammals, birds, reptiles, fishes, crustaceans, amphibians and other aquatic life in the wetlands (marsh/lagoon). In addition, it also includes vegetation such as trees, shrub, grasses, reeds, and cattails with aquatic vegetation such as lilies, sea-grasses etc.

Several project-related issues were identified at the proposal stage.

Social conflicts

Two main groups of communities are affected by this project. The first are those involuntary resettlers to be relocated because their houses will be demolished (130 houses and six small shops). Sixty five percent of the dwellings are shanties built by squatters. Eighty per cent of residents are employed in temporary occupations and more than 77 per cent earn around Rs. 3000/= per month (approx. US\$45).

The remaining families (in 60 houses), allowed to stay in the road reservation (expressway) acquired by RDA, will be vulnerable to ill effects even after the construction.

Ecological issues

The expressway passes through the ecologically sensitive habitats of wetlands, such as the Muthurajawela Marsh, ponds, streams, brackish water swamps, network of canals and the Negombo Lagoon etc.

In addition to loss of area of the existing habitats, the biological diversity on both sides of the express way would be affected by noise and other impacts. Large quantities of sea sand will be dredged off shore to fill the roadway and this may cause damage to coral reefs, benthic habitats, etc. Seawater from the sand stockpiling may also affect the ecology in the area. The expressway runs through the lagoon for a distance of 1.4 km and would isolate a narrow strip (3 per cent) from the main lagoon area.

Other impacts on ecological resources are obstruction of storm water flow, obstruction of animal paths, disturbance of animals by noise during construction and operational phases, disruption of water flow in the old Negombo Canal, and contamination of aquatic habitats with pollutants such as oil, cement, tar, lead, zinc, iron, rubber and solid litter.

Hydrological issues

The existing railway track and the A3 road already act as barriers. The expressway will cause only marginal increase to free flow of water. The

crossings of the express way at old Negombo canal, local drainage canals and major streams will cause congestion of water flow.

Policy issues

Two major policy issues needed to be addressed before granting approval for the implementation of the project:

- It is proposed to maintain the proposed expressway as a toll-road and thus to charge a fee from the vehicles using it. Since this is the first time a fee levying system on a roadway has been introduced, there may be some resistance to it. The government should take a firm decision to go ahead with the proposal since it has several long-term benefits.
- The expressway runs through the conservation zone of the Muthurajawela wetlands affecting the Muthurajawela Visitor Centre (MVC) and separating the permanent building from the nature trail area. In addition, during the construction phase MVC may lose its attraction for visitors, and the boat trips along canals will have to be suspended.

PROCESS AND PROCEDURAL CONTEXT

There are several major requirements established by the EIA and other existing institutional framework for the project, as follows:

Legal requirements

Projects for the construction of national and provincial highways involving a length exceeding 10 km fall within the prescribed list for EIA as published under National Environmental (Approval of Projects) Regulations No.1 of 1993. Under the provisions of section 23Z of the National Environmental (Amendment) Act of No.56 of 1988 the preparation of an EIA is a mandatory legal requirement for projects prescribed by the Minister in charge of environment.

The EIA will have to be implemented through a designated Project Approving Agency (PAA) as prescribed by the Minister under section 23Z of the NEA. The CEA acts as the PAA for this project and the Road Development Authority (RDA) is the project proponent for the CKE. (A list of statutes relevant to the assessment is given in the annex).

Preliminary information

The project proponent is required to submit preliminary information on the project. This should include a description of the nature, scope and location of the project accompanied by location maps and other details as required by the PAA. This would also include the magnitude of the proposed project, use of natural resources, employment opportunities, operation method of

the project etc. The preliminary information would enable the authorities to decide whether the project falls within the prescribed project list.

Designation of Project Approving Agency (PAA)

Depending on the type of the project, the Central Environment Authority (CEA) appoints another government agency from among the identified list of agencies as the PAA. An agency which will have any special interest in the project promotion is not considered eligible for appointment. In this case the CEA acted as the Project Approving Agency. Since the Road Development Authority was the project proponent the Ministry of Transport and Highways was not appointed as the PAA in order to avoid any biases towards the approval of the project.

Scoping

Scoping is done through an inter-agency meeting of all relevant agencies. In regard to CKE, the relevant agencies are CEA, Wildlife Department, Urban Development Authority, Water Supply and Drainage Board and Sri Lanka Land Reclamation Board and other relevant agencies. Scoping meetings were held to identify significant issues, type of analysis and mitigatory measures to be considered. This was also used to determine reasonable alternatives that should be considered in the EIA and also set the Terms of Reference (ToR) for EIA. In addition this is the forum to communicate with the developer about the requirements of EIA and to inform the community.

Preparation of Terms of Reference (ToR) for EIA

The ToR was prepared by the PAA after the scoping stage of the EIA process. CEA professional staff members served on the committee on ToR preparation. In addition, the CEA also granted its formal approval to the ToR after having reviewed it thoroughly.

Public participation

The provision for public participation is contained in the NEA. On receipt of the EIAR the PAA will make preliminary assessment of its adequacy as measured by the ToR. If found adequate, the notice of the availability of the EIAR for public review will be announced in the gazette and in newspapers in Sinhala, Tamil and English languages. Thirty working days are allowed for public review. At the end of the public comment period, the PAA will decide whether the case warrants a public hearing. The public comments received during the period of 30 days will be sent to the project proponent for review and response, all the substantive comments received on the draft will be attached to the final draft.

Technical Evaluation Committee (TEC)

The PAA appoints a TEC comprised of professional staff from the PAA and the CEA plus other invited subject matter experts. The TEC reviewed the EIAR and the public comments received. The TEC also asked for more

information on the project proposal from the proponent for further review. On the basis of recommendations made by the TEC, the PAA approved the EIA subject to certain conditions being met.

Decision making

The PAA will grant approval for the project subject to specified conditions or will refuse approval for the project (giving reasons for the non-approval). A project proponent who is aggrieved by the refusal can appeal to the Secretary of the Minister in charge of Environment. A member of the public aggrieved by a decision to grant approval for a project has to seek recourse through the courts.

Mitigatory measures

As a requirement of the EIA, the proponent prepared a mitigation plan indicating how he was proposing to limit some of the project's adverse impacts on the environment. Accordingly, the proposed mitigatory measures for resettlement of people, construction of Muthurajawela Visitors' Centre, regular testing of water quality of water bodies, noise reduction devices and other measures will be monitored by the Road Development Authority.

Monitoring Plan

As part of the final EIA, the proponent submitted a monitoring plan for implementing the proposed mitigation measures. The members of CEA, RDA and other relevant agencies will serve as the monitoring committee.

(A flow chart depicting the EIA process is at Figure 1)

APPROACHES TAKEN

The issues related to this project have been addressed in different ways. The various strategies and methods used in this process are discussed below.

Selection of the best option

Four different reasonable options were considered together with the 'no action' alternative:

- Option 1 - Access controlled express way to the west of Colombo - Negombo Road A3, (Western Trace).
- Option 2 - Access controlled express way to the east of Colombo - Negombo Road A3, (Eastern Trace).

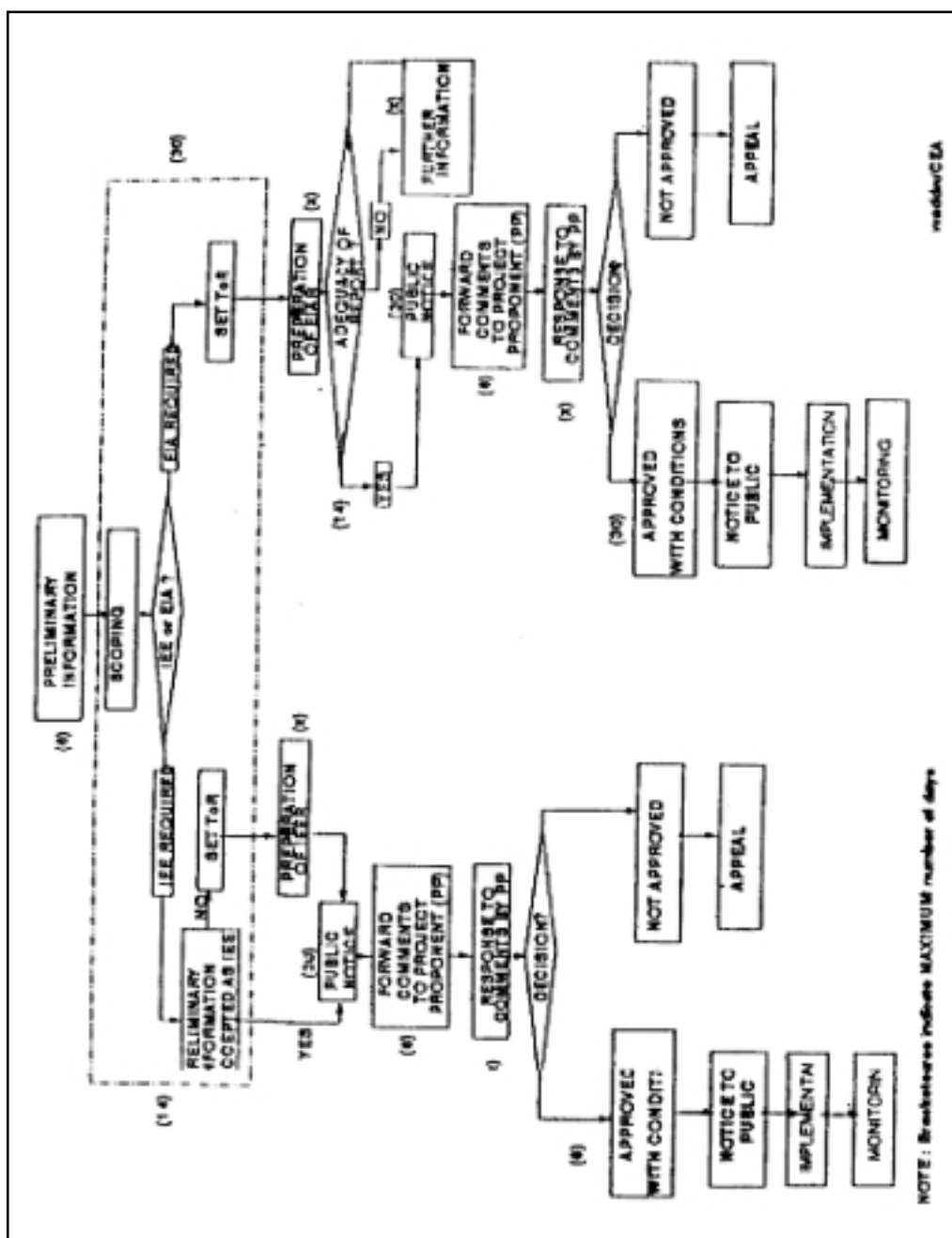


Figure 1: The EIA/IEE process

- Option 3 - Improvements to the existing Colombo - Negambo Road A3 (widening of the Road, better traffic control measures etc.).
- Option 4 - Improvement to the railway between Colombo and Katunayake. (More locomotives, and rolling stocks laying an additional track and improved signaling).
- Option 5 - 'No action' alternative.

All five options were evaluated on the basis of ecological, hydrological, socio-economic, engineering and economic criteria. A comparison of options according to different parameters is shown in Figure 2.

The economic appraisal is based on social cost benefit analysis. The benefit and cost of each alternative is calculated, and compared, to identify the most beneficial option. To conduct a cost benefit analysis a base line (no action alternative) option is selected, against which all the other options were measured. In this case the existing level of the A3 road and the railway system in 1996 is taken as the base line.

Based on the comparison of the above evaluations, controlled express way to the west of Colombo-Negombo road A3 was selected as the best option.

Re-settlement of displaced people

The resettlers (inhabitants of the 130 houses and six small shops) will be provided with better housing and other facilities close to the original settlement as far as possible. Some of them will be employed in the CKE (Construction and Operational stages). The people who live in permanent houses ear-marked to be demolished will be faced with loss of property, loss of income (agriculture, fishing, etc.), disruption of the social structure etc. They will be paid reasonable compensation, based on current valuations. New land for re-settlements will be provided with water, sanitation, access roads and electricity for those who request land.

Noise reduction

Noise barriers will be installed to reduce the noise to acceptable levels in places close to dwellings, schools and religious places.

Construction of over passes

It is also proposed to provide links through vehicular and pedestrian overpasses to minimize the separation of communities on either side of the expressway. Proper signaling and traffic management measures will be used to reduce the inconvenience caused by the congestion during construction.

Drainage and flood control

Local drainage canal crossings will be provided with culverts to avoid drainage congestion and these will also serve as pathways and refuges for fauna (animals) crossing the CKE. Major stream crossings would be provided with sufficiently wide bridges to permit floods to be discharged without upstream inundation. A short segment of a bypass canal will be constructed to ensure the hydraulic continuity of the old Negambo Canal. The horizontal alignment of the canal will be merged with the existing canal by a smooth transition curve. The runoff of the CKE will be sent through a system of wet ponds to minimize much of the pollutants.

Protection of the eco-system

No new access roads will be built to the construction sites through the marsh. Strict waste control programmes will be implemented at the construction sites as a safe guard to prevent adverse effects. Measures will be taken to minimize damage to coral reefs in laying pipelines to dredge sea sand. Evacuation pumping will be carried out simultaneously with the pumping of a sand/water mix to minimize percolation from escaping seawater in sand stockpiling area. Two underpasses will be built into the CKE to permit tidal mixing and navigation, in order to mitigate ill effects on the isolated strip of the lagoon.

Muthurajawela Visitor Centre

Construction of a new visitors' centre away from the CKE is proposed. This will be in a suitable location selected by the Wetland Conservation Project in consultation with the Department of Wildlife Conservation. An overhead bridge to be constructed over the Nonage Ela canal will provide access to the nature trail area.

RESULTS AND IMPLICATIONS

Several approaches were used in the EIA process to ensure proper management of the environment. Most of the approaches enabled the project proponent and the government to improve the project through introducing modifications before the project commenced its operations.

Establishment of a future national requirement

The urgent requirement of a high-speed link between Colombo and Katunayake was established by the EIA study. The towns close to the International Airport are rapidly expanding residential and industrial areas. The existing links (the A3 road and the railway track for passenger and goods transport) between Colombo and Katunayake are unable to meet even the present demand while incurring substantial financial loss to the economy. Considering the projected demand for the future it has been established as an urgent requirement of a high-speed link (expressway) between Colombo and Katunayake.

Selection of the best option

It has been proved that the Western Trace (CKE) was the best option out of the four on the basis of economic performance and minimum environmental impacts. Five reasonable options for enhancing the transport link were considered in the study . They are the two alternate traces (Western and the Eastern Trace) for an access control express way, improvements to the existing A3 road and the railway, and the 'no action' alternative. It has been proved that the railway improvement will not be able to meet the objectives without a parallel upgrading of the entire national railway network. The widening of the existing A3 road which runs through highly populated

areas with unlimited access to satisfy the projected requirements would be impossible as this will cause unacceptable social impacts of a high magnitude. Comparison of the two remaining traces proved that the Western Trace is preferred as it will cost substantively less, and cause low environmental and social impacts.

Secondary alternatives

Secondary alternatives for four segments of the selected option (Western Trace) have also been identified to minimize detrimental social and environmental impacts. As certain segments of the selected Western Trace cause serious consequences secondary alternatives were considered for four segments of the Western Trace. The alternatives which would help minimize adverse impacts could be implemented with reasonable cost. It has also been directed that secondary alternatives within the proposed trace should be selected so that the trace will not traverse the Muthurajawela sanctuary.

Fish breeding

In order to protect the fishing breeding area, a bridge of appropriate width will be constructed in the Madabokka area of the Negombo Lagoon. This would help free movement of fish from the mangroves to the lagoon. It has been shown that the measures recommended in the report are not sufficient to compensate for the ill effects caused to fish production. As such, PAA has requested the project proponent to implement the following measures:

- Any loss in productivity resulting from the loss of sea grasses should be compensated by establishing a similar area in close proximity within the estuary.
- To compensate the decrease in organic production due to loss of mangroves by replanting *Rhizophora* to an acceptable level.

Baseline data

A base line survey of flood levels, inundation duration, water spread areas along the trace and the project area will be carried out for the preparation of the final designs of the expressway. In addition, mapping of expected flood detention inundation areas and assessment of flood duration changes will be carried out and this data will be submitted to CEA for monitoring.

Other considerations

The following areas for action were also identified. There was a need to:

- obtain approval of the Sri Lanka Land Reclamation and Development Corporation for the final drainage management plan prior to implementation;
- ensure the construction methods are suitably modified to minimize turbidity and inflow of additional sediment into the lagoon;

- identify suitable land area along the lagoon verges for expanding the water area to compensate for loss of water area for the construction of CKE;
- compensate for any loss in productivity resulting from the loss of sea grasses by establishing a similar area in close proximity within the estuary;
- compensate for the decrease in organic production due to loss of mangroves by replanting *Rhizophora* to an acceptable level;
- further improve the proposed resettlement and compensation package by an additional compensation to be paid to those families whose livelihood will be directly affected (vegetable cultivators, boutique keepers, fishermen, etc.) and to establish new income sources;
- payment of an additional compensation to all families whose houses to be demolished as a 'settling down' allowance, to mitigate for disruption of their livelihood etc;
- establish a clear channel of communication between the project proponent and the community affected through out the resettlement process; and
- monitor the resettlement process to be continued to a reasonable period in order to alleviate difficulties of the resettlers after resettlement.

LESSONS TO BE LEARNED

Several lessons can be learned from experience of the EIA of CKE. Some of the key points are discussed below.

The EIA process improves the project planning

It has been shown from this project that the EIA has been very useful in improving project planning. Five different reasonable alternatives (options) were to considered when selecting a preferred alternative, which was socially, economically and environmentally acceptable. The preferred option was modified to suit the EIA requirements and practical situations.

If the proponent had tried to implement a single option he would have been faced with serious problems from the Community, Government Agencies and NGOs. It can therefore be clearly concluded that the EIA process has helped to modify the project at planning stage that enabled to produce an acceptable solution to address the issue.

An incomplete EIA delays the implementation of the project

The EIAR prepared for this project was not complete and therefore the Technical Evaluation Committee of the PAA has recommended various

types of additional information and studies to be conducted in hydrological sociological and economical aspects. An EIA should include a review of several feasible alternatives, all reasonable likely impacts, recommended mitigatory measures that can be implemented, and should ensure that other necessary approvals are obtained concurrently with the EIA process.

Proponents interactions with the community is vital for a good EIA

The project proponent was able to select options with limited social impacts that can be mitigated within a reasonable cost by having direct dialogue with the affected parties. But if the project proponent had established a good, continuous rapport with the affected communities from the beginning he could have offered a more acceptable resettlement plan and could have thereby avoided delays which occurred in the project. In this case, the project-approving agency has recommended additional compensation to improve the settlement plan.

Ecological issues should also be given the same due consideration as social issues

It is interesting to note that the EIA process had forced the project proponent to give the same weight to the ecological issues as to social issues when selecting a preferred option for the project. In this case the alignment of the CKE has been shifted to pass through the environmental sensitive Muthurajawela Marsh, Negombo Lagoon conservation zone to avoid detrimental environmental impacts caused by passing through an urbanized area.

Involvement of political authority in decision making

In this particular issue, the highest political authority, the President of the country, who intervened in the project as a matter of national interest was convinced of the need to protect the environment. She therefore instructed the project-approving agency to select an option which had low social as well as ecological impacts. This intervention led to the selection of the most preferred alternative for the project. It can therefore be concluded that if facts are properly presented to the political authorities they will make better decisions for long-term benefits for the country.

O P T I O N S

IMPACTS ON	WESTERN TRACE	EASTERN TRACE	IMPROVE ROAD A3	IMPROVE RAILWAY	'NO BUILD'
Hydrology	●	●			
Fauna and Flora	●	●			
Humans	●	●	●	●	●
Land Use	●	●	●	●	
Visual Amenity	●	●	●	●	●
Noise Level	●	●	●	●	●
Air and Water Quality	●	●	●	●	●
Economy	●	●	●	●	

Other
Considerations

Note: The circle size reflects the severity of
the impact

Engineering Considerations	●	●	●	●	●
Achieve Aims and Objectives		✓	✓		

Figure 2: Comparison of adverse environmental effects from the five options considered

ANNEX 1

Some statutes relevant to the present assessment

- National Environmental Act No.47 of 1980 as Amendment No.56 of 1988.
- Coast Conservation Act No.57 of 1981 as Amendment of 1988

- Board of Investment Act No.49 of 1992 (which replaced the GCEC-Act No.4 of 1978)
- The Road Development Authority Act 1981
- The Urban Development Authority Law 1978
- Urban Development Projects (Special Provision) Act No.2 of 1980
- The Greater Colombo Economic Commission Law No.4 of 1978 (Amended Act No.49 of 1992 which established the Board of Investment)
- Land Acquisition Act No.9 of 1950 as amended.
- Flood Protection Ordinance No.4 of 1924 (as amended)
- Sri Lanka Land Reclamation and Development Corporation Act No.52 of 1982.
- Fauna and Flora Protection Ordinance No.2 of 1934 as amended by Acts Nos.44 of 1964, 1 of 1970 and 49 of 1993.

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Key words

**project
planning**

**preferred
alternatives**

**mitigatory
measures**

**social
impacts**

The Termosantander gas turbine project

Monica Cuellar

INTRODUCTION

A national Energy Expansion Plan was established in Colombia in 1993 to promote projects for electric generation from gas and coal, with the purpose of increasing national capacity and ensuring electricity supplies.

The project called Termosantander was carried out during October 1996 to October 1997. The purpose was to generate electricity by a gas turbine power station with an installed capacity of 2172 MW and gas consumption of 55 million cubic feet per day. The gas was brought from the gas facilities located about 350 m from the station site, where exploration and exploitation of crude oil is carried out for the company AMOCO COLOMBIA. The energy produced by the station power was conducted to the national electric system through a transmission line of tension intensity of 230 kV.

The project is located in the north east part of Colombia in the Department of Santander in the municipality of Cimitarra. It is located in the Magdalena River valley (the main river of Colombia which crosses the country from south to north) and the foothills of the Eastern chain of mountains of the Andes system. The area has various wetlands and marshes raging from 100 to 350 m above sea level. There is more variation in the topography in the vicinity of the station and within the first 20 km of the transmission line. There are erosive processes caused by natural and human factors (this includes removal of vegetation cover for small road construction and extraction of materials).

The temperature varies between 25 and 28 °C and the precipitation between 2800 and 3000mm. Humidity is between 82.8 and 86.4 per cent.

Estimated population of the area is 35 000, with the highest density in the municipality of Cimitarra. Economic activities are based mainly in agriculture and livestock, and there is insufficient infrastructure for education, health, housing, water supply and energy in this area.

The major influence of the project has been the acquisition of land for the power station and the 66 km for the line transmission. Additionally, there is further land use for the construction of the workers houses, offices and storerooms. These areas were selected after an analysis of four alternative sites.

See Topic 4

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Screening

The station power was donated and installed by the Westinghouse Electric Corporation, and it consists of two units of simple cycle with potential to generate 108.6 MW each, and operated by turbine gas and electric generators. The length of the pipe system transporting gas is 350 m. It was also designed with the purpose of increasing generation tension from 13.8 kV to 230 kV and in this way to be connected with the national transmission system. The transmission line has 161 steel towers, each 400m apart. The main activities for the construction included access adjustment, corridor clearing and adjustment of tower sites.

The Environmental Impact Study was implemented according to the Terms of Reference (ToR) provided by the Ministry of Environment and based on social, biological and physical criteria.

In November of 1998, the Termosantander Company asked the Ministry of Environment to cancel the environmental license because of the lack of a guaranteed gas supply. So the thermoelectric project had a life of only two months (from January to March 1998), even though it was built to operate for 25 years. This was a very complex situation because there were no established ToR for the dismantling of this kind of project. What was needed were specific guidelines for abandoning the project and restoring the landscape. The Termosantander Company spent three months in accomplishing this and the existing infrastructure of the station power was used to make a greenhouse and a kindergarten, both administered by the municipality. The productive capacity of the greenhouse was 8 000 000 plants/year and the kindergarten catered for 120 children.

Total cost of the project was approximately US\$141 000 000 for the thermoelectric station and US\$8 000 000 for the line transmission, financed totally with private capital from foreign investors. The costs for Environmental Management Plans were US\$1 500 000 and US\$430 000 respectively.

NATURE AND SCOPE OF ISSUES

Impacts were identified for both the construction and operating stage. In the former, the most significant issue was destruction of 40.7 ha of forest with its consequential habitat destruction and ecosystem fragmentation. In the later stage, noise, water and air pollution were identified as the most relevant impacts. All of them caused fauna displacement and environmental quality degradation.

The project was developed in a remote area, where local people had low incomes and difficulty in meeting basic needs, so expectations of employment and economic benefits were high and a massive immigration process occurred.

Special Terms of Reference were needed to dismantle the project and restore the landscape. Seminars, discussions and workshops with the community were necessary in order to make clear to them the reasons for closing the project. Programmes of social content for the long term had to be proposed including environmental education programmes and reforestation activities.

The fact that the project did not operate for more than two months and the cost of the project was so high, make visible the lack of provision in governmental planning. However, environmental assessment had been carried out.

The local environmental authority (CAS) was also involved in the EIA process, giving permission for cutting the forest and using water of two rivers located near the station. Each permission had determined the amount of natural resource to be used and under the figure of 'retributive taxes'; compensation programmes were enforced, such as reforestation activities and economic tariff.

Apart from the impacts caused by the construction of the power station, there was also a need to identify impacts associated with the pipe installation for gas transport and the installation of the transmission line for electricity conduction. In the first case, the pipes were laid 1m deep in the soil. Where the pipes crossed water surfaces a superficial infrastructure was used to minimize negatives effects if the pipes became damaged. The route for the transmission line was selected to run in less forested areas and the line ran for only 66 km before it was connected to the national transmission system.

Access was limited due to the topography and lack of infrastructure, so materials and equipment were transported with helicopters, except those easily transported by cars or small trucks on very simple unmade roads. However, it was necessary to improve the existing road and construction of seven bridges was needed for transporting the two generators. Material for construction such as sand, stones, and clay among others, was provided by the rivers in the area and the local authority gave the administrative permission for this.

PROCESS AND PROCEDURAL CONTEXT

Legal issues

The Ministry of Environment is the head of the national environmental system, which is composed of 35 regional authorities and five research institutions. The Ministry gives environmental licences for high impact projects, which are designated by law. Local authorities regulate small-scale projects.

This project was referred to the Ministry, which provides specific Terms of References for different sectors such as energy, transport, chemical, mining, industry, and agriculture. EIA is mandatory.

The sequence of the EIA process

The first step includes an Environmental Diagnostic of Alternatives, which basically is to guarantee that the best place has been chosen for developing the project. Normally three different options must be analyzed, but in the Termosantander project four were studied. The differences between them were not only in economic aspects but also in selecting a place with the lowest environmental impact and a better location considering access, resources availability and minor impact to the community.

Because there was not any doubt that the place suggested was the best, taking into account environmental, technical and social aspects, there was no need to meet this requirement and no detailed studies for each alternative were ordered.

Terms of Reference for EIA were established and Environmental Impact Study was submitted to the Ministry for evaluation by an interdisciplinary team. A technical concept was developed in two months, giving the environmental licence for developing the project, and mitigation measures for controlling negative impacts were fixed. By law there is a maximum of six months for evaluating the EIA. However, the administrative process, lack of trained practitioners, number of concerns and lack of appropriate technical information make it impossible to fill this obligation and normally the time used for this purpose ranges between one and three years. Given this scenario, the evaluation of Termosantander was done in a very short period of time.

The EIA components were as follows:

- Justification of the project.
- Description of the project.
- Definition of influence area.
- Baseline considering physical, biotic and social components.
- Zoning of critical environmental areas.
- Identification and evaluation of impacts according to the aspects considered in the baseline.
- Establishment of environmental plan management.
- Risk analysis and contingency plans.
- Monitoring programme.

The aspects mentioned above are included in the ToR produced by the Ministry and are based on the Law 99 of 1993 and Dec.1753 of 1994.

The EIA process also had to include local public participation with community consultation about the design of the project and the environmental management plan. The mechanism for this was through continuous workshops and meetings with local leaders, regional authorities, NGO's and environmental institutions.

Agreements were reached between the owners of the project and other stakeholders. Local people had priority when engaging workers for the project. Regional authorities were responsible for providing permits for using water and forestry utilization and for controlling effluents and emissions discharges.

In order to develop the project the following resources were needed:

RESOURCE	AMOUNT
Forest	17 ha of secondary forest 11 ha of high stubble 2.7 ha of low stubble 1.7 ha of grass
Soil	28305 m3 removal
Water	180l/h/day
Gas	55 millions
Manpower	300 people

Direct and indirect areas of influence were established. The first one was considered to be about 2142 ha, where the power station, encampments and transmission line were settled, and the second one of about 26 537 ha, where indirect impacts on physical, biotic and social effects occurred.

Briefly, the major negative impacts identified are summarized in Table 1:

The methodology used to predict impacts was based upon a matrix, which associated the activity developed and the effect produced on the environment.

The impacts were ranked according to five characteristics:

- Type: positive or negative.
- Magnitude: high, medium and low scale.
- Duration: short term (less than one month), medium term (up to ten months) and long term (life long of the project).
- Tendency: increasing, stable and decreasing.
- Alternative of management: prevent, mitigate, correct or compensate.

Indicators of physical, biotic and social components were also used in order to identify impact.

APPROACHES TAKEN

In order to contribute to the effectiveness of EIA process, different studies were carried out, starting with the analysis of four alternatives for selecting the site for the station and to open the transept to install the transmission line. This process of characterization and analysis was supported with basic general and thematic cartography, aerial photography, satellite images and specialized software.

The selection of the best alternative was based on the use of Geographic Information Systems (GIS), which enabled the establishment of the relation and comparison of variables which would take place in the project. The use of GIS was important because by overlapping thematic layers, it was possible to identify vulnerable and critical areas.

Only one area with problems was identified: it corresponded to the first 28 km of the transmission line, located in a hilly topography and with a dense forest cover. As a consequence this section of the line was replanned with towers placed on higher ground and in open spaces.

In order to carry out the baseline investigation, the area of influence was divided into five sectors. Characterization of physical, biotic and social components was implemented for each sector and using the same methodology.

- For the physical component the geology, geomorphology, climatology and hydrology were studied. Field work was carried out by specialists and a database was created.
- For biotic components the fauna and flora (vegetation cover) were studied.
- For the social component interviews and meetings were undertaken with the community, and secondary information was also used.
- The thematic base for the geospheric analysis was obtained from general cartography with a scale of 1:75 000 and thematic cartography with a scale of 1:200 000. The result was a map characterizing relief, rocks and soil of the area in a scale of 1:25 000 with field verification.

SYSTEM	COMPONENT	IMPACT
PHYSICAL	Atmospheric	Mobile gas emissions
		Dust emissions
		Noise mobile and fixed sources
		NOx emissions
		SOx emissions
	Hydrologic	CO emissions
		Sediments
		Bacteriologic pollution
		Grease and oil pollution
		Water waste
BIOTIC	Geospheric, Geology, Soils	Fluvial dynamic alteration
		Solid waste
		Changes in the physical and chemical characteristics of water
		Removal of Soil
		Increased hydrological erosion
	Vegetation Cover and Ecosystems	Mass remove
		Permanent and temporal changes in use of the soil
		Landscape alterations
		Damages in vegetal cover
		Decrease vegetal cover
WILDLIFE	WILDLIFE	Pressure upon the resource
		Decrease nesting areas and food
		Hunting pressure
		Fragmentation of Ecosystems
		Noise displacement
		Death by car accidents
		Risk of collision with cables
		Alterations of wildlife ecosystems

Table 1. Gas turbine station and transmission line: environmental impacts

This analysis permitted identification of places with more potential for erosion and defined better conditions for locating both the power station and the towers. The air quality of the area was researched, involving parameters for different classes of pollutants and noise. Results were used to identify possible impacts during different phases of the projects.

STAGE	ACTIVITIES
PRELIMINARY ACTIVITIES	Acquiring land Finding and contract of hand work Construction of encampments Construction of storerooms Location of infrastructure Opening access
CONSTRUCTION ACTIVITIES	Operation of encampments Excavation for the infrastructure Obtaining material (sand, clays etc) Material transport Construction of appropriate infrastructure for drainage Opening channels for pipes Hydrostatic proof of the pipe system Construction of foundations Installation of infrastructure and equipment Installation of towers Construction of control building Construction of infrastructure for protection Establishment of the corridor for the transmission line Installation of the energy conductors Material disposal Revision
OPERATION ACTIVITIES	Operation of the generation plant Operation of the line transmission Maintenance of the line and the corridor Maintenance of the equipment of generation
DISMANTLE ACTIVITIES	Packing of equipment Disposal of material Restoring of the station site as a greenhouse and kinder garden Reforestation of open areas Transfer of the infrastructure to environmental and regional authorities

Table 2: Main activities of the project

A Pasquill-Guildford model for dispersion of atmospheric contaminants was run, according to the meteorological characteristics of the zone. Results of the modeling showed that emissions would be below the permitted levels established in policy guidelines.

Monitoring during the two months of the operation of the project showed that equipment and controlling measures established were appropriate and there were no significant impacts on the air quality.

The main water bodies were also identified and divided into four hydrologic categories: macro river basins, micro river basins, small river basins and water bodies. Additionally, an evaluation of hydrological information was produced by the IDEAM with physical, chemical and biological characteristics of all water systems in the area.

It was found that the river quality was not appropriate for human consumption due to the high amount of microbiological contamination especially of the *Troulodus spp*, and offer of nutrients was low (oligotrophic). Consequently, water treatment was needed before using the resource.

Characterization of fauna was undertaken using secondary and primary information. Statistical analysis was used to establish population density, habitat preferences and food consumption. Results showed that some species of mammals were in danger of extinction: *Myrmecophaga tridactyla*, *Bradypus variegatus*, *Felix wiedii* and *Panthera onca*.

The actions oriented to the protection of the fauna were focused on the prohibition of hunting, signs on the road to prevent death of the animals by cars and enforcement of environmental education programmes.

The flora was characterized and quantified by using 45 small holdings for a total area of 1532 m². The data obtained was analyzed ecologically and statistically and the GIS was used in order to see geographical distribution and produce a map of vegetation cover.

The socioeconomic component was studied, based upon secondary information existing in the plans of development for the regions produced by the governmental institutions and by primary information obtained directly by meetings and interviews with the community. Additionally, there were workshops with the leaders and other members of the community, in order to tell them about the project and its possible effects (negative and positive). The objective was to develop the environmental management plan.

An archaeological study was implemented, oriented towards identifying and evaluating potential places of cultural heritage and consequently developing a plan for rescuing archaeological objects before constructing the project. For this purpose photo-interpretation activities and revision of cartography were needed, complemented with field work and laboratory analysis of the samples found. As a result, the presence of archaeological material was established, together with its exact locations. This formed the basis for the implementation of control measures.

RESULTS AND IMPLICATIONS

The EIA of the project identified environmental components (physical, biotic and social) of the influence area of the project both direct and indirect. It was also possible to identify the activities causing degradation of the

environment and define environmental management measures to prevent, control, mitigate, compensate and correct impacts caused by the development of the project.

It has to be mentioned as a deficiency of the EIA that measurements for conservation of fauna were restricted to installing information signs and meeting with workers and local people. This situation indicated a lack of existing information about the region because there was little research into this aspect.

Environmental legislation for EIA has been an important factor in whole process. Without proper policies and environmental legislation it would have been impossible to enforce any mitigation measure.

Even if the project had a short life span, it can be said that environmental management was appropriate and that relations between Termosantander and the community were established properly. Local people recognized the benefits of the project and its economic importance, not only because people had employment opportunities but also because infrastructure were built for the welfare of the community.

Plans for implementation of EIA for a project were made using specific ToR which reflect current environmental policies. However, this case study has shown that ToR for dismantling and abandoning a project still need to be developed.

Cumulative impacts that could be produced by this project were not properly identified because of a lack of scientific knowledge. Also a lack of appropriate and holistic databases makes prediction and management of these kind of effects impossible. It is also necessary to mention that in the area in which the project was developed several industries for crude oil exploitation and exploring and electricity production have been established.

The transmission line was not dismantled because of the possibility that it could be used to be used in a future for connecting remote areas with the national electric system. Consequently, the government and Termosantander negotiated that for the 66 km of transmission line all the environmental obligations were assumed by ISA - a public company that is administrating the line.

Environmental and administrative agreements were made with the local municipality, which undertook certain obligations. The local community was involved in this.

LESSONS LEARNED

- EIA for the construction and operation and dismantling phase of this project, were key factors in developing the project in an environmentally friendly way.
- Environmental Analysis of Alternatives allows a better decision

making process.

- Social participation in different phases of the project, from the initial conception of the project to its operation and dismantle, guarantees the maximization of the objective of the EIA.
- The short operation time of the project meant huge economic loss for the investor who developed the project for 25 years of duration. There was no guaranteed gas supply. Termosantander depended on one gas reservoir and its capacity was over estimated. In this situation there is evidence of a lack of Colombian Government support for investors in searching for solutions.
- It is important that the State through different institutions elaborates TOR for all kinds of projects in their different stages. Also it is important to start considering the significance of cumulative effects and identify scientific and technical knowledge resources for developing methodologies for this.
- The development of an environmental network which allows a better understanding and comprehension of the situation for an efficient decision making processes is also important.

LIST OF RELEVANT PUBLISHED PAPERS OR OTHER SOURCE MATERIAL

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Key words

EIA process

terms of
reference

cumulative
effects

public
participation

Glycol waste incineration in a wet process

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ABSTRACT

Air samples collected from the surroundings of a wet-process cement kiln showed no difference in air quality before and after glycol waste incineration. Use of EIA techniques, on the other hand, was more useful in ascertaining the actual problems associated with the incineration process. The life cycle analysis and computer model revealed that the waste largely came out of the kiln unburned. This had the potential of damaging both the electrostatic precipitator and human health. An analysis of alternatives identified that direct waste feeding into the burning zone ensured complete pyrolysis of waste including dioxins and furans, without damaging equipment or human health. A scientific and technical knowledge of the system was found essential for making effective use of EIA techniques in planning and decision making.

Introduction

A polyester staple fibre manufacturing unit in Pakistan used to dump its glycol waste in the sea. Because of public and government pressure, the waste was sent to a wet-process cement factory. There it was mixed with the raw material slurry and fed into the cement kiln. A team of scientists did not find any difference in the quality of cement and all samples before and after glycol waste incineration. The EPA nonetheless insisted that the incineration activity should be examined using EIA techniques. The polyester manufacturers thus approached IUCN-Pakistan office, which conducted the study in April-May 1997.

The cement factory on three sides had 2000 ft high semi-arid hills with several mining and quarry operations for extracting salt, coal, limestone, gypsum, clay and gravel. The fourth side had open land interspersed with a few small villages and some agricultural fields. Wildlife largely comprised jackals, rabbits, monitor lizards, snakes, rodents and a variety of birds. Winters were mild (rarely falling below 0°C) and summers were hot (frequently above 40°C). Much of rain came during the monsoon period (June-August).

The cement factory had 3 kilns, each with 600 ton production capacity. Each kiln burned 100 tonnes high-sulphur (2.2-3.5%S) furnace oil. Smoke stacks were 52 metres high. During the trials, one ton of glycol waste was mixed

See Topic 5

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Resource Manual**

Scoping

with 1000 tonnes of raw material slurry and fed into the kiln from its cold end where temperatures were 180°C. The 135 metre kiln had a burning zone on the other end with temperatures around 1500°C.

NATURE AND SCOPE OF ISSUES

- Workers complained about an unpleasant smell when glycol waste was mixed with raw material slurry; it caused headaches, running noses and vomiting in some workers.
- The management complained about choking of slurry feed pipes by glycol waste, which sometimes caused system shut-down.
- The general public complained about dust and smoke from the cement factory. They did not appear concerned about glycol waste incineration.
- The EPA expressed concern about incineration efficiency and the production of dioxins.

PROCESS AND PROCEDURAL CONTEXT

Since the snapshot air quality sampling had not provided satisfactory answers, it was decided to use a computer model for predicting pollutant fall-out around the factory throughout a year. Because of the EPA's concern about incineration, it was decided to conduct a life cycle analysis of the process.

APPROACH TAKEN

The entire process was studied step-by-step. This included detailed examination of waste transport, storage and handling, feeding temperatures, cement kiln internal working; temperature regime in the kiln; exhaust system etc. An air dispersion model (RTDM) was used to determine exhaust dispersion patterns. This information was projected on a satellite imagery of the area. An analysis of alternatives was done, focusing on a comparison of two incineration options (i.e. waste mixing with slurry and kiln feeding from cold end; and direct waste injection into the burning zone).

RESULT AND IMPLICATIONS

The life cycle analysis showed that the approach tried for waste incineration did not subject the waste to a high temperature. Fed from the cold end, much of the glycol waste evaporated during the slurry drying process.

The remaining waste caught fire at 200°C and escaped to the smoke stack. It never reached the burning zone on the other side of the cement kiln where

the temperature was 1500°C. The escape of unburned and partly burned glycol waste threatened the functioning of the electrostatic precipitator by coating its charged surfaces. The small quantity of escaping fumes was difficult to detect in the factory surroundings but had the potential of affecting human health. Small amounts of polymers are known to deceive human immune systems, mimic certain hormones and act as endocrine disrupters altering metabolic and growth pattern especially in the foetus.

The option of direct waste feed in the burning zone offered organic component pyrolysis immediately after entry into the burning zone. The gaseous component attained a temperature of 1500°C and stayed in the kiln for about 10 seconds. This condition was more than sufficient for dioxins and furans destruction. The organic matter free exhaust did not affect the electrostatic precipitator or surroundings. The inorganic residue got mixed with cement without affecting its quality.

LESSONS LEARNED

- The life cycle analysis and computer model use were helpful in the identification of environmental problems which could not be ascertained using an actual snapshot field air quality survey.
- Snapshot studies can miss the big picture.
- Scientific and technical knowledge of a given system is essential for making effective use of EIA techniques in planning and decision.

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Key words

process EIA

lifecycle
analysis

occupational
and
environmental
health problems

Experiences in the first pulp mill project submitted to the environmental impact assessment system in Chile

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The opinions stated in this document are the sole responsibility of the author and do not necessarily reflect the opinion of the National Commission on the Environment (CONAMA).

ABSTRACT

This case study concerns the first environmental impact assessment conducted on a cellulose project in Chile. The project site was in Southern Chile (Region X). The facility was to discharge its effluents into the Cruces River, along the banks of which a Natural Reserve and a RAMSAR site are located.

What follows is an analysis of the procedures established during the voluntary implementation of Environmental Impact Assessment in Chile, the benefits to be derived from using Terms of Reference, the assessment criteria that were taken into account to protect the sheltered area, and the difficulties encountered in determining the significance of the ensuing impacts.

INTRODUCTION

This document discusses the Review and Assessment of the Environmental Impact conducted on the Valdivia Project. The proposal was for the construction of a new Kraft pulp mill with a 550,000 tonne/year output capacity, which would make a significant contribution to the national economy (investment is estimated at US1.3 billion), given the fact that it would generate major revenues from export sales on the world market.

The introduction of new pulp mill plants was highly probable given Chile's vast forestry resources and current cellulose prices on the international marketplace. Central and Southern Chile, which present comparative advantages in terms of the proximity of raw materials and abundant watersheds – indispensable for running this type of industry – were particularly appropriate locations.

The Environmental Impact Assessment for the Valdivia Project was of great significance given its voluntary nature and the geographical location and sheer magnitude of the project. It has established an important precedent for future environmental impact assessments. A salient feature of this project –

See Topic 6

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Assessing

the construction of a bleached Kraft pulp mill – is its location upstream from the Cruces River Natural Reserve and the discharging of effluents into this watercourse. This project had to be evaluated on the basis of extremely demanding criteria which precluded even minimal alterations to this Natural Reserve, which is included in the RAMSAR Convention on 'Wetlands of International Significance, particularly as a habitat for Waterfowl'. This is the only stretch of Chilean wetland with the necessary characteristics for inclusion in this category. Furthermore, this Convention binds the State of Chile to place particular emphasis on the safeguarding and protection of this ecosystem.

The project was voluntarily included in the Environmental Impact Assessment System (EIAS) in October 1995, and it secured its environmental approval in May 1996. The assessment procedures used were the result of two years' experience in both the public sector, which evaluates the projects, and the private sector, which conducts the Environmental Impact Study (EIS) and presents them to the authorities for review purposes. For this specific project, the authorities issued Terms of Reference (ToR) to be used in conducting the Study. The ToR established the minimum content requirements for carrying out an Environmental Impact Study (EIS).

This case study addresses the particulars that were involved in analyzing synergistic and cumulative effects, the procedures used in reviewing the Environmental Impact Assessment, as well as the criteria and background information which served as the decision-making basis in evaluating the project's effects on the ecosystem of the RAMSAR-protected Cruces River Natural Reserve.

NATURE AND SCOPE OF ISSUES

The Environmental Impact Assessment for this project was carried out at a time when Chile still lacked regulations for the establishment of consistent procedures and criteria to address this issue.

Notwithstanding the above, the Environmental Impact Assessment System (EIAS) considers that the environmental assessment of a project provides the Regional Commission on the Environment (COREMA) with information deemed sufficient for that authority to issue a well-founded resolution that will assign a certain environmental approval to the project. The requirements include a consideration of the technical aspects of the project, a balanced summary of the objections raised by the community, the measures promulgated in the mitigation, remediation and indemnification plans, environmental follow-up or monitoring, the environmental approval either approving or rejecting the project, the environmental conditions or demands under which permits would be issued (if the project is approved) and mention of the public entities with competent jurisdiction in overseeing and monitoring the project.

In other words, should the project be approved, it would not only receive its environmental qualification but also all related environmental permits. Failure by the EIA to include the necessary requirements or background information for the issuing of these permits will also prevent the authorities from issuing an approval for the project.

The ToR provided by the authorities for the conduct of this study failed to render an accurate definition for, and limits to, the most relevant aspects of the assessment, incorporating all environmental components (climate and weather, air quality, geology, geomorphology, hydrology, water quality, vegetation and flora, fauna, socio-economic aspects, infrastructure, archaeology, landscape) and requiring a detailed description of each component. The authorities' lack of experience in determining the area of influence of the project, given its magnitude and location, accounts for these difficulties. Moreover, since the Valdivia Project was the first of its kind (cellulose) to be included in the EIAS, everyone was concerned that excessive zeal in defining the limits of the requested data would lead to the exclusion of important aspects from the assessment. Thus, the State would have been to blame for any impact generated by the project and not included in the ToR.

The project filed with the authorities for the issuance of ToR was by then well defined, having already established its exact location, the concept engineering and the technology to be used, i.e. a project not adaptive to substantial modifications. There was also a preset timetable for the start-up of activities, construction and installation.

The EIS for the Valdivia Project presented a description of a project at the concept engineering stage. However, much detailed and indispensable background information required for the granting of sector permits connected with the EIAS in Chile had not been included.

The Environmental Impact Assessment for this Study suffered from major shortfalls in the identification and analysis of the environmental effects arising from the project, particularly with regard to the Cruces River Natural Reserve. In this sense, the Study Baseline was painfully incomplete in most of its components (e.g. hydrology, water quality, aquatic vegetation and flora, land-based and aquatic fauna, socio-economic aspects), which precluded building a real scenario of the project's area of influence and of the environment without the project.

Furthermore, several factors were not considered in the assessment, e.g. the impact of emissions into the atmosphere (viz. the transformation of SO₂ into sulphuric acid) and the disposal and handling of solid waste generated by the project.

PROCESS AND PROCEDURAL CONTEXT

While the environmental impact assessment was being carried out, several aspects were considered that had been provided in the Environmental Law

which promulgated the EIAS as well as other instruments applicable within the context of the voluntary system and established by CONAMA.

The following aspects are significant:

- ToR were laid down for the preparation of the EIS. The Study contemplates the environmental components that must be considered for assessment purposes and the minimum requirements established by the authorities to review the EIS. However, this document carried no legal force to be established as a mandatory requirement during the review process. Under the Environmental Law, the authorities have 120 days to issue a project's environmental approval. The following action is taken during this period:
- the Environmental Impact Study is reviewed by the State bodies deemed environmentally competent by virtue of the characteristics of the project, its emplacement and potential to affect either resources or communities protected under the Environmental Law. The following entities participated in the review: Regional Planning and Coordination Office, Regional Water Bureau, Regional Highway Department, Regional Housing and Urban Development Office, National Forestry Corporation, Farming and Livestock Service, National Fishing Service, National Tourism Service, Valdivia Public Health Bureau, and National Bureau of Maritime Territories and Merchant Marine.
- These entities reviewed the EIA in light of the established ToR and sectoral criteria. They then sent their comments to CONAMA and requested clarification or revision of EIS data which they deemed necessary for a proper understanding and assessment of the project.
- CONAMA used the collected data to prepare a report in which it requested clarification, further elaboration or revision of information from the applicant, pointing out the most serious shortcomings revealed by the Study.
- Once the queries were answered and the problems resolved, CONAMA drafted a Technical Report on the basis of the reports issued by the competent entities. This Technical Report sets forth all relevant precedents from an environmental standpoint, requisite action to comply with the environmental regulations, and confirms that the necessary background data has been furnished for the issuance of the sectoral environmental permits related to the project.

Lastly, the competent authorities (COREMA) were called upon to give the project an environmental qualification, including any applicable conditions or restrictions.

Based on the Study's characteristics, the project owner was required to clarify several aspects in connection with the project. Salient among the problem areas were the following:

- The completion of the hydrology baseline, which should at the very least consider water flow measurements during a given annual cycle and include all seasonal fluctuations. This completion of the baseline was of vital significance in assessing the impact caused by the diversion of water for running the pulp mill, as well as the impact on water quality in the Cruces River due to effluent discharge.
- The EIS only mentioned the eventual design of a sanitary landfill for the disposal of solid waste generated by the project. However, the Study failed to provide any information on where the landfill would be located, the baseline data, and the impact assessment for the site. The authorities demanded that further information be delivered in connection with the landfill for environmental impact assessment purposes. Moreover, the Public Health Bureau required the data in order to issue the sanitary permit – sectoral environmental permit – for the construction and operation of the waste site.
- The air pollutants to be generated by the project would include 2.24 tonne/day of particulate matter and 13.2 tonne/day of SO₂. These emissions would have an impact on air quality in terms of primary effects (human health) and secondary effects (natural resources). The EIS failed to provide an accurate determination of the magnitude and extent of the impact generated by these emissions.
- This project provided for the arrival of 3500 people during the construction stage of the plant. Workers would lodge in the communities neighbouring the mill site, such as San José de la Mariquina, Lanco and Máfil, the largest of which had a population of merely 2500. A request was therefore filed to assess the socioeconomic and cultural impacts on that towns, as well as to account for the impacts caused by an eventual increase in the demand for infrastructure and services.
- One of the most problematic issues faced during the environmental impact assessment was the presence of the RAMSAR site within the Project's area of influence. In fact, this Reserve lies 30 km downstream from the mill site and is fed by the Cruces River. The Reserve operates under the auspices of the National Forestry Corporation (CONAF)

and is the only RAMSAR site in Chile, as ratified by an Executive Order issued in 1981.

EIS results indicate that the Reserve would be affected by project-related environmental impacts of moderate to minor significance, in particular with regard to exotic nutrients which could possibly alter the ecosystem.

Nevertheless, the public entities in charge of reviewing the project refuted the accuracy of the assessment, since the flow of exotic nutrients to the Reserve would be far greater than those presented in the Study. The authorities thereafter demanded that the future impacts on the RAMSAR site be reassessed.

APPROACH TAKEN

Following the official request for more information on the topics mentioned above, the applicant delivered a revised Study that incorporated the following additional data:

- Update and analysis of maximum water flows in the Cruces River.
- Water quality monitoring programme to be carried out in the summertime.
- Information on solid waste disposal, which is still found deficient in terms of eligibility for the respective permit. Not only was the location provided tentative in nature, but it was also outside the influence perimeter of the EIA project. The authorities were therefore unable to render an opinion on the environmental viability of the landfill.
- The report mentions the synergistic effects on the Reserve produced by a combination of factors, such as the discharge of organic matter, increased temperature and minimum river flow. However, since no data were provided in connection with this effect, the authorities were unable to determine whether an impact would be generated on the receiving watercourse or not.
- Data were furnished in connection with socioeconomic impacts, albeit still insufficient for environmental assessment purposes.

The predicament of the Cruces River Natural Reserve merited the attention of the Head of the Special Policy Department of the Chilean Foreign Affairs Ministry, in order to clarify how Chile would live up to the environmental commitments assumed by the government when this Reserve qualified as a RAMSAR site. These obligations include the comprehensive protection and preservation of the conditions which make this site unique, and the Special Policy Department had in its possession data that revealed the fragility of this area as regards its self-preservation. Following consultation with the

public entities related to the RAMSAR site, the Department concluded that the project's features would generate environmental impacts to the detriment of the aquatic environment and its biodiversity – in short, a violation of applicable environmental regulations.

The work conducted by the public entities that participated in reviewing the Study was enhanced by information provided by some NGOs that took up this issue. The NGOs voiced their concern for the RAMSAR site and for certain species that inhabit the local ecosystem and are classified as endangered. Scientists and non-governmental organizations vehemently opposed the project and came to the defence of the Natural Reserve, arguing that the effluents would be discharged into the river that runs through the site and greatly impair its viability.

On the other hand, the large investment sums considered for the project and the distinct possibility of new jobs engendered great expectations among the local population. In recent years, the region had been mired in an important economic depression, and the potential new job sources to be generated by the project raised hopes that the situation would finally be reversed.

Finally, CONAMA issued a Technical Report concluding that – in light of the information furnished by the Environmental Impact Study – it was unable to qualify the project as environmentally viable, given that it had failed not only to demonstrate compliance with environmental regulations, but also to assure that the proposed mitigation action would fend off adverse effects on the quality and quantity of renewable resources, or on protected resources or areas of environmental value.

RESULTS AND IMPLICATIONS

The COREMA is in charge of assigning environmental approvals to projects or activities, certifying their viability from an environmental viewpoint. The COREMA is a collegiate body made up of the Regional Intendant, the Regional Ministerial Secretariat, the Province Governor, Regional Councilmen and the Director of CONAMA. This particular COREMA made decisions about this project on the basis of the following background information:

- the Technical Report prepared and certified by the Technical Committee;
- a balanced summary of the observations made by the local population; and
- other considerations, such as regional and local development policies, public opinion, an analysis of the social and economic costs and benefits that the project or activity would generate for the country, region, community, State etc., adherence to international treaties etc.

The Environmental Impact Assessment System (EIAS) is intent on establishing a uniform procedure to analyze environmental permits in any

single instance; therefore, the Technical Report must be conclusive in its determination of whether the requisite data and requirements provided by law have been delivered in order for the competent environmental State authorities to issue the applicable permits. There was no way the Technical Report could be favourable for the project if the EIA lacked information that was necessary for a positive decision to be reached in connection with any particular permit. Such a departure from established procedure would have completely frustrated the original intent of the EIAS.

The COREMA finally agreed to approve the project, albeit establishing multiple environmental restrictions and the obligation to evaluate several project aspects environmentally.

The Natural Reserve

The Technical Report prepared by CONAMA, with data contributed by competent entities, concludes that the information furnished in the EIA and the review thereof by the Technical Committee precludes the making of any assurances as to the presence or generation of impacts in the Natural Reserve. Even if the project were to adhere to the benchmark emission standards established for plant effluents, this safeguard would still fall short of preventing significant adverse impacts from being generated in terms of alterations to the characteristics of the protected site.

The conditions which COREMA established in order to approve the project were based on the Technical Report prepared by the Technical Committee, the additional background information furnished by the applicant and the data included in the project's EIS. What follows is a detailed account of the conditions.

The industrial effluents from the pulp mill must be treated by the primary and secondary treatment systems provided in the EIS. Moreover, and with the intention of protecting the Natural Reserve and RAMSAR site, the applicant will be required to opt for any of the following alternatives for the discharge of effluents:

- discharge into the Cruces River, calling for the incorporation of a tertiary treatment system that will operate on the terms to be established by COREMA; or
- discharge into a stream or body of water other than the Cruces River and not directly communicating with, or flowing into, the Natural Reserve.

Furthermore, any option chosen would be subjected to an environmental assessment submitted for approval by COREMA. Regardless of which alternative the applicant chooses, the assessment must include a study of the effects of consuming a given amount of water from the Cruces River and discharging it into another stream or body of water. All of the above is aimed at evaluating potential impacts on the Natural Reserve.

Disposal and treatment of solid industrial waste

The applicant must implement a disposal system for solid industrial waste, to be located in a suitable area within the limits which the EIS establishes for the mill site. This sanitary landfill must comply with all applicable environmental regulations and abide by the EIAS. A detailed profile on the types and quantities of the waste to be dumped in the sanitary landfill must also be included. Particular emphasis was placed on information regarding the degree of toxicity of the waste and the compatibility among waste materials from a reactive point of view.

Water supply and consumption

Consumption of water from the Cruces River was limited to the maximum figure, established in the EIS, of 900 l/s, for both process and cooling water. Also, should the water flow on the Cruces River border on the minimum flow rate limits and/or be deemed by the General Water Bureau as cause for concern, the applicant must consult with CONAMA and the General Water Bureau for the implementation of measures conducive to the prevention of undesirable environmental impacts as soon as possible, in order to stave off irreparable damage to the aquatic environment.

Emissions into the atmosphere

It was recommended that the applicant consider the implementation of a control system for SO₂ to reduce plant emissions. This measure cannot be imposed by the authorities as the project meets the environmental quality standards currently in force in Chile. However, emissions from the pulp mill would create a zone where environmental quality would fall close to the maximum authorized limit. This would be caused exclusively by the installation of the mill, since no other sources of this type of emissions exist in the vicinity.

Monitoring or follow-up plan

Stations must be set up in areas adjoining the Cruces River Natural Reserve and in the protected site itself during the first three years of the plant's operation, aimed at monitoring water quality. Standardized essays and protocols must be used with key Chilean species in order to account for the effects on the Reserve's ecosystem components.

The applicant must constantly monitor smokestack emissions and air quality for sulphur dioxide concentrations (SO₂). Moreover, permanent monitoring of weather conditions is necessary in order to check the emission levels stipulated by the EIS and undertaken by the applicant.

LESSONS LEARNED

Terms of Reference

Several problems have arisen from the existence of ill-adapted ToR which, moreover, have no binding force in so far as the preparation of the EIS (given the voluntary nature of this system) and are based on a predetermined project that was conceived without any community involvement. These issues are as follows:

- a voluminous Environmental Impact Study full of unnecessary details;
- the relevant aspects of the project were identified during the EIS review and not while preparing the ToR or the Environmental Impact Study;
- loss of time and money because irrelevant or inapplicable information is not deleted;
- separate presentation of environmental impacts; not accounting for synergistic or cumulative effects from the combination of environmental factors and project emissions and discharges;
- competent authorities must decide on the basis of information furnished by the Technical Report prepared by competent entities and relevant aspects for regional development, political and social factors, among others; and
- Terms of Reference must be adapted to each specific project, since they assist in identifying relevant impacts even prior to the environmental assessment. They are also helpful in defining the practical areas in which the authorities shall require the applicant's commitment.

Significance of impact assessment

The approval of any given project and the conditions established for its execution hinge directly on how impact significance is interpreted.

Assessment criteria or methodologies used in this project were found wanting in the following areas:

- environmental quality and emission standards currently in force in Chile (very few as of now);
- fundamental criteria to allow for a broad and consensus-based comparison of aspects not currently regulated;
- methodology guidelines to focus environmental assessment on the aspects deemed most relevant to this type of project and to the emplacement thereof ; and
- in the specific case of the Natural Reserve's ecosystem, additional

assessment instances had to be established that would include the participation of environmental experts. The goal was to achieve consensus in assessing the significance of the impacts and not leave this task to the decision-making process, since the latter takes non-environmental aspects into account.

On the other hand, project owners must include environmental variables from the conceptual stage, and regard them with the same relevance as the technical and economic aspects. Incorporating environmental factors in the decision about the feasibility of a project affords the following benefits:

- determining a proper location for the project in order to diminish potential environmental impacts;
- substantially minimizing environmental degradation since impacts are forestalled;
- minimizing potential conflict with affected communities or environmental activists;
- expediting the Environmental Impact Assessment procedure; and
- establishing precedents to facilitate the environmental assessment process for other investors wishing to participate in this type of project.

DECISION-MAKING

The following is deemed necessary, given the characteristics of the project, Chile's transition to democracy from an environmental standpoint, and especially the evolution made by environmental impact assessments:

- Keep the authorities (COREMA) informed as to the progress being made in reviewing the Environmental Impact Study, and the project and the opinion of the community most directly affected by it, prior to making the final decision, in order to keep undue pressures at bay.
- Begin the Environmental Impact Assessment process early enough to allow for modifications.
- Support and strengthen the technical review of the EIS to reduce uncertainty when making the final decision.

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Key words

sustainability
integrated
approach to EIA
process and
procedures
ecological and
biological
impacts

Environmental impact statement: 105 km highway corridor in the State of Durango

Julieta Pisanty -Levy

This case study has written authorization from the project proponent.

ABSTRACT

This is a case study of the construction of a two-lane highway in the State of Durango. The average right of way will be 60 metres wide to allow for future expansion to four lanes. The highway will be built to high specifications and will have intersections, bridges, crossings for roads, railroads, pedestrians and cattle and minor drainage works. The area required will be 632.61 hectares. The surrounding environment has dry and temperate climates that support desert vegetation, stands of conifers and other trees and irrigated and rain-fed agricultural areas. There are several rivers of varying flows and small streams. The topography is highly varied with large canyons, plateaus, hills and plains.

The Environmental Impact Assessment (EIA) for this project was prepared in accordance with Mexican environmental legislation. When it was carried out, the project was in its planning phase.

INTRODUCTION

The project involves the construction of a two-lane highway in the State of Durango. The average right of way will be 60m wide to allow for future expansion to four lanes. The highway will be built to high specifications and will have intersections, bridges, crossings for roads, railroads, pedestrians and cattle and minor drainage works. The area required will be 632.61ha.

The corridor is the first phase in a larger project whose final destination lies on Mexico's west coast. When the statement was completed in 1995 the date of commencement of work had not been set.

The main cities the highway will link are Durango (348 000 inhabitants) and El Salto (39 000). There are localities neighbouring the corridor that vary in size and number of inhabitants. The aim of the project is to facilitate the transportation of people and regional produce to the Pacific coast. The surrounding environment has dry and temperate climates that support desert vegetation, stands of conifers and other trees and irrigated and rain-fed agricultural areas. There are several rivers of varying flows and small

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Assessing

streams. The topography is highly varied with large canyons, plateaus, hills and plains.

The Environmental Impact Assessment for this project was prepared in accordance with Mexican environmental legislation. The statement was evaluated and reported by the competent federal authorities. When the assessment was carried out, the project was in its planning phase and it was possible to propose impact prevention and mitigation measures that could be considered and applied by the project proponent in the implementation phase.

In addition to complying with current federal legislation and regulations, a professional study was made that identified not only the potential impact of future work but furthermore, suggested that certain design aspects of the project be revised.

NATURE AND SCOPE OF ISSUES

From the technical viewpoint, the project was planned with all the major works typical of high-specification highway construction. In response to the topographical conditions of the area, bridges up to 400m in length, cuts up to 30m in height, the extraction of huge volumes of construction materials and the clearing of various species of desert scrub and trees were all planned.

The project proponent must purchase more than 600ha of land for the right of way and has a legal department responsible for dealing with all aspects of the purchase and/or expropriation of the privately and commonly owned plots needed for the construction of the highway and space for future widening.

It sometimes happens that the project proponent has not finished paying for land acquired before work has begun. From the social viewpoint, this generates ill feeling among those affected. Therefore, in this study it was recommended that what is called the 'freeing of the highway right of way' be completed before construction commenced in order to avoid conflicts with the owners.

PROCESS AND PROCEDURAL CONTEXT

Mexico is a North American and Latin country with several years' experience in the application of federal, state and municipal government environmental policies on different levels. There has been progress in mitigating environmental impact, due to the fact that preventive policies have been recognized as an important tool in the correction of existing environmental imbalances.

In Mexico, the General Ecological Balance and Environmental Protection Act and the Environmental Impact Regulations establish which projects must be

assessed. Highways and communication routes must be analyzed to anticipate the environmental impacts that their construction and operation will generate.

Carrying out environmental impact statements for proposed projects and integrating them into the environmental impact procedure of the National Ecology Institute – a decentralized body of the Ministry of the Environment, Natural Resources and Fisheries – is the responsibility of the Federal Highways Bureau of the Ministry of Communications and Transportation.

The personnel of the Bureau of Environmental Impact, backed by other bureaus in the National Ecology Institute, are responsible for reviewing statements and issuing technical reports approving, applying conditions or rejecting projects.

The project proponent must implement not only the mitigation and other measures proposed in the study but also the recommendations and/or conditions established by the authorities in the report. The Federal Attorney General for Environmental Protection must ensure that the project proponent complies with the terms of the report. In this case, the Federal Highways Bureau is in the process of implementing a system of internal oversight to verify that works constructors quantify the cost of each project's mitigation measures and any conditions imposed at the time of approval, and implement them.

The environmental study for this highway project was prepared based on the 'guidelines for the development and presentation of the environmental impact statement in the general modality referred to in articles 9 and 10 of the Regulation to the General Ecological Balance and Environmental Protection Act in the field of Environmental Impact', and the special guidelines for federal highways issued for such purpose by the National Ecology Institute.

The different chapters of the study contain the following information:

- general information on the project proponent and the consultant preparing the EIS; a description of the planned works;
- a description of the physical, biological and socioeconomic environment;
- factors of the project relating to land use and protected natural areas regulation of environmental impacts; and
- mitigation measures and programmes to reforest and/or restore of affected areas.

Various laws, regulations, highway construction standards and official Mexican standards relating to the protection of forest areas, soils, protected plant and animal species, in addition to regional, municipal and sectorial development plans and programmes were revised.

APPROACH TAKEN

One of the first activities carried out was the collection and analysis of the available bibliographic and cartographic information which provided, on the one hand, detailed information on the works to be built in the project and, on the other, the characteristics of the physical and chemical, biological and socioeconomic environment of the area. In this phase, materials provided by the Highway Project Department were used – mainly aerial photographs of the highway corridor, drawings of each one of the 105 planned kilometres and information on structures, drainage work, pavements, location of quarries and surplus material dumping sites, etc.

The aerial photographs allowed identification of the settlements along the corridor, farming and grazing land, scrub land, woods, forestry trails, quarries in use and physical features such as canyons, rivers and streams.

The necessary information was ordered, classified and selected; only the information pertinent for the study was used.

The purpose of the field visits was to:

- learn about the prevailing environmental characteristics along the corridor;
- verify the existence of farming and forestry;
- observe quarries in use and locate those proposed;
- observe the conditions of existing settlements;
- identify types of vegetation and dominant species;
- corroborate bibliographic and cartographic information related to geological aspects, soils, and surface and underground currents; and
- talk with local informants and with persons performing other studies related to the highway.

The identification and evaluation of environmental impacts was performed with the help of checklist and map overlay methodologies. A list of activities for the site preparation, construction, operation and maintenance phases was drawn up. The second list included the climatic, edaphic, hydrological, geological, biological (plants and animals), landscape and socioeconomic characteristics of the area of influence and the region.

This methodology was used to order all the activities planned and to identify in which phase of the project they will be carried out, to decide whether they will be simultaneous or consecutive and to infer the impacts they will have on the environment.

Overlaying different types of maps allowed the projected works to be correlated with environmental characteristics such as:

- types of vegetation and soils that will be affected by clearing the right of way;
- rivers and streams that will suffer increased sediment as a result of the mining of quarries and the construction of the highway;
- types of vegetation and surface currents that will be affected by the location of dumping sites for excess material not used in the construction;
- types of vegetation and farming in the area affected by the construction of gravel access roads;
- places where cuts will be made and intersections and bridges built; and
- privately and commonly owned land that will be affected.

In addition, the project's area of influence was highlighted on a map, showing the aforementioned correlations but mainly concentrating on an exhaustive analysis of the direction of flow of the area's surface currents. This map can be considered as the result of the integrated approach to impact analysis.

Both the desk and field work was carried out by an interdisciplinary professional group made up of a civil engineer, a geological engineer, three biologists and two architects.

The main environmental impacts identified were as follows:

- a socioeconomic impact due to affected private and common property lands; and
- impacts on local climate, air, soil, surface water, geomorphological dynamic, vegetation, wildlife, landscape and inhabitants due to such action as clearing, cuts, the mining of quarries, the operation of machinery and equipment, the installation and operation of crushing and asphalt producing plants, and the creation of dumping sites.

The impacts could take the form of :

- changes in local climate;
- the presence of suspended particles, gas, smoke and noise;
- an increase in proneness to soil erosion;
- an increase in solid particles suspended in rivers and streams, and the silting up of water courses;
- an alteration of the natural pattern of drainage;
- an intensification of erosion and sedimentation processes;
- changes in the original topography and stability of the terrain;
- a loss of tree stands, desert scrub and crops;

- the destruction of wildlife habitats and the creation of barriers to movement;
- a visual impact due to changes in the landscape mainly in mountain areas due to the height of cuts and embankments, and the extraction of construction material; and
- soil pollution due to accidental spills of fuel, grease and oil in machinery and equipment operating yards.

For each of the above impacts the phases of the project in which they could arise and the specific place or area affected were identified and their corresponding mitigation measures were proposed. The impacts were graded by intensity and extension; reversibility; duration, and whether they were adverse or beneficial, cumulative, avoidable or unavoidable.

RESULTS AND IMPLICATIONS

Once the EIS was completed, it was delivered to the project proponent who had it revised internally. In accordance with the study's results, proposed measures and conclusions, the proponent determined that some aspects of the project design should indeed be analyzed once more and modified to avoid significant environmental impacts. This was the case of the proposed sites for dumps, that would have been located in canyons, streams, rivers, *Pinus* and *Quercus* woods and areas of desert scrub, among other sites.

A study was also proposed of the technical and economic feasibility of transporting material remaining after excavation and general earth movement to quarries to be used in restoration work. This analysis has not yet been performed because the construction of the highway was postponed and, therefore, it is not known if the proposals will be taken into account. The project proponent has, however, delivered the environmental impact statement to the National Ecology Institute for review and report. At the time of writing the terms of the report were being examined by the Federal Highways Bureau.

It must be said that although this highway is included in the Communications and Transportation Sector 1995-2000 Development Programme, it apparently is not currently a priority project which is why a date has yet to be set for its construction.

In developing countries like Mexico, consideration must be given to such important factors as the economy. Faced with insufficient public funds, the federal government implemented a programme to build and operate new four-lane toll highways some of which were leased to the private sector and Mexico's State governments.

Projections made before 1994 for the highway kilometres needed by the country and the investments required to build them have not been met partly due to the economic crisis which began towards the end of 1994.

Construction costs exceeded forecasts, tolls charged by lessees were very high and traffic flows turned out to be much lower than forecast. Once again the federal government had to take charge of these highways to avoid damage and to promote use by drivers.

Against this background, it is understandable that priority is being given to what are considered strategic projects. Since there currently is a toll-free highway linking the city of Durango with the Pacific Coast, an alternative route already exists; but it is not a high-specification link and journey times are considerable due to the difficult topography of the terrain.

In conclusion, it may be said that this particular environmental impact statement was prepared properly and in a highly exhaustive fashion but that the project has not gone ahead due to reasons unrelated to the corresponding environmental report.

LESSONS LEARNED

With respect to environmental impact assessment practices in Mexico, in general terms there has been significant progress in recent years but much remains to be done in certain areas. For example, assessments must be made in parallel to the planning of projects in order to integrate environmental protection measures and to estimate their potential monetary costs. This goal currently seems unlikely because projects are normally analyzed in the final stages of their design.

The consulting group carrying out an environmental impact statement should participate in the follow-up stage to support the project proponent in the implementation of mitigation measures. This is not the case today because regulations do not require it and the authorities responsible for overseeing compliance with reports do not have adequate resources to supervise all works accepted or conditioned.

There must be greater awareness, both on the part of project proponents and certain consulting groups and authorities, of the importance of such studies in preventing harm to the environment. In Mexico the time and money set aside for these studies remains limited and there have been problems with excessive commercialization, poor quality reports, unreliable and often dubious data, and a common attitude of going through the motions.

Nevertheless, in recent years the Ministry of Communications and Transportation in particular has set aside extensive funding for the preparation of environmental impact statements for various highway corridors in different states of the country and this has allowed the particular environmental impacts of each one to be identified and the measures to avoid, minimize or compensate for them to be proposed.

Unfortunately, some highway lessees did not correctly implement the proposed mitigation measures, with the result that the actions they took –

for example to stabilise tall and steep faces of cuts using sprayed concrete – are not having the required effect (avoiding rock falls). In this specific case the impact on the landscape is visually catastrophic. Such actions are usually less expensive and more readily achieved than stabilisation using replanting with appropriate species but in the long term their maintenance costs rise considerably. On some highways these errors are being corrected; one short-term goal would be for construction companies to prepare realistic budgets not only for the construction of works but for the implementation of mitigation measures and the restoration of affected areas, such as quarries. In addition there must be much closer oversight both by the project proponent and the competent authorities.

In the case of public sector works in general, there must be a change in the Acquisitions and Public Works Act to loosen the tight restrictions put on available funding: environmental impact studies and construction projects are being granted to whoever guarantees the all too often incongruous factors of quality and a low price tag.

LIST OF RELEVANT PUBLISHED PAPERS AND OTHER SOURCE MATERIAL

Secretaría de Comunicaciones y Transportes. Subsecretaría de Infraestructura. Dirección General de Carreteras Federales. 1995, Manifestación de impacto ambiental modalidad general de 105 km de la carretera Durango-Mazatlán, tramo Durango-El Salto, en el estado de Durango, Final EIS written by Pisanty, L. J. México. 189 p.

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Key words

cumulative,
large scale
effects

mitigation
integrated

approach to EIA
decision making

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 Científico Tropical (CCT) in 1988. This organization has on a number of occasions undertaken environmental and ecological studies of hydroelectric projects.

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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 predictable 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 2.0m³ in the Toro river and 0.4m³ 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 596.569m³ and the four deposits as having a capacity of 640.00m³.

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 top of the slope 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 is also a recommendation to keep the necessary inflow to maintain the waterfalls as a tourist attraction of the Toro and Gata Rivers.

LIST OF RELEVANT PUBLISHED PAPERS AND OTHER SOURCE MATERIALS

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Key words

**cumulative
impacts
environmental
management
monitoring**

Huites irrigation project

Maria A. Gomez-Balandra

ABSTRACT

The case study presented here deals with a multiple purpose project for flood control, irrigation and generation of electricity. The project was evaluated within the legal framework of the environmental impact legislation enacted in 1988 and in response to specific guidelines for the water sector.

Construction of the dam and installation of the hydroelectric generating plant have since concluded. Feasibility studies for the works in the irrigation district are underway. The irrigation districts, as members of the private sector, will finance the project – a first in Mexico.

Many of the mitigating measures for the impacts identified in the natural and social environments have been implemented. The proposed follow-up and monitoring programme includes long-term activities including water quality analysis. The successful implementation of this programme will depend on the agreements among involved agencies.

INTRODUCTION

The Huites Irrigation Project centres around a conventional concrete gravity-flow storage dam, 162m high with a capacity of 4,023 million m³. Additional structures include diversion works, a spillway and a hydroelectric generation plant, as well as the main channels and the distribution networks in the irrigation district. The dam is located in north western Mexico in the states of Sonora and Sinaloa (fig.1).

The dam was designed to control floods by storing up to 1115 million m³ to protect 50,000ha of cropland, provide irrigation water to 70,000ha and 89,700ha in 1.28 cycles, and generate electricity at a rate of 875 kW.H/year with a minimum capacity of 400MW.

This project harnesses 95 per cent of the runoff from the watershed and provides virtually complete control of flooding.

The cost of the structure in 1992 was USD 212 million (Ps7.8: USD1). Construction began in that year with a record estimated completion time for the dam and the hydroelectric generating plant of 29 months.

The project was located in an agricultural region where storage and diversion dams, irrigation districts and hydroelectric plants were present.

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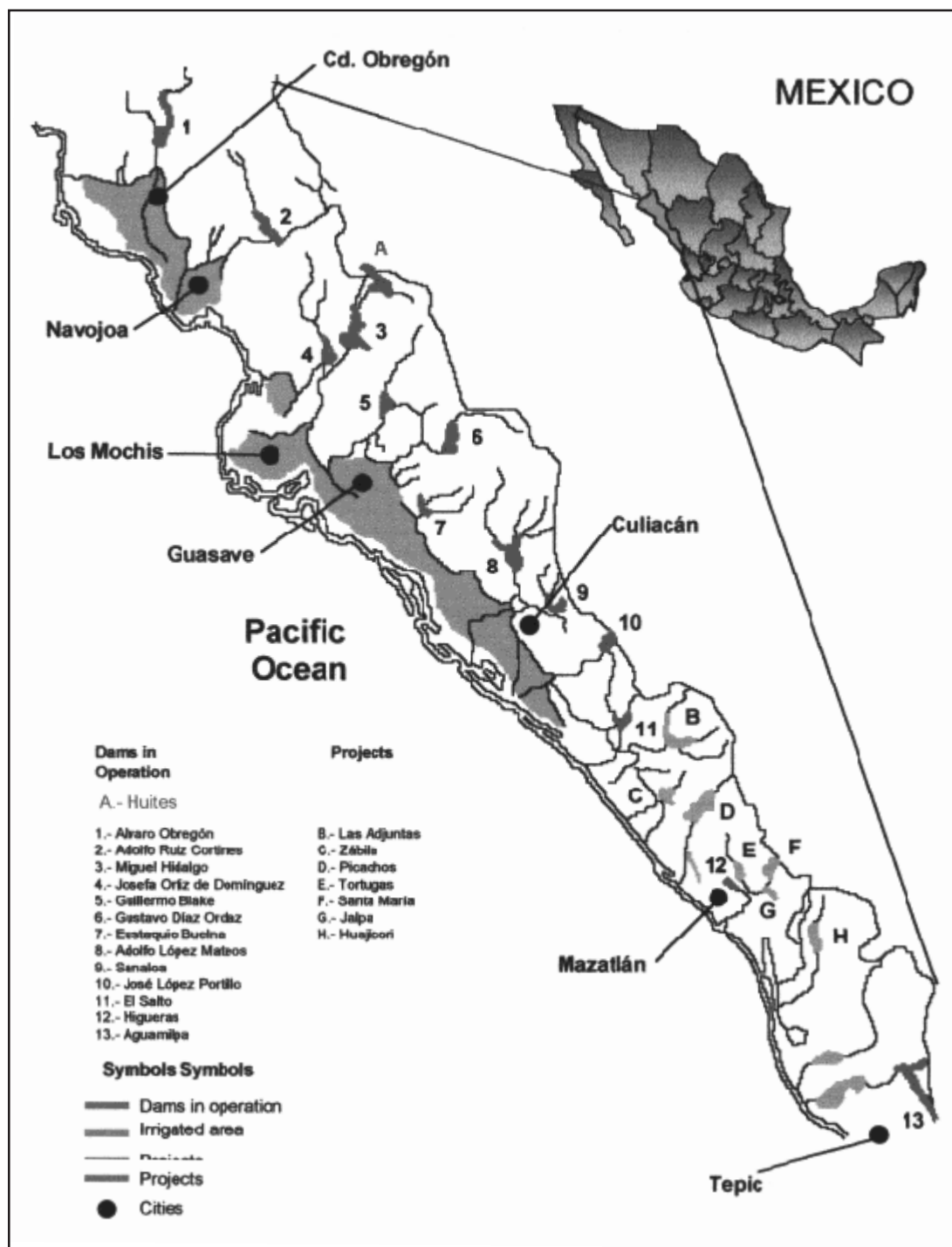


Figure 1: Project location

The Huites Dam, upstream of the existing dams, provided flood control for the runoff from the thawing snow, an enlargement of the irrigation districts and an additional source of electricity. The regional crops are wheat, soybean, sorghum, rice, safflower, maize, dry beans estimated to increase to 386 000 tonnes with a value of 250 000 million Mexican pesos that would benefit 6650 families in six municipalities in the adjoining states of Sonora and Sinaloa. Domestic consumption was to account for 68 per cent of the production and export, 32 per cent.

Irrigated agriculture in the north west provides 30 per cent of all the nation's production. This proportion would rise with the implementation of the Huites project to reach 65 per cent of the estimated potential crop area in the zone.

The project influence area is around 73 902ha of which 20 023ha (27.09%) are cropped, 1140ha (1.55%) are used for animal husbandry, 44 290ha (59.93%) are forestry areas, 1278ha (1.78%) are being cleared and 3269ha (4.42%) lie fallow. Urban centres occupy 405ha (0.55%) and hills account for 3497ha (4.73%).

The major negative impacts identified were related to the flooding of 9457ha (maximum extraordinary water level of 288.43), part of which was low deciduous forest that was the property of nine ejidos (4924ha), private parties (2050ha) and the federal government.

Other negative impacts were related to changes in soil use, hydrology and ownership, the loss of habitats for the terrestrial and aquatic fauna, and the relocation of fourteen communities with a total of 1130 inhabitants according to the 1990 census (INEGI, 1990).

NATURE AND SCOPE OF ISSUES

The technical studies for the design of this project were started in 1991 by the Hydraulic Resources Secretariat. It was initially conceived as part of a regional development plan, the Northwestern Interconnected Water Plan and later the Northwestern Interconnected Water System (SHINO), that joins watersheds through storage, deviation, conveyance and distribution works in Nayarit, Sinaloa and Sonora.

The Environmental Impact Statement was prepared in 1992, after considering the guidelines established in the regulations concerning environmental impact of the Ecological Equilibrium and Environmental Protection Law and the Cooperation Agreement between the National Ecological Institute (INK) and the National Water Commission (CNA) (INE-CNA, 1991). The CNA, in accordance with the requirements of its projects, adopted and complemented the guidelines to fulfil the requirements of the Environmental Impact Statement.

During the execution of the screening procedure proposed by the CNA, the need to prepare an Environmental Impact Statement tailored to the project

was recognized. For this purpose, the CNA hired Construcciones y Estudios, S.A., duly registered as an environmental impact consultant with the National Ecology Institute, as required under law.

In accordance with the environmental impact regulations of the Ecological Equilibrium and Environmental Protection Law (1988-1996) and the modifications proposed by the CNA, the evaluation included:

- general information about the proposing party, the project and consultants;
- a description of all phases of the project or activity;
- a description of the environment before the execution of the project;
- an analysis of the environmental parameters at present and in the future;
- identification and evaluation of the environmental impacts of each phase;
- evaluation of the modified environmental scenario;
- prevention and mitigation measures for the environmental impacts identified;
- conclusions and recommendations;
- references,
- a list of participants including professional resumes; and
- appendices.

The appendices contained a detailed description of the methods used to study each parameter (water, flora, fauna, socioeconomic aspects, etc.), and the results of the samples and design calculations, and work schedule.

One of the difficulties of the project was the wide zone of influence, including the Fuerte River basin, its tributaries, dams, irrigation districts and a projection on the Pacific coastal region, approximately 220km from the project site. The diagnosis, and the identification and evaluation of the impacts were focused on the storage area and works, and the region downstream to the coast. The reconciliation of interests of the investors was another obstacle. The participation in the project financing was 51.5 per cent from the region's irrigation districts; 22.8 per cent from state funds, and 25.7 per cent from federal funding through the National Water Commission. The federal government agreed to build the storage dam and the hydroelectric generating plant, while the growers, with the support of the state governments, promised to build the irrigation facilities.

The National Water Commission and the Federal Electricity Commission (CFE) have not completely defined the terms of transfer of the dam electric generating plant nor the responsibility for the long-term mitigation and monitoring activities.

Irregularities in land possession have arisen during the process. Proposals were made to redefine the property limits with the participation of the Agrarian Reform Secretariat and the Agrarian Attorney-General's Office. The area destined for the dam was duly expropriated and compensation paid. The information concerning the communities cited in the environmental impact statement and used to estimate the number of dwellings required for the relocation of the families was taken from the 1990 census. The mitigating measures included the recommendation to prepare a specific census of the families to be relocated, the property to be compensated and the individual preferences as to sites and means of compensation.

PROCESS AND PROCEDURAL CONTEXT

The procedure to evaluate projects of this nature, as specified in the Environmental Impact Regulation, is summarized in Figure 2. A basic requirement is that no portion of an ecological reserve be included in a project.

During the 1992 evaluation, this project formed part of the objective proposed by the Sinaloa State Urban Development Plan and the State and Local Ecological Development Plans.

The method used to identify and evaluate the impacts was developed by the Environmental Impacts of Irrigation and Drainage group and published in 1986 by the International Commission of Irrigation and Drainage (ICID). In it *ad hoc* techniques are used for the development of each phase. A check list of the major environmental components and a data list to identify the activities that will cause these effects were developed. These two elements, combined in an interaction matrix, serve to identify and rank the effects based on reversibility, duration, geographic area and direct or indirect relation to the activities.

Once the environmental impact statement has been drafted, it is reviewed by the National Institute of Ecology (INE). The INE has 90 days to authorize, impose conditions or reject the project. A project of this nature usually receives a conditioned acceptance. In this case, because of a shortage of qualified personnel, the INE required more time for the review. Under an inter-institutional agreement, the CNA and CFE sent staff to assist the INE.

The INE sent its decision after the project had started and gave conditional approval to compliance with the proposed mitigating measures. The decision included other measures including the control of the storage, handling and transport of explosives, an archeological study of the region, training in the use of agrochemical and pesticides and in industrial safety.

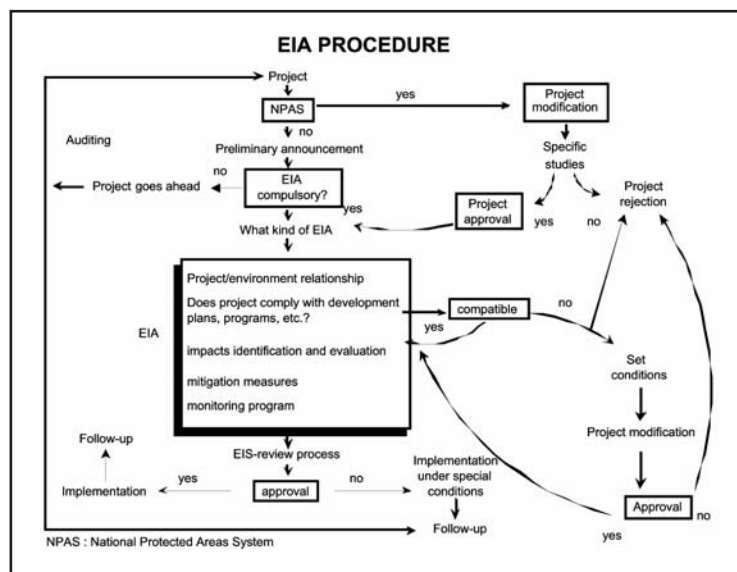


Figure 2: EIA procedures as specified by the Environmental Impact Regulation

APPROACH

The bibliographic and cartographic information for the diagnosis of soil use, vegetation and geology was obtained from the National Institute of Statistics, Geography and Census (INEGI). This data, which is generally more than 20 years old, was updated from aerial photos.

Population, dwelling and agricultural census data from 1990 were also provided by the INEGI. Economically active population, age pyramid, economic activities, educational level, public health, public services and number of persons that speak dialects were other socioeconomic parameters taken into consideration. This information was compiled through communication strategies and negotiations with the affected communities.

The project permit included the CNA's recommendation for specific field and laboratory studies to determine water quality, agrochemical and pesticide pollutant concentrations, and inventories and classification by importance of the aquatic and terrestrial communities.

The process was divided to correspond to site preparation and construction, creation of irrigation districts, dam operation and expansion of the excavation and removal of soil, road construction, creation of drains, headwork, etc.

A wide range of criteria were used relating to hydrology, pollution, soils, sediments, biology, socio-economics, health and ecological imbalances. For example, hydrology considered dry and rainy seasons, hydric balance, and extraction and waterlogging. The socioeconomic component evaluated

changes in income and social well-being, migration, relocation, participation by gender, ethnic and minority groups, the presence of historic sites and regional effects.

To rank the impacts, certain conditions and characteristics were assumed and described with respect to conservation of the environment to interpret the impact that had been identified.

The positive and negative environmental effects were compared, in the presence and absence of the project over 10 years. This period allowed for the inclusion of a large part of the impacts after initiation of operations. With the use of a scale from 1 (favourable) to 8 (unfavourable), large numerical values were associated with predominantly negative impacts.

The evaluation indicated that the region in the absence of the project would suffer significant changes, while the project would occasion only minor changes because dams were already present on the river, and the benefits were greater than the drawbacks, taking into consideration the mitigating measures.

The description of the proposed modified environmental scenario served to portray the conditions and characteristics of the landscape, climate, soils, erosion, and water flow downstream of the dam system, changes in the coastal regions resulting from modifications in the frequency of the runoff, alterations in the aquatic and terrestrial flora and fauna, and the proliferation of species adapted to the new ecosystems.

The economic benefits included strengthening of the existing ejidos and irrigation districts, with little immigration to the zone, and improved living standards for all, especially for the relocated families who would have better housing and public services.

In general, the mitigating measures included

- relocation of communities, with census and surveys to determine preferences for compensation and replacement of housing and services;
- efficient water use to maintain the water levels needed for agriculture and the aquatic fauna in the lagoons;
- soil reclamation, including control of salinity and pollution by agrochemicals and pesticides;
- rescue and conservation of genetic information of the local fauna for relocation to previously-defined sites and the rescue from islands formed in the dam;
- reforestation to reduce erosion and dispersion of agrochemicals, and to create new habitats;
- deforestation of the floor of the dam (5000 ha), and the use of the greatest part of the cut trees; and

- ecological monitoring to study the recovery mechanisms, control the entry of pollutants, and protect natural resources and public health.

The estimated cost of the mitigating measures was 9.6 per cent of the total project budget.

RESULTS AND IMPLICATIONS

When the construction of the dam concluded in 1995, personnel from the CAN and the Federal Environmental Protection Attorney General's office (PROFEPA) visited the site, from the entry to the reservoir to the dam, and graded areas to verify compliance with the mitigating measures.

Due to the shortage of personnel in the recently-created PROFEPA, and the then undefined responsibilities at the federal and state levels, guidelines for the inspection were not available. However, the CNA had transmitted quarterly reports to the INK for follow-up and discharge of the mitigating measures during construction time.

For the relocation of the communities, representatives, including ejido presidents and others named by the communities, participated in the negotiations with the authorities at 150 formal assemblies. As a result, the compensation for land and structures including homes, schools, tick control stations, churches, warehouses, fencing, and orchards was agreed upon. Specifically, the head of the household received a sum corresponding to that required for him to rebuild his home based on the number of inhabitants (four to six and more than six). Some families preferred cash settlements for the value of their home. In total, 323 dwellings were built by the heads of families.

The families were relocated in Choix, municipality of El Fuerte, where other members of the Yaqui ethnic group were living. Only four families refused to move to the selected site due to, in their words, greater expenses arising from participation in the electricity and water distribution systems. This group was relocated above the extraordinary maximum water level.

Other improvements included the building of six primary schools, two preschools, a church, roads between the communities, the planting of orchards and placing of fences; the latter two were paid for in cash based on the assessments of the National Assessment Commission. Reservoir deforestation of portion of the 6250ha required for the dam produced the boards used for fence construction in the relocated ejidos.

The relocation of the communities to a new environment resulted in a partial decentralization as witnessed by a loss of values and customs, already on the wane, in the existing ethnic group. A new cemetery was established. The remains of existing burials were left in the old one.

Other mitigating measures included the creation of terraces with the excavated soil and reforestation to prevent erosion. By December 1995, 3755

trees of six different species were planted along the dam and in the civic area.

Efforts to locate and rescue archeological ruins produced nothing and this phase of the programme was cancelled. The flora rescue programme was also cancelled when it was found that none of the species were in danger of extinction.

Local labour was used for the construction of the dam and most of the other activities described. According to the work schedule, up to 3500 workers, with differing levels of skills, were hired.

The ecological monitoring to be carried out by the CNA for water quality has continued. However, the effects on the coast have not been evaluated.

LESSONS LEARNED

The INK environmental impact statement review process is improving although, for this project, the permit to begin work and the identification of mitigating measures were not received at the same time. The follow-up of the project did not start with the project. Due to a lack of specific information, and local and regional quantitative indicators, the Environmental Impact Statement was more descriptive than quantitative and analytical from the diagnosis, the projections, the impact evaluation to the proposal of the mitigating measures.

The use of different classifications and standards, for example of soil, water quality, and species abundance and diversity, made comparison of the magnitude and importance of the resources and possible impacts difficult.

There is a marked need to reduce, among the communities to be relocated, speculation that may result in mismanagement of compensation. The communities should be invited to participate early in the environmental evaluation of the project to evaluate with better precision the costs of the impacts and mitigating measures that directly affect them. In this project, these aspects were considered later on and not defined until agreements were reached with the communities.

A clear idea must be obtained of the social aspects of each group affected and benefited, directly or indirectly.

The participation of state and federal institutions resulted in new programmes for use of the dam, including seeding with fishes and other alternatives for production, and the creation of programmes to stimulate the participation of women in the irrigation districts.

The communities involved in the process should be encouraged to participate in its organization to develop their own programmes and prevent manipulation by outside influences.

Precise information should be used to identify the combination of effects and evaluate the residual and cumulative impacts.

The estimated costs for the mitigating measures, such as deforestation, reforestation, relocation and compensation, are often much lower than the real costs. As much data as possible should be compiled to increase the precision of the estimate.

Post-project environmental monitoring should be considered as part of the project with a budget for short, medium and long-term studies.

Although there have been previous experiences with projects of this nature, they have not been compiled to create specific terms of reference for the scope of the environmental assessments nor entered into data bases to serve as a learning experience.

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Acknowledgements

The author wishes to express her appreciation to Marco Antonio Guadarrama Suarez for his assistance in the preparation of the visual material for this article and Dianne Hayward for her translation of the text.

Key words

mitigation
assessment
project
management

Environmental impact assessment: for whose needs?

J H Y Katima

ABSTRACT

Tanzania, like many other developing countries, is keen to attract foreign investments to foster the country's socioeconomic development. However, the competition among developing countries to attract foreign investment preference has in many cases sacrificed policies geared towards sustainable development for short-term economic gains. With the intention of conserving the global environment, the multinational financing institutions have made it mandatory that all development projects should be subjected to EIA before they can be funded. Is this sustainable? This case study suggests that an effective (and sustainable) EIA regime is dependent on, among other things:

- the government's political will;
- effective environmental legislation;
- institutional support;
- proper development objectives; and
- trained personnel.

Unfortunately, many of these factors are not in place in Tanzania (and probably not in place in most developing countries). This has led in many cases to frustration on the part of environmental impact assessors, governmental advisors and the public at large. Because of economic considerations some projects have been given a go ahead despite negative assessment and public outcry. In some cases, projects have been assessed positively even though the negative impacts are obviously overwhelming, which may be due to the fact that the investor is paying for the assessment and thus may influence the outcome of the assessment process. This case study examines the prawn project, which was subjected to EIA, rejected by the review team and approved for implementation by the government. The paper poses a question: For whose needs is the EIA conducted? The investor? The government? The assessor? The environment? The public?

See Topic 9

**UNEP EIA Training
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Reviewing

INTRODUCTION

The Rufiji River delta is the largest block of mangrove forest (mangroves) on the eastern African coast. The delta is linked to the interior river system by an extensive flood plain about 130km long and more than 20km wide. It is also linked to a system of ocean currents and coral reefs.

The mangroves provide a unique ecosystem that displays dynamics of a flood plain and delta system as expressed by changes in mud and silt deposition, major fresh water outlets, and the creation of oxbow lakes, local flooding patterns, salt water intrusion etc. The mangroves provide an inter tidal fishery, serve as nursery grounds and breeding areas for the prawn industry for the locals and produce large quantities of mangrove poles for export.

Mangroves protect the coastline from waves and currents and thus prevent coastal erosion. Through their retention of sediments brought downstream by rivers, they extend the coastland into the ocean. As they are highly productive elements of the marine ecosystem, mangroves generate large quantities of detritus, which form the basis of a complex marine food web thus making them a unique ecosystem that is rich in floral and fauna biodiversity in both freshwater and saline environments. The delta has been utilized over the years by the Rufiji people basically relying on fishing, mangrove poles and rice farming for their sustenance. The present population living in the delta is 35 000 people.

The African Fishing Company Ltd (AFC), a subsidiary of Tannol Holding Ltd. of Korea, intends to develop a prawn farm covering about 6,000ha of surface water, with grow out ponds on 10 000ha of land. The proposed location of the prawn farm is within the Rufiji delta and the downstream end of the flood plain. The proposed farm will consist of production ponds plus water pumping stations, and supply and drainage canals. Staff quarters, and storage facilities for the materials and supplies will be built close to the farm. The target species for shrimp aquaculture is *Penaeus monodon*. AFC plans to employ semi-intensive production methods at farm level management.

The proposed development is planned to be accomplished in eight years with the first year of operation targeted to build 500ha of ponds. The ponds will be of 6ha x 1m average depth in size. There will also be some smaller ponds of the size of 0.1m x 1.0ha built for research and development purposes. A hatchery is proposed at Bwenjuu Island in the Mafia Island Marine Park where brood stock will be stocked at a density of 10 to 12 prawns per m² and will be fed with feed meals. There will be 2.3 crops of prawn per year with an annual production of about 2680 to 4600kg/ha. The annual feed is estimated to be between 6624 and 8280kg/ha. The estimated labour requirements are as follows: construction 250-500 people; farm operation about 6000 people; the hatchery 500 people; at the processing plant 1200 people. Other project components include:

- deep sea fishing in the Exclusive Economic Zone (EEZ) of the Tanzania coastal waters with a total fleet of six vessels;
- the provision of fish meal plant at Mwanza to recycle waste from the processing units and a feed mill at Mbegani for production of feed stuff from cereals and other unwanted fish and additives; and
- the provision of training and education for personnel.

NATURE AND SCOPE OF ISSUES

Policy and legal issues

In licensing the project the following pieces of legislation were contravened:

The National Land Policy of 1995 and Land Ordinance of 1923 were contravened by transferring right of occupancy to the developer without recognizing the customary rights of smallholders. The Forest Ordinance of 1997 and the Forest Ordinance Cap 389 of 1957 were contravened by allowing the developer to establish the prawn farm in the forest reserve. All mangrove forests are forest reserves. Allowing the developer to establish a hatchery at Bwenjuu Island has violated the Marine-Park and Reserve Act No. 29 of 1994. The project also falls within the licensed area to CANOP for the purpose of oil exploration. Other legislation contravened includes: the Water Utilization (Control and regulation) No. 110 of 1981 and international conventions such as CITES Convention (because of the existence of two endangered species in the area i.e. the Dugong and the Nile Crocodile) and the Ramsar Convention (because the Delta is a contiguous wetland which is part of the international landing sites for migratory birds). There also other development projects within the area e.g. The Mangrove Management Project, The Rufiji Delta and Floodplain Environmental Management and Biodiversity Conservation of Forest, Woodland and Wetland, The Rufiji Basin Management and Irrigation Project and The WWF Coastal Forest Project.

Environmental issues

Loss of mangrove forest is estimated to be 1200ha. There is loss of biodiversity in mangrove areas as a result of destruction of breeding sites and nursery grounds for fish and other intertidal fauna, destruction of rare species of mangroves such as Rhizophora, together with the threat to endangered Dudong and Nile crocodile and over-exploitation of wild fish stock by increased human population. Self generated pollution and eutrophication in ponds, rivers and the ocean will come from effluents containing antibiotics and toxic chemicals. Other impacts will be the acidification and salinization of agricultural lands, disposal of wastes in Kioboni and Bumba rivers and associated water borne diseases and formation of complex land uses e.g. a town within the mangroves forest

reserve and flood plain. There are no suitable soils within the reserve for housing, sanitary landfill, oxidation ponds/lagoons, septic tanks etc.

Socio-cultural issues

The project will result in loss of agricultural land, displacement and resettlement of local people, increased social conflicts between those who are for the project and those against it, increased government costs for provision of infrastructure and social services and changes in cultural values.

Economic issues

Calculations indicate that the project will make a net loss of US\$ 24.9 million in year one and a net forex gain of US\$ 120 million in the fifth year. However, the government has given a tax exemption and forex retention holiday of 5 years, and the experience world-wide has shown that such projects fail in their fifth year which means the government will not realize anything. Using the overall risk of 30% the estimated foregone benefits in Rufiji delta area ranges between US\$ 72-107 million which exceeds the adjusted income benefits of the project which is US\$ 21 million.

Process and procedural context

Unfortunately, there is no legal requirement for EIA in Tanzania. There is neither environmental policy nor environmental law. However, there is a National Environmental Management Council which advises the Government on environmental issues and the Division of Environment under the Vice President's Office, which looks after policy issues. The National Environmental Management Council has developed EIA guidelines.

The Investment Promotion Centre has the sole responsibility of approving all foreign projects. Its mandate is to assess economic viability. In this particular case, maybe because of public pressure, the government required an EIA before it approved the project. The developer had to produce an EIS for evaluation. Furthermore, the developer intends to borrow money from international financing bodies, in which case he has to show the environmental impact of the proposed project.

The EIS was sent to the Environment Management Council for Evaluation. The Council constituted a team of 11 experts, with three foreign experts from the USA, Zimbabwe and Germany. The reviewers prepared a report, and the NEMC also organized a public hearing, which drew participants from the Rufiji people, experts in different fields, and politicians. Written comments were received from within and outside the country. The Councillors mostly represented the Rufiji people. Thirty-two participants gave verbal comments on the project during the public hearing and 18 written comments were also read during the public hearing. The EIA review

team raised numerous questions about the EIA and the recommended mitigation measure. These views were supported in public hearings.

MITIGATION MEASURES

Mangrove forest

The EIA proposed a no-net loss of mangroves by suggesting that the project replant mangroves in other areas. This was found to be unrealistic by the review team as the mangrove species respond differently to ecological requirements and other environmental factors and they are site-specific. Also there are not enough bare saline areas or clear cut mangrove areas in the Delta for replanting to compensate for the mangroves cut in the prawn farm project. The project does not give alternatives to meet the objectives of the mangrove management project. However, the EIA report admits the serious negative impacts of construction of canals, roads and other prawn farm project activities.

Fisheries and marine environment

The EIA does not cite the fact that there are no alternative sites for hatchery and grow out ponds. The EIA proposes that the use of DDT and antibiotics should be minimized without suggesting alternatives and thus there was no guarantee in the management submission in response to the EIA. The EIA also reports that AFC is committed to implement the mitigation plan. However, there are no funds budgeted to implement the plan. It was also observed that unless there are screens at pump intakes there would be a massive killing of fish and other aquatic zooplankton. Besides, there are no funds set aside for this measure.

Land use

There are no mitigation plans to avoid a town growing in the mangrove forest reserve. The septic tanks and/or oxidation pond necessary for the treatment of domestic waste requires suitable soil, which is not available in the delta. The ponds and other related structures will most likely be inundated during spring tides at equinoxes. There is no mitigation plan for this. There is a provision of 1m high levees above the surface which is not enough to mitigate the inundation impact since the spring tides could be as high as 1.5m.

Social benefits that are proposed for the locals who will be affected do not have financial commitment. Nor are there funds set aside for resettlement of the displaced families. No funds have been set aside set for land acquisition. And finally there are no alternative sites for the project.

Water resources

The drainage canals at the hatchery will be directed into small sedimentation basins before discharging by an overflow into coastal waters; no treatment is proposed. The EIA proposes, as a mitigation measure, that the pond sediments be stored in specified areas and allows rainfall to leak in and percolate to the ground. Also the EIA proposes that the pond sediments could be used for road construction or other repair work. The review team and the public hearing questioned the proposal because impact on ground and surface water was not analyzed. There is no proposed mitigation measure for an increase in waste matter, which will be disposed of in the Kiomboni and Bumba rivers. The contamination of the two rivers by the excessive use of lime will raise the pH of the rivers which serve as potable water for the local residents.

Agriculture

No specific mitigation measure is proposed by the EIA despite the fact that there is a possibility that polluted water from the prawn farm will leak into agricultural fields.

Wildlife

The EIA does not look at alternative usage of the Delta e.g. wild life protection for ecohunting and ecotourism. There are no mitigation measure against possible poaching of Dugong and Nile Crocodiles, which are already in alarmingly low numbers.

Socio-cultural

The EIA report uses cautionary words (non-committal) to address the socioeconomic benefit of the project to the local people e.g. such words as 'the proponent will support to a certain extent a dispensary, health centres, schools and water.' However, no financial commitment is made. The EIA does not provide mitigation measures to cover the cost of displacing and resettling people, costs of infrastructure and services for resettled people, loss of boat tract in one of the sites, and the decline of food security through the decline of agricultural land. However, the EIA proposes to discourage clearance of vegetation for agricultural purposes (i.e. after the project has cleared thousands of hectares for ponds).

There will be increased hygiene risks through water borne diseases and increased demand (with its environmental and social consequences) for fuel-wood, drinking water, farmland and settlement areas. The EIA gives vague statements such as 'insurance that local cultural pattern will be maintained'.

MONITORING PLAN

There were no comprehensive baseline studies done which could have been used in the monitoring activity. The roles of the developer, the government, local residents and other stakeholders are not clearly defined in the monitoring plan. Besides this, monitoring activity is neither costed nor budgeted for.

RESULTS AND IMPLICATIONS

The EIA review-team and the public hearing concluded that the EIA report was highly biased in favour of the project. It was proposed that the project be rejected on the following grounds:

- The project is planned to be located in a Mangrove Forest Reserve and Mafia Island Marine Park. Millions of dollars have already been spent on both projects.
- The plan is to discharge untreated effluents into the rivers that drain into the Mafia channel and Bwenjuu Island reefs.
- This will release untreated effluents containing silt, suspended solids from the remains of feed and pond sediments, dissolved chemicals from fertilizers, prawn feed, medicines (including antibiotics) and other nutrients.
- There are conflicts with existing and planned land use plans for the Rufiji basin and Mafia Islands.
- The proposal has many negative socioeconomic impacts on both the vicinity of the proposed site and beyond.
- The EIA is unsatisfactory, given so many uncertainties in the form of the size of the project, the newness of technology that is expected to be used and the relatively unknown baseline conditions.
- The EIA, which looks very much like a polished project proposal, is biased.

The Environment Management Council advised the government that:

- The project should be rejected, and proper land-use plan and baseline studies should be carried out in the Rufiji basin in order to harmonies the various competing interests in the area.
- A moratorium should be declared on all commercial mariculture in Tanzania until the government establishes proper guidelines for the development of commercial aquaculture in the country.

- Large scale aquaculture should not be conducted in ecologically sensitive areas like mangroves.
- The letter of offer allocating part of Bwejuu Island to the AFC should be revoked, since this offer contravenes the National Policy (1995) and the Mafia Island Management Plan and legislated under the Marine Parks and Reserves Act No. 29 of 1994.

Against all these recommendations the government approved the project without consulting the National Environment Management Council. In whose needs was EIA carried out? That is the question.

LESSONS LEARNED

- EIA can not have any meaning, unless there is a strong government commitment in a form of a policy and environmental law.
- Lack of awareness of the importance of avoiding unnecessary environmental degradation hampers the success of the EIA regime.
- As long as EIA remains the responsibility of the developer, objective EIA will take time to come by. This leaves a loophole for influencing the EIA in the proponent's favour. Using experts from abroad is not a solution; this is because the local experts know the local environment better and they are the ones who have to perform the monitoring. In these circumstances the use of foreign experts is not sustainable.
- Lack of harmonized institutional arrangement with a clear and properly co-ordinated flow of events guarantees a continued contradiction in approval processes.
- Financial institutions should not only be concerned with seeing EIA reports but should also be interested to ensure that the recommendations are implementable and that the local capacity to monitor the implementation is in place.
- Some funds, such as those of GEF, could be used to commission EIA initially to ensure an unbiased report.

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Key words

EIA process and
procedures
review
mitigation
decision
making

Towards 'sustainable development' in the Southern African Development Community (SADC)

Jane Kibbassa

ABSTRACT

Sustainable development has become one of the most popular concepts in the evolution of ideas about managing the environment. Most of the definitions for sustainable development basically refer to development activities that do not deplete non-renewable resources at a rate that jeopardizes the ability of future generations to meet their own needs.

Environmental Impact Assessment has been accepted globally as an effective decision making tool in the move towards sustainable development. However, unlike developed countries, most developing countries are still at the initial stages of establishing the Environmental Impact Assessment (EIA) process.

Based on apparent environmental degradation emanating from economic activities, the SADC Region is now proposing to harmonize the EIA process. The main objective of the proposal is to ensure that, within the region, equity issues are given the same weighting as economic and environmental issues in the decision making process. To emphasize this approach, the region has proposed the renaming of EIA to EIA3 which takes care of the three components to be considered equally in the decision-making process, namely; *Equity, Environment and Economic*.

Tanzania is among the SADC countries still fumbling with the EIA process in the absence of a comprehensive EIA policy, legislation, effective political commitment, adequate expertise and public awareness. This paper attempts to discuss pertinent issues that need to be addressed in the SADC member countries in order to facilitate harmonization of the EIA process regionally. Practical examples of recent experience in EIA in use will be drawn from Tanzania.

INTRODUCTION

Tanzania has subscribed to the new Southern African Development Community (SADC) policy for sustainable development - 'towards equity-led growth and sustainable development in Southern Africa.' The gist of the policy is that the integration in all key policy sectors of Economic,

See Topic10

UNEP EIA Training
Resource Manual

Decision making

Environmental and Equity Impact Assessments (EIA³) should improve decision-making.

It is envisaged that EIA³ would compel decision-makers to assess and defend their choices in terms of economic, social and environmental sustainability (SADC-ELMS, 1996). In order to achieve its goals SADC is now proposing to establish a common charter for the EIA process.

This paper gives an account on the status of EIA process in Tanzania and the challenges for the implementation of the SADC policy. The discussion will mainly dwell on the following questions:

- Who should give final decisions on EIA reports (EIS) ?
- Ideally where should the institution responsible for EIA be located ?
- What should be the role of the EIA institution ?

NATURE AND SCOPE OF ISSUES

Harmonization of the EIA process depends primarily upon the state of art in individual countries. Despite the official recognition and commitment to EIA as exhibited in various policies such as the National Conservation Strategy for Sustainable Development (NCSSD), National Environmental Action Plan (NEAP), National Environmental Policy and Forestry Policy and pledged by our leaders, Tanzania is yet to establish a comprehensive EIA system. The existing legislation and policies do not provide for the implementation of the EIA process.

Institutional framework and legal deficiencies

Various institutions are empowered by sectoral laws to propose and regulate development in their respective areas of responsibility. Moreover, legal deficiencies as regards institutional frameworks have to a certain extent continued to pose serious threats to the EIA process in Tanzania. Lack of an effective sectoral and institutional co-ordination at national level is a major weakness in the EIA process. There is no requirement for one institution to liaise with others and ensure that a project has fulfilled the requirements in other relevant sectors prior to issuing a permit. This tendency leads to inter-agency conflicts either through duplication in mandates or violation of sectoral laws.

Lack of effective EIA co-ordination

The cross-sectoral nature of environmental issues calls for coordinated and holistic approaches. The mechanism for coordination of assessment and registration of development projects and programmes at the national level is currently done through the Planning Commission, whereas registration of the private investment is undertaken by the Tanzania Investment Centre (TIC). Ideally TIC should, together with all other stakeholders, ensure that

all feasibility studies of new projects and major expansions include a component of environmental assessment. However, there are no effective linkages between the government and private sector on environmental management issues. There is no overall mechanism in place to provide adequate support and guidance to the government and private sector (*Financial Times*, 6-12 May 1998). The two bodies entrusted with the control of development projects do not have established criteria for impact assessment to guide the review and eventual project approval.

There is no single authorizing agency whose advice on technical matters is regarded as final and conclusive. At present there are ambiguities regarding who should issue an environmental approval or a permit upon which other licenses may be issued. Officially there is no recognized standard procedure and guidelines for conducting EIA. This implies that proponents are not formally bound to use the draft National Guidelines prepared by the National Environmental Management Council (NEMC). Although NEMC is an established body by Act No 19 of 1983 (the NEMC Act), its functions are essentially advisory on all matters related to the environment. The Act does not provide for regulatory and supervisory powers on environmental impact assessment.

Inadequate public participation in the EIA process

Lack of clear methodologies for ensuring participation of all stakeholders, especially local communities, is among the weaknesses of the EIA process in Tanzania. These weaknesses, however, are related to the socio-political system e.g. lack of effective environmental leadership, lack of openness and transparency, increasing political interference, minimal political will, lack of independent decision-making capabilities and general lack of environmental awareness.

The aforementioned issues show clearly that in Tanzania proponents are not officially bound to integrate environmental concerns in the early stages of project design. Consequently, most of the EIAs are conducted either voluntarily or due to pressure from financial institutions as a loan condition. This has contributed to a tendency for EIA studies to be carried out in a way that is tailor-made to suit the requirements of the commissioning body. As a result most of the EIA studies carried out so far are commissioned after the projects have been designed; they differ greatly in terms of content and quality.

PROCESS AND PROCEDURAL CONTEXT

The state of art of the EIA process in Tanzania as indicated above poses a great challenge to the implementation of the SADC policy. In a practical sense, it is difficult to establish how the Government is committed to the principles of sustainable development. The National Environmental Policy, which was approved in December 1997, states that 'EIA shall be a

mandatory requirement to ensure that environmental concerns receive due and balanced consideration in reconciling urgent development needs and long term sustainability before a final decision is made.' Although this statement is a positive move towards EIA legislation and consequent implementation, the pace is rather slow.

EIA procedure and guidelines

Current changes in macro-economic policies in Tanzania have to a great extent promoted the rate of investment in the private sector. This is quite a change in comparison to the time when the Government was the sole investor in many areas such as agriculture, industries, infrastructure, etc. Thus, in order to guide private investments in a more sustainable way, development of EIA procedures and guidelines is more important now than before.

Tanzania is yet to enact a comprehensive environmental law with a requirement for EIA properly elaborated, and setting out clearly the guidelines, procedures and arrangements for institutional mandates and stakeholder participation. Cognisant of the need for an authorized EIA procedure and guidelines, NEMC has prepared draft national guidelines which are awaiting approval from the government (NEMC, 1997). One of the key requirements of the guidelines is that, prior to undertaking an EIA study, a proponent must submit a draft Terms of Reference identifying all stakeholders and key environmental issues. The terms of reference which in essence guides the EIA study would be reviewed by NEMC in collaboration with a cross-sectoral Technical Review Team to ensure involvement of all stakeholders.

Lack of official guidelines as well as a legal requirement to conduct EIA has been a major cause of EIAs being undertaken in a haphazard way. For example, it has been revealed that the Tanzania Investment Centre (TIC) had registered 1025 projects valued at US\$ 3.2 billion; however, there are no reports to establish that these investments were subjected to EIA (*The Guardian*, 1998). According to a study carried out on EIAs (Mwalyosi and Hughes, 1997), there is no documented list of EIAs so far undertaken in Tanzania. The study further identified over 40 documents that were purported to be environmental impact assessments, but only 26 were found to be genuine EIAs. These cases indicate that EIA at the national level has not been adequately adopted (NEMC, Newsletter, 1999).

EIA practitioners and the quality of EIA reports

Due to the absence of official procedures, there is no formal mechanism to ensure that EIA practitioners (consultants) have the required expertise. A study by the Institute of Resource Assessment (1997) on EIA competency has indicated that 69 per cent of organizations involved in EIA lack specific expertise. On the other hand, for the qualified organizations, only 20 per

cent of the experts had been involved in the EIA process. This indicates that the qualities of most EIA studies conducted are inadequate as a basis for informed decision making.

APPROACHES TAKEN

Decision making process

Throughout the SADC region the policies and programmes for economic reform, social progress and environmental improvement are very much separated. Essentially, these key development efforts must be increasingly integrated as a 'single agenda and strategy' for sustainable development.

The new SADC policy is an attempt to achieve this integration. In order to anchor and reinforce the new policy in the development agenda, SADC countries must incorporate impact assessment as an integrated part of decision making in at least three key respects:

- assessing the likely 'environmental' impacts of economic policies and activities;
- assessing the likely 'economic' impact of the environmental policy and measures; and
- assessing the likely 'equity impacts' of both economic and environmental policies.

The new SADC Environmental Policy is basically trying to advocate that development strategies that fail to improve the lives and livelihood of the poor majority are not socially or politically sustainable.

If an EIA review of a proposed policy or programme indicates that it will not lead to at least some improvement in the living conditions and prospects of the majority, then a sustainable alternative must be found that does' (SADC-ELMS, 1996).

With the current situation of the EIA process in Tanzania it is not clearly established as to who should give a final decision when it comes to approving a project. In fact the first project which unveiled the weaknesses in the decision-making process in Tanzania was the Prawn Farming Project in the Rufiji Delta. The most striking part is the fact that decision-makers preferred the proponent's EIS though it was found to be very inadequate by the technical review team.

In the course of reviewing the proponent's EIS prior to approving the project, the review team saw a necessity of visiting the site to ascertain facts presented in the EIS. The exercise enabled the review team to identify a number of negative impacts not only on the local communities but also on the already existing activities in the Delta. Thus, the Government was advised to reject the project. Alternatively, NEMC advised the Government

to carry out a detailed baseline study so as to explore more viable options for the Delta, and to prepare a holistic land use plan to harmonies the various development activities in the delta (NEMC Report, 1997).

Public involvement in the decision making process

Participation of the public in decisions affecting their livelihood can only be achieved by making people aware and involving them during the early stages of project proposals. The prawn farming project approach was basically top down. Residents of the Delta were involved in the project at a very advanced stage when the site had been determined and the project design completed. The same applies for the EIA study that seems to have been commissioned merely to document the project location and its purported economic returns. This can be judged from the EIS that lacks costs and benefits analysis as well as alternatives in terms of site, design and technology.

Review of the prawn farming EIS

The review process included a workshop and public hearing meeting involving a number of interested parties as well as the Government. The forums were meant to seek opinions from both experts and general public. Views expressed by people from the Delta were focused on opposing the project. Their argument was that apart from endangering the environment, the project would be a hindrance to the socioeconomic development of the area.

The experts warned that the project had far-reaching implications on the livelihood of the villagers as well as on legally approved activities in the Delta. The decision also contravenes a number of international conventions that Tanzania has assented to. As for domestic laws the decision contravenes a number of sectoral laws *inter alia* the Marine Parks and Reserves Act No.29 of 1991 that gives protection to Mafia Island Marine Park; protection of the Mangrove Forest under the Forestry Ordinance Cap. 381, etc.

Lack of awareness of the long-term implications of the project among the communities and the leaders contributed to the formation of two groups with contradictory opinions. The contradiction was centered around the envisaged financial perspectives of the project. Looking at short-term benefits the project may appear to be beneficial to the Rufiji area which in comparison to other parts of the country is relatively undeveloped (*JET News*, March, 1999). Nevertheless, one would have expected the Government to guard its poor majority against projects that will in the long run make them worse off.

Despite opposing arguments from the experts, Rufiji Delta communities and other interested and affected stakeholders, the Government approved the project. *The Family Mirror* (August, 1998) argued that the project was approved by the Cabinet without debate ostensibly because most Ministers

knew very little about prawn farming. One would have expected the Cabinet to consult experts to explain the intricacies of the project before approving it.

In the mean time, it has been revealed that the proponent has yet to be issued with a Tanzania Investment Centre (TIC) certificate of incentives for the envisaged US\$ 180 million project in the Rufiji Delta (*Family Mirror*, 1998). According to TIC, the proponent has to meet certain requirements before getting the certificate, this includes a Title Deed and Environmental Permit from NEMC.

RESULTS AND IMPLICATIONS

The villagers are now seeking an injunction to prevent the proponent from undertaking the prawn project in the Delta. Two thousand villagers have taken both the Government and AFC to court stating that they are dissatisfied with the decision that will displace them from their villages and deny them access to the natural resources.

Notwithstanding the outcry from the Delta people, experts and other affected stakeholders, the Government stands firm on its decision. According to a report by one daily newspaper, the Minister for Natural Resources and Tourism affirmed that the Cabinet decision on the Prawn Project in the Delta was final. 'All that was required were remedial measures to take care of any environmental risks as certain people have cautioned' (*The Guardian*, 1998). A monitoring team has been formed to prepare a monitoring programme that will ensure that the negative impacts from the project area minimized

Contradictory statements given by the Government leaders regarding the prawn farming project revealed that the Government lacks a clear vision of the whole question of development. It also became apparent that Government commitments to the principles of sustainable development are highly dependent on a strong political will. Therefore, there is a need for the Government to show, in a transparent way, its practical commitment to development activities.

The prawn project was handled in a manner that revealed previous perceptions that politicians regard EIA as a stumbling block in the path of economic development. Moreover this indicates a lack of awareness among our leaders on the value of natural resources and their inability to recognize the use of technical advice. Our politicians overlook the fact that confidence in technical information is an important parameter for guiding an informed decision-making process (*The Guardian*, April 7 1998). The fact however remains that EIA is a tool for development planning as it ensures that potential problems are foreseen and addressed.

CONCLUSION

In short, the experience of current practice shows that EIA in Tanzania is being used passively as a rubber stamp. A more active role for EIA is envisaged where proposals should be turned down if they reveal environment effects that cannot be mitigated. The challenge ahead is to encourage economic activities that are environmentally friendly while discouraging those practices which are not. Under such circumstances conditional approval may be issued in which projects must satisfy certain conditions in order to gain approval. This will make EIA a more effective tool in the decision making process towards achievement of sustainable development.

LESSONS LEARNED

Institutionalisation of EIA

Tanzania needs to recognize that the cross- sectoral nature of environmental issues calls for coordinated and holistic approaches. Therefore, there is an urgent need to institutionalize the EIA process by ensuring that:

- a formal EIA system is in place and is backed by law to ensure that all development proposals, plans, policies and agreements are sufficiently screened prior to their implementation and execution;
- existing sectoral procedures and guidelines are harmonized within the frameworks of national EIA procedures guidelines;
- appropriate Terms of Reference (ToR) for EIA studies are produced and approved prior to undertaking investigations;
- roles and mandates of EIA institutions are clearly stipulated to avoid sectoral conflicts;
- EIS reviews are geared to evaluating adequacy of the information for decision making; and
- EIA practitioners are capable of clearly linking the implications of project activities on the biophysical and socioeconomic environment; most of the time alternatives are not provided and there is a lack of analysis of the costs and benefits of each alternative. As a result the outcome of EIA studies have been nothing more than encyclopedic documentation containing basic scientific inventories.

Informed decision making

In order to fulfil its commitment to the principle of sustainable development Tanzania needs to strengthen analytical decision making. The following issues are important:

- there is a need to support and strengthen the technical capabilities of the EIA institution;
- decision makers should be well informed and rely primarily on technical opinion prior to approving a project;
- holistic land use plans should be established as a strategy for all development plans;
- there should be criteria to guide the decision making process as well as stipulating relevant Government levels to be involved at project level; and
- there should be a mechanism to ensure public involvement from initial stages of project proposals up to the decision-making stage.

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Key words

**institutional
framework
environmental
policy
EIA process
decision-
making**