Monitoring environmental compliance in the construction of the Cuyutlán lagoon railroad in Manzanillo, México.

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INTRODUCTION
Some Regulatory Background and Problem
Infrastructure Project

1. EIS
2. Land use change permission
3. Environmental authorization

- Environment fragility
- Project impacts
- Mitigation measures: construction and rescue/restoration programs

Changes during project execution need constant regulation adjustment and update.

Companies are reluctant to comply and try to avoid spending money on mitigation measures as much as possible.

Sanction by authorities
- Project delay
- Increased cost
- Environmental damage

Environmental supervision assures action coordination, compliance and updating of all environmental requirements.
CASE STUDY
Cuyutlán Lagoon railroad in Manzanillo, Mexico
New project design.

Prevention of environmental and social conflicts.

Successful in terms of legality.

Mitigation measures reduced impacts.

OBJECTIVE

Our job, as the environmental supervision company was to make sure that:

- Project had no setbacks (very tight execution schedule), jointly with the Ministry for the Environment and Natural Resources (SEMARNAT), the Ministry of Communications and Transportation (SCT), the Federal Transportation Department in Colima (SCT-Colima Center), and TRADECO (contractor).

- Mitigation measures were properly executed.

- Environment, specially mangroves and fauna, were kept safe.
Railroad project along the northern margin of the Cuyutlán Lagoon

- Railroad tunnel (2ª phase)
- Manzanillo
- Power Plant
- Tepalcates channel
Original Project Description

Railroad information
- Constructed over a stone base over the lagoon surface.
- Double lane railroad.
- Length of 12,074 km.
- Period of 24 months for construction.
- Cost of about 176.5 million dollars.

Construction activities
- Extraction and movement of 4,510,856 m³ of rocks from nearby banks.
- Deposition of rocks inside the lagoon (6-10m depth).
- Forming a platform of about 8 to 12 m high above lagoon sediment.
- Building of 37 drainage structures.

IMPLICATIONS

Social
- Unsatisfied fishermen.
- Fishermen could no longer use their original docks.
- New docks had to be constructed.
- Social negotiations harsh.

Ecological
- Sediment trap.
- Rising of oxygen poor sediments by the rock structure.
- Reduced water flow between railroad sides.
- Residual impacts were presumably going to be high and permanent.
CASE STUDY
Cuyutlán Lagoon railroad in Manzanillo, Mexico

Project modification

Railroad information
- Construction on elevated structure over lagoon surface.
- Single lane railroad.
- Length of 12,074 km.
- Period of 14 months for construction.
- Cost of about 217.39 million dollars (40.9 million dollars more expensive)

Construction activities
- In situ perforation and pile building.
- Cranes along a temporal road were used for construction.

Environment-friendly alternative

Benefits
- Social acceptance, no fishermen affectation.
- Done faster (14 months).
- Lower residual environmental impacts.
METHODS
Multidisciplinary Environmental Supervision Team

- Flora Experts
- Fauna Expert
- Environmental Engineers
- Civil Engineers
- GIS experts
- Lawyers

Environmental Mitigation Program (EMP)
Construction began

- ETE
- EMP
- $ Bond

Construction company

SELOME

Execution of mitigation measures

Supervision and orientation

Monitoring forms

Dailly supervision

Monthly and semianual reports

Complete logbook of the project
RESULTS
Monitoring of compliance
Monitoring of compliance

A Follow-up of environmental authorizations.

B Observance and register of in site compliance of the contractor for all mitigation measures concerning to construction.

C Observance and register of compliance with the mitigation programs for the rescue and conservation or restoration of flora, fauna and soil.
Follow-up of environmental authorizations.

1. Keep record and update of environmental permits.
2. Followed up of all project modifications and Produce documental requeriments to comply with:

   The Law for General Ecological Equilibrium And. Environmental Protection Law.
   The Law for Sustainable Forestry Development.
   The Law for General Wildlife Protection Law.
   The Law for General National Property.

Example Results:

Construction of fraction 8+200 al 11+127 could not be done with temporal road due to lagoon depth, therefore dredging was needed.

EIS for dredging authorization of the Impact department authorities as well as from federal maritime zone was obtained.
Observance and register of in site compliance of the contractor for all mitigation measures concerning to construction.

Monitoring of:
- 9 construction fronts
- Provisional offices
- Equipment platforms
- All sites occupied by construction

- Good management of water, concrete and iron residues
- Special care was taken for flammable or dangerous residues

Forms designed to register compliance
Monitoring and orientation of correct application of Mitigation programs:

1. Ecological conscience-building workshops for the construction workers
2. Plant rescue, conservation and vegetation restoration program
3. Wildlife rescue and relocation program
4. Soil conservation and restoration program.
Courses were given to workers from all shifts (day and night).
Addressed to administrative and construction workers, construction helpers.
Specially designed triptychs were delivered to all attendants.
Course given every three months.

As a result, people involved in the construction of this railroad were more aware of the importance of environmental protection and even more helpful in the application of mitigation measures.
There are 79,034 plants being germinated nowadays. Successful ones will be added to the former for a maximum total of 187,583 available native plants for restoration purposes.

<table>
<thead>
<tr>
<th>TYPE OF PLANTS</th>
<th>INDIVIDUALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rescued plants</td>
<td>12,423</td>
</tr>
<tr>
<td>Cactus and Bromelias</td>
<td>3,882</td>
</tr>
<tr>
<td>Plants produced from seeds</td>
<td>92,244</td>
</tr>
<tr>
<td>(including mangroves)</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>108,549</strong></td>
</tr>
</tbody>
</table>
We had to be sure that the nursery was ready before plant rescue started. Seeds were cleaned and classified according to the species and a seed bank was established as stated in the program. Trial plots of mangrove plantations are already being studied to identify the best conditions for reforestation. Native plants fruits and seeds were collected from the surrounding area and were taken to germinate inside the nursery. For the job inside the nursery, construction workers wives, sisters and mothers were employed. 180,000 plants will be used in the restoration program.
Monitoring of compliance

Observance and register of compliance with the mitigation programs for the rescue and conservation or restoration of flora, fauna and soil.

Wildlife rescue and relocation program.

Animals were rescued from all construction sites previously and during construction.

Actions were coordinated following a Fauna Rescue and Relocation Program.

Reptiles had highest numbers of law protected organisms.

<table>
<thead>
<tr>
<th>GROUP</th>
<th>TOTAL RESCUED INDIVIDUALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reptiles</td>
<td>2507</td>
</tr>
<tr>
<td>Amphibians</td>
<td>32</td>
</tr>
<tr>
<td>Birds</td>
<td>34</td>
</tr>
<tr>
<td>Mammals</td>
<td>33</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2606</td>
</tr>
</tbody>
</table>
Relocation sites

Adequate site selection:

- Vegetation type
- Physiognomy
- Water availability
- Patch extension
- Available food
- Reduce competition
- Presence of the species
A total of 656 m$^3$ of soil and 253 m$^3$ of fallen leaves were rescued. Piles or rescued organic soil horizon were covered with grass or plastic to conserve their humidity. Crushed residues of plant removal and workers meals were used to make a compost.
CONCLUSIONS
This railroad project is still under construction.

Mitigation measures are being taken into consideration as well as EIA requirements stated by all the environmental authorities involved.

All permits are in forced and project modifications have been taken care of in regulation matters.

Environmental supervision compliance reports are being delivered every month to the SCT and every six months to the SEMARNAT.
Compliance of regulations dealing with construction itself is not yet finished.

Up to now, the average compliance of all supervised work fronts is around 70%; some work fronts are still to observe all of the measures that need to be taken into account for.

Environmental supervision evaluates and ensures that all mitigation measures are fulfill, if our supervision detects any inadequacies we will request the contractor to do what is needed to resolved the issue immediately.
Conclusions

Best compliance results are being obtained in the execution of all the required programs:

- Adequate management of plants and the increase in native plant numbers within nursery will be very useful in the ecological restoration of affected sites, once the construction will be finished.

- Mangrove species, reproduced within the nursery, have already been tested in plantation plots, in order to optimize plant survival during restoration.

- Fauna has been rescued before and during construction and relocated at specially evaluated sites, including several species protected by law.

- Soil is being conserved and its nutrients and texture improved for future use during ecological restoration activities.
IMPORTANT CONSIDERATIONS

Compliance of environmental regulations has to involve all stakeholders in order to have a successful project.

Environmental protection is not only the responsibility of the contractor, but a shared environmental value in a gain-gain relationship for environment, society and development.

The role of the Environmental supervision does not end when construction is finished. It has to make sure that ecological restoration programs are applied to all of the affected sites, and all types of residues removed.

AKNOWLEDGMENTS

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