

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

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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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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.

Ley General del Equilibrio Ecológico y la Protección al Ambiente 1997, Editorial Porrúa, México. 184 p.

Poder Ejecutivo Federal 1996, Programa de Desarrollo del Sector Comunicaciones y Transportes 1995-2000. México. 155 ABSTRACT

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