

Mitigating negative impacts

This section considers the need and mechanisms to protect the public interest and prevent/mitigate negative impacts.

While there are normally negative impacts from new roads, especially major roads, there are also positive impacts such as lessening heavy traffic from small towns and villages. There are also design possibilities to mitigate impacts (See section...).

Policy makers in public authorities responsible for road network development act on behalf of the Government. As such, they are entrusted with the role of protecting the interests of the community. Such a responsibility is particularly important when assessing and mitigating negative impacts.

Protecting the public finances from the fiscal/financial risks inherent in contracting and partnering with the private sector. This issue is described in Module 5.

In the field of public welfare, protecting the environment and taking sustainable development into account feature increasingly among the main concerns of the public authorities, particularly when dealing with the development and management of road networks, and more generally with transport infrastructure facilities.

In the case of PPP-type relationships, there are two reasons why the public authorities must clarify the rules to be respected in this matter:

- The private operator will bear part of the environmental responsibility, which is variable according to the specific characteristics of the PPP. It must therefore know precisely what this responsibility involves.
- Even in the case of a PPP, part of the responsibility remains within the public sector, which is mainly in charge of the preliminary/scoping studies. It is essential that these studies be carried out so that any subsequent difficulties may be avoided, as they may have serious consequences for the operator. The procedures and integration within FS studies is shown in Module 5.

When establishing these rules, the public authorities should take into account the main environmental aspects to be considered in the road sector.

Main environmental aspects

The environmental impacts of a road to be considered, and the hierarchy of these impacts, vary considerably according to local conditions: climate, vegetation, population density, hydrology, etc.

It is nevertheless useful to give an exhaustive list of the possible impacts to help each decision-maker to draw up its own list, taking into account its specific situation.

The following check lists have been prepared using the following two references, but are not exhaustive:

- Noise (traffic, works).
- Transport of dangerous materials.

- Vibrations (traffic, works).
- Loss of interesting habitats.
- Air pollution: local (CO, NO_x, particles), regional (ozone, NO_x, smog, acid rain), global (CO₂, CFC, greenhouse effect).
- Reduction in agricultural production due to the reduction of the productive surface.
- Road safety.
- Increase in speed of propagation of endemic diseases.
- Land acquisition and resettlement.
- Drinking water quality.
- Impacts on indigenous or traditional populations.
- Effects on the inhabitants' way of life and culture.
- Aesthetics and landscapes.
- Protection of archaeological sites.
- Surface water quality (traffic, works).
- Erosion.
- Ground water quality (traffic, works).
- Sedimentation.
- Modifications of the flow of surface water due to cuts (borrow areas or trench sections of road).
- Floods upstream of embankments.
- Losses of topsoil in borrow areas.
- Risk of pollution of sensitive areas (mangrove, etc.).
- Erosion.
- Subsidence of areas of soft soil.
- Modification of soil texture in the neighborhood of backfill and excavations.
- Reduction of the number of species (biodiversity).
- Disappearance of reproduction and food zones for fish, aquatic and migratory birds.
- Deforestation.
- Reduction of the surface area of pasture land.
- Destruction of rare plants.
- Various consequences of an increase in tourism.
- Wild flowers specific to the wetlands.
- Severance effect.
- Increase in poaching during the works period.
- Reduction in the number of species (biodiversity).
- Increase in fishing and hunting due to easy access.
- Extinction of rare species.
- Wild animals specific to the wetlands.



Roads and the Environment: a Handbook, World Bank, Technical Paper 376. 1997.

Archaeological discoveries

Special attention should be paid to regulations relative to archaeological discoveries which exist in most countries. They will generally require reporting on the discoveries to the appropriate department and interrupting the works until investigations can be made and the discovery saved, sometimes with a serious effect on costs and schedule.

As such, they constitute a risk. This risk should incite maximum effort to be made to detect archaeological sites during the preliminary study stage. Besides carrying out surveys among specialists of the regions concerned, the performance of aerial photography detection methods should be underlined in such research.

How Environmental concerns should be taken into account at the design stage

The most useful, relevant references for integrating environmental concerns into the design and the construction of a new road are the World Bank (Roads and the Environment: a Handbook) and European Bank for Reconstruction and Development Guidelines.

The WB Handbook and EBRD Guidelines are, in fact, very similar in spirit. They use the same vocabulary. Both recommend a progressive process combining design, environmental studies and public consultation.

According to the Guidelines, the process of environmental assessment for road projects consists of a number of distinct steps, including screening and scoping the studies required, environmental assessment studies, mitigation plans, training and monitoring.

It is important to synchronize environmental studies with the project development process and its technical studies in order to integrate the findings into planning, design and further analysis as early as possible and get the best results from both types of activity.

The main steps to be considered are described below.

Screening

Screening is the term used to describe an assessment of the potential magnitude of impacts and hence the depth of the study required. This should be the first stage in incorporating environmental considerations into a road development project. While the methods used by various agencies vary in their details, projects are generally classified in one of three categories.

- Full environmental assessment (also known as an Environmental Impact Statement - EIS).
- Limited environmental analysis or mitigation plan.
- No environmental study.

Sometimes, there are precise regulations as to which study should be applied to a project. In other cases the degree of study needed will be at the discretion of the agency. In these instances, the factors to be considered are:

- Scale and type of project.
- Location and sensitivity of the site.
- Nature and sensitivity of potential impacts.

Scoping

The aim of this component of the preliminary evaluation is to determine the focus of the environmental assessment studies, including what can and cannot be accomplished. Definition of the scope of the study will enable the most important environmental impact of the road project to be concentrated on. This stage should achieve the following objectives:

- Define the spatial limits of the study.
- Select the method and parameters to be used.
- Consult with interested organizations and the affected population to identify environmental concerns.

In establishing the scope of the study, it is highly desirable for the different parties concerned to arrive at a consensus. Involvement of interested parties such as ministries (for the main projects), project designers, local officials, associations, community representatives and local residents can help to ensure that the program will not be subject to last-minute disputes. Meetings and discussions on the scope of the environmental study should:

- Provide information on the objectives of the project.
- Identify the natural, economic and social resources of importance in the area.
- Agree on the issues which should take precedence in the study.

Choice of alignment

Having determined, in the scoping studies, the field of environmental constraints to be considered, the next stage is to take them effectively into account in the studies which will lead to choosing an alignment and general characteristics for the road.

The environmental constraints are, of course, only one of the elements to be considered, the other determining physical data being topography, the nature of the soil, hydrology, the landscape features of the site, etc.

As for the other physical data, the designer's first step is to represent the environmental constraints to be taken into account in map form.

These constraint maps are drawn up for the main potential impacts listed during the scoping phase: protected areas, wetlands, predominant forms of agriculture, forests, interesting habitats, etc.

Based on this data, the designer carries out a series of repetitive steps. He selects possible alignments (or rather alignment zones), numerous at the first stage of the project, then becoming fewer and fewer until the final stage of the public inquiries is reached.

At each stage, the different possible alignments are assessed from various angles including:

- project cost,
- diverted or induced traffic,
- acceptance by the public and politicians,
- social-economic profitability,

It is in everyone's interest that this complex but necessary process is carefully codified. This is particularly important when alignment studies are taken charge of by a private partner (Module 2 -> Scope). Codifying this process consolidates the legitimacy of the operator and reduces the risk of excessive extension of the pre-construction period.

Information, consultation and participation

Consultation and communication with various interested parties are an integral part of this process. To be successful, they must be carefully planned and managed.

Mitigation plan

The last step, once the alignment has been determined, is to identify feasible and cost-effective measures that may reduce environmental impacts; prioritize their relative importance and their capital and recurrent costs, along with the institutional, training and monitoring requirements involved by these measures. The mitigation plan (also known as an action plan) should provide details of proposed work programs and schedules. The plan should consider compensatory measures if mitigation measures are not feasible or cost-effective.

An early indication of the scale or likely cost of mitigation is very useful input to any preliminary project financial studies.

Environmental concerns during the O&M stage

At the road operation and maintenance stage, the responsibilities incumbent upon the government in standard contracts are mainly transferred to the private operator in the case of PPP-type contracts.

The nature of the impacts to be considered, along with their ranking, varies considerably depending on local conditions such as climate, vegetation, population density, hydrology, etc.

The following list is therefore only an indication, to be considered as a memory jogger by decision-makers and engineers.

Water

The existing road networks generate several types of pollution:

- solid particles being carried along from bank, shoulder and ditch erosion,
- chronic pollution mainly due to pavement and tire wear and the emission of exhaust fumes. This results in the presence of heavy metals, rubber and oil, etc., in the run-off, which are particularly dangerous for the natural drainage systems (containers),
- seasonal pollution from de-icing products,
- accidental pollution from spills of dangerous products and pollutants.

Measures to eliminate or limit the causes of this pollution should be introduced at the design stage and others at the operation and maintenance stage.

For example, the following should be dealt with at the operation and maintenance stage:

- preserve vegetation in erosion-prone areas, strengthen this natural protection, if necessary (fascine work, geotextiles, etc.),
- keep settling tanks, lagooning basins, de-oiling tanks, storm water basins, etc., in good repair,
- limit the quantities of de-icing salt spread on the pavement and when choosing such products, consider their effect on the
- environment as well as their efficiency and cost,
- make sure that action in case of accidental spills of dangerous products is well organized. This problem should be examined with particular care when preparing operation manuals in close agreement with the public authorities.

Noise

Noise from road traffic is unfortunately inevitable. Efforts can only be made to reduce it. The main noise-reduction measures should be taken at the design and construction stages. Some, however, concern the operation and maintenance stage:

- choosing noise-free pavement surfacing. However, the quietest types of surfacing which often have a very fine texture, do not provide much grip when wet, with one exception, porous macadam, which is both silent and provides a good grip, but is costly and has other disadvantages,
- operation measures to avoid congestion, which considerably increases the noise caused by road traffic, or to divert HGV traffic from certain sections in sensitive areas.

Flora (wild plant life)

The extent of green areas surrounding roads is far from negligible. They usually account for nearly one percent of the surface area of some developed countries.

From an environmental point of view, they often have the advantage of not being part of the intensive production system, thereby avoiding the harmful effects of fertilizers

and weed killers. They also act as substitute habitats, providing a sort of sanctuary for wild flowers and plants.

It is desirable to take these considerations into account as regards roadside maintenance, by not scything cut or fill embankments, for example, so as to allow the natural vegetation to regain ground. Generally speaking, it is advisable to take advantage of every opportunity to restore new areas to nature (road extra-widths, settling tanks/biological purification tanks with vegetation growing up the sides rather than concrete tanks, etc.).

Trees planted along roadsides cause other types of problems. They contribute to the quality of the landscape and to a certain degree to traffic safety by serving as markers. They contribute to the richness of the plant life in the areas travelled through and as such, should be preserved as far as possible.

At the same time, they are a danger to vehicles leaving the road (accidents) or when they are in a bad condition and fall onto the road. The operator's road management plan should therefore include a tree component and periodic inspections of their physiological condition should be planned (e.g., every five years).

Fauna (wild animals)

As for the wild plant life, the various ancillary parts of the road may constitute advantageous, useful refuges for some species of insects, birds and small mammals. Any care taken to preserve local plant life will also be beneficial to them. Another precaution which should be systematically taken during the nesting period is to limit scything to a narrow strip on either side of the road pavement. This will provide satisfactory visibility while still preserving the nesting species.

Another aspect to be considered is the risk of collisions between cars and animals. This constitute a danger for both and may also contribute to the disappearance of rare species. Precautions should therefore be taken involving maintenance of protective fencing, additional protection in accordance with the number of collisions, maintenance of wild animal passages and setting up dissuasive devices during the night (reflectors).

Lastly, in countries where hunting and fishing are not strictly regulated, the contract should specify the constraints imposed on works and maintenance staff in this matter.

Re-using pavement demolition materials

Techniques for recycling deteriorated pavement materials have considerably progressed. They concern both pavement surfacing and its structure.

By reducing the quantities evacuated to rubbish dumps and economizing new materials, these techniques, which are moreover often more economical, fit well into the perspective of sustainable development. As such, their inclusion in the specifications should be encouraged.

Nuisances caused by maintenance work

The consequences of maintenance work are very similar to those of construction work, i.e., noise and dust, pollution, soil contamination, impacts on the population, noise and vibration caused by explosives.

Rules concerning contact with the local population

The conditions specific to certain countries may lead to imposing precautions to be taken by staff as regards hygiene and relations with the inhabitants of the areas concerned.

In conclusion, even if it is not easy to formalize the various environmental protection requirements in the form of performance obligations, it is essential that they be respected and therefore set down either in national standards and rules, or in the contract.

This contract comprises both rehabilitation works and routine maintenance and emergency works and thus covers all the circumstances to be considered for earth roads in developing countries. It should be noted that some passages go beyond merely wanting to protect the environment, but cannot easily be separated from it. Another solution for wording the contract could have been to include environmental clauses in each of the general or specific technical clauses.



Environmental, Health and Safety Guidelines for Toll Roads



Road Maintenance and the Environment, World Bank 1994



Environmental Impact of Existing Pavements, PIARC Environment Committee, PIARC, 2000.