
ENVIRONMENTAL MANAGEMENT STRATEGY FOR INFRASTRUCTURE AGENCIES IN DEVELOPING COUNTRIES

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INTRODUCTION

This paper describes an environmental management strategy for agencies located in developing countries charged with the design, development, supervision and/or maintenance of infrastructure projects. It uses as illustration an environmental management strategy developed for an urban roads maintenance and rehabilitation program in the Republic of Trinidad and Tobago, located in the Caribbean Sea.

The roads program is a five-year operation financed through local and multi-lateral funding whose main objective is to improve the road services provided by the national network in order to reduce overall transportation costs, thereby contributing to a more competitive and diverse economic base. The program has two main components. The first is investment and maintenance, which comprises routine maintenance, periodic maintenance and rehabilitation, and trunk road expansion. The second is institutional strengthening, which includes the rationalization of the institutional framework for road management and technical assistance.

During the process of design and evaluation of the program, which ended in 1995, it became clear that the local program executing agency (PEA) had

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neither the institutional capacity nor the technical expertise to carry out the environmental evaluation and monitoring of projects. In effect, there was not an organizational structure within the PEA charged with conducting the environmental assessment of the operations that it planned and implemented. In addition, with the exception of a landscape architect, there were no personnel with degrees in any of the environmental sciences or with environmental training in the PEA.

The environmental management strategy consists of the following three components:

- ▶ Institutional capacity building in environmental assessment, involving the creation of an *environmental unit* at the PEA and the provision of technical assistance, training, and equipment to the unit.
- ▶ Development of an *environmental evaluation procedure* to institutionalize environmental review as part of the project selection, design, and execution process.
- ▶ Establishment of an *environmental monitoring system* to verify the application of mitigation measures and impose sanctions for violations.

The next section of the paper discusses the legal and institutional framework for environmental impact assessment in Trinidad and Tobago. The last three sections deal with each of the components of the environmental management strategy in the following order: capacity building, environmental evaluation procedure, and environmental monitoring system.

LEGAL AND INSTITUTIONAL FRAMEWORK FOR ENVIRONMENTAL IMPACT ASSESSMENT IN TRINIDAD AND TOBAGO

Two laws govern the environmental impact assessment process in Trinidad and Tobago: the Town and Country Planning Act, enacted in 1960 and amended in 1974 and 1977, and the Environmental Management Act, enacted in 1995.

The Town and Country Planning Act grants to the Ministry of Planning and Development (MOPAD) the authority to issue permits for the development

of land, defining development as “the carrying out of building engineering, mining or other operations in, on, over or under any land, the making of any material change in the use of any buildings or other land, or the subdivision of any land.”

Under the above definition, the types of new infrastructure development carried out by the PEA fall under the jurisdiction of MOPAD with respect to the application for permits to develop those structures. However, the act specifically excludes from the permit requirement the types of projects included in the first year of the urban roads maintenance and rehabilitation program: “the carrying out by a highway authority of any works required for the maintenance or improvement of a road if the works are carried out on land within the boundaries of the road.”

For development projects regulated by the act, the Division of Town and Country Planning at MOPAD determines if an environmental impact assessment (EIA) is required. If it is, the division defines the terms of reference for the EIA, conducts the public review process, issues a certificate of environmental clearance for the EIA if it is adequate, and finally grants the permit for the development project.

The Environmental Management Act explicitly grants authority to MOPAD for the environmental impact assessment process for projects involving land development: “Where an activity ... constitutes a development requiring the express grant of permission under the Town and Country Planning Act, the developer shall deal directly with the entity responsible for town and country planning with respect to the application for a Certificate and any environmental impact assessment which may be required.”

The Environmental Management Act establishes the *environmental management authority* (EMA), whose responsibilities include the definition of a national environmental policy; the development, implementation, and coordination of policies and programs for the management of the environment; the establishment of national environmental standards and criteria; the monitoring of compliance with environmental standards; and the coordination of inter-institutional actions relating to the environment.

A project for the Planning and Development Land Act, which is designed to replace, update, and expand the Town and Country Planning Act, was expected to reach Parliament at the end of 1997. One of its objectives is to

“maintain and improve the quality of the physical environment...” In the area of environmental quality, it provides for the establishment and regulation of development in areas of special interest, such as environmental protection areas. It also provides for the requirement of an environmental impact assessment for proposed developments in certain areas of special interest and for certain types of land development. Further, the proposed act introduces new devices for the management of development such as the environmental repair order, aimed at stopping unauthorized developments that pose environmental hazards and restoring environmental quality at the affected site.

Constraints to the Environmental Assessment Process

The nonexistence of national standards and criteria of acceptable levels of air, water and land quality constitutes a constraint in the performance of environmental impact assessments. In effect, current and projected baseline conditions can only be compared to international standards to make a determination regarding present and future environmental quality levels (before and after project implementation), but these standards are not legally defined in the country and thus the legal basis for their enforcement is questionable.

Another possible constraint in the application of the environmental impact assessment process is the limited national experience in the establishment and coordination of the inter-institutional actions and mechanisms demanded by the process. In addition, there is also limited experience in conducting the public review and comment process. These restrictions are expected to be overcome gradually as the agencies charged with implementing the environmental assessment process gain experience in its implementation.

INSTITUTIONAL CAPACITY BUILDING IN ENVIRONMENTAL ASSESSMENT

Given the lack of environmental expertise and experience at the program executing agency (PEA), it is clear that any environmental management strategy must start by building these capabilities. The establishment of an environmental unit within the PEA was necessary in order to assure that environmental considerations are incorporated into the project cycle since the identification stage. This unit would conduct the environmental evaluation procedure proposed for the roads program (see next section), as well as all other activities in the environmental area required for the whole PEA,

including the environmental review of all the other programs co-financed by bilateral and multilateral agencies.

The need and justification for the creation of the environmental unit are clear. First, both recent government policy and legislative initiatives, as reflected by the creation of the Environmental Management Authority (EMA), the proposal of the Planning and Development Land Act, and the enactment of the Environmental Management Act, are placing greater emphasis on environmental matters. These efforts demand the active involvement of governmental entities with responsibility in environmental management, such as the PEA. For instance, the Environmental Management Act directs EMA to consult with the 28 governmental units performing environmental management tasks to create mechanisms of inter-institutional communication and develop coordination means across jurisdictional lines to implement integrated environmental programs. In addition, the Environmental Management Act authorizes EMA to designate environmental officers, chosen from the 28 government bodies with participation in environmental management, whose responsibilities are to—

. . . (a) assist in maintaining ~~intragovernmental coordination~~, communication and institutional linkages for the development, integration and effective implementation of the various policies, laws, regulations, rules, guidelines, programs and other activities designed to protect and conserve the environment; and (b) carry out on the Authority's behalf such functions as may be agreed to between the Authority and the other governmental entity.

Furthermore, the government of Trinidad and Tobago is designing, negotiating, or executing programs in the transportation and infrastructure sectors with funding from bilateral and multilateral agencies, all of which require environmental evaluation and monitoring activities which can be carried out by the environmental unit. These programs are in addition to the infrastructure development and maintenance functions already being implemented by the PEA, which were being carried out with little or no environmental input or supervision.

Given the fact that the proposed scope of work of the environmental unit covers all of the PEA's operations, the unit was attached directly to the Office of the Technical Permanent Secretary and not to any division in particular.

Tasks of the Environmental Unit

The main tasks of the environmental unit are to—

- ▶ Apply the environmental evaluation procedure (see next section for details about the procedure).
- ▶ Design the different instruments required to apply the procedure: environmental questionnaire, preliminary environmental report, model terms of reference for detailed environmental impact assessments and for more limited environmental analyses, and model reports for the evaluation of EIAs and supervision of the application of mitigating measures.
- ▶ Assess the applicability of the program's environmental evaluation procedure to other programs and projects being planned or currently undertaken by the PEA, and make the necessary adjustments.
- ▶ Design guides containing detailed environmental criteria, guidelines, and mitigating measures for the design, evaluation, implementation, and monitoring of the different types of infrastructure and transportation projects for which the PEA is responsible (drainage, roads and high-ways, ports, bridges, etc.).
- ▶ Serve as liaison with other government agencies with responsibility in environmental management, in particular the EMA (the head of the environmental unit will be the environmental officer designated by EMA for the PEA), and with environmental specialists of bilateral and multilateral agencies co-financing programs with the PEA.
- ▶ Determine training needs in environmental assessment and, where possible, meet them or define the terms of reference to provide them.
- ▶ Establish a computer-based information system for the environmental quality control of projects, indicating environmental classification of projects, necessary environmental analyses and their progress, and required mitigating measures and verification of their application or sanctions for violations.

Organization of the Environmental Unit

In the interest of efficiency, a structure based on functional rather than administrative tasks was recommended. The unit consists of three sections—

environmental assessment, environmental design, and environmental monitoring—with responsibilities assigned as follows:

Environmental assessment

The head of the unit will be directly in charge of this section and will be the environmental officer at the PEA. The main tasks of this section are—

- Environmental classification of projects
- Specification of mitigating measures
- Terms of reference and follow-up of environmental assessments
- Preparation of environmental guidelines and criteria for project selection, design, and implementation
- Establishment of a project environmental quality control database
- Provide training in environmental assessment
- Establishment of contacts and coordination mechanisms with other institutions and bilateral and multilateral agencies with regard to environmental matters
- Making recommendations to top administrators of the PEA with respect to sanctions for violations of mitigation plans.

Environmental design

The basic task of this section is to review projects and make recommendations for the incorporation of environmental design elements and criteria (natural barriers to noise and air pollution, arborization, pedestrian boulevards, signs that harmonize with the natural environment, and the like). This will make projects more viable from the environmental point of view and will maximize the potential contributions of infrastructure and transport projects to the enhancement of the overall quality of life of the areas for which they are proposed. This section will be formed by transferring the existing highway beautification office to the environmental unit.

Environmental monitoring

The basic responsibility of this section is the verification in the field of the application of required mitigating measures. The personnel assigned to this section will have technical training so that they can act not only as inspectors but also as consultants in the correct implementation of measures. This section will be formed with technical personnel within the PEA who already have field experience in the inspection of construction works. These individuals need to be retrained in environmental monitoring.

Establishment of the Environmental Unit

A multilateral bank provided technical and financial support for the establishment of the environmental unit through the institutional strengthening component of the roads maintenance and rehabilitation program described in the introductory section of the paper. The government of Trinidad and Tobago approved the creation of the unit in 1996. The head of the unit was selected in 1997. The official title of the position is Director of the Environment, with a rank equivalent to that of a division director and reporting directly to the Permanent Secretary. The process of selection of all professional staff was open and competitive, and was expected to be completed by the end of 1997. The unit had office space and basic supplies in the middle of 1997.

The establishment of the environmental unit was facilitated by the fact that two of the sections that would form part of it were to be created by transferring and retraining personnel already employed and familiar with the PEA's procedures. The willingness to support the creation and operation of the environmental unit expressed by top officials at the PEA, EMA, and MOPAD is another factor that facilitated its establishment.

The following personnel, equipment, training, and technical assistance specifications were used in the design of the unit. These requirements were incorporated, together with their costs, as an integral part of the roads maintenance and rehabilitation program.

Personnel

The professional and technical personnel requirements for each section of the unit are the following:

Environmental assessment section: In addition to the environmental unit head (a civil engineer with environmental training or environmental professional with experience in infrastructure projects), this section requires three other specialists, one for each of the following aspects of environmental analysis—physical, social, and biological.

Environmental design section: One landscape architect (to be transferred from the highway beautification office) will coordinate the section, another architect with training in environmental design will be hired, and three technical drafters will be transferred from the highway beautification office.

Environmental monitoring section: This section will have 12 environmental inspectors, two for each regional office of PEA in the country.

Equipment

The following equipment was scheduled to be acquired to carry out the duties of the environmental unit: office equipment (computers, printers, photocopy machine, and supplies), two 4-wheel drive vehicles and spare parts, and fieldwork equipment.

Training

Training and retraining is a fundamental requirement for the successful operation of the environmental unit. This component includes national and international courses, seminars and workshops, and exchange of experiences in environmental assessment and management in the Caribbean region. Preference would be placed on intensive training in topics directly related to the **tasks** of each of the sections of the unit specified above.

Technical assistance

An international consultant with expertise in the institutional and technical aspects of the design and implementation of the environmental assessment process would assist the **PEA** in working out the details involved in the instrumentation of the environmental evaluation procedure designed for the program and in setting up the environmental unit. The consultant has been identified and is expected to complete this assignment in the second half or 1997 or the first half of 1998.

ENVIRONMENTAL EVALUATION PROCEDURE

Objectives

The objectives of the environmental evaluation procedure are twofold:

- ▶ To establish the steps to follow and define the instruments to apply in evaluating the potential environmental impacts of proposed projects.
- ▶ To ensure that the environmental implications of proposed projects are considered and that measures to avoid, correct and mitigate adverse effects are implemented.

Stages

The environmental evaluation procedure consists of the following six stages:

- Environmental screening
- Preparation of terms of reference for environmental impact assessment
- Supervision of the execution of the EIA
- Review of final environmental impact report
- Monitoring of mitigating measures
- Review by participating agencies

Given the type and the small and moderate magnitude of projects typically included in the urban roads maintenance and rehabilitation program, in addition to the fact that projects are proposed for already-occupied areas with final road alignment, the applicable stages of the environmental evaluation procedure for the great majority of projects will be environmental screening and the monitoring of mitigating measures.

A more involved environmental review will be required if any of the following conditions apply:

- ▶ More complex projects (e.g., extension, widening, and paving of earthen rural roads; opening of new roads), other than those involving the maintenance, rehabilitation, and repair of roads and bridges, are proposed for future years of the program, and thus more significant adverse impacts are anticipated.
- ▶ There is not sufficient baseline information about the areas where projects will be implemented to make an initial evaluation of the significance of potential impacts, and thus further environmental analysis is required.
- ▶ New projects are proposed for environmentally sensitive areas, and thus further environmental analysis is required.

Only projects presenting potentially significant negative impacts require a full-blown environmental assessment resulting in a detailed **EIA**. Thus, these types of projects are the only ones that will undergo all the six stages of the environmental evaluation procedure.

Environmental screening

This stage involves securing and analyzing information about proposed projects and their areas of influence to determine if this information is complete and reliable enough to identify the environmental implications of projects and categorize them based on their potential impacts. The analysis of information will allow the characterization of projects in the following terms:

- Projects requiring additional information in order to clarify their environmental implications.
- Projects with environmental impacts predominantly positive or neutral. This group of projects does not require an EIA and, in case they present moderately negative impacts, the definition of mitigating measures is required, and these measures and their costs are incorporated into the project.
- Projects with potentially significant negative impacts. A detailed EIA is required for these projects.

The characterization of projects is a methodological strategy directed at simplifying the environmental analysis process by listing projects in priority order based on their level of potential environmental effects, so that immediate and special attention is devoted to those projects presenting adverse negative impacts.

A series of steps and instruments are designed to collect data on projects and their areas of influence in order to classify projects into one of the above three categories. The steps that make up this stage are the following:

- Application of the environmental eligibility criteria defined for the road program to all proposed projects. These criteria constitute the initial technical environmental controls established to assure that proposed projects will have a minimum environmental impact.
- Revision of an environmental questionnaire filled out by the project designer. The environmental questionnaire is designed to collect relevant information about the project and the affected area. It must have a checklist format so that it can be completed easily and quickly.
- Preparation of a preliminary environmental report with an evaluation of the information presented by project proponents and the environmental categorization of the project. This report must contain a detailed review of the information presented on the project

and the affected area, in terms of how complete and reliable it is. This review can have one of the following results:

- If the review is unsatisfactory, the report must indicate why and identify the additional information to be collected and possible sources where to find it. If the project is likely to have negative impacts and the required information is critical but not available, a preliminary categorization of the project is made and the terms of reference for the necessary study are defined.
- If the information presented is adequate, the project is characterized according to its potential impacts. If the project will have mainly positive or neutral impacts but is also likely to produce some known moderately adverse impacts for which proven mitigating measures are available, the negative impacts are identified and the appropriate mitigating measures and their costs are identified and incorporated into the project as ***general and particular environmental specifications***. In case there are doubts about the appropriate mitigating measures for moderate impacts, terms of reference for the required study are defined. For projects presenting moderate negative impacts, the next applicable stage of this procedure is the monitoring of mitigating measures. For projects presenting significant negative impacts, the next applicable stage is the preparation of terms of reference for the EIA.

This stage must be implemented between the idea and profile phases of the project cycle.

Preparation of terms of reference for EIA

The terms of reference define with precision the tasks to be performed, the topics to cover, and the environmental aspects to emphasize in the EIA. This document also contains general guidelines on the methodology and content of the study, defines the qualifications and fields of expertise of the professional team that should carry out the study, and presents estimates of the cost and duration of the study. This stage must be implemented during the pre-feasibility phase of the project cycle.

Supervision of the execution of the EIA

This stage is designed to guarantee that the EIA is performed according to the specifications of the terms of reference. To this end, three reports are requested from the consulting firm or research organization conducting the

EIA: the first when the characterization of the project and the environmental description of the affected area are completed, the second at the end of the evaluation of impacts, and the third when the mitigation plan is designed. This stage must be implemented between the pre-feasibility and feasibility phases of the project cycle.

Review of final EIA report

This stage consists in the evaluation of the final **EIA** regarding its content, methodology, and adherence to the terms of reference. The purpose of this stage is to ensure the overall quality of the **EIA**, that all alternatives were considered, that appropriate mitigating measures were incorporated, that a suitable monitoring plan was proposed, and that nongovernmental organizations (NGOs) and governmental organizations (GOs) and all other interested parties were consulted. This stage must be implemented between the feasibility and design phases of the project cycle.

Monitoring of mitigating measures

The objective of this phase is to ensure that the project is executed with minimum environmental damage and according to the mitigation plan proposed. The **PEA** has the fundamental responsibility to inspect periodically the site of the project, verify that the mitigating measures are implemented adequately, and impose sanctions in case of violations. This stage applies both to projects subject to a detailed environmental impact assessment and to projects presenting moderate negative impacts. This stage must be implemented during the execution, operation and maintenance phases of the project cycle.

Review by participating agencies

This stage is performed in parallel to all other stages of the environmental evaluation procedure. It comprises all the actions that must be executed by the three other institutions with direct involvement in the procedure, as required by the environmental legislation of Trinidad and Tobago and the operational procedures of multilateral agencies (**MAs**) co-financing projects.

On the part of the **PEA**, the environmental unit has the main responsibility in organizing, coordinating, and carrying out this environmental evaluation procedure. In particular, it must apply the different instruments and implement the different steps (e.g., initial environmental categorization of projects, definition of terms of reference for EIAs), supervise the application of mitigation measures, impose sanctions for violations in the application of

mitigation measures, and coordinate the inter-institutional efforts demanded by the procedure.

As explained in the section dealing with the legal and institutional framework for EIA, two government agencies have a central role in the EIA process in Trinidad and Tobago: the environmental management authority (EMA) and the division of town and country planning in the Ministry of Planning and Development (MOPAD). Their participation in the environmental evaluation procedure is explained according to the final assignment of responsibilities contained in the Urban and Regional Planning Act.

Following are the actions to be taken by EMA, MOPAD, and MAs, organized according to the different stages of the procedure:

- ▶ ***Environmental screening.*** The preliminary environmental report is reviewed by the MAs' environmental specialist to assure agreement regarding the environmental categorization of projects, possible impacts, and mitigating measures. The terms of reference for baseline studies and definition of mitigating measures are also submitted to MAs' environmental specialist for review and comments.
- ▶ ***Preparation of terms of reference for EIA.*** EMA and MAs must review and approve terms of reference for EIAs.
- ▶ ***Supervision of the execution of the EIA.*** EMA and MAs must review and approve the three reports prepared by the consulting firm or research institution conducting the EIA.
- ▶ ***Review of final environmental impact report.*** EMA must organize the public review and comment process for the final EIA report. MAs must review and approve the final EIA report. MOPAD must issue or deny a certificate of environmental clearance for the EIA.
- ▶ ***Monitoring of mitigating measures.*** EMA and MAs must be informed of any sanctions imposed by the PEA for failures to apply correctly the required mitigating measures.

This stage must be implemented from the idea to the maintenance phases of the project cycle.

ENVIRONMENTAL MONITORING SYSTEM

The measures designed to prevent, correct, and mitigate the direct negative impacts of the roads program are operationalized as *general and particular environmental specifications*. These specifications are included in the Conditions and Specifications of Contracts, and will be an integral part of tender documents for contracts.

The environmental inspector in charge of field monitoring of the execution of a particular project will have copies of the project design and of the environmental specifications defined for the project, so that there is clarity regarding which, when, and where appropriate mitigation measures should be applied.

It is the responsibility of the contractor to implement the required mitigation measures. The environmental inspector will file a report with one of the following conclusions: (a) the correct application of the measures is verified; (b) justifications for adjustments or delays; or (c) violations. In case violations are reported, the inspector will issue a *notice of correction*, specifying the violation and how to rectify it. In case of continued noncompliance with the notice of correction and unwillingness to conform on the part of the contractor, the inspector will issue a *notice of violation* recommending sanctions, which can range from a fine to the suspension of work or suspension of the contract. The final determination on the imposition of serious sanctions will be made by the Permanent Secretary, based on the recommendations of the environmental unit head.

The environmental inspector will make efforts, where feasible, to involve affected parties and NGOs in monitoring activities, by being receptive to their complaints or specifically requesting their input regarding perceived unacceptable levels of certain impacts (i.e., noise, air pollution, dust generation, traffic congestion) and violations difficult to detect (i.e., illegal or inadequate disposal of construction material, garbage, human wastes, effluents, lubricants, oil and paint).

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