

## SUMMARY WITH CONCLUSION AND RECOMMENDATIONS TO ECE GOVERNMENTS

The importance of environmental concerns and their relationship to economic development is recognized by Governments. One significant response to this realization is reliance on assessment of environmental impacts. Environmental impact assessment (EIA) is a procedure used in order to evaluate the effects of economic activity before a development takes place. This instrument is thus an aid in interpreting and communicating information about eventual impacts. Environmental impact assessment allows possible effects to be investigated and consequently a means for their management to be identified. By providing the decision-maker with a composite picture of the environmental consequences of a proposed activity along with alternative developments, environmental impact assessment contributes to good environmental management.

The increasing use of EIA and its value in dealing with the economy-environment linkage has stimulated attempts to improve this practice. Two functions are in need of improvement. They are: (a) EIA's ability to predict project impacts accurately and convincingly; and (b) EIA's capacity to allow project decisions to be made in the absence of certainty about environmental impacts. Concern has been expressed, for example, that EIA analysts lean too heavily on expert opinion when they are making predictions and do not rely enough on empirical evidence from actual projects. In other words, it is felt that there is too great an inclination to "re-invent the wheel", to start each time at the beginning as it were, with too little study of actual project impacts.

Making decisions in the absence of certainty is of course a problem that manifests itself in a variety of ways. The very high cost of "react and cure" strategies (compared with "anticipate and prevent" strategies) should preclude approving any project with significant unmitigated impacts. It goes without saying, prior assessment of predicted effects can likely save money in the long run. Insisting on mitigation measures for every possible impact could be inordinately expensive, however.

One of the most cost-effective tools for improving assessments of environmental impact is post-project analysis (PPA). PPAs are environmental studies undertaken during the implementation phase (prior to construction, during construction or operation and at the time of abandonment) of a given activity - after the decision to proceed has been made. PPAs may be undertaken to ensure or facilitate the implementation of the activity in accordance with the terms imposed by the environmental assessment process, or to learn from the particular activity being studied.

The findings of the task force were derived from a comparative analysis of 11 case studies. The case studies have made significant contributions to addressing the two problematic aspects of EIA discussed above. Examining projects as they are implemented (that is, in the phases of preconstruction, construction, operation and abandonment) and documenting and analysing the observed impacts and the effectiveness of mitigation measures elicits precisely the sort of factual evidence needed for future environmental reviews. This observation also applies to procedural and administrative aspects of project management. That is, the case studies cover not only scientific and technical aspects of the projects but also deal with the

effectiveness of the environmental management systems employed. In this way authorities responsible for future projects of the same type or projects with parameters similar to those studied will reap the benefit of the better understanding gained of likely impacts and effective mitigation measures possible.

The difficulty of making decisions in the absence of certainty will always be a part of any environmental review: after all, the projects examined are inevitably those which are relatively new or expected to have significant impacts or risks. For some of these impacts, case-study PPAs indicate that final decisions regarding mitigation measures may be postponed until more is learned about their efficacy. Conversely, the prevention of many types of impacts depends on mitigation measures being incorporated from the very beginning of the project in order to be effective. In the latter instance, deferral of decisions on mitigation measures is definitely not appropriate. The role of PPAs in these circumstances is to monitor project consequences, evaluate the results, and employ such mitigation measures as are actually required. In this way, resources devoted to environmental management can have a much more efficient yield while mitigation measures may be applied where they are needed but not where they are unnecessary. In addition, public confidence in a project can be legitimately enhanced by the use of suitable PPAs. This "monitor, evaluate and manage" strategy was found to be very effective in the case study PPAs.

The case studies have led the task force to appreciate the value of PPAs in managing environmental consequences of development projects. Moreover, they illustrate how the EIA process can be improved through reiterative feedback during the project implementation phase. Not only can PPAs contribute to assuring that the benefits anticipated as a result of the environmental review are effectively put in place when the project proceeds, but they can also improve the environmental impact assessment process itself by providing feedback about how environmental impact assessment has worked.

CONCLUSION AND RECOMMENDATIONS TO ECE GOVERNMENTS 1/

as endorsed by the Senior Advisers to ECE Governments  
on Environmental and Water Problems at their second  
session 2/

The task force concluded that post-project analyses are a very effective and necessary means of continuing the EIA process into the implementation phase because of their uses for the following purposes:

- (a) To monitor compliance with the agreed conditions set out in construction permits and operating licences;
- (b) To review predicted environmental impacts for proper management of risks and uncertainties;
- (c) To modify the activity or develop mitigation measures in case of unpredicted harmful effects on the environment;
- (d) To determine the accuracy of past impact predictions and the effectiveness of mitigation measures in order to transfer this experience to future activities of the same type; and
- (e) To review the effectiveness of environmental management for the activity.

With a view to promoting the use of effective and efficient PPAs as well as to strengthening EIA processes in the project implementation phase, it is recommended that:

1. Post-project analysis should be used to complete the environmental impact assessment process by providing the necessary feedback in the project implementation phase both for proper and cost-effective management and for EIA process development.
2. ECE Governments should apply the specific recommendations set out hereafter to suitable projects and should report back to the Senior Advisers in three years' time on the results of those PPAs and experience gained in their implementation.

Relationships between environmental impact assessment and post-project analysis

3. A preliminary plan for the PPA should be prepared during the environmental review of a project; the PPA framework should be fully developed when the EIA decision on the project is made.
4. The PPA should focus on important impacts about which there is insufficient information; identification of these impacts and their priorities is undertaken during the environmental review process.
5. The authority to undertake a PPA should be linked to the EIA process so that the concerns identified for inclusion in the PPA during the environmental review can be properly addressed.

6. The conditions of approval for a project should be such that the environmental management for that project will take into account the findings of the PPA.

7. PPAs should be done for all major projects with potentially significant impacts. In addition, for other projects, focused PPAs may be suitable either for environmental management of the project or to learn from the project.

#### Content of PPA

8. The development of hypotheses to test should be a part of PPAs. The hypotheses will depend greatly on the nature of the PPA and may involve comparisons of impacts with predictions or with standards or they may relate to how well the environmental management system worked.

9. In order to undertake PPAs effectively, baseline data relevant to the hypotheses should be collected and be as complete as possible.

10. Monitoring and evaluation of the data collected in the monitoring process should be an essential part of PPA. These steps are needed in order to test the hypotheses.

11. Documentation of the project and its impacts should be encouraged in order to improve PPAs.

#### PPA development and design

12. The first and most crucial step in developing a PPA should be to define its purpose. This would include the development of a specific purpose and focus for each component of the PPA.

13. Once the purpose of the PPA is known and its conceptual content identified (from the environmental review), it is essential to define the roles and responsibilities of the various participants in the PPA - the proponent, the various government agencies, scientific and technical advisers, and the public.

14. Management and participant responses required in the light of PPA findings should be, as far as possible, specifically addressed.

15. The need to deal with environmental surprises must be built into PPAs. Monitoring should be done in such a way that unexpected results have a good chance of being detected and those responsible for the PPA should have the power to respond appropriately to unexpected results.

16. The use of independent experts to help design the PPA should be encouraged as it leads to a better and more credible PPA.

17. The detailed development of the PPA should consider features such as the different phases of the project (preconstruction, construction, operation and abandonment), the need for integration of different aspects being studied, and the need to relate the effects being monitored to the project (separating out confounding effects of other activities).

PPA management

18. As a tool for managing PPAs, advisory boards consisting of industry, government, contractors, independent experts and public representatives, should be used. Such boards with well-defined terms of reference increase the credibility and quality of the PPA.
19. Public participation in the PPA should be encouraged.
20. PPA reports should be made public.
21. The use should be encouraged of independent researchers to do those parts of a PPA that are particularly sensitive and for which work done by the proponent (or possibly even by a government agency) may not be regarded as credible.
22. PPAs should be managed adaptively with opportunities to refine them depending on the results obtained. More effort should be put into examining those effects that are observed and important, and less effort should be expended on those effects which the PPA indicates are not resulting in significant impacts.

Notes

1/ An analysis of the information which led to the conclusion and recommendations is contained in Chapter III B.

2/ The United Kingdom fully concurs with the principle that the actual effects of a development project on the environment should be evaluated, after development consent has been given, both during the construction phase and subsequently during the project's operation. Such evaluation needs to be continuous and to be accompanied by powers to enforce environmental standards and conditions of operation, to require action to remedy adverse environmental effects and to secure improvements, for example by continually upgrading plant to the standard of the best available technology not entailing excessive cost, or by the tightening of pollution controls in the light of new evidence of risk. The United Kingdom has long-standing provisions of this kind, applying to all relevant installations, not only those which have been subject to environmental impact assessment. These provisions will be refined and expanded by planned new legislation on the introduction of an integrated system of pollution control for industry. In the United Kingdom's view the elaborate post-project procedures recommended by the task force would not improve on these arrangements. (In accordance with document ECE/ENVWA/9, paragraph 42).

## I. DESCRIPTION AND CLASSIFICATION OF POST-PROJECT ANALYSIS (PPA)

In this section the term post-project analysis (PPA) is defined in greater detail and its role in the EIA process is identified. Related terms such as "monitoring" and its many variations are also defined. Two different classifications of PPAs are introduced then subsequently used to describe the case studies.

### A. PPA in the environmental impact assessment process

Environmental impact assessment (EIA) is a process that attempts to identify and predict the impacts of proposed activities on the environment and on human health and well-being. EIA also interprets and communicates information about those impacts, and investigates and proposes means for their management. In an EIA process, proposed activities undergo an environmental review followed by a decision on whether or not to proceed with the activity (and, if so, under what conditions). This process is illustrated in Figure 1.

The details of how this environmental review takes place vary, depending on the activity proposed and on the EIA process employed in the relevant jurisdiction. Most environmental reviews include significant involvement of the public.

Some would argue that the decision on whether or not to proceed with a project ends the EIA process, but most EIA analysts today would agree that the process continues into the implementation phase when the proposed activities are under way. The implementation phase (including preconstruction, construction, operation and abandonment of the activities) begins with the decision to proceed with the project. It should be recognized that, in principle, EIA deals not only with projects but also with programmes, policies and plans. However, the case studies presented deal only with projects and most EIA processes have been applied mainly to projects. Accordingly, for simplicity, it has been assumed that a project is involved.

Post-project analyses encompass environmental studies undertaken during the implementation phase of a project; that is, PPAs are the set of environmental studies undertaken following the decision to proceed with the project. These studies are generally undertaken either to ensure or facilitate the implementation of the project in accordance with the terms imposed by the environmental assessment process (management-oriented studies). They may also be done to learn from the particular project (EIA process development studies). Compliance monitoring studies required by regulatory agencies are considered to be PPAs.

### B. Classifications of post-project analyses

There are two different ways of classifying PPAs. The first groups them according to the use or purpose to which they are put (project management or EIA process development); the second identifies them by the type of study undertaken (scientific and technical, or procedural and administrative).

Classification by purpose of PPA

As mentioned above, there are two major kinds of PPAs. The project management PPA involves studies undertaken for the purpose of controlling the environmental impacts of a project. These may involve monitoring and analysing selected aspects of the environment or of the project and applying the findings to manage the project appropriately (e.g., in accordance with the terms imposed as a result of the environmental assessment process).

The project management PPA may involve compliance monitoring directed at ensuring that regulations are observed and that standards are met. Effects monitoring may also take place; this involves looking at environmental variables in order to determine those changes attributable to the construction and operation of the project. Base-line monitoring - the measurement of relevant environmental variables during a representative period of pre-project conditions - is a valuable component of PPA because it is crucial to relate the findings of the PPA to the project. Any of these types of monitoring may in turn involve target monitoring or factor monitoring.

Examples of how monitoring can lead to better environmental management of the project are numerous. If construction techniques observed during compliance monitoring are found to be less than satisfactory, then the timing or nature of the construction practices may be adjusted. In extreme situations, it may be necessary to stop work in order to resolve problems that the project has created. Environmental effects monitoring may lead to the conclusion that certain impacts are greater than was expected and hence that mitigation measures are called for. If measured noise levels are higher than those found acceptable during the environmental review, for example, additional steps may be taken to achieve the lower levels specified in the permits granted at the time of project approval. Conversely, if monitoring indicates that certain predicted effects are not occurring, it may be wise not to spend resources on any mitigation efforts but rather to reallocate resources to areas where the benefits will be worthwhile.

A final example is the use of monitoring results in order to determine the compensation required to be paid to local citizens affected by a project. If the local employment levels are too low, or if wear on local roads is too great, the project proponent (or perhaps the government) may agree to provide compensation to affected communities. The magnitude of that compensation, or indeed the need for it, may depend on the outcome of effects monitoring.

PPAs may also be relevant for EIA process development. There are, of course, process development benefits other than those which accrue to the field of EIA. Improvements in science, engineering, and management may also result but, for the sake of simplicity, attention here is focused on the process development benefits for EIA. The EIA process development PPA involves learning the lessons to be learned from the particular project (and process) so that this knowledge can be applied productively and lead to discovery of ways to improve EIA. The predicted impacts may be compared with actual impacts, in an effort to improve predictions of environmental impacts; or the means of managing projects may be examined from an environmental point of view. For EIA process development PPAs, the purpose is to learn by doing. Thereby society can take advantage of successful methods and avoid in future those which have proven inadequate.

### Classification by type of study

The second classification of PPAs characterizes them according to their typology: scientific and technical or procedural and administrative. Scientific and technical studies generally deal with the scientific accuracy of impact predictions and the technical suitability of mitigation measures. Such studies compare predictions made in the environmental assessment review with facts observed when the project proceeds.

Procedural and administrative studies deal with EIA process-effectiveness (hence they are often evaluation-type studies). They may deal with environmental management systems and practices, public participation roles, or the relations between environmental assessment processes and other government procedures. These environmental managements systems will generally involve the proponent and relevant government agencies (including the agency responsible for environment matters, i.e., the agency with responsibility for the affected environment; the competent authority, i.e., the agency with responsibility for regulating the project; and such other agencies as appropriate). It may also include outside technical experts, contractors, and members of the affected public. It should be noted that, for project management orientated PPAs, the environmental management system is likely to be responsible for the PPA.

It may be useful to subdivide procedural and administrative PPAs into those which are project related and those which are process-related. The former deal with environmental management of the project when it proceeds while the latter address the environmental assessment process. Anyone concerned with the environmental assessment process might question its effectiveness or its efficiency. Did the EIA identify the right concerns? Were all stakeholders (public, proponent, government agencies, technical experts) involved appropriately? Are there more efficient means of getting the same information? Was the process fair to all participants? What was the relationship between the environmental review and other government planning processes? These process-related studies, it should be noted, still involve specific projects, but the focus of the study is the review process and not the project itself. (C.f. Figure 2 for a succinct view of this system.)

Procedural and administrative PPAs that are project-related look at how the recommendations arising from the environmental review were acted on during the implementation phase of the project. These reviews may well be coupled with a scientific and technical assessment of the project and can address a variety of techniques used to ensure that the good environmental-management plans developed during the environmental review are practised when the project proceeds. These techniques may include the use of an environmental co-ordinator for on-site supervision, an environmental committee charged with responsibility for implementing suitable environmental-protection measures, or a binding agreement between the proponent and the environmentally responsible agency. Questions asked might deal with the successes and failures of the environmental management system. Was it effective in seeing that the mitigation measures were applied properly? How did it respond to the inevitable environmental surprises not predicted during the review? How was the final project design reviewed for environmental concerns? How did the environmental management system respond to the results of monitoring



programmes? Did the system work well for the participants? Was it able to function when key project actors were promoted or replaced by others? The key to such studies, as with all PPAs, is to identify what works well so that it can be emulated, and to avoid repeating problems.

For the purpose of this study, PPAs include not only those focused on scientific and technical issues but also those dealing with procedural and administrative matters. Both types of analyses have much to offer for the improvement of EIA.

Other classifications of PPAs may also be mentioned. One common classification, similar to that of study type, involves defining audits and evaluations. 1/ Audits are PPAs that compare the measured impacts of the project with the pre-project conditions and the predicted effects of the project. Evaluations are PPAs that examine the effectiveness of the processes used to manage environmental impacts.

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1/ See, for example, "Environmental Monitoring and Audit: Guidelines for Post-project Analysis of Development Impacts and Assessment Methodology", October 1988, Environment Canada and Transport Canada (Environmental Impact Systems Division, Environment Canada, Manuscript Series), Ottawa, Canada.

Figure 1. Environmental Impact Assessment Process

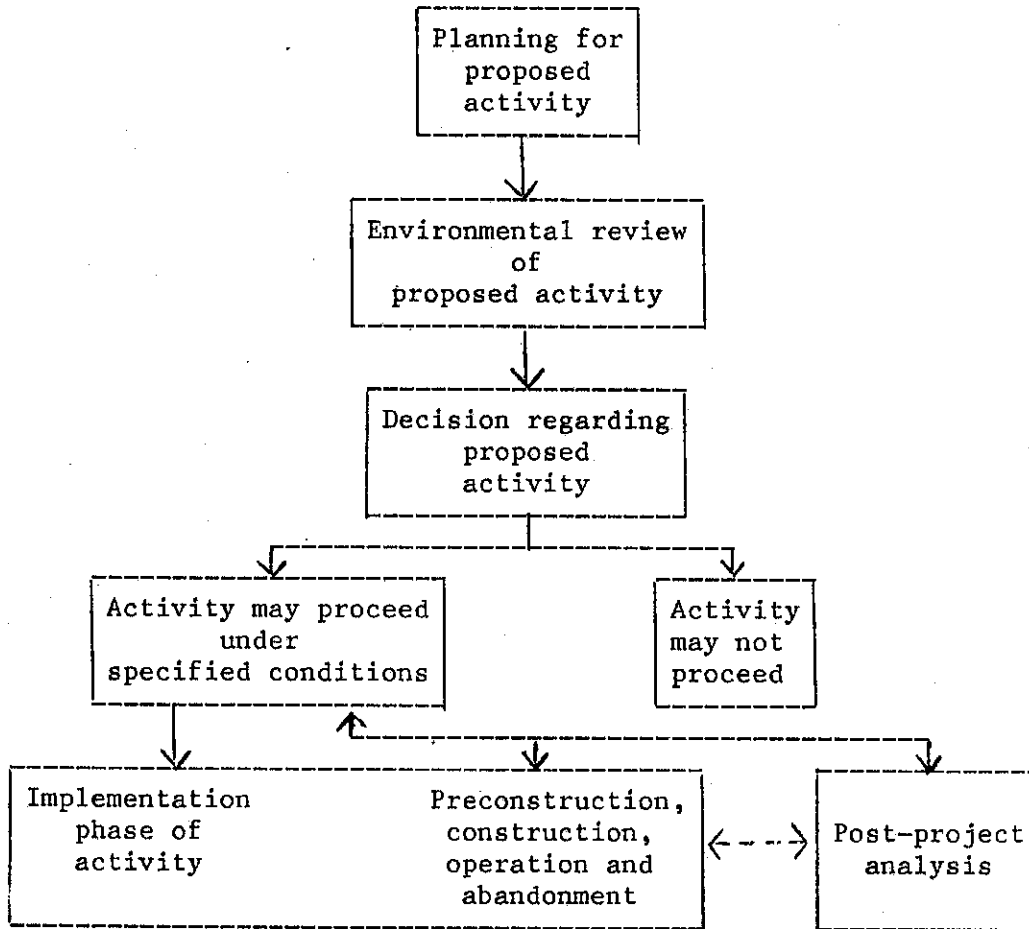


Figure 2. Summary of Classifications for Post-project Analyses (PPA)

CLASSIFICATION BY USE OF PPA

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|--------------------------|---|
| Project Management PPA   | Undertaken for the purpose of managing the environmental impacts of the activity.                                       |
| Process Development PPA. | Undertaken to learn the lessons to be learned from the activity so that future reviews of similar projects can benefit. |

CLASSIFICATION BY TYPE OF PPA STUDY

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|-----------------------------------|---|
| Scientific and technical PPA      | Deals with the scientific accuracy of impact predictions or the technical suitability of mitigation measures. |
| Procedural and administrative PPA | Deals with EIA process effectiveness. May deal with the project as implemented or with the EIA process.       |