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# **5**

**Application of Environmental  
Impact Assessment Principles  
to Policies, Plans and  
Programmes**



UNITED NATIONS



ECONOMIC COMMISSION FOR EUROPE  
Geneva

# **Application of Environmental Impact Assessment Principles to Policies, Plans and Programmes**

*Report prepared by the task force,  
with the United States of America as lead country,  
on the application of environmental impact assessment principles  
to policies, plans and programmes*



**UNITED NATIONS**  
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## PREFACE

Policies, plans and programmes adopted at all levels of government may have significant environmental impacts, either directly or indirectly. In order to take these impacts fully into account, such policies, plans and programmes should be subject to environmental assessment. It has become increasingly recognized that principles of environmental impact assessment (EIA) at the project level could be applicable to the environmental assessment of relevant policies, plans and programmes. It is equally important that responsibility for protecting the environment be acknowledged and accepted at all levels of government. The application of EIA principles to policies, plans and programmes is now widely considered as a way of substantially strengthening environmental management. With a view to documenting suitable approaches in this respect, the Senior Advisers to ECE Governments on Environmental and Water Problems, at their third session in March 1990, established a task force with the United States of America as lead country. Participating in the task force were experts from Austria, Canada, Czechoslovakia, Denmark, Germany, Finland, France, Greece, Hungary, Italy, Netherlands, Norway, Poland, Sweden, United Kingdom, United States of America, and the Commission of European Communities.

The purpose of the task force was to consider the extent to which the principles of EIA for projects could be applied to the assessment of policies, plans and programmes. It was expected that this activity would help to develop a framework for including environmental considerations in decision-making at the national, regional and local levels. To that end, ten case studies covering the EIA of policies, plans and programmes on various activities were prepared and evaluated. Descriptions of the relevant national legal/administrative EIA systems were also studied.

Between June 1990 and August 1991, the task force met three times in Geneva and once in Washington, D.C. The work of the task force was completed during 1991 and the report prepared by the task force was submitted to the fifth session of the Senior Advisers to ECE Governments on Environmental and Water Problems in March 1992. The Senior Advisers acknowledged and appreciated the work and technical observations of the environmental impact assessment experts of the task force on the application of environmental impact assessment principles to policies, plans and programmes, and noted that the report is not intended to reflect policy views of governments, but rather to stimulate discussion and consideration on an important aspect of EIA policy. The Senior Advisers also noted the findings of the task force regarding the differences between EIA for project-level activities and for planning and policy development and the important acknowledgement of differing approaches to public consultation and legal and constitutional systems among ECE member countries. Accordingly, the Senior Advisers found that the report was a useful contribution to governments' ongoing consideration of this area and welcomed its distribution for their use. The Senior Advisers also expressed their appreciation to the Government of the United States of America in leading the task force.

The present publication represents the state of knowledge and experience to the end of 1991. The report begins with an introduction which is followed by the findings of the task force. Annex I contains a summary description of the case studies and Annex II presents a description of various legal and administrative systems for environmental impact assessment. In accordance with established practice, this report is published under the sole responsibility of the Secretariat.





## INTRODUCTION

During recent years, environmental impact assessment requirements and procedures in the region of the United Nations Economic Commission for Europe (ECE) have been influenced to various extents by, *inter alia*:

(a) The European Community (EC) Directive on the assessment of the effects of certain public and private projects on the environment (85/337/EEC);

(b) The report of the United Nations World Commission on Environment and Development (Brundtland Commission) on Our Common Future and the 1990 Bergen Ministerial Declaration;

(c) The Charter of Paris for a New Europe;

(d) The elaboration of the Convention on Environmental Impact Assessment in a Transboundary Context (adopted by the Senior Advisers to ECE Governments on Environmental and Water Problems in February 1991 in Espoo (Finland), and signed so far by 28 countries and the European Community).

The EC directive adopted in 1985, established EIA requirements at the national level. It applies only to projects and does not include provisions for the assessment of the potential environmental effects of government policies, plans or programmes.

The Brundtland Commission's report addressed the need to integrate environmental protection with economic development at the policy level in relation to sustainable development. It was stated in the report, *inter alia*, that:

"... the ability to choose policy paths that are sustainable requires that the ecological dimensions of policy be considered at the same time as the economic, trade, energy, agricultural, industrial, and other dimensions on the same agendas and in the same national and international institutions. This is the chief institutional challenge of the 1990s."

In addition, the Brundtland Commission's report addressed the need to apply a broader environmental assessment to policies and programmes, especially major macroeconomic, financial and sectoral policies that have

a significant impact on the environment, and to shift the focus to policy sources of environmental effects.

The Government of Norway, in cooperation with the ECE, organized a Regional Conference on "Action for a Common Future", in May 1990 as a follow-up to the report of the World Commission on Environment and Development. The Bergen Ministerial Declaration on Sustainable Development in the ECE region stressed the need, *inter alia*:

"... to integrate environmental considerations with economic and sectoral planning and policies and to encourage all relevant institutions to be accountable for evaluating environmental effects of their programmes and policies."

In the Charter of Paris for a New Europe adopted at the Conference on Security and Cooperation in Europe (CSCE) Summit Meeting on 16 November 1990, the Participating States committed themselves, *inter alia*:

"to promote public awareness and education on the environment as well as the public reporting of the environmental impact of policies, projects and programmes."

The Convention on Environmental Impact Assessment in a Transboundary Context stipulates the rights and obligations of Parties to carry out the assessments of environmental impact and to arrange for the application of such assessments at an early stage of planning for certain activities likely to cause adverse transboundary impacts. The Convention provides for procedures, in a transboundary context, for incorporating environmental considerations in the decision-making process and for the assessment, at an early stage of planning, of the environmental impact likely to occur. The Convention also stipulates that:

"To the extent appropriate, the Parties shall endeavour to apply the principles of environmental impact assessment to policies, plans and programmes" (Article 7).

The above-mentioned considerations indicate that the application of the principles of environmental impact assessment to policies, plans and programmes is now widely considered as a way of substantially strengthening environmental management.



## EXPLANATION OF TERMS

In the context of this report, the term "policies, plans and programmes" refers to a variety of different governmental initiatives, actions or proposals, the characteristics of which may differ between ECE countries. In some countries, policy, plan or programme initiatives are the responsibility of the highest level of government (e.g., the cabinet). In other countries, they may be initiated or developed at other levels of government (e.g., planning authorities, provincial or municipal governments). For some countries, policy, plan or programme means a broad approach adopted by a government with respect to a usually sectoral public policy area, such as economic, fiscal or transportation policy. For other countries, these terms can also refer to the development or selection of a course of action in a more specific area of public policy, such as the production of electricity, the location of industrial development, or the way waste will be managed on a regional or national level. For the purposes of this report, policy, plan and programme refer to an action or a course of actions with a set of objectives and measures related to the deployment of financial or other resources or tools intended to affect the future use of natural resources, and the form or location of development and other activities in one or more social or economic sectors or geographical areas.

Policies, plans and programmes in some areas (e.g., energy, transportation, agriculture, extraction of raw materials, waste management, forestry, fisheries, water management and tourism) have a clear potential for direct impact on the environment, and the need for environmental assessment is obvious therein. In other areas (e.g., welfare, taxation, education), the potential exists for indirect and secondary effects on the environment. The level of analysis needed for any policy, plan or programme will depend on the complexity of the issues. The level of environmental assessment will also reflect this factor. Decision making for policies, plans and programmes involves identifying, describing and comparing environmental, economic and social implications for the future. These implications raise broad issues, including values, expectations and interregional or inter-generational issues.

For environmental assessment of policies, plans and programmes, a selection of quantitative and qualitative analytical methods can provide important insights into the nature and extent of the impact on the environment. However, methods developed at the project level are not always transferable to environmental assessment at the policy, plan or programme level.

Qualitative information and analysis have usually been used for environmental assessment of policies, plans and programmes. The use of qualitative information and analysis in environmental assessment needs to be supplemented with quantitative information, since reliable quantitative data strengthen the evaluation of en-

vironmental factors. Problems in developing quantitative information result from the following:

- (a) The broad nature of the issues;
- (b) The time lag between decision and implementation;
- (c) The extended causal link from source to effect (i.e., from decision to implementation to activities/behaviours to environmental impact);
- (d) The shortcomings of predictive and evaluative techniques; and
- (e) The lack of applicable baseline data.

This type of environmental assessment calls for new kinds of baseline data and methods of assessment. However, these do not always need to go deeper than the sources of the environmental impact. Knowledge of the relationship between activities and behaviour (e.g., consumption of energy, raw materials and water; use of motor vehicles) and their impact on the environment can help provide these data. In other cases, more detailed data will be required.

### Initiation of Assessment

Mechanisms for environmental review of policy, plans and programmes vary among participating countries. Countries may have an internal cabinet level agreement to conduct such a review (e.g., Canada), or the need for review may be explicit in a broad environmental statute (e.g., Netherlands and United States of America). In some countries, requirements for environmental review of policy, plan and programmes exist within a particular act (e.g., the Petroleum Act of Norway). Frequently, this type of review is required or primarily carried out in conjunction with urban planning.

For the purposes of this report environmental impact assessment is the process of examining projects for their environmental impact prior to making decisions on their implementation and environmental assessment means a process applied to policies, plans and programmes to evaluate the potential impact of a proposal and reasonable alternatives prior to making a decision. Initiation, as used here, refers to the process of deciding the need for and the type of environmental assessment to conduct for a particular policy, plan or programme. Initiation is not always a procedural element of project-level EIA, but is necessary to the environmental assessment process for policies, plans and programmes because of the variety and breadth of such undertakings.

Because the formulation of policies, plans and programmes varies so widely, depending on the subject matter and on the institutional and political background, it is not appropriate to specify one formal approach for deciding on the need for and the type of environmental

assessment. Lists, a screening procedure, or a combination of these approaches can be utilized to decide the need for and the type of environmental consideration required.

### Scoping

The term scoping, as used in this document, means examining all anticipated environmental impacts, likely or unlikely, direct or indirect, and determining the importance of these impacts for subsequent investigation, analysis and evaluation. The purpose of scoping is to identify reasonable alternatives, provide early identification of areas (including data gathering and research) that will need attention for evaluation of their significance, and facilitate consideration of alternatives and mitigation. In addition, effective scoping contributes to making the best and most efficient use of human and financial resources and reduces the cost of assessment. Scoping is an ongoing process, but is most effective and useful when begun early in the planning process and helps to avoid conflicting interests and unnecessary costs and delays.

Scoping can be fully or partially public or internal. Currently, at the broadest level of government decision-making for policies, plans or programmes, internal scoping is the norm. About half of the case studies (which dealt with relatively specific policies, plans or programmes) involved the general public in scoping. Thus, there is relatively limited experience with general public involvement in scoping.

### Outside Review

The term outside review, as used in this report, refers to reviews conducted by the general public, independent experts, interest groups or relevant government authorities other than those initiating the policy, plan or programme. Outside review of environmental assessment documents is needed to ensure: (a) that the methods used for analysis are appropriate and (b) that the environmental information and evaluations of proposed actions and alternatives are comprehensive and accurate. Such reviews can contribute to better decision-making and enhanced government credibility and accountability. The extent of review necessary will depend on the nature and size of the environmental impact identified. There may be cases where outside review is limited by the confidentiality of a proposed action. In these circumstances, review by other government authorities, at a minimum by the environmental authority, is appropriate.

Ideally, outside review includes the participation of the general public in addition to independent experts and other government authorities. The case studies show that in practice, however, the general public is not often involved in the review of environmental assessment documents for policies, plans and programmes.

### Public Participation

Public participation at the policy, plan and programme levels of environmental assessment means informing the public at an early stage of the goals of and alternatives to a proposed action, including the environmental impact and the constraints. Public includes individuals, interest groups (including non-governmental

organizations) and independent experts. General public means unaffiliated individuals. The public is frequently not involved, or only minimally involved, in efforts to decide on the scope of a policy, plan or programme EIA, or in the review of a draft document; but the public could play an important role in soliciting information and concern related to the proposed action and additional alternatives and the potential environmental impact.

Public participation in early planning can contribute to the information available to the decision-maker, alert decision-makers to potential environmental concerns, improve the credibility of government decision-making and help achieve subsequent public support for the initiative. The extent of public participation during the assessment process may differ depending on the types of environmental impact and the level of confidentiality required by the policy issue.

For example, the environmental impacts of transportation policy can be direct and widespread, thus calling for extensive public participation. Confidentiality requirements sometimes preclude full public participation in the development of national security policies, however. Although in 50% of the case studies the general public was involved in scoping, the public is frequently not involved, or only minimally involved in this or in the subsequent analysis and evaluation steps of a policy, plan or programme environmental assessment. When the public is given the opportunity to participate in decision making on broad government issues, it is generally the interest groups rather than individuals that are active. Individuals are more likely to participate in the early planning of site-specific projects.

Public participation can be an advantageous way of securing the acceptance of subsequent projects implementing the policies, plans or programmes in question; of identifying technical problems which may need further investigation; of highlighting possible resistance to initiatives; and of making public attitudes clear. There are various techniques that can be used. These include, for example, public meetings, opportunities for review and written comments, consultation with interest groups, and public opinion surveys. However, full public participation is not always possible for reasons of confidentiality.

For planning purposes, it is useful for governments to know if additional investigations are needed to address public concerns or if there is international, national or local resistance to future actions (e.g., transboundary effects).

### Documentation and Information

Documentation is to provide a written record of environmental concerns related to the formulation of policies, plans and programmes and any analysis conducted on these and other factors. In addition to being vital information for decision makers in assessing policy options, such a record is valuable in establishing accountability and the credibility of government decision making. The extent and depth of assessment and subsequent documentation required will depend on the scale of the impact and on its importance in the context of the policy, plan or programme. In addition, written materials are necessary for facilitating outside review and public

participation in aspects of the assessment. Content of information refers to the topics or subject areas that need to be considered in an assessment; level of information refers to the type, quantity and detail of information on environmental matters that is desirable in such an assessment; presentation refers to how the environmental information and analyses are presented (i.e., separately, or included in a general report with socio-economic and other information).

Review of the case studies showed that, collectively, their content included all of the standard elements of project-level EIA. Individual case studies, however, were frequently missing or deficient in one or more elements. For the most part, alternative plans were not evaluated, nor were monitoring or follow-up needs discussed. Other aspects frequently not covered were technical and regulatory uncertainties, cumulative impacts and external policy constraints. The presentation of the case studies varied from a stand-alone environmental report to a general description or summary of the policy, plan or programme and associated concerns in environmental and other areas.

For the broadest initiatives, some task force participants felt that environmental analysis should be integrated into other documents; however, other participants felt that for more specific policies, plans or programmes, a separate document was appropriate. In general, it is understood that the content of environmental assessments of policies, plans and programmes should include most of the elements of project-level EIA. None the less, environmental assessment at the level of policies, plans and programmes requires some adjustment in content and level of information.

### Decision Making

Environmental assessment can provide important information to decision-makers on the environmental impact of policies, plans and programmes. Review of existing environmental assessment practices of participating countries showed that, at present, most do not require the application of an environmental assessment process for policies, plans and programmes as a support to decision making. Moreover, case studies showed that environmental studies carried out were not used in subsequent decision making, and that policies, plans and programmes were implemented without the results of environmental analyses having been considered.

Because decisions on policies, plans and programmes are made at various levels of government, depending on the nature of the action and the structure of the government, it is difficult to develop a standard procedure for decision making. Considerations that influence decisions on policies, plans and programmes are not always made public. If they are, the announcements seldom contain statements about the nature and extent of the environmental impact associated with the policy, plan or programme or its alternatives.

### Post-Decision Analysis (Monitoring)

Monitoring is a procedural element of EIA at the project level. Monitoring, as typically carried out at the project level, was not generally considered applicable at the level of policies, plans and programmes. Therefore, for the purposes of this report the term "post-decision analysis" refers to this procedural element in the context of evaluating the impact of policies, plans and programmes. Although review of the case studies showed that post-decision analysis was usually not discussed at the level of policies, plans and programmes, it is important in order to:

- (a) Determine if the proposed action occurred as described in the environmental assessment and thus follow the status of implementation;
- (b) Verify the environmental information in the documentation (e.g., the predicted environmental impact or the predicted changes in the behaviour of individuals or organizations leading to the environmental impact);
- (c) Determine the effectiveness of proposed measures to prevent, reduce, mitigate or control adverse environmental impact, give advance warning of potential environmental problems and, when necessary, develop further measures to anticipate unpredicted impact;
- (d) Enhance public confidence in and accountability for the decision taken;
- (e) Modify the policy, plan or programme in relation to current environmental requirements and understanding;
- (f) Review the effectiveness of environmental management; and
- (g) Apply the experience to future policies, plans and programmes.



## **FINDINGS OF THE TASK FORCE**

Systematic consideration of environmental consequences is an important component of decision making, both at the levels of policies, plans and programmes and at the project level. Assessment of the environmental impact of projects has revealed that decisions made for policies, plans and programmes can hamper environmentally sound decision making at the project level. A well-prepared and timely environmental assessment of policies, plans and programmes can anticipate and highlight potential environmental problems, prevent delays, assist in long-term planning and prevent or simplify litigation. Environmental assessment at the level of policies, plans and programmes may differ somewhat from project-level assessment. However, the goals of environmental assessment remain the same, namely (a) To alert interested governmental and non-governmental parties at the earliest possible time to the potential environmental impact of a new policy, plan or programme; (b) To ensure that environmental concerns are fully incorporated into decision making.

It is therefore suggested that:

1. Environmental impact should be considered on a par with economic and social issues in the development of policies, plans and programmes, and in the decisions taken on these.
2. Environmental assessment should be carried out for policies, plans and programmes where the possibility of significant environmental impact cannot be reasonably excluded.
3. Environmental assessment procedures for policies, plans and programmes should, as much as possible, reflect the principles of environmental impact assessment that are applied to projects. However, environmental assessment of a policy, plan or programme should not substitute for environmental impact assessment at the project level.
4. In order to enhance the quality of information used in environmental assessment for policies, plans and programmes, efforts should be pursued to adapt and develop methodologies and databases and to promote the exchange of information gained from ongoing experiences.

### **Initiation**

5. There should be a provision, legislative or other, for systematically determining the need for and the type of environmental assessment for policies, plans and programmes.
6. This provision should be formalized using mandatory lists or a screening mechanism or a combination of both.

### **Scoping**

7. The process of scoping should be started early in the formulation of policies, plans and programmes to identify significant alternatives and environmental impacts that need to be considered, and to eliminate those that are not considered significant enough for inclusion in further assessment.
8. As an optimum goal, the process of scoping should involve relevant governmental authorities, independent experts, interest groups and the general public.
9. In cases of confidentiality or timing, where it is not feasible to involve the general public in scoping, an effort should be made to involve independent experts and interest groups on a select and, if necessary, confidential basis.
10. The involvement of government environmental authorities at the appropriate level (i.e., national, regional, and local) and/or independent experts should be the minimum condition for scoping of policies, plans and programmes.
11. The following elements should be included in the process of scoping:
  - (a) Early access to appropriate information for all parties (including the general public where applicable), so that full participation is possible;
  - (b) Identification of the level and type of information required for analysis of the environmental impact anticipated from the proposal and its alternatives;
  - (c) Documentation of the scoping process (e.g., conclusions of the process, records of participants, public meetings).
12. For some types of policies, plans and programmes (e.g., consumption tax proposals), it should be determined during scoping if a description of expected changes in environmentally related behaviour of individuals and organizations (e.g., consumption of energy or raw materials) is adequate information on which to base a decision.
13. The conclusions of scoping should be made available to those who participated in the process and should be used to determine the nature and depth of analysis in subsequent phases of environmental assessment.

### **Outside Review**

14. Outside review procedures for environmental assessments of policies, plans and programmes should be developed to provide for review both during scoping and when an environmental assessment is nearing completion.
15. As an optimum goal, these procedures should include review by the relevant governmental authorities,

independent experts, interest groups and the general public.

16. In cases where outside review is limited by confidentiality, every effort should be made to involve independent experts or interest groups on a confidential basis in order to get a broad range of opinions on the quality of the environmental information and analysis.

17. At a minimum, review of documents should be carried out by governmental environmental authorities at the appropriate level and/or by independent experts.

### Public Participation

18. The public should be part of the environmental assessment process (unless confidentiality or timing requirements limit involvement). For this purpose:

(a) Opportunities should be provided for consultation between governmental authorities, interest groups and the general public (e.g., meetings and hearings);

(b) Timely measures should be taken to facilitate participation, (e.g., adequate background information on the proposal; notification of public meetings in newspapers, on radio and television); and

(c) Response should be made by governmental authorities to issues raised by the public.

19. Where a proposed policy, plan or programme is likely to have significant transboundary effects on the environment, affected countries should be informed, in accordance with the provisions of the Convention on Environmental Impact Assessment in a Transboundary Context. These countries should cooperate with the government of the country of origin in making appropriate arrangements for public participation.

### Documentation and Information

20. The information presented in environmental assessments for policies, plans or programmes should be presented in a timely fashion, in the detail and depth needed by the decision maker to reach an informed decision.

21. This information should always be clearly presented and identifiable, either in a separate document or in a specific chapter of a document containing the policy, plan or programme.

22. The following general elements should be documented in environmental assessments for policies, plans and programmes:

(a) Description of the issue (including history of its development) and its relationship to existing policies, plans and programmes;

(b) Identification of objectives and constraints;

(c) Description of the scoping and review processes;

(d) Alternatives including the no-action alternative;

(e) Analysis of environmental information, including discussion of cumulative and synergistic effects and of any transboundary effects;

(f) Description of the need for and extent of environmental assessments of any projects and/or measures resulting from the policy, plan or programme;

(g) A plan for post-decision analysis (monitoring); and

(h) A non-technical summary of the environmental effects of the proposal and its alternatives (including gaps in knowledge, uncertainties and any recommendations).

23. The environmental information that should be documented in environmental assessments for policies, plans and programmes should include the following:

(a) Methodology, availability of data, and uncertainties associated with their use;

(b) The relationship of the environmental impact of the proposal and its alternatives to relevant environmental conditions and goals;

(c) Adverse and beneficial environmental impact, including environmentally related changes in behaviour of the proposal and its alternatives, and their relative importance;

(d) Opportunities to prevent, reduce, control, mitigate and, where appropriate, to compensate the likely adverse impact on the environment.

24. Surveys should be undertaken to identify both existing environmental information applicable to environmental assessments of policies, plans and programmes and gaps in this information.

### Decision Making

25. Decision makers should take into account the conclusions and recommendations of environmental assessments on a par with the social and economic implications of policies, plans or programmes.

26. A record of decision should be prepared and be publicly available, to include the following:

(a) A statement of the decision;

(b) A brief discussion of all alternatives considered and the associated environmental information;

(c) A description of measures to prevent, reduce, control and mitigate adverse environmental impact;

(d) Consideration of additional studies and environmental assessment needed for any projects or measures resulting from the policy, plan or programme; and

(e) A commitment to review the policy, plan or programme to evaluate the actual environmental impact (beneficial or adverse) resulting from the decisions.

### Post-Decision Analysis (Monitoring)

27. Where there may be significant environmental impact from policies, plans and programmes, post-decision analysis of the environmental impact should be carried out and reported to decision makers.

28. Review of the overall environmental impact of projects or measures that result from a policy, plan or programme should be included in any evaluation of its effectiveness. The evaluation should also include a list of any follow-up measures that may be needed.

29. Results of a post-decision analysis should be made available to the public unless precluded by confidentiality.



## ANNEXES

### Annex I

#### *SUMMARY DESCRIPTION OF THE CASE STUDIES*

The summaries of the case studies provide examples, in a variety of formats, of policy, plan or programme EIA carried out in participating countries. The material ranges from original programmatic EIA documents (e.g., an Environmental Impact Statement (EIS)) to synopses, reviews or analyses of EISs or other documents containing environmental analyses for proposed plans and programmes.

The studies were reviewed for the presence of the standard elements of project-level EIA, as summarized in the table below.

The following summary description of the case studies focuses on the nature and scope of the EIA process, the anticipated impacts, relationships to review and decisions. Several of the case studies included descriptions of the environment which would be affected, but such material is not included in the summaries. Tables of contents for the original studies, where they exist, indicate the availability of such descriptive material.

**Presence of Selected EIA Elements in Case Studies**

<i>Study</i>	<i>Scoping</i>	<i>Alternatives</i>	<i>Review</i>	<i>Mitigation<sup>1</sup> Monitoring</i>	<i>Decisions/ Recommendations</i>
Canada (Hydro)	x	x	x		x
Canada (Waterfowl)			x	(x)	x
Czechoslovakia					x
Finland					
Germany	x	x	x		x
Netherlands	x	x	x	(x)	x
Norway			x	x	x
Sweden		x		(x)	x
United States (Clean Coal)	x	x	x	x	x
United States (Fuel Use Act)	x	x	x		x

<sup>1</sup> Items in parentheses indicate that the topic was only mentioned or briefly considered.

## 1. ONTARIO HYDRO 25-YEAR ENERGY PLAN (DERIVED FROM A REVIEW OF SEVERAL FEDERAL AND PROVINCIAL PLANS) (CANADA)

*Type of Action:* Plans to construct, operate, maintain or refurbish energy-supply facilities to meet projected demands for electricity.

*Action Characteristics:* Seven major energy supply options were analysed to develop three alternative supply plans to meet 25-year planning criteria.

### GENERAL INFORMATION ON THE ACTION

*Providing the Balance of Power:* Ontario Hydro's plans to serve customers' electricity needs (1990).

This is a comprehensive assessment of the strategic direction of a provincially-owned electrical utility over the next 25 years. Although still under way at the writing of the review report, it is presented as a full case study of environmental assessment of a policy. The assessment addresses demand and supply alternatives, and recommends one plan. The review is being conducted through the Ontario Environmental Assessment Act (EAA). While the EAA is structured to allow for assessments of policies and programmes, this is the first major provincial policy to be assessed.

Ontario Hydro is a publicly-owned, financially self-supporting utility, supplying electrical power to more than 3.5 million customers in Ontario. It is among the largest electrical utilities in North America, with a mandate to serve the electrical needs of Canada's largest province. Ontario Hydro concludes that annual peak power demand for electricity is expected to increase by an average of 2.2% per year from 1989 to 2014. During that time several existing generating stations will be retired or require upgrading.

From 1984 to 1989, Ontario Hydro conducted a demand and supply options study, which formed the basis for a demand and supply planning strategy. The strategy contains a set of principles, guidelines and priorities that were used in the development of a Demand and Supply Plan (DSP). The DSP is described by Ontario Hydro as a plan of projects. However, for the purpose of the case study in the report, the DSP is referred to as a policy plan, because it examines options that presuppose fundamentally different policies. There is no formal agreement on whether the DSP is, in fact, a policy in the conventional use of the term.

### PLANNING PROCESS

Ontario Hydro's DSP, *Providing the Balance of Power*, has been submitted under the *Ontario EAA*. If the DSP is approved, Hydro would then complete environmental assessments for individual projects in the programme.

The EAA has been used to review projects since 1975, but this is the first time a policy plan is being submitted to the environmental assessment process. The

EAA was designed to deal with such policy plans, which are included in the definition of undertakings. An undertaking includes "an enterprise or activity or a proposal, plan or programme. . .".

### Requirements of the Act

The EAA contains several requirements that make it suitable for reviewing a policy plan:

A proponent must give a clear statement of the requirement and rationale for the undertaking. The proponent must justify the need for the policy plan, and provide a rationale for the way it proposes to fulfil this need and the various alternative solutions considered. In this case, Ontario Hydro must provide a justification for how much energy will be needed in the future. Alternatives include reducing demand for energy, and the provision of energy by a variety of means known to be technologically feasible.

The act requires the examination of alternatives to the undertaking and alternative methods for carrying out the undertaking. Alternatives are functionally different ways of addressing a problem. Alternative methods are different ways of implementing a chosen plan. For example, alternatives may be different ways of meeting energy needs in Ontario, such as demand management, the provision of nuclear energy or the provision of hydraulic energy. The proponent must compare the various alternatives and alternative methods, noting their advantages and disadvantages to the environment.

Another factor that makes the EAA process appropriate is that it includes a very broad definition of "environment", including social, economic and cultural conditions. The act provides for the examination of a wide variety of possible impacts of policies, especially those such as energy, which may be very far-reaching. The proponent must describe the environment that may be affected, the anticipated impact, and mitigation measures that may be required.

The act also provides for extensive public and government review of proposals, including a quasi-judicial hearing before the Environmental Assessment Board or, if necessary, the Joint Board, including members of the Environmental Assessment Board with the Ontario Municipal Board (which normally deals with planning matters). The board's decision has the force of a decision by the Minister. But that decision may be changed by the provincial Cabinet within 28 days.

In the DSP, 14 major supply options were examined to satisfy demand requirements remaining after 40% of the long-term demand. Shortfall would be made up of demand management, upgrading of generating capacity, non-utility generation, and purchase of electricity from other systems. From these, 7 options were selected for

planning development. About 40 detailed cases were developed for analysis under the 7 supply options, using computer models to simulate each case. Three cases, differing primarily in method of generation (fossil, nuclear, or mixed) were formally presented in the DSP as possible supply plans. The plan preferred and proposed by Ontario Hydro is a mix of base-load nuclear and peaking fossil methods, achieving a balance between low acid and greenhouse gas emissions and radioactive waste production. The preferred plan calls for 10 nuclear units at 3 stations and 32 gas-fired combustion turbine units at 4 stations over a 25-year period. The Programmatic Environmental Impact Statement (PEIS) is prepared by the proponent.

#### CONTENT OF THE PEIS

The contents of the PEIS, which was a four-volume report, are not listed in the review report; however, aspects of the contents are discussed under the various subject headings below. The PEIS clearly contains a consideration of the environmental impact, broadly defined, of the preferred plan and of alternative plans.

#### DESCRIPTION OF THE PROPOSED ACTION AND TYPES OF ALTERNATIVES

The EAA requires the examination of alternatives to the undertaking and alternative methods for its implementation.

#### SCOPING

##### *Policy constraints*

One issue related to scoping is the degree to which the proposed policy is constrained by other government policies and regulations. Development of alternatives, for example, was constrained by Canada's commitment to limit emissions of greenhouse gases. Additionally, the DSP took into account the results of public consultations and of a review by a legislative committee on energy. It is important to consider if these policy constraints have had a positive or negative effect on the scope of inquiry. On one hand, it is perhaps only fair that an agency such as Ontario Hydro receive some policy direction before embarking on the difficult task of exploring alternative ways of meeting Ontario's electricity needs. Ontario Hydro is not a policy-making body, and should not be held responsible for such decisions. Conversely, it is fair to question whether or not the scope of inquiry was unduly constrained by these priorities, principles and guidelines, and whether their translation into programme components was a reasonable one. Were there other options that would have been consistent with these priorities, principles and guidelines? These questions are to be addressed in hearings before the provincial Environmental Assessment Board.

##### *Weighting of primary and secondary criteria*

Another aspect of the scoping of the assessment is Ontario Hydro's use of primary and secondary criteria and the effort to compare or "weight" their significance.

Assessing major supply options, Ontario Hydro has used two sets of criteria: primary criteria, which according to Hydro, must be met, and secondary criteria which are considered desirable. Primary criteria are: customer satisfaction, reliability standards, safety requirements and standards, environmental requirements and standards, low-cost electricity, social acceptance, technical soundness, and flexibility. Secondary criteria include resource preferences, economic impact, other social considerations, diversity, and environmental and public safety considerations, in addition to requirements or standards.

Some of the secondary criteria seem to be extensions of the primary criteria. For example, social acceptance was listed as primary, while "other social considerations" is secondary, suggesting that secondary criteria may not differ substantively from primary criteria. Using this example, a programme will meet the primary criteria if it is merely acceptable. The programme would be more favoured if it had other redeeming social impacts. In terms of weighting these criteria, Hydro states:

"While the above considerations (the primary and secondary criteria) can be applied in evaluating options, there can be no systematic calculation to determine how the criteria are weighted against each other. Judgements about relative performance and how an option's best characteristics can be maximized and worst characteristics minimized are considered later. . ."

Since the difference in several primary and secondary criteria appears mainly to be one of degree, it cannot be concluded that primary criteria are necessarily given more weight than secondary criteria.

Clearly, the way evaluation criteria are applied relative to one another is not rigorously structured. Whether this is a positive or negative characteristic of the analysis, it can be concluded that there was considerable scope for judgement in comparing these factors.

The weighting of evaluation criteria may be a difficult task. It is important to keep in mind that it is better not to "weight" criteria, unless there is sound justification and basis of measurement for doing so. Judgement, accompanied by written explanation, is not necessarily an invalid method of analysis. To create weighted criteria merely for the sake of providing a complicated and quantitative framework of analysis, which may look more authoritative, is misleading. A complex analytical framework used without foundation will only produce invalid results. A set of criteria for which relative values can be provided with good justification may provide a more rigorous framework and a more objective analysis.

##### *Consideration of life cycle and inter-generational impact*

An important distinction between project and policy assessments is the need in the latter to consider the broader impact over both time and geography. While such impacts can be evident during a project assessment, they become both less certain and more important when considering the impact of a proposed policy.

Ontario Hydro's DSP states the importance of considering the entire life cycle of a project or programme, and the broad temporal scope. Programmes are considered in

the light of the effects of their facilities in all stages of development, construction, operation, and retirement. The DSP also accounts for the impact of fuel and its life cycle. This approach facilitates consideration of environmental impact over time, and the problems that may be faced by future generations. It will assist decision makers in determining the long-term costs and effects, which may not be apparent in the immediate future.

However, Hydro has determined that some of these life-cycle effects are beyond its range of analysis. It has pointed out that some of the activities associated with its proposals will be beyond its direct control and, in some cases, will be beyond the geographical and jurisdictional boundaries of the Province (e.g., uranium and coal mining which will take place in other Provinces or in the United States).

This situation raises questions about how to deal with consequences that may be significant but beyond the jurisdiction of the proponent. Indeed, the proponent is not responsible for the fact that environmental regulations and standards differ between Provinces, let alone between countries. Since the impact may be significant and far-reaching—and it is no less real for its disqualification from analysis because of jurisdictional boundaries—legislative authorities should develop a policy for dealing with it. Perhaps the impact should be assessed by an independent agency rather than by the proponent.

#### *Potential for evaluating cumulative impact and equity issues*

The Demand and Supply Plan could potentially affect all parts of Ontario and have some impact outside the Province. Given that Hydro is responsible for providing energy to Ontarians, its geographical scope includes the entire Province. The scope of inquiry should include all regions, providing an opportunity to evaluate the cumulative and aggregate impacts of all proposed activities.

The Ontario Ministry of Environment is critical, however, in reviewing this aspect of the DSP. Ministry officials point out that Hydro has estimated the impact of pollutants on regions primarily by estimating the amounts of effluents, air emissions, and solid waste that would be produced. The Ministry argues that there was no attempt to estimate the current impact of Hydro's transmission and generating facilities; and no attempt to estimate the cumulative impact of upgrading or adding new facilities. Reviewers also criticized the lack of baseline environmental data, which would assess current levels of environmental impact, both from Hydro facilities and other sources.

The issue of equity is explicitly stated as being within Ontario Hydro's scope of analysis. This is a clear recognition that the provision of energy is not only responsible for a certain social impact, but that this impact may be positive or negative. An additional issue is whether there should be an effort to ensure that the risks and benefits are distributed so as to avoid large inequities. The Ontario Hydro study addresses in a general manner situations in which communities may be compensated.

### THE ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION AND THE ALTERNATIVES AND COMPARISONS

The key elements in the Ontario Hydro plan related to the prediction and analysis of the impact of its proposed policies are summarized below.

#### *Treatment of technological and regulatory uncertainty*

An energy policy that has a time horizon of 25 years naturally confronts considerable uncertainty in its regulatory, technological, and economic assumptions. Ontario Hydro's study underscores the need to treat uncertainty as an issue.

The DSP has accounted for the fact that impacts can only be assessed today in accordance with the current level of knowledge. With new knowledge, the same situation may later be viewed quite differently. Clearly, flexibility is an issue and impacts are not something to be determined on their own but to be seen within a context. This sort of dynamic or uncertainty, is appropriately taken into account at the policy level before resources are committed to major plans and strategies. Ontario Hydro has recognized a need for flexibility in the size and number of installations to facilitate adjustments in the demand for electricity. Hydro has put forward a plan that relies on a variety of generation methods, providing flexibility in the event of economic trends or crises affecting fuel prices or new revelations about the impacts of different technologies.

It is important to realize that what may be considered the best alternatives today may change in the future. Therefore, it is important to try to anticipate future trends as far as possible (e.g., greater restrictions on fossil fuel emissions because of the greenhouse effect), and to leave room for adjustments in the event of new discoveries.

#### *Use of proxy sites to facilitate analysis*

There may be a need, in the assessment of a proposed policy, to bridge concept and reality in order to help identify the nature and extent of the potential impact. Ontario Hydro attempts such a bridge in its use of proxy sites for generating stations that may need to be constructed.

While Ontario Hydro's DSP examines alternatives based on fundamentally different policies, these policies, and the resulting plan, will be manifested in projects in specific locations.

Consequently, it is important to anticipate what the site-specific impact might be. In order to illustrate the feasibility or constraints on the types of projects that would be carried out, such as nuclear and hydraulic generating stations, Ontario Hydro has used proxy sites. This analysis will help reveal the type of site required for such a facility, and provide some idea of the constraints on location. For example, the report states that certain types of facilities, such as nuclear power plants, must be located somewhere on the Great Lakes, in order to have an adequate supply of water for cooling. The method could be used to identify the possible impact of facilities; however, the study identified only generic impact.

### *Concept of avoided costs*

Ontario Hydro uses the avoided cost technique primarily to integrate demand management and non-utility generation opportunities with the utility's future supply plans. Avoided cost is analogous to the concept of opportunity cost. It is defined as the supply costs that are avoided when any demand or supply component is substituted for an equivalent part of the demand and supply plan. Avoided costs are determined by comparing supply options to a reference system.

The technique of calculating avoided costs is discussed in detail in the DSP. Environmental costs are considered from the point of view of the financial costs to Ontario Hydro in ensuring compliance with current environmental regulations. In its initial review of the utility's plan, the Ministry of the Environment questioned Ontario Hydro's narrow application of avoided costs, arguing that the concept should be expanded to include external social and environmental costs.

### REVIEW AND PUBLIC PARTICIPATION

Three aspects of public participation that were important in the development and review of the Ontario Hydro DSP are: pre-plan consultations, formal hearings and intervenor funding.

Before developing the DSP, Ontario Hydro engaged in extensive consultations between 1984 and 1989. The utility met with 58 provincial organizations, 300 community leaders across the Province and 116 municipal utilities. Ontario Hydro also gathered public and customer opinions through consultation meetings, questionnaires and briefs. It also researched public concerns and perceptions related to planning demand and supply options. In 1986, detailed customer surveys were conducted on a wide range of demand and supply topics. These surveys involved personal interviews with 1200 residential, 200 commercial and 200 industrial customers. Similar surveys were conducted in 1988 and 1989.

Ontario Hydro officials also appeared before the Ontario Legislature's Select Committee on Energy while developing the Demand and Supply Options Study in 1986, and in the course of preparing the Demand and Supply Planning Strategy in 1988.

In 1990 Ontario Hydro submitted the DSP and related background reports to the Minister of the Environment and circulated them for public review. The utility established public information centres, staffed by technical resource personnel, for about 12 weeks in 60 communities across the Province. Public comment was sought through questionnaires. In addition, a toll-free number was printed on the back of all the documents. The results of this public information and comment effort will be provided in a report to the Environmental Assessment Board during the hearings.

### DECISION

The DSP will undergo a quasi-judicial hearing before the Environmental Assessment Board. The board is an independent agency that makes two decisions: (a) whether the submitted environmental assessment includes enough information to justify the requested approval; and (b) whether to grant the approval. The board makes a decision that has the force of a decision by the Minister; however, it may be changed by the provincial Cabinet within 28 days. Although there is no formal appeal process under the EAA, the decision may be challenged in court on the grounds that the board exceeded or failed to exercise its jurisdiction.

This process will allow individuals and organizations to participate and to apply for "party" status. "Participants" are allowed to make representations before the board; parties may make representations, and call or cross-examine witnesses. People and organizations gaining party status may apply for funding (allocated according to established guidelines) to assist them in the preparation of their representations to the board.

## 2. PRELIMINARY SCREENING DOCUMENT FOR THE PRAIRIE HABITAT JOINT VENTURE, NORTH AMERICAN WATERFOWL MANAGEMENT PLAN (CANADA)

*Type of Action:* Joint venture by federal/provincial/non-governmental agencies.

*Action Characteristics:* Retention/restoration of waterfowl breeding habitat in Canada's Prairie Provinces through numerous small projects incorporated into long-term (15-year) implementation plans.

### GENERAL INFORMATION ON THE ACTION

The North American Waterfowl Management Plan (NAWMP) is a joint undertaking by the governments of Canada and the United States in response to declining waterfowl populations. The NAWMP involves a strategy for managing the waterfowl harvest and a series of habitat restoration activities beneficial to both agriculture and wildlife, and to ducks in particular. The plan proposes a North American breeding population goal of 62 million ducks, including 8.7 million mallards and 6.3 million pintails.

Retention and restoration of breeding habitat in the prairies is a first priority of the NAWMP and has led to the development of the Prairie Habitat Joint Venture (PHJV). The PHJV is a coordinated approach by the Canadian Government, provincial governments, and non-governmental agencies with the primary task of enhancing waterfowl habitat on 3.6 million hectares of prairie in Canada at a cost of \$1 billion. The PHJV is an umbrella concept consisting of numerous smaller projects that will be incorporated into long-term implementation plans. These plans will be implemented over a 15-year period throughout the major waterfowl production areas of Alberta, Saskatchewan, and Manitoba. The goal of these plans is to ensure an average annual breeding population of 17.3 million ducks, including 4.8 million mallards and 3.3 million pintails. These plans will also create habitat for other wildlife and plant species of the prairies, including those that are rare or endangered.

### PLANNING PROCESS

#### *Environmental assessment*

Under the Federal Environmental Assessment and Review Process (EARP), Federal departments and agencies are required to review and assess environmental consequences throughout the planning and implementation of projects, programmes and activities that fall under Federal jurisdiction. This process is to be carried out before commitments or irreversible decisions are made. The 1984 EARP Guidelines Order establishes the process and sets out the requirements, procedures and responsibilities of the participants.

In accordance with EARP, this document reviews the various implementation programmes being developed for the PHJV and evaluates whether there are compo-

nents of these programmes that might adversely affect the environment.

#### *Areas of Federal responsibility*

The Constitution Act, as part of the Canadian Constitution, defines the division of powers and responsibilities between the Federal and provincial levels of government. The provinces have control over property, civil rights, and local matters. Since water is traditionally defined as property it is under provincial jurisdiction. In specific areas, such as migratory birds, fisheries and navigation, provincial jurisdiction is overridden by exclusive Federal powers. Areas of Federal responsibility pertaining to this document include:

*Migratory birds:* Canada is responsible for the protection of migratory birds and their habitat under the Migratory Birds Convention Act.

*Fish and fish habitat:* Under the Federal Fisheries Act, Canada has the responsibility for the protection and management of fish and fish habitat and the prevention of pollution to fish habitat.

*Rare and endangered species:* The Canada Wildlife Act permits the Government to enter into agreements with the provinces for the protection of endangered wildlife. This Act also provides for agreements with other governments and organizations respecting wildlife research, conservation and protection, and the assignment of public lands to meet these objectives.

*Canadian Environmental Protection Act (CEPA):* Canada is responsible for the protection of the environment and of human life and health under CEPA.

*Pest Control Products Act:* Under this act, Canada is responsible for the regulation (safe use) of products used for the control of pests and the organic functions of plants and animals.

Before the PHJV can be implemented, it is imperative to consider its impact on areas not specifically targeted by the programme. This may range from effects on rare flora to socio-economic considerations. This screening ensures that potential conflicts or adverse effects are identified early and properly remedied.

The PEIS provides a general description of the PHJV and presents an overview of potential environmental impact and proposed mitigation. The document also describes detailed federal environmental assessment procedures proposed for individual PHJV projects. The PHJV is expected to make a significant contribution to the conservation of prairie wildlife and their habitats.

The document was endorsed by the Environmental Assessment Coordinating Committee on 8 March 1990. It was prepared by the Canadian Wildlife Service, Ed-

monton. Paul Gregoire and Gerald McKeating are listed as authors.

### CONTENT OF THE PEIS

#### Introduction

Federal Policy and Legislation  
Environmental Assessment  
Areas of Federal Responsibility

#### Public Participation

Description of the Environment  
Vegetation and Soil Types  
Wildlife  
Endangered Species and Habitats  
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#### Programme Elements

Target Areas  
Intensive Management Programmes  
Extensive Management Programmes  
Key Wetlands  
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#### Programme Benefits

Potential Impact and Mitigation  
Herbicides  
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Predator Management  
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#### Project Assessment Procedures

#### Summary

#### Appendices

- 1 Environmental Assessment Forms
- 2 Environmental Screening Matrix
- 3 IEE Procedures for CWS
- 4 Literature Review on Non-target Species
- 5 Prairie Habitat: A Prospectus

### DESCRIPTION OF THE PROPOSED PROGRAMME AND TYPES OF ALTERNATIVES

Eight agencies, representing the Federal and provincial governments and non-governmental sectors, formed an ad hoc planning group, the PHJV Steering Committee. Under the guidance of the steering committee, planning and technical groups were established in each province to develop implementation plans. These implementation plans include a wide variety of programmes and projects to benefit waterfowl on the prairie.

#### *Target Areas*

In each province, the areas of highest priority for PHJV programme application were defined. In Manitoba, 3 million acres of pothole habitat (and adjacent upland wetland) were selected as priority for application, 500,000 acres of which will be enhanced by the programme. In Saskatchewan, 7 areas of high capability waterfowl production habitat in the parkland and grass-

land areas were targeted. Of the total 24.3 million acres selected, 5.7 million acres will be the focus of habitat enhancement activities. More than 90% of the affected acreage in Alberta will be in the aspen parklands. From the 14 high capability areas selected, a cumulative total of 62.5 million acres of habitat will be enhanced for wildlife over 15 years.

#### *Management Programmes*

Intensive management efforts (e.g., dense nesting cover, nesting structures and idle hay and pasture) are exclusively waterfowl-oriented and depend almost exclusively on wildlife agencies for delivery. Activity is site-specific and restricted to areas of highest potential for waterfowl and wildlife habitat. The programmes can be accomplished relatively quickly, are generally costly to undertake on a per acre basis and have a high and predictable success rate.

Habitat managed under extensive programmes would likely be on land owned by farmers or ranchers. Landowners would be encouraged to cooperate in conservation activities that benefit the soil, water and wildlife resources and would receive financial incentives to do so.

In the three prairie provinces there are more than 400 large wetlands (> 500 acres) which are important as moulting, staging and, to a lesser degree, breeding habitat (key wetlands). They also provide refuge during periods of drought. The status of each wetland will be reviewed and, if wetland development is recommended, the specific areas will be screened individually by the responsible agencies.

#### *Evaluation Programmes*

The approach being taken for programmes that have significant unknowns is to implement them as pilot programmes. Pilot programmes are then evaluated and adjustments made before full implementation. In addition, there is also a need to assess the programmes and report periodically to participating agencies on the progress towards established habitat and population goals.

Evaluation activities will take place in each province and will be coordinated by an evaluation group. The evaluation programme includes monitoring, assessment, directed studies and policy assessment.

A detailed evaluation plan has been developed and approved by the PHJV. An evaluation group under the chairmanship of the Delta Waterfowl and Wetlands Research Station has been formed to implement this aspect of the plan.

### DESCRIPTION OF THE ENVIRONMENTAL IMPACT OF THE PROGRAMME

#### *Beneficial Impacts*

Improved habitat will replenish and stabilize waterfowl and other wildlife populations. Improved management practices will help wetland vegetation and native grasslands recover from over-grazing. Improved wildlife populations provide more opportunities for sportsmen and for viewing by local residents. Financial benefits of

increased recreation and tourism will diversify the economy.

Conservation farming programmes will contribute significantly to soil and water conservation. Stabilization of the soil will decrease erosion and salinity problems. Trash cover will trap winter snow and increase soil moisture. The organic material of soils will be increased. Surface water quality and ground water supplies will be improved. Vegetation will also trap water and help reduce the impact of flooding. Soil and water conservation practices integrate well with the agricultural community.

#### *Herbicides*

Partial chemical fallow will be promoted to increase waterfowl production and to conserve soil and water resources. Partial chemical fallow involves replacing conventional summer fallow tillage with weed control chemicals. Weed control will also be necessary on marginal land converted to seeded dense nesting cover. There is a concern that herbicides may pollute run-off water, work their way into the food chain and kill non-target (native) vegetation. Studies are planned by Environment Canada to determine how much major-use herbicides are contaminating wetlands, and their effects on aquatic invertebrates and plants. Should significant impact be discovered, the PHJV will alter the use or types of herbicides in chemical fallow applications. With respect to marginal land conversion and predator fencing, only licensed herbicides applied by a licensed operator will be used. Most applications will be infrequent or on a one-off basis. Residual trash cover will reduce the movement of herbicides in surface run-off water.

#### *Non-target/Endangered Species*

Management for a particular group of species may have an unforeseen or negative impact on non-target species. To ensure that potential impact on all species has been considered, a species checklist will be filled out for each priority area and used in the screening of individual projects. Information will also be solicited from local naturalist or wildlife groups. A review of the scientific literature did not reveal any overall negative effects of PHJV management projects on non-targeted species. Impact on endangered plant and animal species will receive first priority and, if significant conflicts arise, alternative project sites will be chosen. PHJV projects are expected to benefit most endangered species.

#### *Predator Management*

Man-made changes to the landscape have reduced the available cover for ground nesting birds so that approximately 90% of waterfowl nests are preyed on. To improve nest success, mammalian predators will be removed from predator-fenced dense nesting cover plots. Crows and magpies may be targeted in selected townships. Possible areas of concern are the method of predator removal, the impact of removal on predator populations and public opinion regarding the killing of predators.

All trapping will be done humanely. Live trapping is an option for the predator-fenced dense nesting cover

plots. Birds of prey are not included in any predator control programmes. Predator management is only a small component of the joint venture and will not have any significant impact on overall predator populations.

A study to commence during the 1990 field season will attempt to evaluate more fully the impact of crows on waterfowl.

#### *Vegetation*

There may be concern over seeding plots of land with introduced grass species to convert marginal cultivated land to cover for wildlife. Introduced species are best suited to this task.

#### *Crop Damage*

Within the agricultural community there is a perception that increased waterfowl populations will result in increased crop depredation. Although there is no clear link between waterfowl populations and crop damage it is important to address landowner concerns. An enhanced crop damage programme will be implemented that will include additional lure crops, feeding stations and increased compensation for damage.

#### *Lead Shot*

Concern has been raised that increased waterfowl populations may stimulate more hunting pressure, resulting in high amounts of lead shot in the environment. High levels of lead in the environment may pollute wetlands and poison aquatic birds. The Canadian Wildlife Service is developing a national policy on the zoning of steel shot. The restoration of waterfowl populations is not expected to increase hunting pressure any more than in previous peak years.

#### *Trespassing*

Incidence of trespassing for the purposes of hunting, although under provincial jurisdiction, is not expected to be any more frequent than in previous years.

### REVIEW AND PUBLIC PARTICIPATION

The draft version of the NAWMP was released jointly in Canada and the United States in December 1985 for public consultation. Within the Western and Northern Regions of CWS an extensive mailing list of individuals and organizations was established. The Plan was mailed to 975 individuals and organizations.

Since the signing of the plan by the Minister of Environment and the U.S. Secretary of the Interior in 1986, an ongoing dialogue has been maintained with key client groups.

No serious criticism of the concepts of the plan have been received.

### DECISION

The revised document was endorsed by the Environmental Assessment Coordinating Committee (EACC) on



March 8, 1990. The specific elements of the programme will be implemented following environmental evaluation and decisions under detailed Project Assessment Procedures. All projects under the PHJV that fall within Federal jurisdiction will undergo an environmental screening that corresponds to the guidelines prepared by the Federal EARP. The steps in the procedure include proposal preparation, preliminary and full screening, preparation of an Initial Environmental Evaluation if needed, and, if necessary, preparation of an Environmental Impact Statement.

#### MONITORING

The effectiveness of many of the techniques proposed for the PHJV can only be estimated in the planning phase and will not be known until the programmes are

initiated. The influence of such factors as climate, the economy and public opinion are difficult to predict. Therefore, it is important to institute a system of monitoring and evaluation which will enable programme managers to adjust their strategies accordingly. Evaluation activities will take place in each province and will be coordinated by an evaluation group.

#### TIME/COSTS

Intensive programmes will require approximately 55% of available PHJV funding in the first several years of the programme.

Extensive management programmes will require about 25% of the PHJV funding in early phases, with an escalation of funding for extensive activities as the 15-year plan evolves.

### 3. ECOSYSTEM APPROACHES IN WATER MANAGEMENT (CZECHOSLOVAKIA)

*Type of Action:* State water management plans.

*Action Characteristics:* Principles and practices for design and construction of water management facilities (e.g., impoundments and waste treatment).

#### GENERAL INFORMATION ON THE ACTION

Because the general legal requirement for EIA in Czechoslovakia is currently evolving (see Annex II), most of the elements of EIA (e.g., scoping, public participation, outside review) are not present in existing environmental planning documents. The following case study presents a historical perspective on the incorporation of environmental considerations into national planning for water development and management. The format for this presentation is not compatible with the general format adopted for the other case studies.

#### DEVELOPMENT OF ENVIRONMENTAL PROBLEMS AND APPROACHES

Until the early 1960s, technological and economical approaches towards the exploitation of water resources prevailed. Environmental aspects were limited primarily to protecting water against pollution and preserving minimum acceptable flows in water courses.

Based on these approaches, the first comprehensive development plan—the State Water Management Plan—was completed in 1953. The plan included measures for construction of waste water treatment plants and directions for levels of minimum flow on the basis of hydrologic criteria. In all rivers and water courses, the minimum flow has to be ensured with a 97.3% probability in an average year.

An advance in the environmental aspects of water management occurred in the early 1970s in connection with the second comprehensive development plan—the General Water Management Plan (GWMP) of 1975. This was the second ecosystem approach to water management.

The GWMP emphasizes a much wider and more comprehensive concept of the relation between water management and environment. In addition to the problems of civilization (i.e., physical, chemical and microbial water pollution), which negatively affect water quality and thus its environmental function, the GWMP also stresses active approaches towards the biological, hygienic, cultural and aesthetic functions of water in the environment.

The GWMP includes a separate chapter devoted to water as a component part of the environment, dealing with, for example, the function of water and the management of water in the landscape and the environment. The GWMP evaluated the technical methods of water course regulation used to reach the required economic para-

eters. The GWMP found that appropriate attention was not paid to environmental problems—meanders were eliminated, water courses straightened, riverside vegetation annihilated and inappropriate materials were used (such as pavements, concrete, and prefabricated materials). Similarly careless technocratic approaches to building dams and water reservoirs can cause irreparable harm—drowning irretrievable natural formations, villages and small towns, agricultural lands and forests, cultural monuments, and so on.

The GWMP established principles of design and construction for water-related activities. These pioneering principles were:

(a) To plan any construction in agreement with the biological and ecological properties of the region and with maximum respect for natural, cultural and aesthetic values;

(b) To maintain a harmony between the dimensions, type, form, material, layout and colour of a construction and the character and specific natural or urban conditions of the region;

(c) To avoid changes in the landscape environment and landscape views caused by large-scale water construction, and to take measures to harmonize the construction and the landscape;

(d) To avoid technically rigorous lines, regular shapes and stereotype profiles of earth objects when constructing water reservoirs and water courses to minimize technical intervention on the environment;

(e) To prevent, using suitable modifications and measures, bare river beds at low water flow rates, wash-outs, river bed deposits and to minimize exposure of river banks and shore areas caused by water level fluctuations in the reservoir; and

(f) To use water elements to enhance settlements and the natural environment; artificial water sources, if well designed, can complete and enrich the environment.

Further, the GWMP stressed the following environmental aspects of water-related design construction and equipment:

(a) To ensure professional design, construction and supervision with attention to environmental protection;

(b) To encourage economic, organizational and other conditions that enable water-related construction to work as a landscape-forming element in the environment;

(c) To evaluate and support environmental aspects of water-related decision making and authorization;

(d) To evaluate alternatives to water-related construction from the environmental point of view and, above all, make selections with respect to long-term objectives.

The pioneering principles of the GWMP had significant shortcomings—they were mere methodical recommendations, not supported by any legislative or administrative act. Their practical applications were dependent on the subjective approaches of the designer or the investors in water-related construction and equipment. Because of this, the principles were often ignored.

Another significant contribution of the GWMP was the concept of protecting regions important for water management, which replaced former approaches that were limited to individual water polluters only.

Protection of quantity and quality in water resources included the following aspects:

(a) Preservation of water resources by eliminating human intervention that results in lower usable water amounts;

(b) Preservation of water quality by reducing or eliminating pollutants that affect surface or ground water in the region of concern; and

(c) Protection of regions intended for water-related construction, especially dams and water reservoirs; reserving areas in land use planning for water management measures that allow for utilization of ground and surface waters.

The GWMP divided water resource protection into three categories: general, strict and special.

(a) According to the water act, the general protection of waters and water resources is applicable to the entire State, without further measures by the Government or water management authorities.

(b) Strict protection means that in some regions important for water management, water protection principles can be more stringent and the Government or the responsible water management authority may modify or prohibit activities in these regions that might violate water management interests.

(c) Special protection includes additional requirements, usually for the quality of ground and surface water intended for drinking water supplies or for cases where the quality of drinking water is prescribed by special provisions.

Areas protected for water management purposes include:

(a) Areas of natural surface water accumulation;

(b) Areas of natural ground water accumulation;

(c) Zones associated with ground water resources;

(d) Zones associated with surface water resources destined for drinking water supplies;

(e) Drinking water supply courses and their catchment areas;

(f) Inundation areas of future dams and water reservoirs; and

(g) Areas determined for possible construction of the Danube-Oder-Elbe canal.

Protection of important areas for water management was safeguarded by legislative and administrative measures. The majority of these areas were established by the Governments of the Czech and Slovak Republics from 1975 to 1981, the remainder by the Government of the

Slovak Republic in 1987. Altogether 29 protected areas of natural water accumulation, covering about 15% of the State territory, and 131 drinking water supply courses and their catchment areas were established. The original 596 areas reserved for reservoir construction in 1975 were re-evaluated and reduced to 266 in 1984. In addition, local water management authorities established hygienic zones of water resource protection for drinking water supplies. Areas subject to strict protection include approximately 1.5% of the State territory.

#### THE PRESENT SITUATION

Until 1989, the ecosystem approach to water management was inconsistent. Various ministries had responsibility for environmental components under the Water, Forest, Air Protection and other Acts.

*Based on these Acts, environmental care was divided as follows:*

Water use and water pollution control—Ministry of Forestry and Water Management;

Forest soil preservation and forest management—Ministry of Forestry and Water Management;

Protection of agricultural land—Ministry of Agriculture;

Nature conservation and national parks—Ministry of Culture;

Air pollution control—Ministry of Forestry and Water Management;

Land use planning—Ministry of Building Industry;

Natural resources and their exploitation—Geological Office;

Waste management—Ministry of Interior and local administration;

People's health protection—Hygienic Service and Ministry of Health; and

International cooperation in environmental problems—State Commission for Scientific and Technological Development and Investments.

Obviously, under such conditions, impact on the environment of proposed water-related activities could not be evaluated as a whole. No general environmental evaluation corresponding, for example, to the environmental impact assessment method was required. Studies estimated the impact of suggested investment or activities upon individual environmental areas, considering their interaction only in certain cases.

Comprehensive studies of the impact of investment on the environment were required only in particularly important cases. An example of such a case is the project for a reservoir and a pump storage hydropower station on the Berounka River near Křivoklát castle. The project would have been a violation of the status of a UNESCO nature reserve. Evaluation resulted in the Government terminating preparations for this reservoir.

The revolution in November 1989 resulted in new approaches to environmental requirements. The Ministry of Environment of the Czech Republic, the Slovak Commission for Environment and the Federal Committee for Environment were established. These bodies are gradually taking over responsibility for environmental areas

(except for the Hygienic Service, which is the responsibility of the Ministry of Health). This allows a comprehensive approach to assessment of the environment, whose components are inseparable. These changes will result in an environmental approach to water management in Czechoslovakia. The third stage of development is beginning.

#### NEW APPROACHES SUGGESTED

The effects of industrialization on the environment in the late twentieth century has resulted in criticism and negative attitudes towards water-related construction and to the establishment of new reservoirs in particular. Some projects that have felt this negative attitude include the reservoir Krivoklát on the Berounka River, the planned Pěčín reservoir on the Zdobnice River to supply drinking water for the town of Hradec Králové and the Kratušín reservoir for a pump storage hydropower station. Another example is the controversy concerning the Danube River hydropower system, Gabčíkovo-Nagymaros, built on the basis of a contract between Czechoslovakia and Hungary.

There are serious objections to the regulation of the Orlice, Luznice, Stopnice and other rivers. Such regulation would protect agricultural land against floods, but would also affect the present condition of these water courses.

As in other countries, reduction in dam construction is expected in Czechoslovakia. New ways are being sought to satisfy water needs, e.g., better use of water, reducing water loss, and the minimization of environmental impact on existing water resources.

As in other European countries, water use has stabilized or declined in Czechoslovakia. Water resources are ample for decades.

New approaches and new ecological understanding are growing slowly in Czechoslovakia. It is expected that cooperation within the ECE and with the European Community will result in a more consistent application of environmental principles to water management and other resource areas. This is supported by the ECE Convention on Environmental Impact Assessment in a Transboundary Context.

The first significant step of the new approach to water management was the establishment of the International Commission for the Protection of the Elbe River in October 1990. This commission is to coordinate the efforts of its member States to improve the water quality of the Elbe, reduce contamination by organic matter and other pollutants such as heavy metals, nitrates, chlorinated hydrocarbons, etc., and protect the biotypic elements of the water ecology. By this means, North Sea pollution from inland sources would also be reduced.

In Czechoslovakia a case study called "The Elbe Project" is under way. The cost was over 21 million crowns in 1991. It is expected to be completed in 1995, at a total of 130 million crowns.

*The Elbe Project study includes the following items:*

- Specifications and methods of work on the project;
- Sources of point pollution;
- Sources of non-point pollution;
- Dumpsites and waste;
- River sediments and biomass;
- Infiltration and influx of subsoil water;
- Monitoring, evaluating and record-keeping of water quality;
- Hydrologic data;
- Operation of water courses and water-related construction;
- Other environmental aspects;
- Exchange of scientific information; and
- Conclusions and proposed measures.

In connection with the Elbe project, analogous studies are under way for the catchment areas of the Oder, Morava and Danube rivers. After the results of these projects are evaluated, the GWMP of 1975 will be revised to meet present criteria and general ecosystem approaches, including the use of EIA both within Czechoslovakia and in the transboundary context.

Based on the reorganization of the State administration, a comprehensive umbrella Environment Act or amendments to valid acts in all environmental fields are expected.

#### 4. THE KANGASALA PROJECT: EIA PRINCIPLES IN OPERATIONAL AND ECONOMIC PLANNING ON MUNICIPAL ADMINISTRATION (FINLAND)

*Type of Action:* Municipal Planning.

*Action Characteristics:* Construction of planned municipal facilities.

##### GENERAL INFORMATION ON THE ACTION

The Association of Finnish Cities, The Ministry of Environment and a selection of municipalities have launched a project to introduce Environmental Impact Assessment into municipal administration. There are 13 municipalities where the experimental phase is to be implemented. The activities where EIA is applied can be classified into three categories:

Land-use planning (five municipalities),

Long-term municipal strategic planning (one comprehensive plan, three sectoral plans and four municipalities); and

Projects (energy production, solid waste disposal, etc., four municipalities). The town of Kangasala is one of the municipalities involved and is used as an example.

##### PLANNING PROCESS

Municipalities have statutory tasks in the field of environmental protection. Legislation regulating the administration of environmental protection at the municipal level came into force in 1986. This requires municipalities to monitor and promote air pollution control, supervise solid waste management, monitor and guide noise abatement and ensure that water bodies are not unduly polluted. Municipalities should also carry out comprehensive planning on environmental protection and follow up the state of the environment within its boundaries. In addition, municipalities take care of the water supply and waste water treatment of communities. They also carry out solid waste disposal. Municipalities are responsible for land-use planning.

In each municipality there is a statutory Board of Environmental Protection in charge of administration and planning, and permit and supervision issues. Officials with responsibility for environmental protection have been engaged by municipalities during the past 10 years. With the help of non-binding guidelines, the boards will study the environmental effects and decide at what stage of planning and decision making, and in which way

studies of the effects and the possibilities of reducing adverse impact are to be taken into account.

The initiator of the project is the secretary of the Board of Environmental Protection in Kangasala. She introduced the idea of developing EIA principles within the framework of present legislation in municipal action and economic planning.

##### PROPOSED ACTION

*Environmental impact is studied in the construction of the following:*

A kindergarten;

A school;

A centre for cultural events;

An ice hall or swimming pool;

A centre for waste separation and recycling; and

A housing area.

Planning of the policy for private and municipal economic activity is included.

##### ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION

*Impacts to be studied include the following:*

Traffic and transportation during construction and operation,

Chosen energy resource and energy consumption, and

Waste production (the amount and quality is taken into account).

In addition, impact on the environment (defined as impact upon human beings, nature and the cultural environment [built-up areas]) are considered.

##### DECISION

A decision to carry out these activities has already been taken. A study of their effects is expected to influence decisions on the implementation of alternatives. With the help of non-binding guidelines, the boards will study the effects and decide when and how these studies along with the possibilities of reducing the adverse effects are to be taken into account.

## 5. ENVIRONMENTAL IMPACT ASSESSMENT IN LOCAL DEVELOPMENT PLANNING (FEDERAL REPUBLIC OF GERMANY)

*Type of Action:* Commercial Development.

*Action Characteristics:* Urban planning of a commercial development complex.

### GENERAL INFORMATION ON THE ACTION

The town of Landau (Platz), situated in the *Land Rhineland-Palatinate*, has 30,000 inhabitants and covers an area of about 83 square kilometres. In 1987, the town decided to set up a building plan (*Bebauungsplan*) for an intended commercial enterprise area. Such a plan, as the second tier in a two-tier system of local development planning, must be based on the first tier plan, or zoning plan (*Blaechnutzungsplan*). The second tier plan contains legally binding rules that, in general, will be implemented by subsequent building permits. However, whether such permits will be applied for depends on the owners or other persons entitled to use the land in question. A zoning plan is always made for the whole area of a community; a building scheme usually deals with a certain sector of that area. The particular scheme of interest here covered an area of about 44 hectares. The planning process included an EIA.

### PLANNING PROCESS

The EIA was carried out in the context of the formal local development planning procedure, as specified in the federal Building Code. This procedure consists of the following general steps:

- (a) Community formally decides to draw up a local plan, the decision is announced publicly;
- (b) Community representatives discuss the general intent and purpose of the plan and alternatives with the public (hearings or otherwise);
- (c) Draft plan is prepared;
- (d) Draft plan is reviewed by other concerned agencies;
- (e) Draft plan is made available for public inspection;
- (f) Comments from public and concerned agencies are taken into account in finalizing the plan;
- (g) Community formally adopts the plan;
- (h) Plan is submitted to supervising State authority for approval, which is given if the plan has been properly drawn up; supervising authority must state any objections within three months or the plan is considered approved; and
- (i) Plan approval is formally announced and implemented.

### CONTENT OF THE PEIS

- Purpose of and need for the intended land-use decision;
- Description of the existing regional environment;
- Description of alternatives;
- The environmental consequences of the intended planning decision to the extent possible;
- Possible remedial measures; and
- Identification of uncertainties.

For the most part, the EIA was carried out using existing information. Special attention and expertise was devoted to climatic conditions, and additional regional analyses were carried out for vegetation, fauna, water resources, climate, geology and hydro-geology. Impact was predicted in a qualitative manner only because the exact type and location of various enterprises under the plan were unknown.

### DESCRIPTION OF THE PROPOSED ACTION AND TYPES OF ALTERNATIVES

Based on the initial impact evaluation (scoping) and a subsequent detailed assessment of the identified concerns (e.g., ground and surface water, biota, climate and traffic), three planning alternatives were developed for the size and shape of the area to be covered with buildings: (a) 30 ha. (b) 22 ha. and (c) 14 ha. The zero- or no-action alternative was also included and additional alternatives (e.g., locating new commercial development elsewhere within the town limits or outside, in cooperation with a neighbouring town) were suggested but not evaluated. The evaluation area was about 400 hectares in order to encompass regional effects. Although the evaluation distinguished between construction, operation and decommissioning of the enterprises, only the construction phase and generic aspects of operation were evaluated because the specific nature of enterprises to be developed was unknown.

### ENVIRONMENTAL IMPACT

The results of the EIA identified the following major areas:

- (a) Alternatives 1 and 2 would not provide necessary protection to the existing surface water resources of brooks and ditches, although measures were incorporated to prevent, reduce, or compensate damage to this system.

(b) All three alternatives were considered to involve risks to groundwater and to drinking water wells; although strict protective measures were included, the risk under Alternative 1 remained too great to permit further consideration.

(c) All alternatives, but particularly Alternative 1, posed town development problems from the creation of a continuous industrial belt north and east of the town.

Overall, the projected impacts raised objections to all three alternatives such that the EIS recommended exploration of other options.

#### **REVIEW AND PUBLIC PARTICIPATION**

The draft and final EIS were made available to the general public and to concerned agencies for inspection and comment as explained.

#### **DECISION**

The Landau town council made its final decision on the plan on the basis of the EIA. The council followed the recommendations of the EIS and abandoned the proposed location for a commercial enterprise area. The decision created a need to search for other possible sites within the town area. Consequently, the town has begun to review its zoning plan and in that context to carry out an EIA for the entire town area.

#### **MONITORING**

No monitoring is involved, since the originally proposed plan was abandoned.

#### **TIME/COSTS**

No information available.

## 6. SECOND PROVINCIAL WASTE PLAN II UTRECHT (NETHERLANDS)

*Type of Action:* Provincial plan for waste treatment and disposal.

*Action Characteristics:* Selection of methods to limit, recycle, treat and dispose of municipal waste.

### GENERAL INFORMATION ON THE ACTION

Since the early 1980s, each of the 12 provinces in the Netherlands has been required to prepare a waste plan every five years. This case study describes the development of the EIS for the Second Waste Plan for the province of Utrecht (about 1 million inhabitants). The plan covers the period from 1991 to 1996 and deals with the removal/treatment of the following classes of waste: domestic, bulky household refuse, small chemical, industrial, building and demolition, waste from streets and canals, agricultural, contaminated soil and hospital reuse. Categories not covered are major chemical waste and manure, which are subject to central governmental policy; and car wrecks and sewage sludge for which the province of Utrecht has recently developed separate detailed plans.

The provincial Waste Plan provides a strategy for organizational and operational decisions.

### PLANNING PROCESS

#### *Planning process of the provincial Waste Plan*

Based on the Waste Substances Act (Afvalstoffenwet), provinces in the Netherlands are obliged to develop waste plans. Before a plan can be developed under the Waste Substances Act (WSA) there is an obligation to provide for an Outline Notice (sometimes the same as the Scoping Notice in the EIA-procedure) by which municipalities and other parties can be consulted. The provincial Waste Plan has to be in line with a number of ministerial guidelines. Furthermore, a number of management reports and plans directing national waste policy have to be taken into account. The most important of these are the Notice on Prevention and Re-use of Wastes (Nota inzake Preventie en Hergebruik van Afvalstoffen, October 1988) and the National Environmental Policy Plan (Nationaal Milieubeleids Plan, May 1989).

#### *Planning process of the EIA for provincial Waste Plans*

Preparation of an EIS for a provincial Waste Plan is legally required (EIA-mandatory). A decision can be taken only after the EIA procedure has been carried out. The procedures called for are described in the General Provisions on Environmental Hygiene Act (Wet Algemene Bepalingen Milieuhygiene (Wabm)). The EIS must include descriptions of the activity under study and the alternatives, together with an analysis of their en-

vironmental effects. EIA does not replace decision making, but serves as decision support. The goal of EIA is to give environmental concerns a place in the decision-making process of equal importance to that of the other interests involved.

The party that initiates an activity that is EIA-mandatory must also prepare the EIA report. Formally, the provincial parliament takes the initiative. In practice, the provincial government is delegated this authority. Often, the actual preparation of the EIS is contracted to a consulting firm. Guidelines on the content of the EIA report are drawn up by the proper governmental authority, with the advice of the national EIA Commission. For each EIS this independent EIA Commission establishes a working party of experts to advise the competent authority. The preparation of the guidelines and their comparison with the EIS is the responsibility of the provincial parliament or the provincial government. In the case of a provincial waste plan, for example, the competent authority is the same as the initiator.

The EIA procedure in this case study was initiated on 5 September 1988 with the publication of a Starting Document in which the provincial government generally explained the proposed policy for waste for the period 1990 to 1996. The outline of the proposed policy from the Starting Document and the EIA guidelines were used as a guide for EIS preparation. The Starting Document was also used for the development of the draft Waste Plan, which was developed at the same time as the EIS.

### CONTENTS OF THE PEIS

The document describes the following environmental aspects of the province of Utrecht:

- Soil and groundwater;
- Surface water;
- Air;
- Noise;
- Flora and fauna;
- Landscape and cultural history;
- Land use and occupation of space; and
- Public health and safety.

### PROPOSED ACTION AND TYPES OF ALTERNATIVES

According to the policy goals presented in the Waste Plan as premises for the new policy, a number of strategic decisions were taken. The main goal of the Waste Plan is to achieve "a waste stream that is decreased in volume as far as possible and an effective and efficient removal of waste from the point of view of environmentally sound management." This main goal can be cat-



egorized in the following sub-goals (in decreasing order of priority):

The production of waste should be prevented as much as possible (quantitative prevention);

The quality of the waste should be optimized as much as possible (qualitative prevention);

Waste must be reused as much as possible in an environmentally sound way;

Non-reusable waste must be treated in an efficient and environmentally sound way;

The strategic decisions stemming from these sub-goals are as follows:

Organizational changes (e.g., the optimization of inter-municipal cooperation, the start of supra-provincial cooperation and permitting the import and export of waste across provincial borders). In this, the EIS does not take a stand.

A number of measures are taken to decrease the amount of waste that enters the final stage of waste removal (incineration and deposit). The aim is to accomplish a transfer from integral to separated waste collection with priority for separated collection of waste causing specific problems and vegetable/fruit-gardens waste (wet organic fraction, GFT-waste). The goal for the collection of this GFT-waste is that by 1995, 70,000 tons of GFT-waste (of a total of 160,000 tons) will be collected separately. The EIS treats this subject in great detail.

In addition to the proposed policy described in the draft Waste Plan of the province of Utrecht, the EIS contains a description of the following alternatives:

The environmentally preferable alternative in which the interest of the environment is best served, in the view of the authors, bearing in mind the legal and technical conditions;

The zero change alternative in which the current situation and policy are unchanged.

Three alternatives (the proposed policy, the environmentally most preferable alternative and the zero change alternative) are described for each waste stream in order to obtain an overview and to compare the results for every alternative. The alternatives are categorized in modules. The waste streams are treated according to content, i.e. paper, plastics or sand. The following 10 modules can be distinguished:

1. Prevention, quantitative as well as qualitative;
2. Separation at the source;
3. Collection through different recovery and conveyance systems;
4. Supply and removal;
5. Separation processing (afterwards);
6. Treatment, such as composting, fermentation, treatment in a break-and-sieve installation;
7. Reuse and other useful applications;
8. Incineration with or without energy collection;
9. Deposition, controlled or uncontrolled; and
10. Storage, controlled or uncontrolled.

The combination of modules may vary among alternatives. For example, the combination can differ by us-

ing different weighting factors for the modules. A combination of 80% incineration and 20% reuse can be compared with a combination of 60% incineration and 40% reuse. Also, variation results from differences in location, manner of execution, technology employed and scale.

The content of the three policy alternatives is dictated by the following:

(a) The draft Waste Plan has been the guideline for the proposed policy. This draft was completed simultaneously with the EIS and based on the Outline Notice for the Waste Plan.

(b) Developing the most environmentally preferable alternative, as required, included the following considerations:

- (i) Maximizing the reduction of each waste stream by prevention and minimization of environmentally hazardous components in the waste to be treated.
- (ii) Using waste separation as much as possible.
- (iii) Minimizing of the amount of waste by reuse.
- (iv) Minimizing negative effects on the environment as is far as technically and socially possible.
- (v) Sparing sensitive areas.
- (vi) Enforcement of the waste plan policy.
- (vii) The zero change alternative follows from the proposed policy of the First Waste Plan. This hypothetical alternative serves as a frame of reference and is in fact a "do nothing" alternative.

#### SCOPING

Alternatives and environmental effects described and compared are included in the recommended EIS guidelines. In the Netherlands this is the formal step between starting an EIS (by the Starting Document) and the legal guidelines laid down by the proper authorities (in this case, the provincial parliament).

Policy makers in the Netherlands increasingly take into account the idea of "sustainable development" when considering environmental aspects. Important concepts derived from that idea include "integrated life cycle management" (less use of resources), "quality improvement" (doubling the economic lifetime of products) and "energy extensification".

#### ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION AND THE ALTERNATIVES AND COMPARISONS

In this EIS a qualitative description of the environmental effects is used. This approach assumes a direct relationship between the magnitude of the influence and the final environmental effect. For every environmental effect, attention is given to the influence of waste removal in general and the magnitude of influence for the specific environmental aspect from each policy alternative. For example, the influence on flora and fauna by emissions from waste transport was estimated by a comparison of waste transport movements. It is supposed that there is a direct relationship between transport movements, emissions and the extent of influence.

Although this approach does not take into account the local difference in vulnerability of flora and fauna, it does present a general view on the degree of influence.

The effects of the three different policy alternatives are compared to each other for every environmental aspect. A choice is made for a relative scale of comparison, in which three classes are used. These are: -- for negative influence and +/- for minor negative influence. In the comparison, a description of the effects for every alternative is given and the effects are summarized in a table.

The description of environmental effects is qualitative. In strategic plans the environmental information itself is mostly qualitative, global and indicative. Additionally, there are effects on a larger scale, e.g., regional. A complete prediction of effects can only be given when location, source and intensity of the measures to be taken are known in relation to the type of activity and the current situation.

In general, it is very difficult to describe specific quantitative effects. A major reason for this is the global, strategic character of the provincial waste plan and, therefore, the description of the policy alternatives in this EIS. An important problem with such a plan-EIS is that the intended policy is not yet definitely established. The policy is not developed in one single step but is adjusted, supplemented and otherwise changed under the influence of the draft EIS. Another, more pragmatic reason for the lack of quantitative effects is the lack of quantitative data on dose-effect-relations. Also, there is a lack of information on existing environmental effects.

It is very difficult, therefore, to describe the effects of certain activities. In the EIA report this difficulty is partially addressed by annexes with descriptions of the general environmental situation of the different waste plants and, as far as possible, the accompanying environmental effects.

It is also difficult to describe the existing state of the environment. Therefore, only an inventory of drawbacks in the current policy are described. Since environmental effects for each alternative are hard to describe quantitatively, only the qualitative effects of the alternatives are compared.

#### REVIEW AND PUBLIC PARTICIPATION

The report was evaluated by the independent EIA Commission using the predefined guidelines as a framework.

##### *Public participation*

At an early stage there were legally defined possibilities for public input. Twenty-one sets of comments were obtained from interest groups (civilians, environmental pressure groups, enterprises, local government) and, as

far as possible, used in the draft Waste Plan. The draft report includes an annex with responses to all questions.

For the draft Waste Plan and the EIS there is a required public review period. Within this period, written and verbal reaction can be submitted and public hearings are organized. Approximately 100 persons attended these hearings. The public input period ended in October 1990.

#### DECISION

Before the EIS and the draft Waste Plan are published and the public hearings begin, the EIS must be formally accepted by the provincial parliament. During the discussions on the EIS and the draft Waste Plan, the Commission on the Environment from the provincial parliament concluded that a number of elements from the environmentally most preferable alternative should be included in the EIS and later in the policy.

After the advice of the EIA Commission and public comment have been received, the Waste Plan will be revised if necessary and submitted to the provincial parliament for definitive acceptance.

Under the influence of the EIA process (the draft EIS and the interaction between the EIS proponents and policy makers) the proposed policy was finalized with adjustment towards the environmentally most-preferable alternative. This was possible because the proposed policy was global in character at the beginning of the EIA process and had not been developed completely in the Starting Document.

Through prediction of effects and formulation of alternatives, EIA can lead to an adjustment of a proposed policy. Methodological procedures can differ for plan-EISs, the procedure here was specific for waste removal planning. The majority of the EISs that have been prepared thus far have dealt with single projects. Possibilities for formulating an environmentally most-preferable alternative with single projects are often very limited because certain alternatives (for example regarding locations and removal methods) have been eliminated at the policy planning level.

#### MONITORING

The EIS contains a procedure for evaluation of the effects on the environment of the policy that is to be implemented. In another province (Northern Holland) this has already commenced. The Waste Plan will be implemented and adjusted or annexed annually.

#### TIME/COSTS

The EIA procedure started officially on 5 September 1988. Preparing the EIS required approximately nine months, which is a little longer than average. Costs for preparing the EIS were Nf. 190,000 (US\$ 110,000).

## 7. OPENING OF THE BARENTS SEA SOUTH, TROMS II, TROMS III AND THE SOUTHERN PART OF FINNMARK WEST FOR PETROLEUM ACTIVITIES, IMPACT ANALYSIS (NORWAY)

*Type of Action:* Proposal to open offshore areas for oil exploration.

*Action Characteristics:* Drilling of wells to explore potential oil and gas fields; subsequent development and operation if new finds occur.

### GENERAL INFORMATION ON THE ACTION

The Norwegian Petroleum Act requires impact assessments to be made before new areas are opened for petroleum exploration and before any discoveries are developed. This case study focuses on the impact assessments before an area is opened, which is the responsibility of the Ministry of Petroleum and Energy.

The Barents Sea is one of the world's largest and most productive shallow seas. Up to now, the most important use of the Barents Sea has been fishing, but lately the search for petroleum has become increasingly important. In 1984, the Government presented plans for opening parts of the Barents Sea from the coast of Troms and Finnmark northwards to Lat. 74° 30' N (Barents Sea South) for general petroleum exploration.

After the Storting (Norwegian Parliament) consented to these plans, the Ministry of Petroleum and Energy initiated a study programme with the aim of analysing the biophysical and socio-economic components of opening the above areas for petroleum exploration. In 1988 the Ministry of Petroleum and Energy presented the impact assessment for the Barents Sea South. This was the first time a comprehensive impact assessment had been made before the opening of a major sector of the continental shelf. The assessment programme ran for three years, and a number of expert groups were involved in studies of possible positive and negative consequences of petroleum activities on this part of the Norwegian shelf. The total cost of the EIA process was 25 million Nkr (about \$4 million) financed by the Ministry of Petroleum. In addition, the Ministry of Fisheries financed a closely associated fish egg and larva research programme.

### PLANNING PROCESS

Responsibility for organizing impact assessments was delegated by the Ministry of Petroleum and Energy to the Working Group for Impact Assessment of Petroleum Activities (the working group). The members of the working group were drawn from the Ministry of Fisheries, the Ministry of Environment, the Ministry of Local Government and Labour, and their subordinate institutions. The petroleum industry also had one representative in the group. The working group was an advisory organ to the Ministry of Petroleum and Energy.

The working group drew up the programme for the impact assessment of the Barents Sea South. The institu-

tions submitted proposals for projects and data collection programmes. The working group evaluated the proposals, and recommended to the Ministry of Petroleum and Energy whether or not the proposals should be carried out. Progress was followed up by steering committees.

With hindsight, this way of organizing the work appears to have given many people the impression that the working group was a source of funds for all types of projects that might be relevant to future petroleum activities in the Barents Sea. This was probably because the objectives of an impact assessment were not adequately understood, and because it was not clearly defined which effects should be investigated; it is believed that the first factor was the more important. At the time, the requirement for a comprehensive impact assessment was new and not embodied into other Norwegian laws.

The Ministry of Petroleum and Energy chose a different organizational model for the new impact assessment programmes. The process started with a brain-storming meeting among researchers and administrators, lasting a couple of days. From the ideas and questions formulated at this meeting, a small group wrote a proposal for an impact assessment programme. This programme was subject to hearings in local communities and research institutions. Based on the comments received, the working group decided which issues should be given priority and formulated the framework for the particular impact assessment. Once this was done, relevant research centres were invited to draw up project proposals. The working group considered the proposals it received and recommended to the Ministry of Petroleum and Energy which of them should be carried out.

### CONTENT OF THE PROGRAMME EIA

In the EIS for the Barents Sea South, the physical condition and the biological environment in a pre-oil context is described. At the start of the study programme, the most damaging event with the most far-reaching consequences to the biological resources of the Barents Sea was thought to be a large-scale oil blow-out. Hence, considerable emphasis was put on evaluating the probability of an oil spill and the likely impact on the fish resources and fisheries, sea birds, sea mammals, the coast and life along the edge of the ice-floe.

The effects of petroleum exploration and production on local and regional employment, and on social conditions, particularly of the Sami (Lapp) population, were considered by the participating oil companies, local authorities and the State as being of equal importance to the potential economic benefits.

## DESCRIPTION OF THE ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION

### *Oil spills*

The Pollution Control Authority calculated the probability of oil spills in the area. Statistically, one must be prepared for one oil blow-out per 1800 exploration wells. Large oil blow-outs (i.e., more than 10,000 tons) are 50 times less frequent, occurring once per 10,000 wells.

Even if the probability of a large oil blow-out is low, it may occur none the less and is unpredictable. A large number of oil spills was simulated, and the results showed how long it would take for an oil spill in a given position to reach the coast. The relative quantity of oil left on the sea surface at various time intervals was also calculated.

### *Effects on fish resources*

The commercially most important fish stock of the Barents Sea is the Arctic cod. There are important spawning areas in the south-western part of the Barents Sea, while the whole of the Barents Sea is vital as a feeding area.

To illustrate the effects of a large oil spill in the study area at a time when it is rich in cod eggs and larvae, two worst-case situations were analysed, one concerning eggs and the other the larvae.

### *Effects on fishing activities*

Oil exploration and production may affect fishing activities directly because they sometimes are competing for the same areas of the ocean. Studies demonstrated that the most important fisheries take place in a 20 km to 50 km zone along the coast of Troms and Finnmark and in certain areas along the edge of the continental shelf margin. It takes between one and four months to drill an exploration well; therefore, area conflicts in the exploration phase are temporary.

### *Marine birds*

As a result of the high level of biological production, the Barents Sea is very rich in marine birds. The area is the most important one for sea birds in Norway and several stocks are of international importance. The areas adjacent to nesting colonies, or those used as migration routes in the moulting period, are areas where an oil spill may cause the most damage.

Large nesting colonies, each with perhaps several hundred thousand birds, are found in many places on the coast of Troms and Finnmark and on the southern part of Bear Island. There are migration routes from a number of these colonies into the open sea, where many birds spend the winter period.

### *Marine mammals*

The most important species of marine mammals in the Barents Sea are seals, whales, polar bears and sea otters.

Experiments in more temperate climates suggest that oil on the skin of seals, though certainly uncomfortable, may not be lethal. How seals react in colder climates is not yet fully understood. It is believed that most species of whales are not particularly vulnerable to oil spills.

Polar bears usually follow the sea-floe edge and may, in years of widespread ice, visit the study area. For otters, which live along the coast of Troms and Finnmark, contact with oil may be very harmful, often lethal. However, these mammals live in a very scattered pattern, and it was considered that one oil spill alone would pose no threat to the stocks as such.

### *The coastline*

Although the coast of Troms, Finnmark and Bear Island is quite rugged and exposed to wave action that may halt cleaning out after any oil spill, the existence of fish farms, fishing villages, habitats of marine birds and mammals, protected beaches and estuaries, etc., suggest that the coastline, generally speaking, is quite vulnerable. Concern should, therefore, be shown if petroleum activities are planned near the coast. An "emergency line" about 50 km from the coast was suggested.

### *The ice-floe*

The edge of the ice-floe is a biologically productive area during spring and summer and attracts large numbers of marine birds and mammals. An oil spill from the northern part of the study area may, given a southerly wind, reach the edge of the ice-floe within a few days.

How oil may interfere with the ice-floe and, to some extent, the effects of oil in the organisms living there was studied. The conclusion was that the ice-floe was a very good absorbent of oil, and that the oil would, consequently, contaminate only 1% of the area it covered in the open sea. Conversely, oil will last much longer in the ice, and may be transported by the drifting ice pack over great distances before being released elsewhere.

### *Socio-economic effects*

The counties of Troms and Finnmark have for many years experienced economic problems within the traditional industries, fishing in particular, and an accelerating emigration. Many local politicians and businessmen of the North hope that the oil activities can provide an additional economic basis and halt migration.

From studies on the economic and employment aspects of oil activities it was concluded that spin-offs of the exploration phase would be negligible. However, the development of an oil field in the Barents Sea would create a considerable demand for labour—a labour force which could amount to more than 3,000 work-years in the peak year. A large share of the Norwegian offshore industry capacity would be needed to produce the necessary platforms, topsides, etc.

It was calculated that the growth in direct employment opportunities in the region would increase by about 100 jobs and indirect opportunities by another 450. Although these figures imply that an oil field may contribute to the economic growth of Troms and Finnmark, one field alone would by no means "solve" the problems of unemployment and emigration.

The situation of the Sami people in relation to oil activities was studied. The question was raised whether, because of cultural and economic characteristics, the Sami people would benefit significantly from oil activities. Large-scale, capital-intensive industries do not play a part in the life of the Sami people living along the coast. Further studies may shed more light on this subject.

### CONCLUSIONS

If all the effects of oil activities are considered together, two conclusions emerge: one concerned with space, the other with time. It was possible to construct a diagram showing the spatial distribution of the most vulnerable resources of the Barents Sea. Four zones were identified:

1. *The fish eggs and larvae zone.* This zone defines where the spawn of the commercially important Arctic cod are present at vulnerable stages. It covers the southwestern part of the study area, i.e., Lat. 71° 30' S. and west of a line drawn from the North Cape to Bear Island.
2. *The coastal zone.* The coastal zone covers the fishing banks where local fishermen get most of their catches, many large colonies of sea birds and adjacent feeding areas and many other vulnerable resources along the coast. The coastal zone can be described as a 20 km to 50 km broad ribbon along the coast of Troms and Finnmark.
3. *The Arctic zone.* The area within 50 km of Bear Island and the constantly moving edge of the ice-floe constitute the Arctic zone, in which the bird colonies at Bear Island and the biologically productive edge of the ice-floe are the most vulnerable resources.
4. *The open sea zone.* The remaining part of the Barents Sea can be described as the open sea. Although many resources exist here, they are not as vulnerable as in the other zones.

Not all resources are equally vulnerable throughout the year. It is, therefore, possible to map out the time, as the crucial factor during which the different resources are the most vulnerable:

Cod eggs and larvae:	mid-March until mid-May;
Seabirds nesting:	April until August;
Seabirds moulting:	mid-July until mid-October;
Seabirds wintering:	November until March;
The coastal zone:	all year;
Coastal fisheries:	all year.

Generally speaking, no part of the Barents Sea should be excluded from petroleum activities on the basis of the information gathered and analysed in the EIA process. However, there is a case for arguing that such activities should be limited or carried out according to special procedures in certain areas or at certain times.

### METHODS USED FOR PREDICTING IMPACT

#### *Conflict indicator for seabirds*

New and improved methods were developed for assessing several aspects of the consequences of petroleum activities. During the Barents Sea South programme, methods were developed for assessing the severity of the conflict between oil and seabirds and potential conflict between the petroleum industry and the fisheries. Both sets of conflict indicators are based on standardized guidelines, which can be used to assess the consequences of a spill.

The assessment model developed for seabirds makes it possible to estimate a relative vulnerability index for species that may be affected by oil spills from proposed activities. A distinction was made between an index for immediate effects and one for long-term effects.

#### *Conflict indicators for fishing activities*

Conflict indicators for the fisheries were developed to analyse the spatial consequences of petroleum activities. The emphasis was on identifying potential areas of conflict between the petroleum industry and the fisheries and their geographical variation. For this type of analysis, the whole area under consideration was divided into grids where the squares were 15' north/south by 1° east/west. Within this grid, potential area conflicts were estimated for each type of fishing gear. The indicators were the value of the catches during a five-year period within each grid, against the value of the catch for the total area.

This type of weighting did not take into account the fact that the area loss to petroleum activities would not be the same for all fisheries. In general, larger vessels would more easily be able to use alternative fishing grounds than local and smaller vessels with a more limited radius of action. The larger ocean fishing fleet was assigned only one fifth of the value on which the general conflict indicator was based. The results emphasize the importance of the coastal fisheries in the areas affected.

#### *Distribution of fish eggs and larvae in space and time*

The development of the offshore petroleum industry made it necessary to know more about where and when fish resources are most vulnerable and how severe the damage would be if a spill occurred. Consequently, the Egg and Larva Programme at the Institute of Marine Research (the HELP programme) was started in 1986. This was a five-year research programme to provide more information on how fish eggs and larvae are distributed in time and space and on the food organisms for fish larvae. The programme was financed by the Ministry of Fisheries, but was closely associated with the impact assessment programme run by the Ministry of Petroleum and Energy.

### REVIEW AND PUBLIC PARTICIPATION, DECISION MAKING

The EIS was widely circulated for comment prior to being used by the Ministry of Petroleum and Energy as

the basis of a Stortingsmelding (White Paper) on the subject of opening up the Barents Sea to petroleum activity.

The four zones referred to above were helpful to the authorities when considering whether or not to open up a specific area for exploratory drilling, and particularly when setting conditions for drilling in different parts of

the Barents Sea South. The major parts of the area are now opened for exploratory drilling, but with strict area and time limitations.

In connection with the opening up of the area, the Government decided to start a comprehensive monitoring programme, initiated by the Ministry of Environment and the Ministry of Petroleum. This programme started in 1990.

## 8. INCREASED ENVIRONMENTAL AWARENESS IN ROAD PLANNING AND DESIGN (SWEDEN)

*Type of Action:* Analysis and planning to increase programme level environmental influence of the road-planning system.

*Action Characteristics:* Conceptual framework for legislative change.

### GENERAL INFORMATION ON THE ACTION

The Swedish Government has charged the National Road Administration, in consultation with the Swedish Association of Local Authorities and the Swedish Environmental Protection Agency, with the task of evaluating provisions related to environmental impact in Articles 15 and 16 of the Roads Act.

According to the Government's directives, the investigating committee has reported on how environmental impact is assessed, how the provisions of the Act have affected the process of road planning and how liaison with the environmental protection authorities has developed.

The report also describes the follow-up work carried out by the Environmental Protection Agency and the Road Administration on a large number of design plans adopted in the period from 1987 to 1989.

### PLANNING PROCESS

The road-planning process as such has not changed, but in the current round of planning, environmental issues have been dealt with in more detail than previously. To provide a basis for the drafting of plans, environmental problems have been listed. Based on the follow-up, it was found that effects on nature and recreational areas are adequately addressed, even in the early design phases. However, the description of measures proposed in the detailed design plan can be improved. Noise and air pollution measures are, as a rule, in-depth; water pollution and vibrations receive less attention but, where they are mentioned, the treatment is considered adequate.

Throughout this process, closer contacts with environmental protection authorities have developed at all levels. Regular cooperation during the planning and design process is now routine.

For enhanced environmental awareness in the design of road networks and roads, it is essential that environmental considerations be an integral part of road planning. By considering environmental issues at the outset, planners can avoid further constraints; moreover, national and regional objectives can more effectively be included in the planning process. Accordingly, detailed design work can be restricted to questions of configuration and safety.

As a result of the investigation, the National Road Administration is to improve staff skills throughout its organization and develop the requisite planning and design aids. In addition, the Administration proposes certain changes in the regulations governing planning and design work.

The aim is better coordination within the Government and development of the decision-making processes in such a way that environmental awareness, environmental impact assessment and consultations with government authorities and the public are included at various stages and in decisions at various levels in the road-planning process.

It is essential that an environmentally sound transport system be defined at the national level. This is a long-term task that should be conducted by the transport authorities and the Environmental Protection Agency, in cooperation with other bodies, in a planning process that considers the transport sector in its totality.

### PROPOSED ACTION AND TYPES OF ALTERNATIVES

The proposals below were drawn up as a result of the studies and the need for environmental awareness in planning and design. Development of methods for identifying, describing and assessing the environmental impact of individual road projects is assumed to form a normal part of the Road Administration's research, development and demonstration work, and has not been specified here.

#### *Planning and Design Process*

An environmentally sound national transport system should be developed. This is a long-term undertaking that should be conducted by the transport authorities and the Environmental Protection Agency, in cooperation with other groups, in a planning process that considers the complete transport sector.

The administration and the agency must compile documentation prior to the next round of planning, including alternative lines of development that can, by means of road building and road maintenance methods, help to achieve an environmentally sound road transport system.

#### *Management by Objectives*

The transport and environmental policy should describe road building and road maintenance objectives to be included in action plans at the national and regional levels.

EIAs must describe the environmental objectives associated with road planning and design. Mitigation and

follow-up for environmental impact can be specified in EIAs and included in the decision to adopt a detailed design plan.

### *Integrated Environmental Awareness*

Environmental impact reports must be part of any documentation for decision making in road planning and design. In addition, general and detailed plans must, under the Planning and Building Act, contain environmental impact assessments.

### *Environmental Awareness early in Decision-making Process*

Development of methods for incorporating environmental awareness requirements into road planning is to continue. EIA requirements in preliminary design work should be formalized.

### *Efficiency*

For minor roads, where environmental impact is minimal, simplified EIAs may be carried out in the initial stages of the design work.

### *Legislative Amendments*

To ensure implementation, legislative amendments are required. Therefore, the following amendments in the National Road Ordinance and the plan for county transport facilities have been selected:

- (a) Each project in a 10-year plan shall include a preliminary study, including an EIA.
- (b) Projects for which construction is expected to begin within three years must have undergone a preliminary design stage. To the extent that the preliminary study finds necessary, an EIA should be reported at this stage.
- (c) The Road Administration should be mandated, in consultation with the Association of Local Authorities, to require EIAs as necessary, at the various design stages.
- (d) Impact during the construction period must be included in EIAs.
- (e) EIAs for detailed design work are supplements to those prepared during previous stages; they must address questions that are relevant at this stage.
- (f) Regulations require simplified EIAs.
- (g) The county administrative board has the mandate of approving the EIA suggested by the Road Administration.

### *Skills and Aids*

The National Road Administration must:

(a) Proceed with developing network analyses in its infrastructural planning as well as methods for assessing environmental impact at the system level. The Administration has taken the initiative for cooperation with other transport authorities on this matter.

(b) Evaluate cost-benefit analysis as a method of describing, calculating and evaluating socio-economic effects. In particular, the treatment of environmental impact should be analysed.

(c) Develop recommendations for the content of preliminary studies.

(d) Develop a catalogue of effects that is coordinated with the requirements of EIAs. A short, informative publication for the public concerning environmental impact and current target values should be issued.

(e) Promote further training of planners, designers and administrative staff employed by the Road Administration, local authorities, county administrative boards and consulting firms.

In consultation with the Environmental Protection Agency and the Association of Local Authorities, the Road Administration should further develop existing recommendations and examples in order to cover methods of detecting, reporting on and dealing with environmental impact at various stages of road planning and design.

The county administrative boards, the Environmental Protection Agency, the National Housing Board, Statistics Sweden and other bodies should work to make various types of data on the regions and the environment, and information on plans and ordinances, easily accessible and usable.

This will afford ample scope for ensuring that environmental requirements, combined with those imposed by the community, influence both road planning and road design. The democratic process involved in road planning and design at present can thus be developed further. The road-planning process is a holistic approach to planning infrastructural measures in order for the community to achieve its general objectives for the transport system.

The Swedish Government stresses that the National Swedish Road Administration must shoulder greater environmental responsibility in terms of future investment and work towards the inclusion of environmental impact assessments at an early stage of planning individual road construction projects. Feasibility studies should always be carried out before road construction projects are included in investment plans. Such a study should include a general environmental impact assessment. For road construction projects with negligible environmental impact, a simplified EIA should suffice. This would free resources for detailed environmental impact assessments for major road construction projects.



## 9. FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT, CLEAN COAL TECHNOLOGY DEMONSTRATION PROGRAMME (UNITED STATES OF AMERICA)

*Type of Action:* Selection, for cost-shared federal funding, of one or more clean coal demonstration projects proposed by the private sector.

*Action Characteristics:* 22 generic clean coal technologies are analysed for the potential environmental consequences of their widespread commercialization by the year 2010.

### GENERAL INFORMATION ON THE ACTION

The proposed action evaluated in the final programmatic environmental impact statement (PEIS) is to continue the Clean Coal Technology Demonstration Programme (CCTDP) involving the selection, for cost-shared federal funding, of one or more clean coal demonstration projects proposed by the private sector. Because such continuation could lead to further development, the PEIS addresses the potential environmental consequences of the widespread commercialization of the successfully demonstrated clean coal technologies by the private sector by the year 2010. This analysis of programmatic issues is being used by the Department of Energy (DOE) in making decisions on specific proposals during the selection process. The PEIS evaluates a no-action alternative, which assumes that the CCTDP is not continued and that conventional coal-fired technologies with conventional flue gas desulphurization controls will continue to be used and a proposed action alternative, which assumes that CCTDP projects are selected for funding and that successfully demonstrated technologies undergo widespread commercialization by the year 2010. The analysis of environmental consequences focuses on changes to the following four parameters of concern: sulphur dioxide (SO<sub>2</sub>), oxides of nitrogen (NO<sub>x</sub>), carbon dioxide (CO<sub>2</sub>), and solid waste. An upper boundary of change to each of these four parameters was estimated for each of 22 clean coal technologies separately, assuming full penetration of potential markets. Using results from the Regional Emission Database and Evaluation System (REDES), the PEIS shows that repowering, New Source Performance Standards and capable retrofit clean coal technologies could lead to a significant reduction in SO<sub>2</sub> and NO<sub>x</sub> by 2010 relative to the no-action alternative. Repowering technologies are the only category in which all technologies could lead to a measurable reduction in CO<sub>2</sub>. The amount of solid waste generated under the proposed action alternative varies with each technology, ranging from a maximum increase of 23 per cent to an equivalent decrease relative to that of the no-action alternative. Commercialization of the clean coal technologies would have a beneficial effect on air quality and could contribute to reducing current effects of acidic deposition. Changes in CO<sub>2</sub> emissions resulting from clean coal technologies would be a direct function of the quantity of coal burned; thus, if

commercialization of clean coal technologies results in changed use of coal resources, the technologies would mean a change in CO<sub>2</sub> emissions. Potential effects of the CCTDP on land use, water resources, ecological systems, endangered and threatened species, socioeconomic resources, and human health and safety are also evaluated in the PEIS. The PEIS includes changes made in response to comments received on the draft PEIS.

### PLANNING PROCESS

The CCTDP involves at least five solicitations for projects, each with individual objectives that will make available technology options on a schedule consistent with the demands of the energy market and responsive to relevant environmental considerations. A significant common element of this multiphase effort is to collect and transfer sufficient technical, environmental, economic, and operational information to the private sector and international community to allow potential commercial users confidently to screen the technologies for those that meet their operational requirements.

The first Clean Coal Technology Solicitation (CCT-I) was directed at demonstrating technologies that could (through increased efficiency and flexibility) increase the role of coal as an energy option. DOE issued a Programme Opportunity Notice (PON) on 17 February, 1986, and 51 proposals were submitted by the 18 April 1986 deadline. Nine projects were selected for negotiation, with an alternative list of 14 projects to be considered if negotiations were not successfully completed with any of the initial candidates.

CCT-II was directed specifically at demonstrating technologies that could overcome impediments to increased use of coal created by the issue of acid rain. The objectives came from the results of the U.S. and Canadian Special Envoys 1986 report on acid rain, which assessed the international environmental problems associated with transboundary air pollution. A second PON was issued on 22 February 1988, and 16 additional projects were selected on 28 September 1988.

CCT-III solicited proposals to conduct cost-shared clean coal technology projects to demonstrate innovative, energy-efficient technologies that are capable of being commercialized in the 1990s. A PON was issued on 1 May 1989, and 48 proposals were submitted by 29 August 1989. Thirteen projects were selected on 21 December, 1990.

The CCT-IV solicitation was originally planned for 1 June 1990 but was delayed because of uncertainties related to pending legislative action to amend the Clean Air Act.

The CCTDP is consistent with and supports the goals of the DOE's 1985 National Energy Policy Plan-V (NEPP-V). The Programme is conducted in accordance with Administration, Department and Assistant Secretary level policy and is responsive to congressional mandates.

This PEIS is part of an overall plan for complying with the National Environmental Policy Act (NEPA) consistent with the Council on Environmental Quality regulations (40 CFR 1500-1508) and the DOE NEPA (52 FR 47662) guidelines. For CCT-I, NEPA compliance was documented with (a) a confidential environmental analysis used by the Selection Official, followed by (b) project-specific NEPA reviews and documentation for each project selected. During the CCT-II solicitation a Programmatic Environmental Impact Analysis (PEIA) was prepared to assist the Selection Official by identifying and evaluating programmatic issues related to the technologies under consideration. The PEIS is based on the PEIA and considers a broader range of clean coal technologies, encompassing all technologies that have been or are likely to be considered during the CCTDP. The results of the PEIS analysis differ from those in the PEIA. These differences reflect refinements in environmental characterization, calculations of applicable markets, and other analytical improvements made during the preparation of the PEIS. The draft PEIS was made available for public comment on 7 July 1989, and the final version, which has been modified to reflect comments received on the draft PEIS, is being used to support decisions made by Selection Officials during the third and future solicitations. As plans for additional solicitations are made, supplements to the PEIS will be developed as needed to ensure full compliance with NEPA. A second part of the NEPA compliance plan involves the preparation of pre-election project-specific environmental review reports prepared by CCTDP Source Evaluation Boards for each solicitation. The Source Selection Official will consider the PEIS, along with the pre-selection project-specific environmental reviews, as part of the selection process. The third element of the NEPA compliance plan is the preparation of site-specific NEPA documentation for each CCTDP demonstration project selected for financial assistance. These site-specific documents will be made available to the public. At present, about 23 site-specific Action Description Memoranda (ADMs) have been requested by DOE. The ADM is used to help with a determination of the appropriate level of NEPA documentation for a proposed action. The ADMs can lead to the preparation of Environmental Assessments (EAs) and a finding of no significant impact (FONSI) or an Environmental Impact Statement (EIS) if it is determined that there will be significant environmental impact. In either case, the site-specific documents are tied to the PEIS, and incorporate by reference the general discussions found in the programmatic document.

Selection of alternatives to be considered in the PEIS was limited by the DOE Office of Fossil Energy's commitment to the use of coal in the United States. This commitment is consistent with the long-range energy projections in the National Energy Policy Plan for energy stability, security, and strength. Thus, the objective of the PEIS was not to look at alternatives to the use of

coal, but to address the continuation of the Clean Coal Programme. Further, no attempt was made to develop scenarios of different mixes of clean coal technologies because it was not known which technologies would be selected, and there was no basis for defining a mix of technologies to be commercialized.

The DOE contracted with the Oak Ridge National Laboratory (a DOE facility operated by Martin Marietta Energy Systems, Inc.) and Technology and Management Services, Inc. (a private consulting firm) to prepare the EIS. The teams included experts in biology, geology, meteorology, engineering and mathematics (quantitative methods). A list of the teams and their qualifications is included in the PEIS. Guidance, supervision and review were the responsibility of the DOE.

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#### DESCRIPTION OF THE PROPOSED ACTION AND TYPES OF ALTERNATIVES

Two alternatives are evaluated in the PEIS: (a) the no-action alternative, which assumes that the CCTDP is not continued and that conventional coal-fired technologies with flue gas desulphurization and NO<sub>x</sub> controls to meet New Source Performance Standards would continue to be used; and (b) the proposed action, which assumes one or more clean coal technology projects are selected for cost-shared federal funding and that successfully demonstrated technologies undergo widespread commercialization by 2010. Included in the discussion are the general assumptions made for both the no-action and proposed action alternatives, descriptions and environmental characteristics of the conventional coal technologies assumed in the no-action alternative, and descriptions of 22 generic clean coal technologies, which cover the range of technologies anticipated for the proposed action. Discussion for each of the technologies includes a description of the technology, its environmental characteristics and its market application.

Each clean coal technology considered was categorized as either a repowering technology or a retrofit technology. Repowering technologies are those that, by replacing a major portion of an existing facility, not only achieve significant emission reductions but also may provide for the use of a new fuel form, increase facility capacity, extend facility life, and improve system efficiency. Retrofit technologies are those that reduce emissions of SO<sub>2</sub> and/or NO<sub>x</sub> by modifying existing facilities or their present feedstock or by utilizing new fuel forms.

The extent of future commercialization of each technology will depend on (a) its economic competitiveness and the technical suitability to retrofit or repower existing facilities, or (b) its use in new facilities. This PEIS does not attempt to predict the economic competitiveness of each of the technologies considered. Further, no attempt has been made to develop proposals of different mixes of clean coal technologies because it is not known what technologies will be selected for demonstration, and there is no basis for defining a mix of technologies to be commercialized. Instead, maximum commercialization of each applicable market is assumed so that

projected changes in the environmental parameters will not be exceeded by actual changes. While clean coal technologies may achieve higher market shares in some future markets, the potential increase in the use of coal could be offset by the higher efficiencies of some of the technologies (i.e., more energy output per Btu of coal input).

#### *Technologies Evaluated (including Retrofit and Repowering)*

Fuel cells	Mild gasification
Gas turbine	Direct liquefaction
Diesel engine	Indirect liquefaction
Copper oxide	Coal oil co-processing
Dual alkali	Coal/water mixture
Advanced FGD with saleable by-product	Circulating atmospheric fluidized-bed combustion
Spray dryer	Pressurized fluidized-bed combustion
Sorbent injection	Integrated coal gasification combined cycle
Gas reburning	Advanced slagging combustor
Low NO <sub>x</sub> burner	Flue gas desulphurization
Ultrafine coal cleaning	Limestone injection multistage burner
Advanced physical coal cleaning	Selective catalytic reduction
Advanced chemical coal cleaning	

#### SCOPING

No public scoping meetings were held for the draft PEIS. However, in response to the PON of 14 December 1988, day-long workshops were held in Denver, Colorado, Irving, Texas and Atlanta, Georgia, in January and February of 1989, to get public views on the conduct of the CCT-III solicitation. In addition, a Notice of Availability soliciting public comment on the draft PEIS was published in the Federal Register on 14 July 1989.

#### ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION AND THE ALTERNATIVES AND COMPARISONS

Under the no-action alternative and under current emission regulations, national emissions from coal-fired utilities and industrial boilers for SO<sub>2</sub> and NO<sub>x</sub> are projected to increase by 16 % and 67 %, respectively, between 1985 and 2010.

In regard to acidic deposition, negative effects on water chemistry from atmospheric deposition of sulphur and nitrogen compounds would continue under the no-action alternative. The northeastern quadrant would continue to be the region of the United States most affected by production of acidic precursors, although a small decrease in the total amount of these materials produced would occur. Increased emissions of SO<sub>2</sub> and NO<sub>x</sub> would occur in the other three quadrants, but the total amounts of pollutants produced are small in comparison to those produced in the northeastern quadrant. Under the no-action alternative, carbon dioxide (CO<sub>2</sub>) emissions are expected to increase by about 37 % between the years 1985 to 2010, depending on the amount of coal burned. The analysis of solid waste generated under the no-action alternative showed that by the year 2010 ap-

proximately 4,340 acres/year would be required to dispose of flue gas desulphurization (FGD) sludge and 2,710 acres/year for disposal of ash. Current land disposal requirements are estimated to be 570 acres/year for FGD waste disposal and 1,440 acres/year for ash disposal.

Under the proposed action, commercialization of clean coal technologies in the year 2010 would have a substantial beneficial effect on air quality. Reductions in SO<sub>2</sub> and NO<sub>x</sub> emissions could contribute to an amelioration of current impact of acidic deposition on surface waters, although the degree and rate of recovery is uncertain. Any decrease in acidification would be greatest in the northeastern quadrant of the United States and in southeastern Canada. The clean coal technologies could lead to reduced emissions of CO<sub>2</sub> if higher efficiency technologies, such as the repowering technologies, were employed in the production of electricity, since the amount of coal used per unit of electricity produced by these technologies would decrease. The impact of any such decrease on global CO<sub>2</sub> levels, however, would be minor because factors other than U.S. coal combustion dominate the global carbon cycle. The PEIS analysis shows that the amount of solid waste generated by the different clean coal technology categories varies greatly. The effect of waste disposal on land use could be less significant than for the no-action alternative since the expected waste is dry waste that would be easier to handle and dispose of and would require fewer acres per ton than wet FGD sludge. Furthermore, several clean coal technologies produce saleable by-products. However, the hurdles these by-products must overcome to be put to beneficial use include purity requirements, transportation costs and competition from current suppliers of the materials.

The analysis of environmental impact is based primarily on information developed from the Argonne National Laboratory REDES, a computer model designed to aid environmental evaluation of clean coal technologies. The regional emission and activity forecast database provides information on activity, emission factors and emission projections as part of the REDES system. The REDES considers 22 generic clean coal technologies individually without any mix or summation of impact from technologies. The model is run separately for each technology and assumes full commercialization of that technology in the applicable market, without regard to economic competitiveness. Thus, the results represent an upper boundary of possible change from the no-action alternative for each technology. No attempt is made to predict scenarios involving mixes of the technologies, because it will only be after the technologies are successfully demonstrated that realistic scenarios can be developed. In addition to national emission changes resulting from the commercialization of each technology, results were also calculated for each of the four geographic quadrants of the United States.

The assessments of the potential impact of commercialization of proposed clean coal technologies are presented in text, tables and figures in the form of comparisons to baseline predictions, which are for the no-action alternative in the year 2010. In the evaluation, the data from model runs have been used to identify differences among the technologies in terms of their atmospheric

emissions and solid waste. In addition, the model has provided a general indication of geographic locations where major reductions or increases in emissions, effluents or solid wastes would occur. For the analysis, other sources of information on the clean coal technologies and their environmental impact have been used to supplement the output from the model, either in cases where information was not available from the model or where other assumptions needed to be considered.

The analysis provided in the PEIA is limited by several factors. Since many of the innovative clean coal technologies have not yet been demonstrated, there is little specific information available on the emissions, effluents and solid waste that would be produced. The exact mix of technologies that would be developed during commercialization is unknown; the analysis has therefore relied on the model projections for full commercialization of each technology without regard to economic competitiveness. This projection represents a maximum value only. Information on where specific technologies would be established is not known and, therefore, estimates of where impact would occur simply reflect the known location of existing power plants and industries.

#### REVIEW AND PUBLIC PARTICIPATION

On 7 February 1989, DOE published a Notice of Intent (NOI) to Prepare an Environmental Impact Statement for the CCTDP (54 FR 6001). This NOI solicited comments on environmental issues related to the CCTDP and on a PEIA published in September 1988. The NOI stated that the PEIA would be used as the basis for preparing the PEIS.

Comment letters in response to the NOI were received from the Environmental Protection Agency (EPA), the Department of Health and Human Services, the U.S. Fish and Wildlife Service and the Tennessee Valley Authority. Comments in these letters were considered in determining the scope of the draft PEIS. The draft PEIS was made available to the public on 7 July 1989, and a Notice of Availability soliciting public comment was published in the *Federal Register* by EPA on 14 July 1989. Comments on the draft PEIS were received from 10 agencies, organizations and individuals and were considered in preparing the final PEIS. The comment letters and responses to the comments were included in Appendix C of the final PEIS that was published November 1989.

#### DECISION

The final PEIS was available to the Source Evaluation Board and the Selection Official prior to their recom-

mending or making decisions on CCT-III specific proposals. In addition, preceding decision making, environmental review reports are prepared by the CCTDP Source Evaluation Boards for each solicitation. These reports contain business, confidential and proprietary information and they are not made available to the public. The Source Selection Official considers the PEIS, along with the project-specific environmental reviews, as part of the selection process. The final part of the decision-making process is the preparation of site-specific NEPA documentation for each CCTDP demonstration project selected to receive financial assistance. These site-specific documents are made available to the public.

#### MONITORING

An important component of the demonstration programme is the development of information for environmental and health assessments and mitigation of impacts associated with commercialization. The industrial participants in the demonstration programme are required to develop and execute environmental monitoring plans during the demonstration. Each plan will address two classes of monitoring activity:

(a) Class I, Compliance Monitoring: Monitoring required by other agencies of Federal (other than DOE), State, and local governments to satisfy statutes and regulations concerning the environment, occupational and public health and safety, and terms of leases, permits, grants, and other requirements;

(b) Class II, Supplemental Monitoring: Monitoring required in addition to compliance monitoring to establish the environmental characteristics and potential impact of the clean coal technology and associated facilities, processes and activities. Supplemental monitoring is intended to satisfy two objectives: (i) to develop the information base for identification, assessment and mitigation of environmental problems associated with the replication of the technology; and (ii) to identify and confirm environmental impact and performance predicted in the NEPA documentation.

#### TIME/COSTS

The PEIS took about one year to complete. The Notice of Intent was published in the *Federal Register* on 14 December 1988; the draft PEIS was made available for public comment on 7 July 1989; and the final PEIS was issued in November 1989. This is a very short time period for development of a NEPA document, but the PEIS is based in large part on the PEIA which was published in September 1988. The cost of the PEIS is unavailable.

## 10. FINAL ENVIRONMENTAL IMPACT STATEMENT: FUEL USE ACT (UNITED STATES OF AMERICA)

*Type of Action:* The proposed action is the issuance of regulations to implement the Powerplant and Industrial Fuel Use Act of 1978 (FUA) Public Law 95-620.

*Action Characteristics:* The potential environmental consequences of employing fuel sources other than petroleum and natural gas fuels for the larger energy production facilities in the United States are evaluated.

### GENERAL INFORMATION ON THE ACTION

The purpose of this Programmatic Environmental Impact Statement (PEIS) is to evaluate the environmental impact of the Powerplant and Industrial Fuel Use Act of 1978 (FUA) Public Law 95-620 on the environment and the general populace. The purposes of the Fuel Use Act, "which shall be carried out in a manner consistent with applicable environmental requirements" include:

"To conserve natural gas and petroleum for uses, other than electric utility or other industrial or commercial generation of steam or electricity, for which there are no feasible alternative fuels or raw materials substitutes;

"To encourage and foster the greater use of coal and other alternative fuels, in lieu of natural gas and petroleum, as a primary energy source;

"To prohibit or, as appropriate, minimize the use of natural gas and petroleum as a primary energy source and to conserve such gas and petroleum for the benefit of present and future generations;

"To ensure that adequate supplies of natural gas are available for essential agricultural uses (including crop drying, seed drying, irrigation, fertilizer production, and production of essential fertilizer ingredients for such uses)."

The proposed action evaluated in the PEIS is the issuance of regulations to implement a programme as directed by the FUA. The FUA prohibits the use of natural gas or petroleum oil as the primary energy source in new powerplant boilers and Major Fuel Burning Installations (MFBI) with heat input rates greater than 100 million Btus per hour. No new powerplants are to be built without the capability for utilization of coal or other alternate fuels (i.e., non-petroleum and non-natural gas). The Department of Energy manages the FUA programme and applies it to both planned and existing MFBI and powerplant facilities. The DOE will evaluate facilities requesting exemptions on a case-by-case basis and may grant temporary or permanent status for mandatory or discretionary prohibition exemptions for new or existing facilities to use petroleum and natural gas fuels. The FUA prohibitions apply only to single units of MFBI and powerplants with a fuel input heat rate of 100 million Btus per hour or greater or an aggregate heat input rate

for two or more units of 250 million Btus per hour or greater.

A major portion of the PEIS deals with the impact associated with burning coal in conventional coal-fired burners. For the purposes of this analysis, a maximum substitution of coal combustion for existing petroleum and natural gas powerplants was assumed. In addition, new facilities would be constructed to burn coal (or alternative fuel) and prohibited from using petroleum or natural gas as a primary energy source. These assumptions permitted the evaluation of a "worst-case" scenario of total coal substitution for the regulated power units. The proposed action impact is that from increased coal usage and extends through the entire coal-use cycle (mining, cleaning, transportation, combustion and waste disposal). For the purposes of this analysis, the conterminous United States is divided into 8 coal supply regions and 10 coal demand regions. The analysis of the proposed action examines the projected impact for the years 1985 and 1990.

The PEIS describes the regional and general effects of increased coal usage on the following resources: air quality, hydrology, water quality, water use, land use, biotic resources, historical and archaeological sites, socio-economics and health. Positive impacts of the programme include an increased flexibility in decisions regarding natural gas curtailment in the priority use of natural gas, the encouragement of advanced coal-combustion technology through retirement of old units and new unit improvements to meet increasingly stringent standards for air emissions, increased national energy self-sufficiency, extension of natural gas and oil supplies, decreased balance-of-trade deficits due to imports, and greater use of waste products for energy generation. Negative impact is identified for each phase of the coal use cycle and includes an increase in air emissions (total suspended particulates, sulphur dioxide and nitrogen dioxide), increases in acid precipitation, increases in acid mine drainage (low pH) and associated trace substances and heavy metals, increases in metal and trace element loadings on surface waters and groundwater, increased disturbance of lands and the related impact on the aquatic and terrestrial environment, and increased potential for the occurrence of coal industry-related injuries and both work-force and general public respiratory diseases. Socio-economic impact is not presented in depth in the PEIS but is developed in this document: Analysis of the Proposed U.S. Department of Energy Regulations Implementing the Powerplant and Industrial Fuel Act, DOE/EIA-0102/21, Energy Information Administration, November 1978. The FUA requires that the use of coal or alternative fuels meets all applicable (present and projected) environmental requirements, standards, and guidelines.

**PLANNING PROCESS (regulations, responsibility, screening, etc.)**

This PEIS is part of an overall programme to assess the regional impact of the implementation of the regulations for enacting the coal and alternate fuels programme in the FUA. The programmatic EIS deals with the overall programmes and regional rather than site-specific impact and is predicted on the assumption that coal will be the primary fuel substituted for oil and natural gas in the short term (1990). Site-specific environmental impact will be addressed in subsequent NEPA compliance documents, for exemption petitions and by other federal, state and local permitting agencies.

The FUA regulations and the EIS were concurrently developed by personnel from the same organizational unit in the Department of Energy. The EIS was designed to reflect the impacts of all the Department's regulations and their effects on all facilities subject to FUA and necessarily predated the promulgation of the regulations. The schedule of the EIS and the regulations allowed limited concurrent reviews between EIS and the FUA regulations; however, section 901 of the FUA provided that the Act would take effect on 8 May 1979. DOE considered it important both to have the EIS serve as a decision-making document in the preparation of the final regulations and to have the regulations and its EIS in final form by the 8 May 1979 date. The comment periods were restricted by this latter consideration. Each existing facility that received a FUA order would be examined on a site-specific basis to assess the environmental impact of the proposed action and its alternatives.

The proposed action in the PEIS is consistent with the National Energy Policy prepared by the Executive Office of the President (29 April 1977) that summarized three overriding energy objectives:

“(a) As an objective that will become even more important in the future, to reduce dependence on foreign oil and vulnerability to supply interruptions;

“(b) In the medium term, to keep U.S. imports sufficiently low to weather the period when oil production approaches its capacity limitation; and

“(c) In the long term, to have renewable and essentially inexhaustible sources of energy for sustained economic growth.”

The PEIS for the Fuel Use Act is part of an overall plan for complying with the National Environmental Policy Act (NEPA) as interpreted by DOE. A regulatory analysis that examined the social and economic implications of the FUA programme was prepared by the Energy Information Administration; “Analysis of Proposed U.S. Department of Energy Regulations Implementing the Powerplant and Industrial Fuel Use Act, DOE/EIA-0102/21, U.S. Department of Energy, Washington, D.C.” in November 1978.

The development of FUA was prompted by the expiration of the Energy Supply and Environmental Coordination Act of 1974 (Public Law 93-319) (ESECA). The ESECA was enacted in response to the energy crisis precipitated by the 1973 oil embargo and prohibited the construction of new powerplants without the capability for utilization of coal or alternate fuels. The scope of ESECA was expanded by the Energy Policy and Conser-

vation Act (EPCA) of 1975 (Public Law 94-163) to include Major Fuel Burning Installations. The authority to issue orders under ESECA expired on 31 December 1978, while the authority to amend, repeal, modify, rescind or enforce such orders expired on 31 December 1984.

The FUA differs from the ESECA and EPCA in four respects: (a) shift of the burden of proof from the regulatory agency to industry in the case of new facilities; (b) clarification of authority to prohibit burning of certain fuels and the relationship of this authority to all environmental standards including the Clean Air Amendments; (c) expanded jurisdiction to include existing facilities that do not already have coal burning capability but could burn another fuel or a mixture; (d) expansion of authority to include gas turbines and combined-cycle facilities. The DOE contracted with the Argonne National Laboratory to prepare the PEIS. A list of the experts (teams) who prepared the PEIS was not included in the document.

**CONTENT OF THE PEIS**

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## 11. ENVIRONMENTAL TRADE-OFFS OF THE PROPOSED ACTION

- 11.1 Environmental Trade-offs: Negative Impact
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## APPENDICES

- A STRUCTURE OF THE COAL UTILIZATION MODEL FOR THE INDUSTRIAL SECTOR (CUMIS)
- B DEFINITION OF BITUMINOUS COAL- AND LIGNITE-PRODUCING DISTRICTS
- C SOCIO-ECONOMIC POPULATION PREDICTIONS
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## K SOCIO-ECONOMIC IMPACT OF MINING

## L ESTIMATION OF SOLID WASTE GENERATION

## M CREDITS

## DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

The proposed action is the implementation of a coal and alternative fuel use programme as authorized by FUA. The FUA is a programme mandated by Congress prohibiting the construction of new powerplants without the capability for the utilization of coal or alternate fuels and prohibiting the use of natural gas or petroleum as the primary energy source in new powerplants and major fuel-burning installations. The FUA presents mandatory and discretionary prohibitions on petroleum and natural gas use for existing (on-line as of 1980) powerplants and major fuel burning installations to stimulate and upgrade these units to permit the combustion of coal and alternative fuel sources (Chapter 2). One of the main objectives of the proposed action is to allow the United States to conserve its limited domestic natural gas and oil resources and reduce reliance on imported petroleum products (Chapter 9). The proposed action examines the impacts related to increasing the utilization of domestic coal resources to meet U.S. energy needs. Although the impact projections in this PEIS are based on increased use of coal, the programme encourages the development and use of technologies based on other energy sources (e.g., biomass and municipal waste).

Within the scope of the proposed action are several alternative coal technologies. Several of these technologies, such as coal liquefaction, high Btu gasification, and pressurized fluidized-bed combustion, will require extensive research and development and were not available for industrial use in 1990. However, low- and medium-Btu coal gasification, and atmospheric fluidized-bed combustion are projected to be available to industry before 1990. Additional non-coal alternative energy sources like oil shale, geothermal, nuclear, biomass, municipal waste, and petroleum coke are other possibilities that fall within the broad definition of alternative fuels.

The available alternatives that could meet the objectives of the proposed action must decrease the domestic consumption of oil and natural gas in general and imported fuels in particular. The alternatives that may partially satisfy these objectives are the Oil and Gas User Tax, Crude Oil Equalization Tax, energy conservation programmes and petroleum from the Outer Continental Shelf. Because each of these alternatives has its own environmental and economic consequences, and because each differs in some important way from the FUA, none appears to be a perfect substitute.

The "no-action" (no regulatory programme) alternative is based on the continued and increased importation of oil and natural gas, despite higher prices, to meet energy demand and operating needs.

The Oil and Gas User Tax alternative would levy a tax on large users of oil and gas, even for consumption at new and existing facilities designed to burn coal as well



as gas and oil. Those taxes directed to industrial and utility users would raise the cost of energy generation by oil and gas for some energy users significantly above the price of coal and result in an increase in the rate of substitution of coal.

The Crude Oil Equalization Tax (COET) alternative would allow newly discovered domestic oil to be marketed at the world oil price. The crude oil tax would affect all users (not just the industrial and utility sector, but also the gasoline and transportation sector). Although for the COET, natural gas users would not be directly affected.

The energy conservation programme alternative is a highly attractive alternative, from an environmental point of view. Reducing the need for energy production and consumption would reduce environmental residuals and land and water requirements. While energy conservation programmes cannot prevent an increase in energy production and consumption, they can be utilized in conjunction with the proposed programme (the FUA) to reduce the potential for environmental assaults without the extensive development of mitigating technologies.

Another alternative examined the increased development of domestic petroleum and natural gas resources from the Outer Continental Shelf. This increased domestic development alternative offered several positive advantages because of 1979 high natural gas and oil prices, an accelerated offshore lease programme, and technological breakthroughs in offshore drilling that could develop supplies to replace the imported natural gas and oil used by facilities considered under the FUA by 1985. However, the utilization of offshore natural gas and oil reserves is less acceptable from an environmental viewpoint. The impact of oil spills, increased turbidity and discharges of drilling fluids with toxic chemicals on aquatic biota and vulnerable coastal habitats could be quite severe. The resulting decrease in aquatic biota primary productivity, alterations in feeding behaviour, and destruction of benthic habitats are effects that are less acceptable from an aquatic ecosystem perspective and more acceptable from a terrestrial ecosystem viewpoint. For these reasons, as of 1979, these offshore natural gas and oil energy sources remain largely untapped.

The PEIS examined alternatives to the proposed action that could meet the same objectives for decreasing the domestic consumption of oil and natural gas, and reducing the amount of foreign natural gas and oil imported into the country. For the proposed action, coal was selected as the major fuel source because it was expected to be the overwhelming choice of alternative fuel at the national level and because the assumption of coal use generally results in the "worst-case" conditions for the environmental analysis. Although other alternative technologies and fuel sources are briefly introduced, the detailed impact projection for this PEIS is developed from a coal conversion and combustion scenario. This commitment to coal use is consistent with the National Energy Plan in place at that time.

The alternatives to the implementation of Fuel Use Act regulations are directed towards achieving similar objectives in reducing U.S. dependence on imported petroleum and natural gas, and promoting the utilization of domestic energy sources through different methods.

The alternatives range from the No-action alternative (no regulatory programme), to increased taxes imposed on oil and gas consumers, energy conservation programmes, and an increase in the development of outer continental shelf domestic oil and gas resources. The No-action alternative does not attempt to achieve the goals and objectives of the FUA programme, although it does provide a view of baseline conditions. The other alternatives are more focused on suppressing the consumption of petroleum and natural gas resources through taxation, energy conservation programmes or increased exploration and development; however, unlike the proposed action there is little direct motivation to stimulate the development of alternative energy sources.

#### SCOPING

It is not known if scoping meetings were held for the draft PEIS. This topic is not addressed in the PEIS. At least one public hearing was held in Fort Worth, Texas, during PEIS preparation.

#### ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION AND ALTERNATIVES

The impact for each phase of the coal cycle (extraction, cleaning, transportation, combustion and waste disposal) is developed for the proposed action. In the analysis it is assumed that most facilities would use coal as an alternative fuel. Coal was selected as the major fuel source because it is expected to be the overwhelming choice of alternative fuel at the national level and because the assumption of coal use generally results in the "worst-case" environmental analysis. The base case projections of coal use were derived from a model created specifically to assess the effects of the proposed incentives included in the National Energy Plan. The coal use attributable to ESECA and other energy policy options are included within the base case. Impact analyses are presented with the EIS for both base case and the proposed action.

Although other alternative technologies and fuel sources are briefly introduced (Chapter 10), the detailed impact projection for this PEIS is developed only for the coal conversion and combustion (proposed action) scenario. The impact assessment for each resource element includes an impact discussion for the years 1985 and 1990, both with the proposed action and without it (base case no-action).

The trade-offs of the FUA represent disparate benefits and effects, with the environmental impact being largely negative. The effects of coal mining, combustion and waste disposal will occur regardless of the proposed action. The thrust of the proposed action is to accelerate the impact to the 1980s and 1990s rather than during a later period when gas and oil shortages and price increases may force an increase in the use of coal fuels for energy production.

#### REVIEW AND PUBLIC PARTICIPATION

The draft PEIS was made available to a variety of federal, state and local organizations. The general public was informed that the draft PEIS was available for review by Notices of Availability in the Federal Register,

dated 13 November 1978 and 9 January 1979. Numerous public inquiries resulted in additional distributions to trade and professional organizations, interested companies, informational institutions and private individuals. Comments on the draft environmental impact statement were specifically requested from numerous federal agencies, State governmental organizations and other industrial and environmental groups.

The proposed regulations for implementing the FUA were published in the Federal Register on 17 November 1978 (New Facilities); 22 November 1978 (Transitional Facilities); 5 January 1979 (Special Rule for Temporary Public Interest); and 29 January 1979 (Existing Facilities). The Proposed Special Rule for Temporary Public Interest of 5 January 1979 states: "DOE continues to prefer that industrial facilities and electric utilities use coal or other alternative fuels rather than either oil or natural gas. Such increased use of coal, uranium, renewables and other alternative fuels will make more natural gas available for existing facilities and thereby further decrease petroleum consumption". The cost test and all its nuances were detailed in the regulations as published in the Federal Register on 17 November 1978 and 29 January 1979. The EIS reflects the "worst-case" analysis by using a sufficiently high cost criterion that virtually all eligible combustors are posited to be affected by the FUA. Any lower test would result in fewer mandatory fuel switches and a diminished impact on the environment. Section 10.3.4 discusses the alternative cost levels and the national and regional impacts within this context, and provides information on which to base the final rule determination for the DOE regulations implementing FUA. The Final PEIS was made available to the U.S. Environmental Protection Agency and to the public in April 1979.

#### DECISION MAKING

The proposed action in this PEIS was taken and several site-specific EISs were developed, tiered to this document. However, in 1987 Congress repealed and amended numerous sections and phrases in the FUA of 1978 with Public Law 100-42. The new and revised

FUA was significantly changed in scope and application. The new FUA is not as rigorously applied to MFBI as was the previous version. The amended FUA programme appears to have more flexibility in granting exemptions to installations and the programme is generally not as focused on reducing imported petroleum fuel consumption.

#### MONITORING

Special environmental monitoring related to the proposed action is not specifically addressed in this PEIS. One of the major purposes of the FUA is to require that all facilities meet applicable environmental requirements. The requirements include air, water and solid waste emissions. The facilities are to meet both federal and state standards, regulations and limitations. These applicable environmental requirements include not only those current laws and regulations governing coal mining and reclamation operations, the licensing of coal transportation carriers, the permitting of coal combustion emissions, and the disposal of combustion waste, etc., but also encompass any future limitation, standard or prohibition, or other requirement that subsequently becomes applicable under environmental law. Regular environmental monitoring would be conducted in conjunction with these laws to ensure environmental compliance.

#### TIME/COSTS

The impact projection related to the proposed action is developed for the period of 1980 to 1990. It is assumed that even with temporary exemptions of up to 10 years, nearly all the conversions will probably have taken place by 1990. The estimations of specific impacts are developed for 1985 and 1990. The overall economic impact of FUA was not evaluated in this environmental analysis; however, information on the cost of the FUA can be found in the document: Analysis of the Proposed U.S. Department of Energy Regulations Implementing the Powerplant and Industrial Fuel Act, DOE/EIA-0102/21, Energy Information Administration, November 1978.

## Annex II

### LEGAL/ADMINISTRATIVE SYSTEMS FOR ENVIRONMENTAL IMPACT ASSESSMENT OF POLICIES, PLANS AND PROGRAMMES

The information presented in this Annex summarizes national legal/administrative policies for the application of EIA to the development of government policies, plans and programmes in countries participating in the task force. This report includes information on legal/administrative systems for EIA complementary to that contained in the three other publications in the Environmental Series related to EIA: No. 1 Application of Environmental Impact Assessment—Highways and Dams; No. 3 Post-project Analysis in Environmental Impact Assessment; and No. 4 Policies and Systems of Environmental Impact Assessment.

#### CANADA

Environmental impact assessment has been part of Canadian Government planning since 1973. A cabinet decision established the Federal Environmental Assessment and Review Process (EARP). The Federal Environmental Assessment Review Office (FEARO), which reports to the Minister of Environment, administers EARP. In 1984, an Environmental Assessment Review Process Guidelines Order formalized EIA procedures and responsibilities. The order led to a movement to reform the EARP, resulting in the announcement of a major package of proposals by the Federal Government in June 1990. The three key elements of the package included:

- (a) New environmental assessment legislation;
- (b) A programme for funding participants in public reviews; and
- (c) A new process for policy assessment.

The proposed Canadian Environmental Assessment Act (CEAA) will ensure that the environmental considerations are integrated into the decision-making process of projects. Complementing the EA procedures for projects set out in the CEAA, the Government of Canada has adopted a non-legislated process for the environmental assessment of policy initiatives that come before the Cabinet. Responsible departments and agencies are required to examine and evaluate the anticipated environmental implications of new policy proposals. The policy proposal may then be modified to take into account any anticipated environmental effects before a final decision is taken by the Cabinet on the proposal.

Environmental considerations will thus be integrated into all areas of public policy, and will address regional, national and global environmental issues. Results of the environmental assessments will be included in Memoranda to Cabinet which accompany a policy proposal. A public statement on the environmental impacts addressed

in relation to the policy initiative will be released by the responsible minister at the time the new policy is announced.

The House of Commons Standing Committee on the Environment, which includes representation from all major political parties, has authority to examine environmental policies of the Government and may ask any minister and members of the Federal Civil Service to appear before it to explain the environmental implications of a policy decision.

#### CZECHOSLOVAKIA

For the time being, there is no general legal requirement for EIA in Czechoslovakia, either at the policy or the project level. A number of special acts include regulations for assessment of the environmental effects of specific projects at the sectoral level of government, particularly projects and programmes with the potential for impact on human health, biota, water, air, natural resources, agricultural or forest land, objects of cultural importance or national parks. Sometimes, separate assessment documents are required but, generally, the information is incorporated into planning or project documents. More comprehensive assessment is found in regional and municipal land-use planning documents.

This practice is the result of different responsibilities for environmental policy according to the sectors of specific ministries at the national or federal levels (e.g., forestry and water management, agriculture, building and housing, culture, national health, interior, geological office, State planning commission, committee for scientific development and investments). Each of these ministries have their own legal regulations.

The situation changed in 1990, when the Federal Committee for Environment, the Ministry of Environment of the Czech Republic and the Slovak Commission for Environment were established and gradually assumed responsibility for the environmental sectors (except human health, which is the responsibility of the Ministry of Health). A new comprehensive environment act is being prepared; it is expected to include a requirement for EIA. In the past, EIA was included in some research projects, but now there is an effort to assess systematically all activities that are likely to have a significant environmental impact as part of the decision-making process. Revision of sectoral legislation is also in progress.

## DENMARK

Since the early 1970s, Danish planning legislation has required that consideration of the environment must be an integral part of the planning process.

Projects with environmental effects are not allowed to proceed without permission. This permission, which requires the preparation of an environmental impact assessment (EIA), describes the conditions under which the planned activity must operate in regard to the environment. Public participation is required before decisions are taken on implementation of the activity.

The EC directive on the assessment of the effects of certain public and private projects on the environment (85/337/EEC) was implemented by amending the National and Regional Planning Act and an Executive Order (23 June 1989) on EIA of major projects, to include the contents of the directive. Subsequent environmental assessment of these major projects will result in supplements to regional plans. Each supplement will be an EIS for a specific project. Following a public participation period of eight weeks, the planning authority may adopt the plan. For other projects with a certain effect on the environment, which are identical with most of the projects listed in annex II of the directive, there have been no procedural changes as a result of the implementation of the EC directive.

To date, no formal procedure has been established for EIA of plans, policies and programmes. However, in December 1988, the Danish Government initiated an action plan on environment and development. This plan was a follow-up to the recommendations in the report of the World Commission on Environment and Development and the United Nations Environmental Perspective to the year 2000.

In January 1988, the Government announced in Parliament that it intended to draw up a general action plan to ensure that sufficient weight is given to environmental considerations in all political decisions. The plan will assess the need for changes and adjustments to policies and to the administrative process with a view to ensuring that sectoral ministries and authorities bring activities and policies into line with the principle of sustainable development.

The action plan was approved by Parliament in February 1989. Since then the Ministries of Transportation, Energy and Agriculture have developed plans that include consideration of impact on the environment.

## FINLAND

There is no general legal requirement for EIA in Finland at either the policy or the project level. However, a number of acts have regulations for assessing the environmental effects of specific projects. No separate documents are required. The appropriate information on environmental resources and impacts is incorporated directly into planning documents or licence applications. In addition, land-use planning includes consideration of the environment at regional, municipal and project planning levels.

The need to introduce EIA into the planning and decision-making processes in Finland was studied for the

first time in 1981 by a working group appointed by the Ministry of the Interior. In 1983, the Ministry of the Environment was established, and the general development of EIA became the responsibility of the Environmental Protection Department of the Ministry. During 1990, environmental impact assessment was integrated at the policy level for (a) preparatory work done in committees before legislation is drafted (Government Decision on Committee Work, February 1990) and (b) the preparation of operational and economic plans and the annual State budget (Directive of the Ministry of Finance, October 1990). Moreover, directives for the drafting of legislation are now required to include assessment of the environmental impact of proposed actions. In 1991, a unit in the National Board of Waters and Environment will work with different administrative levels and authorities to help integrate EIA into the planning and decision systems.

In order to ensure that all activities with potentially significant impact on the environment are systematically and thoroughly examined, EIA principles are being developed at both the policy and project levels, according to plans drawn up by the working group in 1981. The Finnish National Report on Environment and Development was given in 1989 as a response to the Report of the World Commission on Environment and Development. The Report recommended the application of EIA principles to planning and decision making for proposed policy, operational and economic plans and bills.

## FRANCE

In France, the rules and procedures for environmental impact assessment (EIA), implemented in 1976 and 1977, are essentially related to planned activities at the project level, land-development and private and public works. However, the scope of application of the French EIA procedure is broader than the one established by the EC directive (85/337/EEC). Accordingly, this procedure is applied to a large number of projects.

In accordance with physical planning procedures, an environmental study is part of the report that presents a plan (POS) for the use of an area at the communal/local level. An environmental impact assessment is not required when the planned activity is subject to public consultation before it is adopted and when it involves an area of less than 3000 square metres. The content of an environmental study is similar to the content of an environmental impact assessment. An environmental study should include:

(a) An analysis of the original state of the site and the environment (landscape, natural environment, urban environment and industrial areas);

(b) An analysis of the direct and indirect impact of the proposed activity and its impact on land-use (extension of urbanization, choice of sectors of development related to the quality of the environment, etc.); and

(c) An indication of the measures to be taken for the protection and maintenance of the environment and the site.

The preparation of an environmental study is also required when the POS is revised.

On 16 May 1990, the Assemblée Nationale (Parliament) modified its internal rules of procedure. Henceforth, reports prepared by Parliament for a project or a bill that are likely to have an impact on the environment will include an annex with an ecological balance describing the impact of the proposed legislation on, in particular, the environment, natural resources and energy consumption. At present, it is too early to appraise the value of this decision.

### GERMANY

In Germany, EIA legislation applies mainly to projects. There are, however, a number of rules dealing with EIA of plans and programmes. In 1975, the Federal Government issued a cabinet resolution on "Principles for assessing the environmental compatibility of public measures of the Federation". These principles require EIA, *inter alia*, for all federal plans and programmes for public tasks (e.g., the Federal Highways Network Plan, an act of parliament specifying highway building priorities for a period of five years). The principles define the EIA process rather narrowly. Public participation, for example, is not mentioned. Similar resolutions have been adopted by the *Länder* Governments of Bavaria, Berlin and Saarland. Under the Rhineland-Palatinate Act on Nature Conservation, regional plans must be environmentally compatible. Although an EIA is required, the Act does not define a particular procedure for EIA in the planning process.

The most important legal provisions on plan-related EIA are contained in the Act on EIA of 12 February 1990, which, together with other legislation, implements the EC directive. It makes EIA mandatory not only for some 40 projects listed in the EC directive but also for specific local land development plans and other plans that set up licensing requirements (e.g., route determinations for federal highways or waterways). EIA requirements for local development plans are found mainly in the Federal Building Code and supplementary rules issued by some 120 towns and cities. In practice, local development plan-related EIA has been undertaken mostly for building schemes for industrial and business areas. EIA for zoning plans is comparatively rare since such plans are less frequently drawn. Local planning authorities evaluate and approve plans. Citizens may challenge a building plan before an administrative court if they feel that the planning agencies have not weighed and balanced all relevant concerns.

### GREECE

Prevention of environmental pollution and degradation through environmental impact assessment (EIA) of public works and activities has always been a basic component of Greek politics. Requirements for EIA are found in various laws and ministerial decisions.

Law 1650/86 and the recent common ministerial decision (60260/5387, 24 October 1990) implementing the law provide "for the protection of the environment" from all kinds of human activities. This decision, has incorporated into Greek legislation the requirements of EC directives 85/337 for "environmental impact assessment

of public and private works" and 84/360 concerning "air pollution caused by industrial installations". Since publication of the aforementioned decision, all proposed projects are subject to EIA studies and approval by the Ministry for the Environment, Physical Planning and Public Works.

The common ministerial decision classifies public and private projects and activities, defines the level of EIA study required and the approval process for each kind of work. Common ministerial decision 75308/5512, published 2 November 1990, defines the ways in which the public is informed of the contents of EIA studies.

Apart from the legislation described above, there is no general requirement for EIA of policies, plans or programmes.

### HUNGARY

Hungary has had a requirement for EIA for major government projects since 1985. However, the present requirement lacks some of the basic tenets of EIA such as public participation. The recent deregulation of legal provisions will result in repeal of the requirement by the end of 1990.

To promote the establishment of an adequate EIA system, the Ministry for Environment and Water Management has written a draft decree that contains the content and procedural requirements for project-level EIA, including public participation and integration into decision making. Lists of projects requiring EIA are included. EIA will cover the status of the existing environment, assessment of the expected changes to the environment including public health and social and economic consequences, mitigation measures and post-project analyses. All phases of the proposed activity will be evaluated (i.e., siting, construction, operation, including accidents, and closure). The draft decree is in accordance with ECE recommendations in the field of environmental impact assessment.

At present, there are no formal requirements for EIA of government policies, plans or programmes. In the past, the Government occasionally applied EIA to major programmes, but the assessments did not present real alternatives for the decision makers. The Ministry for Environment is working on a new environmental act that will contain general regulatory provisions for EIA at the project level and beyond.

### ITALY

Legislation for the assessment of environmental impact of projects in Italy was enacted in July 1986 followed by two Prime Ministerial Decrees in August and December 1988. The legislation established the Ministry of Environment and regulations incorporating the requirements of Annex I of the EC Directive for assessment of certain public and private projects, including dams. Article 2 of the 1986 law requires a consensus of the Ministry of Environment before adoption of sectoral plans that are likely to have significant effects on the environment. New legislation is being prepared that ensures the complete implementation of the EC Directive on EIA as well as the application of EIA procedures to

sectoral and territorial plans which are likely to have significant effects on the environment before they can be approved.

Consultation is an important part of the environmental assessment of proposed action. For example, regional representatives are involved in the preparation of proposed action drafted by the administration of the Ministry of Transport. Draft action is submitted to the Inter-ministerial Committee for Economic Programming (CIPE) and to other appropriate offices where draft documents can be amended.

There are no formal procedures for EIA of policies, plans or programmes. However, these actions generally have to be submitted to various parliamentary commissions and must be approved by interministerial committees. In addition, they are submitted to the appropriate regions which are also involved during the formulation of the proposed actions.

### NETHERLANDS

Requirements for EIA in the Netherlands are embodied in the Environmental Protection Act of 1986. The General Administrative Order implementing the Act came into effect on 1 September 1987. The Order contains regulations for EIA incorporating the requirements of the EC directive for assessment of certain public and private projects; however, the Netherlands legislation is more restrictive than the EC directive. In most cases, EIA is carried out at the project level. Since 1981 (when the draft legislation was being tested), little practical experience has been gained with the application of EIA at the policy and planning levels. Nevertheless, the Order does require that plans related to land development, expansion of the infrastructure for water supply, exploration and production of oil and gas on the continental shelf, disposal of domestic refuse, and production of electricity are subject to an obligatory environmental impact statement when preparing a decision.

In addition, the Netherlands has prepared a National Environmental Policy Plan (NEPP) that contains the strategy for environmental policy for the attainment of sustainable development. Under this Plan, the Government will first determine the extent to which financial factors (e.g., subsidies, tax rates) and physical planning affect sustainable development. The Ministry for Environment will coordinate the effort and provide all other ministries with a method for screening their particular policy areas. For policy proposals that might have significant effects on the environment, information on the effects must be provided by the initiating ministry. The Government will take this information, along with information on the social and economic impacts, into consideration when making decisions on policy proposals with the potential for impact on sustainable development. Although not EIA in the strictest sense, this strategy embraces the basic precepts found in most environmental legislation and applies them to the development of Government policy.

### NORWAY

On 1 August 1990, Norway implemented a general EIA system based on the main features of good practice developed in countries with significant experience in the field of EIA. The new regulations supplement the Planning and Building Act of 1985. The regulations ensure that possible impact on the environment, natural resources and the community are assessed for all proposed major physical developments. To date, EIA is applied to project-level activities, but there is a growing awareness that this procedure must also be applied to certain types of plans and programmes, e.g., proposals in official assessments, acts, regulations and parliamentary documents. A requirement for environmental impact assessment may be formulated in the Regulatory Order that contains the rules of procedure for these activities. At present, only the economic and administrative consequences of proposals are addressed.

In response to the recommendations of the World Commission on Environment and Development, Norway now requires that the different ministries give an account of EIA in their annual budgets. For 1989 and 1990, the ministries were asked to:

- (a) Clarify their roles in relation to sustainable developments;
- (b) Describe existing environmental and resource problems and evaluate the situation for the year 2000 if proposed projects are not implemented;
- (c) Describe projects needed to solve existing new environmental and resource problems and to prevent new ones;
- (d) Clarify ways that the budget proposals contribute to solving environmental and resource problems; and
- (e) Develop goals related to these challenges.

In addition to being included in each ministry's budget proposal, the information will be included in the general fiscal budget and distributed to the public in the popularized version, "Green Book", of the environmental part of the budget.

Norway is also participating in the Nordic Group. The group was established to find methods and procedures for EIA in relation to development of government policies, plans and programmes.

### POLAND

Environmental assessment of new projects or modifications to existing projects has been performed in Poland for many years. In 1990, however, a formal requirement for preparation of environmental reports was established by the Ministry of Environmental Protection, Natural Resources and Forestry for activities that might harm the environment and human health. A list of such activities was established. For projects on the list, a minority opinion is required. To that end, the Ministry established an EIA Commission to review and evaluate EIA documents prepared for these projects. The EIA Commission is composed of independent experts from many environmental fields. Representatives of local administrations, communities and environmental non-governmental organizations are invited to meetings of the Commission.

The opinions of the Commission are independent and published in a special bulletin widely distributed to all parties concerned. The Ministry of Environmental Protection, Natural Resources and Forestry recently suggested that regional authorities may want to establish regional EIA Commissions when necessary. A new environment act and related regulations have been drafted and are now in the consultative process. If eventually adopted, the EIA procedure as recommended by the ECE will be obligatory for projects and large-scale plans, policies and programmes.

### SPAIN

The Spanish EIA system has no requirement for the application of EIA to proposed Government policies, plans or programmes. The General Directorate for Environmental Planning and Coordination of the General Secretariat for Environment (MOPU) is responsible for project-level EIA. Summaries of specific public or private projects or activities with possible environmental effects must be submitted to MOPU and the appropriate local government.

After consultation with appropriate agencies/persons, the requirements for the environmental impact study (EIS) are provided to the project developer. The developer is responsible for producing an EIS that includes a description of the project and alternatives, description of the existing environment and assessment of potential impacts to the environment, and establishment of mitigating measures and an environmental surveillance programme. The EIS is submitted to the local government and made available to the public for comment, after which an Environmental Impact Pronouncement (EIP) is published. For projects with potential transboundary effects, participation of the affected country is sought through exchanges of information and consultation. Surveillance of the EIP conditions for environmental protection is the responsibility of the local government.

### SWEDEN

At the request of the Swedish Government, the National Environment Protection Board and the Physical Planning and Housing Board have studied (a) the application of environmental impact assessment (EIA) to decision making for activities that may have significant effects on the environment and on the efficient use of natural resources and (b) the integration of EIA requirements and existing physical planning and environment legislation. In environmental and natural resource legislation, EIA is seen as a basis for decision making at all levels. The scope of EIA will depend on the activity, its size, geographical location, and current decision-making rules. It will include assessment of the effects that an activity or measure will have on the land, water and atmosphere, and other technical, economic and social considerations as appropriate. The purpose of EIA is to appraise the comprehensive effects of any planned projects, operations or measures on the environment, human health and the management of natural resources. The expenses associated with EIA are to be met by the party responsible for the activity in question.

On 1 July 1991, requirements for EIA were incorporated into a new chapter of the Natural Resources Act (NRA), the major Swedish legislation for management of natural resources. Furthermore, the Government or authority appointed by the Government may require EIA for actions being reviewed pursuant to legislation related to the NRA. This related legislation includes the following Acts: Planning and Building, Water, Environment Protection, Nature Conservation, Peat, Road, Electricity, Pipelines and Aviation. The Swedish Parliament (the Riksdag) has also determined that the Minerals Act, the Channels Act, and the Act on the Continental Shelf are related to the NRA and that on 1 July 1992 the requirements for EIA will apply to these acts. It has also been determined that permit applications required by the Environmental Protection Act and the Water Act contain requirements for EIA and that municipal energy plans, which are required by the Act on Municipal Energy Planning, include an environmental impact assessment.

In addition, the National Swedish Road Administration is to demonstrate greater consideration for the environment in its investment plans. At the time of the preliminary projections for road construction (i.e., during feasibility studies), a general EIA should be prepared. Subsequently, supplementary EIAs should be prepared for specific road construction projects. For road construction projects with negligible environmental impact, a simplified EIA should suffice. However, for major road construction projects, detailed EIAs are needed.

Thus, the new requirement for EIA in the NRA and its related acts ensures suitable provisions for including such assessments in the current system of regulations.

### TURKEY

The main objective of Turkish national environmental policy is to protect and improve the environment while enhancing socio-economic development. The Law of Environment, enacted in August 1983, directly addresses protection of the environment. Its aim is prevention and elimination of pollution and protection and management of the land and natural resources. Under the law, regulations have been written for control of air quality, water pollution, noise and prevention of environmental pollution. The law also contains provisions for environmental impact assessment and a draft EIA regulation has been prepared. In addition to the general application of EIA to Government organizations, EIA formats are being developed for specific types of activities that have the most significant impacts on the environment. Ten of these specific formats have been completed.

To date, EIA in Turkey has been applied to projects that by virtue of their nature, size and location have the potential for significant effects on the environment. At present, there are no procedures for the application of EIA to Government policies, plans or programmes.

### UNITED KINGDOM

Until adoption of the EC directive, there was no formalized EIA in British law. The directive was given



legal effect in England and Wales through various regulations of which the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988, which came into force on 15 July 1988, cover the majority of projects. Environmental assessment in Scotland and Northern Ireland is similar to that applying in England and Wales but is prescribed in regulations specific to each country. Existing legislation applies to projects and does not require the application of EIA to policy, plans and programmes.

Since 1947, Britain has had a town and country planning system for scrutinizing planning applications and a comprehensive system of planning control. Planning permission from a local authority is required for any project that involves the development of land. Under this planning system, a developer has to supply certain information with the application. In cases requiring EIA under the regulations, specified information about the environmental effects of the project must be provided in an environmental statement; the public has a chance to comment; the planning authority arrives at a decision based on information supplied by the developer and others; and the decision is published, although the reasons for it do not have to be given unless the application is refused. Comprehensive planning control is an administrative system for which responsibility is split between the central government and the local authorities. The central government (i.e., the Secretary of State for Environment) can intervene in the granting of permission. The procedure, however, is used only for a small number of projects of national or regional importance. The procedures under which an applicant can appeal to the Secretary of State against refusal of permission or conditions attached to a permission is used more frequently. These procedures involve public hearings and detailed reports. Planning control is designed to ensure that full consideration is given to an application before planning consent is granted.

Some major projects in Britain are approved under legislation other than the Town and Country Planning Act (e.g., large thermal power stations, motorways and afforestation). Separate regulations apply the requirements of the EC directive to such projects in a similar manner to that applying to projects subject to planning control. Projects approved by an Act of Parliament (e.g., the Channel Tunnel in 1987) fall outside the EC directive, but provisions to require EIA for such projects are in preparation.

## UNITED STATES

Environmental impact assessment was established in the United States with the enactment of the National Environmental Policy Act of 1969 (NEPA). NEPA announces a general commitment to use all practicable means to conduct federal activities in a way that will promote the general welfare and be in harmony with the environment. The Act also establishes the Council on Environmental Quality (CEQ) to monitor progress towards achieving the national environmental goals and to advise the President on national policies and legislation to protect the environment. CEQ also provides guidance to federal agencies on compliance with NEPA. The CEQ regulations governing the NEPA process for all federal agencies were published in 1979.

EIA is required for major federal action with the potential for significantly affecting the quality of the human environment. Environmental assessments (EAs) or environmental impact statements (EISs) are written to assess environmental impact of proposed action. These documents are tools to promote environmentally sensitive decision making. Their development is subject to public participation. A record of decision (ROD) is published following preparation of an EIS. The ROD is a written discussion of how the agency reached its decision. The ROD must also include any mitigation plans and a monitoring and enforcement programme, if applicable, for any mitigation. The Environmental Protection Agency (EPA) reviews and comments on the environmental impact of other agencies' projects, subject to the EIS requirement, and publicly rates the quality of the EISs. EPA also publishes notices of the public availability of all EISs.

The term "major federal action" has been defined by the CEQ regulations to include "programmes [and] rules, regulations, plans, policies, or procedures; and legislative proposals." As a result, policies, plans and programmes are subject to EIA. In all cases, the policy, plan or programme must have the potential for significantly affecting the quality of the human environment in order to require an EIS. However, there are no specific guidelines for policy-level EIA. The CEQ regulations apply to EIA of any scope, whether policy-, programme- or project-level. The emphasis is on the proper evaluation of environmental impact. Agencies are expected to use good judgement and to make responsible, intelligent decisions on scope and timing in applying the CEQ general procedural requisites to their projects, programmes and policies. The analysis of data becomes more complex and the subsequent synthesis becomes more and more important as one goes up the hierarchy.





