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Application of Environmental Impact Assessment Highways and dams

Report prepared by the task force on
the application of environmental impact assessment
with the Netherlands as lead country



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CONTENTS

	<u>Page</u>
Preface	vi
Summary	vii
Conclusions and Recommendations	xi
Introduction	1
Part One Background	2
Part Two Legal/administrative systems for environmental impact assessment	6
Part Three Summary description of the case studies.....	25
Part Four Analysis of the case studies: conclusions and recommendations	33
 ANNEXES	
I. Environmental impact assessment for selected case studies	61
 <u>Highways</u>	
Case 1. The Banff Highway in Canada	61
Case 2. Highway 5 in Finland	72
Case 3. The Wiesbaden By-pass in the Federal Republic of Germany	85
Case 4. Highway 69 in the Netherlands	105
Case 5. Highway E-18 in Norway	118
Case 6. Franconnia Notch Highway in New Hampshire (United States of America)	133
 <u>Dams</u>	
Case 7. The Lower Churchill hydro project in Canada	145
Case 8. The Vuotos Reservoir in Finland	158
Case 9. The Ernstbach Dam in the Federal Republic of Germany	172

CONTENTS (continued)

<u>ANNEXES (continued)</u>		<u>Page</u>
	Case 10. The Kobbelv Hydro Power Project in Norway	180
	Case 11. The Wheeling Creek Dam in West Virginia (United States of America).....	192
II.	Legal and administrative systems for environmental impact assessment	206

In this report the term Environmental Impact Assessment (EIA) is used in its broadest sense. No two countries define EIA in the same way and procedures and methods vary greatly. The term EIA, however, is generally recognized as the generic shorthand term to describe the process of examining an activity for its environmental effects prior to making a decision on its implementation.

PREFACE

Environment plays an important role in the national economy of every country. For the member countries of the Economic Commission for Europe (ECE) a growing awareness of environmental degradation has led them to devote increasing attention to the relationship between economic activities and their environmental consequences. Despite such efforts over many decades, important decisions may still be taken without sufficient insight into the subsequent changes that the environment may possibly undergo as a result of some development activities.

In this respect, environmental impact assessment may be considered as a useful planning tool. The purpose of environmental impact assessment (EIA) is to give the environment its due place in the decision-making process by clearly evaluating the environmental consequences of a proposed activity before action is taken. The concept has ramifications in the long run for almost all development activity because sustainable development depends on protecting the natural resource base which is the foundation for further development. Indeed the link economy/environment is becoming increasingly clear as more and more experience is gained in this field.

The Senior Advisers to ECE Governments on Environmental Problems decided in February 1983 to undertake a project on the application of environmental impact assessment. Carried out by a task force of governmental rapporteurs with the Netherlands as lead country, the focus of the work has been on compiling information concerning practical experience in ECE member countries with the application of EIA to major civil works projects, particularly highways and dams. The purpose was to gain insight into the way in which the EIA process works in practice as well as to learn what points had been addressed and how they were dealt with through various EIA systems within different legal and institutional settings. To that end, a comparative case-study analysis has been carried out. The work was completed during 1985 and the resulting reports presented in March 1986 to the fourteenth session of the Senior Advisers to ECE Governments on Environmental Problems who decided to take note of the conclusions and recommendations when endorsing for general distribution the final report on the application of environmental impact assessment. The present publication is the outcome of this effort.

The Senior Advisers also wished to put on record their appreciation of the valuable work of the task force and their gratitude to the Government of the Netherlands for its generous commitment of resources.

Implicit in work of this nature is the fact that as new knowledge accumulates and as new technological developments overshadow earlier efforts, the conclusions and recommendations drawn today may be further modified at a later date. The report therefore represents the current state of knowledge and experience around mid-1985.

SUMMARY

At their eleventh session (February 1983) the Senior Advisers to ECE Governments on Environmental Problems decided to undertake a project on the Application of Environmental Impact Assessment (EIA) for specific types of activities. This project has been carried out by a task force with the Netherlands as lead country. For more than two years the task force has been working with the active participation of Canada, Finland, the Federal Republic of Germany, the Netherlands, Norway, Portugal and the United States of America. Other ECE member countries have expressed interest in the work of the task force, particularly Czechoslovakia, France, Hungary, Switzerland and the Union of Soviet Socialist Republics. During this two-year period, the task force participants met five times, alternatively in Geneva and The Hague to discuss the method of work, interim results and, finally, conclusions and recommendations.

The purpose of the work of the task force was to analyse practical experience with the application of EIA and to draw lessons from that experience. To that end, 11 case studies were carried out and analysed: six highway and five dam cases. In order to have a proper understanding of the case study material, information on the various national legal/administrative EIA systems was also gathered.

The case study information collected by the task force showed how in 11 individual cases (highways and dams) environmental aspects were taken into account in the decision-making process. The individual projects studied varied considerably in terms of their size, technical and geographical characteristics and environmental impacts. Some cases represent examples of the application of EIA following certain formalized requirements whereas with others environmental studies were performed on an ad hoc basis.

Despite these differences, a basic assumption of the task force participants has been that there are certain similarities or key elements responsible for a successful EIA wherever it is carried out and that a comparative case study analysis can help in identifying those elements.

At the first meeting of the task force, participants agreed on the method of work. It was decided that the lead country would play a co-ordinating role and through extensive questionnaires and interviews work closely with task force participants on the preparation of well-documented and comparable case studies. In order to structure the case-study information, a questionnaire was drafted. Following the questionnaire case-study descriptions were prepared.

Early in its deliberations, the task force agreed upon a definition of a successful EIA as applied at the project level of decision-making: "A successful EIA is one which ensures that all relevant impacts associated with

the proposed project are adequately and fully taken into account in the decision-making process". This definition implies two key elements of EIA:

- Information;
- Influence.

EIA consists not only of the writing of a report through which information is provided to the decision-maker but also of procedural provisions ensuring that the decision-maker takes the information into consideration. Broadly speaking this means that an EIA system should contain at least those process elements which guarantee that the decision-maker is provided with the proper information and that this information is taken adequately and fully into account in the decision-making. This is reflected in the general overall recommendation of the task force which states that: "EIA should be viewed as an integral part of the project planning process beginning with an early identification of project alternatives and the potentially significant environmental impacts associated with them and continuing through the planning cycle to include an external review of the assessment document and involvement of the public".

Furthermore, specific conclusions and recommendations related to EIA and based on the case studies were formulated. These were unanimously agreed upon by the task force participants. The conclusions and recommendations are meant to be broadly applicable (i.e. to a wide variety of project types, not only highways and dams). They are meant to be of use both to countries that already have a system of EIA and to countries interested in establishing an EIA system.

The specific conclusions and recommendations have been divided into three categories:

1. Conclusions and recommendations related to the EIA process;
2. Conclusions and recommendations related to the content of an EIA;
3. Conclusions and recommendations regarding the link between EIA and the decision.

The EIA process refers to a variety of activities aimed at ensuring the inclusion of environmental considerations in project planning. The case study material showed that it is neither possible nor desirable to recommend a uniform approach. EIA is a decision-making tool dependent on the decision-making culture of any given country. It varies greatly in the ECE region. However, certain process elements could be identified as being responsible for a successful application of EIA. Broadly speaking they are those elements of the EIA process which guarantee that the decision-maker is

provided with the right information and that this information is properly considered in the decision-making process. They include, for example:

- Scoping (i.e. identifying the significant alternatives and impacts for consideration in the EIA) involving the proponent, affected agencies and the concerned public;
- Outside review as a quality check of the information to be presented to the decision-maker;
- Public participation; and
- Monitoring.

These elements, among others, were identified by the task force as being responsible for a successful EIA process. Furthermore, the case study material revealed that in those cases where a procedural arrangement existed, specifying steps to be carried out by those involved, the result was a valuable example of transparent planning and decision-making. Different groups of participants were involved from an early stage, alternatives were taken into account and in the end a decision was made that was socially and environmentally acceptable.

As for content, the task force recommended that an Environmental Impact Statement (EIS) or other environmental document contain, as a minimum, the following elements:

- Project setting (purpose and need);
- Description of the proposed project;
- Description of the existing environment;
- Reasonable alternatives, including the do-nothing alternative;
- An assessment of the environmental impacts of the proposed project and the alternatives;
- Summary.

The task force also recommended that the EIS or other environmental document assess, as a minimum, the direct and indirect impacts of the proposed project and its alternatives on the bio-physical and socio-economic environment. The specific types and number of impacts to be assessed depend on the individual project and the environment and can best be determined through scoping and guidelines.

The case study analysis showed little evidence of formalized methods being widely used for predicting impacts and/or comparing alternatives. In most cases best professional judgement and previous experience were the most commonly used methods for predicting impacts. Therefore, the task force recommended that the underlying assumptions and judgements be made explicit in those cases where best professional judgement and previous experience were the main methods for prediction.

Concerning the link between EIA and the decision, the analysis revealed that only in those cases where some formalized EIA requirement existed was there clear evidence that EIA indeed played a role in the choice of the alternative or in design changes and mitigation measures. In the other cases the link between the environmental information and the decision was not discernible. The task force therefore recommended that any EIA process should contain a mechanism for ensuring that its findings were adequately taken into account in the decision-making process.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL OVERALL RECOMMENDATION

It is recommended that, when applied to projects: EIA be viewed as an integral part of the project planning process beginning with an early identification of project alternatives and the potentially significant environmental impacts associated with them and continuing through the planning cycle to include an external review of the assessment document and involvement of the public.

CONCLUSIONS ON THE INITIATION OF THE EIA PROCESS

1. The earliest planning steps in the highway and dam projects described in the case studies took place in the 1960s and early 1970s before environmental considerations as such were viewed as necessary elements of project planning.
2. Owing to the various ways in which Governments responded to the need to consider environmental impacts, EIA was undertaken in a variety of ways and at various stages of project planning throughout the 1970s and early 1980s.
3. The three basic ways in which an EIA process was initiated in the case studies were through:
 - (a) A general EIA requirement set in EIA legislation or other legal provisions;
 - (b) A specific EIA requirement, as a part of other legislation;
 - (c) On an ad hoc (i.e. case-by-case) basis.
4. In most of the cases where an EIA process was initiated in a formal way (3 (a) and 3 (b)), the resultant assessment was carried out in an integrated fashion and provided a comprehensive analysis of the environmental consequences of the proposed project.
5. In most of the cases where EIA was done on an ad hoc basis (3 (c)), specific environmental impacts were assessed by carrying out individual environmental studies.
6. The case study material revealed that the necessity for carrying out EIA for the particular project type was not always evident and, as a result, the assessment itself was often begun rather late in planning when, for example, project siting decisions had already been made. Although it cannot be totally substantiated by the case study material itself, it appears that, where an EIA is initiated on a formal basis, it is better if begun at an early stage of planning when a range of alternatives is still open.

RECOMMENDATIONS ON THE INITIATION OF THE EIA PROCESS

It is recommended that:

1. Formal, obligatory procedural arrangements for the EIA process be created and that, when EIA is deemed necessary, it be applied as early in the planning stage as possible. Procedural arrangements for the process could take a variety of forms, based on, inter alia:

- A legislative requirement;
- An executive order;
- A cabinet decision.

2. The procedural arrangements be clearly applicable to certain types of projects. Those project types (the field of application) could be designated in a variety of ways including:

- Screening criteria or guidelines applied to projects on a case-by-case basis to determine which ones should undergo EIA;
- A list of specific project types which, while allowing for exceptions, must always (or need never) be submitted to EIA.

CONCLUSIONS ON THE RESPONSIBILITY FOR PREPARING THE ENVIRONMENTAL IMPACT STATEMENT

1. In most cases the proponent of the project was responsible for preparing the EIS or other environmental documentation. In many cases the proponent was also the competent authority.

2. A disadvantage when the proponent prepares the EIS may be that incomplete or biased information is presented which must be counter-balanced at a later stage of the EIA process by an outside review [see also Review and Public Participation below].

3. In all cases, to a greater or lesser degree, outside experts were involved in the actual preparation of the EIS or other environmental documentation. The types of experts involved were:

- Private consultants;
- Consultant firms;
- Academics (universities);
- Members of research institutes.

RECOMMENDATIONS ON THE RESPONSIBILITY FOR PREPARING THE EIS

It is recommended that:

1. In order to ensure that environmental implications are taken fully into consideration in project planning and preparation, the proponent, which could also be the competent authority, must be responsible for preparing the EIS or other environmental documentation.
2. Particularly where outside experts are involved in preparing the EIS or other environmental documentation, the proponent must ensure that through appropriate terms of reference and/or steering mechanisms the relevant disciplines are brought together in carrying out the EIA.

CONCLUSIONS ON STRUCTURE AND FORMAT OF THE EIA PROCESS

1. Three basic approaches were taken regarding the form of environmental documentation:

- Environmental Impact Statements;
- Single issue environmental studies and collections thereof;
- Parts of other planning documents.

2. Although the particular form of the environmental documentation as such appeared to be less important than its content, in the case studies where the assessment took the form of an EIS or was included in other planning documents, it was more effective as a decision-making tool than where separate studies had been carried out.

3. In those cases where a formal requirement existed for carrying out an EIA, the proponents were given guidance as to the content of the documents they had to produce. This guidance varied from general guidelines to project-specific guidelines. In all cases the EIS or other environmental document was required to contain at least the following:

- Project setting (purpose and need);
- Description of the proposed project;
- Alternatives;
- Description of the existing environment;
- Environmental impacts.

4. A scoping process was used in some cases to determine the specific content of the environmental documentation. In those cases, as a result of scoping, new alternatives and impacts were identified which proved to be key factors in reaching the decision. In several cases where scoping did not take place delays occurred along with extra costs because of time spent in assessing impacts that eventually proved insignificant.

5. The process of selecting alternatives is, in many cases, unclear. The case-study material showed examples of cases where, in a late stage of the EIA process, new alternatives were suggested in the review and public participation phase and taken into account. This often caused some delay.

RECOMMENDATIONS ON STRUCTURE AND FORMAT OF THE EIA PROCESS

It is recommended that:

1. In terms of helping to ensure the best integration of environmental factors in project planning and decision-making, the forms of a separate environmental impact statement or inclusion of environmental documentation in other planning documents should be adopted.

2. The EIA process should contain a provision for early guidance on what should comprise the content of the environmental information. Though generic guidelines might be useful as a first check-list, each individual case has its own peculiarities which EIA offers an opportunity to identify. Scoping provides such an opportunity. The final determination of the content in a specific case should thus be made through a scoping process, in order to identify any significant alternatives and impacts for consideration and eliminate alternatives and impacts not considered significant enough for consideration.

3. A scoping process contains the following elements:

- Preparation of background information on the proposed project;
- Involvement of interested parties (other than the proponent and the competent authority) defined in conformity with national legislation;
- Documentation of the scoping process.

4. The conclusions of scoping should be an explicit part of the EIA documentation.

CONCLUSIONS ON REVIEW AND PUBLIC PARTICIPATION

1. In almost all cases an outside/external review of the environmental information took place.

2. This outside review took various forms, for example inter-agency review, review by a panel of independent experts or review by a steering group consisting of representatives of the various agencies involved or combinations of the above.
3. In many cases, the outside review resulted in the consideration of new alternatives and helped identify the key issue of concern.
4. In almost all cases there was public participation.
5. The public participation took place through informal public meetings, public hearings, the possibility of submitting written comments on the environmental documentation and combinations of the three.
6. As with the outside review, the public participation often resulted in suggestions for new alternatives to be considered or the identification of key impacts to be studied.

RECOMMENDATIONS ON REVIEW AND PUBLIC PARTICIPATION

It is recommended that:

1. In order to avoid incomplete or incorrect information in the EIS or environmental documentation, it should be submitted to some form of outside review.
2. This review should address as a minimum the adequacy of the document in relation to the decision, as well as the significance of the impacts that were assessed.
3. In cases of potentially significant impacts on the environment, the review should be conducted by means of either an inter-agency review procedure or by a panel of experts or a combination of both.
4. In conformity with national legislation, the public must be involved in the review of the EIS.

CONCLUSIONS ON MONITORING

1. The provision for, and implementation of, monitoring programmes appears to be one of the most neglected areas in EIA.
2. Monitoring programmes, particularly when their design is carefully linked to those impacts which were predicted in the EIS or other environmental documentation, can sometimes result in improvements to the project itself and moreover improve the quality of future predictions of impacts for similar projects.

RECOMMENDATIONS ON MONITORING

It is recommended that:

1. Monitoring programmes should be viewed as an integral part of the EIA process with provision made for them at the time the decision on the project is made.
2. A monitoring strategy should be developed early in EIA to allow base-line data collected during the EIA process to be made comparable with monitoring data collected after the project proceeds. Post project monitoring would also allow any unpredicted effects to be identified and hence mitigated.

CONCLUSIONS ON TIME AND COSTS

1. In general the EIA did not cause significant delays in planning and decision-making.
2. Compared to the total length of project planning, the time needed to carry out the EIA is rather insignificant.
3. For a variety of reasons, no specific figure can be determined regarding the amount of time needed to carry out an EIA. For example:
 - The time needed is linked to the particular planning procedure for the type of project. These procedures vary from country to country;
 - The time needed depends on the availability of information. (When the necessary base-line data is on hand, the time needed is less than when field surveys and data gathering have to be carried out to identify, predict and assess impacts.)
4. When an EIA was integrated with other planning activities (for instance, engineering, feasibility, cost-benefit analysis) the time needed was less and there was less delay than when it was conducted separately and after other studies had been completed.
5. The case study information revealed that the average amount of time needed from the initial environmental assessment to the completion of the EIS or other document ranged from one to one-and-a-half years.
6. No general conclusions can be made on the absolute or relative (percentage of total investment) costs of EIS. Some case studies indicated that an extensive EIA could bring about savings over originally planned investments.

RECOMMENDATION ON TIME AND COSTS

It is recommended that:

EIA should be integrated with other planning activities as early as possible in the planning stage in order to avoid delays and to keep costs at a minimum.

CONCLUSIONS ON CONTENT ASPECTS

1. All cases contained a description of the proposed project and the existing environment.
2. Although most case studies considered alternatives to the proposed project, their range was generally limited to specific sites and locations rather than alternative approaches to meeting water/energy or transportation needs.
3. In some cases the existing environment was described under a separate component of the EIS or other environmental document whereas in other cases it was linked to the description of the expected environmental impacts.
4. Generally speaking, the environmental impacts most often assessed in the case studies were those related to air and water quality, flora and fauna, land use, socio-economic aspects.
5. The specific number and type of environmental impacts assessed was dependent upon the project features and the particular environmental conditions in the areas concerned.
6. Environmental impacts were identified through the use of checklists and guidelines, scoping procedures and through input from concerned parties or through a combination thereof.
7. There is little evidence that formalized quantitative methods were used for predicting impacts and/or comparing alternatives.
8. "Best professional judgement" and "previous experience" most often formed the basis for assessing the significance of the environmental impacts.

RECOMMENDATIONS ON CONTENT ASPECTS

It is recommended that:

1. An EIS or other environmental document contain at least the following elements:
 - Project setting (purpose and need);
 - A description of the proposed project;

- A description of the existing environment;
- Reasonable alternatives, including the do-nothing alternatives;
- An assessment of the environmental impacts of the proposed project and the alternatives;
- Summary.

2. In addition to the minimum elements, the EIS should contain information as appropriate on, inter alia:

- The scoping process;
- A monitoring programme;
- Mitigation measures;
- Gaps in knowledge;
- Uncertainties.

3. Although the EIS should contain a description of the proposed project and alternatives and the existing environment, this should be limited to those elements necessary for assessing environmental impacts.

4. The EIS or other environmental document should assess, as a minimum, the direct and indirect impacts of the proposed project and its alternatives on the bio-physical and socio-economic environment. a/ The specific types and number of impacts to be assessed are dependent on the individual project and the environment and can be best determined through scoping.

5. Wherever appropriate, formalized quantitative methods should be used to predict environmental impacts. In every case, best professional judgement should prevail and the underlying assumptions of the methods used and the judgements made clear.

CONCLUSIONS ON THE LINK BETWEEN EIA AND THE DECISION-MAKING PROCESS

1. Only the United States cases show a clear link between the EIA findings and the decision. b/ In many of the other case studies, environmental considerations had obviously played a role. The direct link between the EIA and the decision was not clear-cut, however.

2. In most of the cases where an affirmative decision was taken, to construct the project, the EIA process influenced that outcome. Its influence was reflected in the choice of alternatives as well as in design and mitigation measures which would otherwise not have been considered.

3. In the cases where the decision was taken not to proceed with the project, although environmental considerations probably played a role, it was not clear how decisive their role was in relation to other considerations.

RECOMMENDATION ON THE LINK BETWEEN EIA AND THE DECISION-MAKING PROCESS

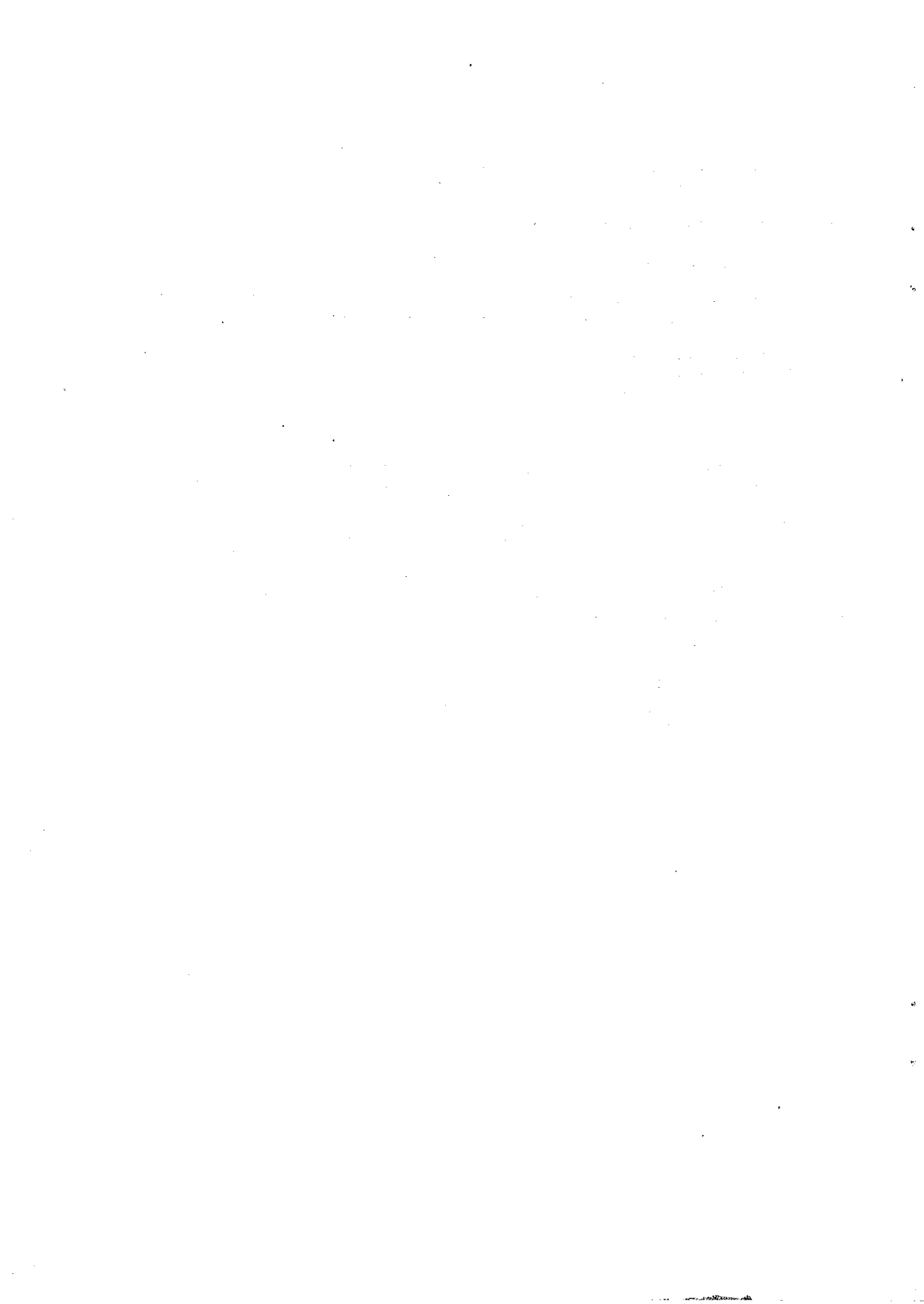
It is recommended that:

1. Any EIA process contain a mechanism for ensuring that its findings are adequately taken into account in the decision-making process.
2. Where appropriate, the way in which the findings are taken into account should be documented.

Notes

a/ Impacts on the bio-physical environment include, inter alia, impacts on: human health and safety; the quality of air, water and soil; survival of flora and fauna and their habitats; the cultural heritage; land use, etc. Impacts on the socio-economic environment include, inter alia, impact on human settlements, lifestyles, employment etc.

b/ This was so because at the time the case studies were conducted, only the EIA system of the United States of America had a requirement that the decision reflect the findings of the EIA. Since then Canada (1984) and the Netherlands (1985) have instituted similar requirements.



INTRODUCTION

In February 1983 the Senior Advisers to ECE Governments on Environmental Problems decided to undertake a project on the application of environmental impact assessment (EIA). This project has been carried out by a task force of governmental rapporteurs with the Netherlands as lead country. The focus of the work of the task force was the practical experience of ECE member countries with the application of EIA for major civil works projects, in particular, highways and dams.

The purpose of the work was to gain insight into the way the EIA process works in practice, what points are addressed and how they are addressed in different EIA systems with their differing legal and institutional settings. To that end, a comparative case-study analysis was carried out. Eleven cases were provided by the participants for analysis: six on highways and five on dams.

The case-study material has shown how in 11 individual cases environmental aspects were taken into account in the decision-making process. In order to be able properly to analyse the case-study material, it became necessary to also gather information on the national legal/administrative systems for EIA especially of those countries providing case-studies.

The final report of the task force consists of five parts: this introduction which outlines the mandate of the task force; part one which gives the historical background of the work of the task force and describes the procedures employed while offering suggestions for further activities; part two which describes the national legal/administrative systems for EIA of those countries providing case-studies; part three which contains summary descriptions of the case-studies and part four setting out the results and conclusions of the analysis of the case-study information as well as the recommendations based on that analysis. Annex II gives information on national legal/administrative systems for EIA provided by delegations which did not present a case-study. Annex I contains the case-studies themselves.

Part one

BACKGROUND

The work of the task force established under the auspices of the Senior Advisers to ECE Governments on Environmental Problems had its beginnings in 1979. In September of that year, ECE convened a seminar on environmental impact assessment in Villach (Austria). Representatives of 24 ECE member countries and 7 international organizations participated. The Villach Seminar addressed a number of topics, including:

- (a) Methodologies and techniques for environmental impact assessment;
- (b) Integration of environmental considerations into the planning and decision-making process;
- (c) Public information and participation; and
- (d) Environmental impact assessment as an instrument for handling transboundary problems.

In addition to agreeing on a number of general conclusions and recommendations, the report of the Villach Seminar contained three recommendations directed to the member States regarding future EIA development. Specifically:

- (a) Each member country should prepare and send to the ECE secretariat a document describing its EIA process (if any), including information on how it is structured and implemented;
- (b) The Senior Advisers should decide to collect and analyse that information for the purpose of providing reference material to countries considering the application of EIA procedures; and
- (c) Each member country should give early consideration to the adoption of an EIA process by legislative or administrative means.

As a result of the Villach Seminar and acting on its recommendations, the Senior Advisers held a policy debate on environmental impact assessment at their ninth session in February 1981. This debate and follow-up considerations resulted in the establishment of the Group of Experts on Environmental Impact Assessment.

The Group met for the first time in Geneva in November 1982 to formulate a programme of work. It included activities related to:

- Frameworks and methodologies for EIA;
- Transboundary aspects of EIA;
- The use of EIA in various sectors of the economy; and
- Economic assessment of environmental damage.

The proposal for the task force on the "Application of EIA" was submitted by the Netherlands to the first session of the Group of Experts. It was revised on the basis of comments and proposals made by the Group of Experts, then submitted to the Senior Advisers to ECE Governments on Environmental Problems who approved the proposal in February 1983.

This proposal contained a description of the aims of the task force. In the ECE region practical experience had been gained with different types of EIA systems. Research had been or was being carried out on methodological, technical, institutional and procedural aspects. Progress had been made but also failures recorded. The proposal had thus been formulated so as to profit from practical experience.

Some ECE member countries were interested in introducing a system of environmental impact assessment (EIA). In order to provide them with information about the experience and knowledge already gained in other ECE member States and in order to facilitate an exchange of practical experience among countries that already had a system of EIA, a case-study analysis by a task force of government rapporteurs and experts was deemed to have significant value. In carrying out this work, the task force has made a direct contribution to the Villach meeting's request for information and help both for those countries contemplating the introduction of EIA as well as for those interested in improving their present systems.

The work of the task force has also complemented the project on "Frameworks and methodology of EIA", being carried out by the Group of Experts. The latter is concerned with the theoretical aspects of a range of EIA topics while the task force has dealt with experience related to their actual application.

The 1st meeting of the task force took place in The Hague (Netherlands) in June 1983. Government rapporteurs and experts from the following countries participated: Belgium, Canada, Finland, Federal Republic of Germany, Netherlands, Norway, Portugal, Sweden and the United States of America. Representatives of the following international organizations took part: United Nations Environment Programme (UNEP), European Economic Community (EEC) and Organisation for Economic Co-operation and Development (OECD). Although unable to attend, delegations from France, Italy and Switzerland expressed interest in the work of the task force and a willingness to co-operate.

Participants at the 1st meeting took the opportunity to exchange information on practical experience and referred to specific case-studies on the application of EIA to major activities in their respective countries. In particular, EIAs for programmes and projects in the areas of harbour dredging, infrastructural works, coastal zone management and water supply were presented and discussed.

In deciding on the scope of further work, the task force agreed to study the following kinds of projects: waste water treatment; hydroelectric power; highways; harbour dredging; and water supply. The decision was made to study selected cases of certain types of projects.

The participants at the 1st meeting also agreed on a method of work. It was decided that the lead country would play a co-ordinating role and, through extensive questionnaires and interviews, work closely with task force

participants on the preparation of well-documented and comparable case-studies. In order to structure the case-study information, a questionnaire was drafted for discussion at the 1st meeting and agreed upon by participants. The questionnaire consisted of questions relative to the national, legal and administrative setting of EIA and a section dealing with case-specific information.

The task force met a second time, in Geneva in November 1983. Government rapporteurs and experts from Bulgaria, Canada, Finland, German Democratic Republic, Federal Republic of Germany, Netherlands, Norway, Portugal, Switzerland and the United States of America participated. A representative from UNEP also attended. Regrets were conveyed by Hungary and the USSR which had not been able to attend the meeting, although both countries expressed interest in the work of the task force. At the 2nd meeting attention was paid to the input of task force participants concerning the national legal/administrative settings for EIA. Discussion also took place regarding potential case-studies to be undertaken. It was decided to focus on the application of EIA to highways and dams. Participants agreed to transmit specific case-study information to the lead country.

Thought was also given to the way in which the case-study material should be analysed. Two possible approaches to international or cross-national comparative studies were discussed. One was the explorative "state-of-the-art" approach, aimed at producing a general survey on how different countries under different conditions dealt with similar situations. This type of research is mainly descriptive. Another was the comparative analysis approach which aims at determining some basic features responsible for success or failure of a given EIA. The task force decided to use both approaches in its work.

The 3rd meeting of the task force took place in The Hague (Netherlands) in June 1984. Government rapporteurs and experts from Belgium, Canada, Finland, Federal Republic of Germany, Netherlands, Norway, Portugal, Switzerland, United Kingdom and the United States of America participated. A representative from UNEP also attended. Hungary and the USSR expressed regrets that they had not been in a position to send experts but were interested in the outcome of the meeting.

At the 3rd meeting the discussion was devoted primarily to the draft highway and dam case-study descriptions which had been prepared. It became clear that although there was already a rich variety of practical experience, the case-study information had to be expanded in order to be able to compare and analyse it or formulate conclusions and recommendations. The missing information was gathered by interviews and written responses to additional case-specific questionnaires. The case-study descriptions, including the additional information, were presented to the participants at the 4th meeting.

The 4th meeting of the task force took place in Geneva in January 1985. Government rapporteurs and experts from Belgium, Canada, Finland, Federal Republic of Germany, Netherlands, Norway, Portugal, United Kingdom and the USSR participated. The revised case-study descriptions were discussed. The main issue for discussion at the fourth session was a comparative summary of the case-study information by topic. The following items were discussed: initiation of the EIA process; responsibility for preparing the environmental impact statement (EIS); form and content requirements for the EIS;

description of the proposed project and alternatives; description of the existing environment; description of the impacts of the proposed project and the alternatives; review and public participation; the effect of the EIA on the decision, monitoring, time and cost aspects. It was decided to use this "comparison by topic" as the basis for conclusions and recommendations for approval at the 5th meeting of the task force.

The 5th and final meeting of the task force took place in The Hague in May 1985. Government rapporteurs and experts from Canada, Finland, Federal Republic of Germany, Italy, Netherlands, Norway, Portugal, United Kingdom and the United States of America participated. The main topic for discussion was the analysis of the case-study material as reflected in the working document for the 5th meeting. On the basis of the analysis, conclusions and recommendations were formulated which were unanimously agreed upon by the task force participants. They are meant to be of use to countries that already have a system of EIA as well as countries interested in establishing an EIA system.

The conclusions and recommendations relate to three aspects of environmental impact assessment. First, the EIA process (its initiation, responsibility for preparing the EIS, structure and format of the EIA process, review and public participation, monitoring, time and costs). Secondly, they relate to the content aspects of EIA (i.e. the specific environmental impacts analysed). Finally, they were formulated in relation to the link between the EIA and the decision-making process (i.e. the way in which EIA findings influence the decision to implement a project).

Part two

LEGAL/ADMINISTRATIVE SYSTEMS FOR ENVIRONMENTAL IMPACT ASSESSMENT

INTRODUCTION

Within the ECE region, EIA has been or is being introduced in a variety of forms; it is implemented in various procedural and institutional contexts and applied to a wide range of activities. Because EIA is not strictly a scientific or technical activity, the form it takes and the results it accomplishes are largely dependent on the particular national setting where implementation takes place. Indeed, EIA operates within an overall national, environmental, institutional framework with a corresponding administrative structure for implementation.

Thus, in order to analyse properly the case-study material, it was necessary to be informed about the national legal/administrative setting in the participating countries for assessing environmental impacts. Information on the national legal/administrative EIA systems of those participating countries that provided case-studies appears below. Some countries which did not provide such material nevertheless informed the task force of their legal/administrative system. Annex II contains that information.

I. CANADA

Environmental Impact Assessment has been formally part of federal Government planning in Canada since a 1973 Cabinet decision established the Environmental Assessment Review Process (EARP). This decision was amended in 1977 and a clause defining the role of the Minister of the Environment in this area was included in the Government Organization Act of 1979. In June 1984, pursuant to subsection 6 (2) of the Government Organization Act, guidelines drawn up by the Minister of the Environment for implementing federal policy on environmental assessment and review were approved. These guidelines set out the requirements and procedures of the federal Environmental Assessment and Review Process and the responsibilities of participants.

A. Field of application

The process applies to all federal departments and agencies in Canada and also applies to proprietary Crown Corporations and federal regulatory agencies as long as there is neither a legal impediment to such application nor a resulting duplication of responsibilities. Federal projects are considered to be those initiated by federal departments and agencies, those for which federal funds are solicited and those involving federal property. This definition includes projects that may originate outside the federal Government, but which involve a particular federal department through funding or property considerations.

B. Definition

The Government Organization Act of 1979 states that the Minister of the Environment:

"shall initiate, recommend and undertake programmes and co-ordinate programmes of the Government of Canada that are designed to ensure that new federal projects, programmes and activities are assessed early in the planning process for potential adverse effects on the quality of the natural environment and that a further review is carried out of those projects, programmes and activities that are found to have probable significant adverse effects and results thereof taken into account."

The "Guidelines respecting the implementation of the federal policy on environmental assessment and review" (1984) by the Minister of the Environment, state that:

"the Process (EARP) shall be a self-assessment process under which the initiating department 1/ shall, as early in the planning process as possible and before irrevocable decisions are taken, ensure that the environmental implications of all proposals for which it is the decision-making authority are fully considered and where the implications are significant, refer the proposal to the Minister (of the Environment) for public review by the Panel."

1/ Initiating department means any department that is, on behalf of the Government of Canada, the decision-making authority for a proposal.

C. Integration of EIA

The Federal Environmental Assessment Review Office (FEARO) administers EARP for the federal Minister of the Environment and is responsible for the conduct of formal public panel reviews. Each department is responsible for screening and initially assessing projects for their environmental impacts. Formal reviews conducted by panels provide independent advice which Ministers may use directly in decision-making while the self-assessment principle of EARP allows direct integration with existing decision-making procedures.

D. Participation in the EIA process

In the Canadian system, the following dramatis personae are involved in the EIA process in the way described:

(a) Initiator: a federal department or agency which intends to undertake or sponsor a project, programme or activity having potential environmental effects and which is thus required to take appropriate action according to federal environmental policy. The initiator is responsible for screening and for making the initial environmental evaluation (IEE). If the environmental impacts are considered significant, it is the responsibility of the initiating department to refer the project to the Minister of the Environment for a formal review by an independent panel. FEARO may provide

advice on matters related to the review process; Environment Canada (the Ministry) and other agencies may provide advice on technical matters at the screening and IEE stage;

(b) Proponent: a federal department, a company, province or other organization which intends to undertake a project, programme or activity having potential environmental effects. The proponent is responsible for the preparation of studies, IEEs or EISs to be submitted to the initiator in the case of the IEE and to the panel in the case of the formal review. When the proponent is not a federal agency, its project is referred for formal review through the initiator. Government agencies with jurisdiction in particular areas participate at different stages of environmental assessment. They assist in gathering base-line information; they review material in the course of a formal review and provide advice to independent panels. They may also be responsible for implementing panel recommendations;

(c) Review agency: once a project has been referred to the Minister of the Environment for a formal review, the Minister appoints an independent panel of experts and issues terms of reference to guide them in the conduct of the review. Panels may issue guidelines to the proponent for the preparation of an EIS. In most instances, guidelines are issued and in so doing panels seek input from government agencies, public interest groups and the general public prior to their compilation. Once the EIS has been prepared by the proponent, the panel makes it public and invites comments from participants in the review. Upon receipt and examination of those comments, the panel decides whether it will issue a list of deficiencies or call public meetings.

At this stage public input takes one of two forms: written submissions to the panel; or formal public meetings held by the panel.

Once the review is completed, the panel reports to the Minister of the Environment and the initiating department recommending that the project: (a) be allowed to proceed as proposed; (b) proceed subject to certain conditions; or (c) not be allowed to proceed.

The panels often retain the services of independent advisers to assist them and other participants in the review with comments on the proponent's EIS. These advisers are selected for their expertise on issues of major concern in the review. The public is involved from the start of the formal review. Public input is solicited at the guideline stage, the EIS review stage and the public meetings' stage. All the information made available to the panel is in turn made available to the public.

E. Type of documentation

In order to assist in screening their activities, some agencies prepare an Initial Environmental Evaluation (IEE). The IEE is a documented assessment of an intended activity prepared to help determine whether potentially significant environmental impacts might occur.

When a project is determined to have potentially significant environmental effects, an Environmental Impact Statement (EIS) is prepared. The EIS is a documented assessment of the environmental consequences of an intended activity. It is prepared by the initiator/proponent generally in

accordance with guidelines established by the panel undertaking the EIS review. EISs are usually supported by studies directly related to issues of major concern; those studies and results are then summarized in the EIS.

F. Responsibility for the preparation of EIS

The proponent is responsible for the preparation of the EIS. In so doing, the proponent may draw upon a considerable number of sources, such as regulatory agencies, consultants and sometimes the initiating department.

G. Content requirements

The exact requirements for the content of any particular EIS depend upon the guidelines issued by the panel. There is some variation depending on the terms of reference and the particular case under review.

A typical project may include:

- Overview summary;
- Project setting:
 - project rationale;
 - alternatives;
 - interrelationship with other proposals and projects;
- Description of the proposed activity;
- Description of the existing environment;
- Environmental impacts and mitigating measures;
- Residual impacts and monitoring.

H. Procedural steps

Once a proposal has been screened or initially assessed for its environmental impact, and the initiator has decided to refer the project to a formal public review under EARP, the process is started by the letter of referral from the initiator to the Minister of the Environment.

- The Minister of the Environment then formally announces that the project has been referred to the Ministry. He or she then issues terms of reference to an independent panel of experts appointed by the Minister.
- The panel generally prepares draft guidelines which are publicly reviewed, finalized and issued to the proponent. The proponent prepares the EIS in accordance with the panel guidelines.

- Upon submission of the EIS, the panel makes the EIS public and invites comments on it. If, after review of the EIS, the panel is satisfied with the information received, public meetings are called to discuss issues of major concern; if not, the panel issues a list of deficiencies to the proponent.
- After public meetings, the panel prepares a report to the Minister of the Environment and the Minister of the initiating department.
- The Ministers are required to make the report public. The Minister of the initiating department, in co-operation with any other agency to whom the recommendations of the panel have been directed, is required to indicate the extent to which the recommendations should become a prerequisite to authorizing commencement of the proposal.
- Monitoring is the responsibility of regulatory agencies, but FEARO is responsible for informing the Minister periodically about implementation of the process by initiating departments.

I. (Environmental) aspects covered

Items such as water, soil, air, animals and plants are an integral part of the natural environment and are included as appropriate in the EIS.

Recent practice has been to focus on ecosystems of particular significance rather than cataloguing all components. The social consequences of environmental impacts are included together (when appropriate) with broader socio-economic issues. Aesthetic, natural and cultural-historical values are also incorporated.

II. FINLAND

Finland does not have a general legal requirement for EIA. While there are several acts regulating activities affecting the environment, they do have some limitations. For example, stipulations included in the various acts regarding the quality of the information to be acquired, its method of presentation, requests for submission, public participation and the use of information vary. Moreover, as several authorities handle the information and make the decisions, the required data do not yield a comprehensive picture of the possible environmental effects of an activity.

The need to introduce EIA into the planning and decision-making process in Finland was studied for the first time in 1981 by a working group appointed by the Ministry of the Interior. In the opinion of the working group, EIA should be included in the various levels of planning and decision-making, from the drafting of legislation to project planning.

The working group considered the examination of alternatives and the assessment of their effects a matter of particular importance. Monitoring was also believed to constitute a fundamental part of the assessment procedure. Furthermore, the working group emphasized the importance of public participation in the early planning phases. Accordingly EIA should cover, in addition to effects on the physical environment, the impacts on citizens and their living conditions as well.

Owing to the comprehensive approach of the working group, the proposals tended to be of a rather general nature and many of them called for further investigations and studies. According to the Decree of the Ministry of the Environment (established in 1983) the general development of EIA is the task of the Environmental Protection and Nature Conservation Department of that Ministry. Further studies had already started concerning the field of application of EIA and possible EIA procedures and methods. A comprehensive research programme on EIA was also under preparation. In addition, development co-operation authorities, water authorities and highway authorities were preparing guidelines for including EIA in their planning procedures.

In the meantime, a number of acts had established regulations for taking environmental aspects into consideration as well as for assessing environmental effects of certain activities. Various projects which might have adverse impacts on the environment required licensing by authorities or, in the case of many water management projects, by the water court. Environmental impacts were also studied during the planning of infrastructural works in order to get an approval by the competent authority. In addition, environmental aspects had been taken into account at all three land-use planning levels, namely regional, municipal and detailed planning levels.

A. Participation in the "EIA" process

In the case of licensing procedures, the following persons and authorities are involved:

- The proponent of the project, who must include certain environmental information in his or her application;
- The competent authority who is responsible for deciding on the application;
- Other authorities whose scope of duties is affected (e.g. building authorities; water authorities; public health authorities), who may comment on the project;
- Expert advisers and consultants;
- The public, who may comment on, and raise objections to, the project, and if their rights are affected bring the decision taken by the authority before the courts at a later stage.

Those involved in the preparation of land-use plans comprise the competent authority, planning authorities, other State and municipal authorities, inhabitants in the planning area, especially the land-owners, and also non-governmental organizations. Consultants are often used. The public has the opportunity to comment on the plans in several planning phases. The parties involved in the planning of infrastructural works such as roads and highways follow a similar pattern.

B. Responsibility for the preparation of the "EIS"

No separate document is required. The information on environmental aspects and impacts is usually incorporated into planning documents or into

the application for a licence. In the case of licensing procedures, it is the proponent who has to carry out the environmental studies. In the case of road planning and water-resources management planning, i.e. sectoral planning, which is the task of roads and water-ways authorities and water authorities, the authorities act both as proponents and competent authorities.

C. Procedural steps

The procedural steps in the licensing procedures vary according to the licence in question. In general, either the notification to the competent authority of the intent to start an activity or the application for the licence initiates the procedure. The competent authority invites comments from other authorities and parties concerned. The public may also comment. Monitoring requirements are often included in licences.

D. Content requirement

The requirements concerning the information that must be included in the application for a licence vary to some extent, depending on the licence. In general, the following information is required:

- Purpose of the project;
- Description of the proposed activity and the manner in which it is to be carried out;
- Description of the effects on the environment if the proposed activity takes place;
- Description of mitigation measures;
- A proposal for a monitoring programme.

If deemed necessary, the competent authority may also require additional information from the proponent.

E. Environmental aspects covered

In the licensing and plan-approval procedures, the following aspects are usually taken into account: water, soil, air, humankind, animals, plants, inanimate objects, aesthetic values, natural and cultural historical values, and socio-economic aspects. The extent to which these aspects are studied varies according to the type of activity and the relevant legislation.

III. GERMANY, FEDERAL REPUBLIC OF

In the Federal Republic of Germany there is no legislation explicitly requiring a comprehensive, detailed and formalized EIA. However, in 1975 a federal Government resolution stipulated that all "public measures" (e.g. drafts of new laws, rules, regulations, administrative instructions, contracts, plans, programmes, and similar acts) by federal authorities must be subjected to EIA, unless special provisions for environmental protection were applied. This EIA should be carried out by the competent authority itself. Similar resolutions have been adopted for their authorities by several Länder (provinces).

The fact that the Federal Republic of Germany has not, to date, established a general, formal EIA system does not mean that the environmental impact of activities is not taken into account in the decision-making process. The country has provided information on the present (environmental) legislation requiring official licences or approvals. These are based on some kind of EIA for activities with significant impact on the environment.

According to environmental legislation in the Federal Republic of Germany, many activities require an official licence or a similar decision by an authority based on some type of assessment of environmental impact. There are various procedures for these decisions but the most important are:

(a) Formal procedures for licensing a large number of industrial plants, certain water uses, and nuclear power stations. In these procedures, other authorities whose range of competences is affected may participate along with the public concerned;

(b) Plan approvals, in which the plans of certain activities are formally adopted by the competent authority. These comprehensive procedures - in which all other authorities as well as private persons can take part if they are affected - are required for infrastructural works such as motorways, railway lines, waterways, harbours, airports, waste processing plants, and others.

In addition to licensing procedures, there exists in nearly all of the Länder a formalized regional planning procedure which aims at ascertaining whether a certain activity (e.g. a long-distance electric power line, a highway, or a larger power plant) is compatible with regional planning objectives. In this procedure, which takes into account, inter alia, the environmental consequences of the activity in question, all authorities and planning agencies concerned are involved, but no private persons may take part. It does not replace any licensing or similar decision by an authority, but aims at preparing for those decisions..

A. Participation in the EIA process

In the case of licensing and plan-approval procedures, the following persons and authorities are involved in the "EIA" process:

- The proponent of the project who has to supply certain information along with his or her application for a licence or a plan approval decision;
- The competent authority responsible for deciding on the application;
- Other authorities whose scope of duties is involved (e.g. building authorities; water authorities) may comment on the project;
- Expert advisers, if required;
- The public (in plan-approval procedures and certain other formal procedures, the persons directly affected) which may raise objections to the project, and which at a later stage if their rights are affected may bring into question before the courts the decision taken by the authority.

In the case of regional planning procedures, the following authorities and agencies take part:

- The regional planning authority responsible for the procedure;
- Other authorities and planning agencies concerned which may comment on the activity in question.

B. Responsibility for the preparation of the "EIS"

None of the procedures mentioned above requires a separate EIA document. However, in the formal licensing and plan approval procedures, the proponent of the project has to submit extensive information which could be seen as the basis of an "EIS". Furthermore, the licensing or plan approval decision by the competent authority will contain reasons for the action taken and in this context will provide a kind of EIS. The final report under the regional planning procedure also includes such a statement.

C. Content requirements

As no separate EIA document is required in any of the procedures mentioned above, the question of content does not apply in this case. For example, in the formal licensing procedure under the Federal Immissions Control Act, the proponent of a project has to submit at least the following items:

- A description of the proposed activity and its effects such as kind, amount and sources of emissions;
- (If specifically required by the licensing authority) a description of the existing state of the environment and its expected development (if the proposed activity does not take place);
- (If specifically required by the licensing authority) a description of the consequences for the environment if the proposed activity does take place;
- A summary;
- Other items - proposed measures to protect the environment;
 - proposed measures to protect the public and neighbourhood from danger; significant impediments and interferences;
- Measures to recycle or dispose of waste;
- Industrial safety measures.

The authority may require such additional information from the proponent as it deems necessary for a decision. It is also entitled to obtain information elsewhere, ex officio, if necessary. Furthermore, the proponent may have to submit updated information after the licence has been granted.

There are similar requirements for the other licensing authorities and for plan approval procedures.

D. Procedural steps

The formal licensing and plan approval procedures contain the following steps:

- A formal start to the procedure (application/submission of the plan/public announcement);
- Public participation;
- Monitoring (as required by the applicable laws).

However, no separate and formalized EIA is required in the Federal Republic of Germany and so these steps do not refer to any particular (separate) EIA process.

E. Environmental aspects covered

In the procedures mentioned above, the following aspects are taken into consideration (although not all to the same degree):

- Water;
- Soil;
- Air;
- Human kind;
- Animals;
- Plants;
- Inanimate objects;
- Relationships between these objects (ecosystems, cycles, interactions);
- Natural and cultural/historical values (landscape, monuments).

Not specifically included are: aesthetic values and social, economic aspects (except recreation).

IV. NETHERLANDS

The Netherlands did not at the time of writing have a general legal requirement for EIA. However draft legislation on EIA was under discussion in Parliament. This legislation was approved by Parliament in May 1986.

A. Field of application

Under the legislation, EIA will be mandatory for specific decisions on certain types of activities. These decisions and activities will be listed in

a General Administrative Order based on the law. The list will contain, among other elements, the project types considered by the task force (taking into account certain thresholds).

B. Definition

In the explanatory note (not in the bill itself) the following description of EIA was given:

"EIA must be seen as an aid to planning and decision-making. This aid consists of the compilation, review and application of an Environmental Impact Statement (EIS) and of subsequent monitoring of the implementation of a decision, taking into account a number of procedural principles".

An EIS has been described as follows:

"An EIS is a public document, describing in a systematic manner the expected environmental consequences of a proposed action and of alternatives that can be reasonably considered at that stage. It is compiled to assist in making a decision on the action concerned".

C. Institutional setting

No special agency is charged with responsibilities for an EIA as far as the compilation of the EIS or the decision-making is concerned.

A review board consisting of independent experts (EIA Commission) will be given the opportunity to review the EIS as well as to be involved in the scoping process preceding the compilation of the EIS. This review board has already been established by virtue of the draft legislation.

D. Integration

The compilation, review, public participation and application of the EIS and the subsequent monitoring of the environmental consequences of the implementation of the decision will be integrated as much as possible into the planning and decision-making process.

E. Participation in the EIA process

The EIA legislation in the Netherlands states that the proponent of an activity having serious environmental consequences would prepare the EIS. The proponent may employ consultants or research institutes to help in this task.

The essential feature of the legislation is that the competent authority may not take a decision on an activity which might possibly have serious environmental effects until an EIS has been compiled and dealt with in accordance with the rules.

The competent authority must give guidelines to the proponent regarding the desired content of the EIS. Even if the authorities themselves are the proponent, such guidelines must be produced. In such a case, these guidelines would be intended for internal use within the authority's organization.

The competent authority is not allowed to prepare guidelines without consulting others. For example, advisers, the EIA Commission and the public must be given a chance to present their ideas on the content of the EIS. After the EIS has been prepared, the competent authority first reviews it to determine whether the EIS is complete and correct.

If the authority as proponent has prepared the EIS, the first review of the EIS will primarily concern its quality. In the final analysis, the competent authority decides on the activity in question, taking into account the results of the EIS. In so deciding, the competent authority will also have to indicate when and how the actual events that occur during or after implementation (monitoring) will be investigated.

Review agency: the EIA Commission will be involved in the scoping process preceding the compilation of the EIS as well as in the review of the EIS itself. The "Advisers" (government agencies already involved as advisory agencies in the planning and decision-making process) will also be involved in the scoping process as well as in the review of the EIS. The public will be involved in the scoping process as well as in the review of the completed EIS.

F. Procedural steps

According to the legislation, the EIA process will proceed as follows:

- Formal start of the EIA process, i.e. announcement of intent to prepare an EIS;
- Scoping, resulting in the formulation of specific guidelines for preparing an EIS;
- Preparation of the EIS by the proponent;
- Review of the EIS by the EIA Commission;
- Public participation;
- Decision;
- Monitoring.

G. Content requirements

The EIA legislation sets the following minimum requirements for an EIS:

- (a) An environmental impact statement shall contain as a minimum:
 - (i) a description of the purpose of the proposed activity;
 - (ii) a description of the proposed activity and the manner in which it is to be carried out, together with any alternatives which should reasonably be considered;

- (iii) an indication of the decisions for purposes of which the environmental impact statement is being prepared and a survey of any earlier decisions by government agencies having a bearing on the proposed activity and the alternatives described;
- (iv) in so far as the proposed activity or the alternatives described may affect the environment, a description of the existing state of the environment as well as its predicted development in the event that neither the activity nor the alternatives would be carried out;
- (v) a description of the effects on the environment which the proposed activity and the alternatives described, respectively, may have, together with justification of the manner in which such effects have been determined and described;
- (vi) a comparison between the predicted development as described at (iv) and the described environmental effects of the proposed activity and each of the alternatives considered;
- (vii) a survey of points omitted in the description given at (iv) and (v) owing to the lack of necessary information;
- (viii) a summary giving the lay person sufficient insight in order to review the environmental impact statement and the effects described therein of the proposed activity and the alternatives described;

(b) The alternatives described pursuant to subsection (a) (ii) above shall in all cases include the alternative offering the best prospects of protecting the environment;

(c) The manner in which the data referred to in subsection (a) are to be determined and described may be regulated by General Administrative Order.

H. Environmental aspects covered

The following impacts might be considered in an EIS: the direct, indirect, secondary, cumulative and synergistic consequences for the physical environment of the EIA obligatory activity, both owing to pollution as a result of physical actions and from an overly intensive use. The term physical environment covers water, soil, air, humankind, animals, plants and inanimate objects. EIA will also have to take into consideration the consequences for the relationships between these objects (ecosystems, cycles and interactions) and for the aesthetic, natural and cultural historical values (nature, landscape and monuments). With regard to the consequences for mankind, both the physical and the psychological consequences must be taken into account.

V. NORWAY

Although sectoral legislation (i.e. Water Regulations Act, Highway Act) contains EIA provisions, Norway does not yet have a general legal requirement for EIA. Legislation, however, has been debated and has been under preparation for several years. A proposal for an EIA bill was prepared by the Planning Act Commission. It stated that, as a part of the planning process of certain major projects, an impact assessment must be carried out to ensure that consequences for the local community, natural resources and the natural environment were presented and evaluated in an adequate manner.

In a planning act proposal presented to the Parliament in 1985, the Ministry of Environment commented on the proposed EIA requirements from the Planning Act Commission. The Ministry had decided not to present these requirements as part of the new legislation, referring to objections and comments from other ministries and organizations. The Ministry stated that a revised planning and building act should contain general requirements for impact assessments. However, the reactions to the Commission's proposal indicated that more simplified procedures would have to be explored. In addition, there seemed to be a need for further studies of the relations with existing legislation. With these reservations, the Commission's proposal is hereby presented.

A. Field of application

The Commission's proposal contains a short list of major projects which should be subject to the EIA process in Norway:

(a) Construction, significant expansion or altered use of sizeable buildings and works for the purpose of utilization in the private and public sectors, such as industrial and oil activities with related transport systems, quarries, public transport, facilities and projects for the public and private service sectors;

(b) Opening or expansion of major activities which involve significantly altered use of areas, such as military shooting ranges, extraction of gravel and turf, etc., new agricultural cultivation and forest planting.

It is assumed that it will be necessary to make further provisions regarding the nature and size of projects for which impact assessments will be required.

B. Definition(s)

The Commission's proposal contains the following description: "As a part of the planning process of major projects ... which may have extensive consequences for the local community, natural resources and the natural environment, an impact analysis shall be carried out to ensure that such consequences are presented and evaluated in an adequate manner".

C. Institutional setting

No special agency will be charged with general EIA responsibilities but the Norwegian Ministry of Environment is responsible for the implementation of the EIA system.

D. Integration

EIA is meant to be integrated into the existing planning and decision-making processes and the existing EIA requirements following sectoral regulations.

E. Participation in the EIA

EIA will deal with both public and private projects. The proponent of both public and private projects will have to prepare the EIS following project specific guidelines from the initiating ministry (competent authority). The competent authority will co-operate with the Ministry of Environment and other authorities involved at the national, regional and local levels, etc. The competent authority will conduct a public review including a public hearing. The hearing may include special advisers.

F. Procedural steps

A formal start is required including a project description and preliminary impact study (announcement).

Scoping will take place based on the preliminary information from the announcement. Scoping ends with the issuing of specific guidelines by the competent authority.

The proponent will prepare a draft EIS subject to review by affected authorities. Amendments will be included before public review.

Following public review, the competent authority decides whether the EIS fulfils the requirements of the Planning Act. Monitoring is not explicitly covered by the EIA requirements but should be considered as a part of the terms for implementing the project.

G. Environmental aspects covered

The impact assessment should, to the extent necessary, include the following aspects:

- (a) Consequences for the natural environment;
- (b) Consequences for the welfare of the population;
- (c) Consequences for other economic and industrial activities and for the public sector;
- (d) Specific consequences as described in items (a) to (c) during the construction phase.

The assessment should outline possible alternatives and measures intended to avert damage and drawbacks. Further guidelines in Norway concern how, and to what extent, different consequences should be evaluated.

VI. UNITED STATES OF AMERICA

In the United States, EIA is based on a legal requirement. The National Environmental Policy Act (NEPA) of 1969, Executive Orders and Regulations (1978) of the Council on Environmental Quality (CEQ) form the basis for EIA.

A. Field of application

EIA is mandatory for every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment. Environmental assessment allows for compliance with NEPA without the filing of an Environmental Impact Statement (EIS) for actions which will have no significant impact on the human environment.

B. Definition

NEPA, section 102 (2) c, states that for those activities significantly affecting the quality of the human environment, the responsible official will have to make a detailed statement on:

- The environmental impact of the proposed action;
- Any adverse environmental effect which cannot be avoided should the proposal be implemented;
- Alternatives to the proposed action;
- The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and
- Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

THE CEQ regulations state:

"1508.9 Environmental Assessment:

(a) means a concise public document for which a federal agency is responsible that serves to:

- (1) briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact;
- (2) aid an Agency's compliance with the act when no environmental impact statement is necessary;
- (3) facilitate preparation of a statement when one is necessary;

(b) shall include brief discussions of the need for the proposal, of alternatives as required by sec. 102 (2) (E), of the environmental impacts of the proposed action and alternatives and a listing of agencies and persons consulted."

"1508.11 Environmental Impact Statement:

'Environmental Impact Statement' means a detailed written statement as required by sec. 102 (2) c of the Act."

C. Institutional setting

The President's CEQ is responsible for overseeing the implementation of NEPA. The United States Environmental Protection Agency (EPA) is substituted for the CEQ as a filing point for EISs because of a parallel function under the Clean Air Act.

D. Integration of EIA

EIA is integrated into the decision-making process.

E. Participation in the EIA process

The following description of the EIA process established by the CEQ regulations provides background for understanding how NEPA is integrated into an agency's decision-making process and who is involved.

F. Procedural steps

An agency begins by considering whether or not to take an action. The action may be generated by a federal agency or by an applicant for federal permits, funds, grants, etc. If the action under consideration may affect the environment, the agency must prepare an "environmental assessment" at approximately the same time as it would prepare any other feasibility analysis (technical, economic, legal, etc.). If the assessment shows that the environmental effects may be "significant", the agency is required to prepare an EIS. If not, the agency makes a "finding of no significant impact" available to the public and uses the assessment internally to consider the alternatives and their impacts and how best to proceed.

If an EIS is required, the agency issues a "notice of intent" to prepare a statement and announces the commencement of the "scoping" process. All affected levels of Government and interested members of the public are invited to participate in the "scoping" process which may include one or more public meetings. Among the critical matters to sort out at this stage are how to address project requirement questions, what would be the reasonable alternatives, what are the major impacts and how to proceed when information is deficient.

With the benefit of co-operation among other agencies, the "lead" 1/ agency prepares a draft EIS which is filed with the Environmental Protection Agency and circulated to federal, State and local agencies and the public for comment. After revising the draft, the agency files and circulates a final EIS prior to taking a decision. Concerned parties are given the opportunity to evaluate the agency's response to their comments and to raise any serious

issues. The head of one agency also has the possibility of referring the proposal of another agency to CEQ as being "unsatisfactory from the standpoint of public health or welfare or environmental quality". CEQ then reviews the proposal and seeks to resolve the inter-agency dispute.

When a decision is made, the lead agency makes available a formal "record of decision" which explains the decision, states any mitigating and monitoring measures to be taken, identifies the environmentally preferable alternative(s) and explains what considerations were weighed by the agency in reaching its decisions.

G. Responsibility for the preparation of the EIS

The lead agency is responsible for preparing the EIS. Assistance is obtained from consultants and other knowledgeable agencies. For a regulatory EIS, assistance and data are supplied by the applicant as well as by consultants. Assistance may also be obtained from other federal agencies through their status as co-operating agencies.

H. Content requirements

In the United States, the format and content of an EIS is specified by regulation. Agencies must use a format for environmental impact statements which will encourage good analysis and clear presentation of the alternatives including the proposed action. The following standard format for environmental impact statements should be followed:

- (a) Cover sheet;
- (b) Summary;
- (c) Table of contents;
- (d) Purpose of, and need for, action;
- (e) Alternatives, including proposed action;
- (f) Affected environment;
- (g) Environmental consequences;
- (h) List of preparers;
- (i) List of agencies, organizations, and persons to whom copies of the statement are sent;
- (j) Index;
- (k) Appendices (if any).

I. (Environmental) aspects covered

The scope of the EIS may vary greatly depending on the input from the scoping meetings. These meetings and input from federal, State and local agencies identify the important concerns and as such they determine the scope and, to some extent, the content of the EIS.

The CEQ regulations in this regard state that: "Effects include ecological (such as the effects on natural resources and on the components, structures and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social or health whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial".

Part three

SUMMARY DESCRIPTION OF THE CASE STUDIES

INTRODUCTION

As pointed out in the previous part, environmental impact assessment (EIA) has been introduced in a variety of forms in different procedural and institutional contexts within the ECE region. In order to understand and analyse case study material from such different contexts, it is necessary to be familiar with the various national settings for EIA.

No two countries have adopted EIA in exactly the same way. Nevertheless it is assumed that there are certain attributes or elements associated with EIA (as it is broadly understood) which come into play regardless of the particular national setting in which they function. In other words certain elements of EIA (institutional, procedural, methodological) appear to be essential for its successful implementation. In order to be able to identify those elements and make informed judgements about their usefulness and importance, the following case studies have been analysed:

Highways:	Banff Highway	-	Canada
	Highway 5	-	Finland
	Wiesbaden By-pass	-	Federal Republic of Germany
	Highway 69	-	the Netherlands
	Highway E-18	-	Norway
	Franconia Notch Highway	-	United States of America
Dams:	Lower Churchill hydroelectric power project	-	Canada
	Vuotos Reservoir	-	Finland
	Ernstbach Dam	-	Federal Republic of Germany
	Kobbelv Hydro Power Project	-	Norway
	Wheeling Creek Dam	-	United States of America

The summaries given below of the case studies briefly depict the projects, their settings and the major environmental issues associated with them. The case studies themselves are presented in Annex I.

In the following part a comparative analysis of the case study information has been attempted. The major EIA issues or topics addressed are analysed then followed by conclusions and recommendations.

I. HIGHWAYS

Banff Highway (Canada)

This project provides an example of the application of EIA to an infrastructure project in a particularly ecologically sensitive area. Proposals to expand the existing two-lane Trans-Canada Highway to a four-lane limited access highway within the boundaries of Canada's best known park were reviewed extensively with public consultation. Environmental and other interest groups raised issues of energy conservation and multi-jurisdictional responsibilities which were addressed in reports completed by an independent expert panel. Particular emphasis was placed on consideration of such matters as the need for the project, possible alternatives, park planning, social considerations as well as the particular environmental impact of the project. Special mitigation measures were proposed to deal with impacts on mountain sheep, fish and other wildlife found in the area. Innovative design and special attention to aesthetic factors were expected to minimize the impact on sensitive habitats. Construction was underway at the time of writing.

Highway 5 between Vuorela and Siilinjärvi (Finland)

Planning of the part of Highway 5 between Vuorela-Siilinjärvi in central Finland started as early as 1964. After various phases, a localization plan was drawn up by the National Board of Roads and Waterways (NBRW) in 1982. Three alternatives were studied: repair of the existing highway; or construction of a new highway either (a) to the west or (b) to the east of the old highway. The localization plan included a description of the environmental impacts (nature protection, water protection, landscape, noise) of the three alternatives. In order to compare the environmental effects, a working group was formed by the NBRW. The Roads and Waterways District of Kuopio, the Regional Planning Association of Pohjois-Savo, the provincial government of Kuopio and the municipality of Siilinjärvi were represented in the working group. The plan was sent for comment to the provincial government, the Regional Planning Association, the Water District, the municipality of Siilinjärvi, the Ministry of the Interior, the Ministry of Agriculture and Forestry, the National Board of Railways and the National Board of Aviation.

The NBRW could not make the decision on the basis of the comments, as most of them objected to the alternative preferred by the NBRW. The NBRW preferred the western alternative because of its lower costs and for technical reasons. The western alternative would, however, go through an esker 2/ area included in the National Esker Preservation Programme and an important recreational and ground-water area.

The Ministry of the Interior expressed as its opinion that, before making the decision on the localization alternatives, a more detailed study on the impacts to the esker area should be made. If the study revealed that problems with the landscape, recreation and ground-water protection could be solved, the Ministry would accept the western alternative.

On the basis of the statement of the Ministry of the Interior, the NBRW ordered three studies from experts (consultants). The studies were made from July through November 1983. One of them concentrated on ground-water protection, one on land-use and landscape and the third focused on the impacts on nature and on the geological value of the esker. The NBRW also formed a working group to supervise the studies. The group consisted of representatives from the Ministry of the Environment, the National Board of Waters, the NBRW, and the Roads and Waterways District. Four of the members were engineers and three were natural scientists. The three environmental studies were reviewed by the supervising group. In the short report by the group, it was concluded that no acceptable solution for the highway could be found in the area. However, on the basis of the comments on the three environmental studies, a new alternative was developed which was environmentally acceptable. The decision was taken to proceed with this new alternative in December 1984.

Wiesbaden By-pass (Federal Republic of Germany)

This project concerns the planning of a western by-pass for the city of Wiesbaden, the capital of the province of Hessen. The purpose of the by-pass would be to re-route north-south traffic, which presently traversed the city, around the western edge of Wiesbaden. In 1973, a preliminary traffic analysis was undertaken for the project. In 1976 the city fathers decided on the need for an overall look at the environmental consequences of building versus not-building the project. In 1978 the city of Wiesbaden commissioned two consultant firms to prepare jointly a study of both traffic and environmental consequences of the project. The study was to compare the alternatives of "by-pass" and "no by-pass" in a comprehensive way giving special attention to ecological impacts. The study did not follow any specific content requirements of existing planning procedures. As a decision to build the by-pass would meet "traffic goals" but not "ecological goals", the study recommended the construction of an improved by-pass which would minimize environmental impact. The city of Wiesbaden decided not to proceed with the project.

Routing of National Highway 69 Eindhoven-Valkenswaard-Belgian Border (the Netherlands)

In the years preceding the formulation of the draft legislation on EIA in the Netherlands (1977-1979), several so-called "trial runs" were sponsored by the Environment Ministry and carried out in order to gain experience with EIA that could be helpful for its formalized introduction. EIA was carried out on a voluntary basis following a procedure that was later (in slightly modified form) incorporated into the draft legislation (1981) currently under consideration in Parliament. One of these trial runs considered the routing of National Highway 69 (Eindhoven-Valkenswaard-Belgian border) (approximately 20 km). The National Highway Plan 1968 and the Plan for Future Traffic and Transport already contained the proposal for constructing a motorway from Eindhoven to Valkenswaard to the Belgian border. The (national) multi-year plan on passenger transport accorded high priority to this road.

Following the existing planning and decision-making procedure regarding highway planning, the Department of Public Works drafted a routing memorandum. It contained an extensive study into the various aspects connected with the construction of a national highway, such as: traffic; planning; the living environment; nature and landscape; agriculture; construction.

In 1977 the Minister for Health and Environmental Protection assigned two consulting firms to assist the Department of Public Works (proponent) in the environmental impact assessment (trial run) of the proposed extension of National Highway 69. It was decided to integrate the EIS into the routing memorandum. This means that the routing memorandum gave more attention to environmental aspects than it would have done without the EIA. Four alternative options were described in the EIS. After completion, the quality and adequacy of the EIS were reviewed by a Commission of independent experts.

As this EIA was only a "trial run" with no formal status, there was no formal public participation concerning the EIA. However, there was a possibility for the public to be informed and to comment on the EIS, which was published together with the routing memorandum. In December 1983, the Minister for Public Works decided on one of the options only as far as part of the highway was concerned. The road has not yet been built.

E-18 in Vestfold (Norway)

The planning and decision-making process for a new part of one of the main national roads in Norway was the subject of a study. Some 20 km of alternative corridors for highway E-18 were considered near Vestfold about 100 km south of Oslo on the western part of the Oslofjord. The road section under consideration would form part of the main connection between the cities.

The new section of the E-18 was intended to replace an existing two-lane road. Today the E-18 goes through a semi-urbanized area, with about 540 houses located less than 100 metres away. It also passes areas of prime agricultural land and areas of great historic interest. The average daily traffic is between 10,000 and 12,000 vehicles rising to about 20,000 in summer. The existing E-18 serves local, regional and national traffic and gives direct access to numerous individual houses.

In general the rationale for building the new section of highway E-18 was primarily to reduce accidents (on the average 20 police-reported accidents per year), to make a better environment for people living adjacent to the existing E-18, to reduce traffic flow disturbances and to increase the speed of long-distance (regional) motor traffic on the E-18. The planning process of this part of the E-18 started in the early 1970s after an extensive transport analysis of the county. In 1978 the decision was taken to carry out an EIA to be included in the road master plan. Three major alternatives and many sub-alternatives were considered. For a part of the proposed highway, Parliament decided. For a part of the highway a new round of road master planning was begun. The completed master plan/EIA document was to be presented in 1986.

Franconia Notch (United States of America)

The proposed project concerned construction of a highway to complete the Interstate Highway System in the White Mountains region of New Hampshire, a segment of 12 miles (or approximately 19.2 km). The New Hampshire Department of Public Works and Highways and the Federal Highway Administration proposed to complete Interstate route 93 in the White Mountains region by constructing a roadway through the Franconia Notch Corridor, one of the three corridors investigated in the draft EIS.

Following a detailed review of the draft EIS and the comments, opinions and public testimony received in the review period, the New Hampshire Department of Public Works and Highways made its corridor location decision. On the basis of transportation, cost and environmental factors, as well as widespread public opposition, the Bog Pond and Kinsman Notch Corridors were rejected and the New Hampshire Department of Public Works and Highways decided that, if anything were to be done to complete Interstate 93 through the White Mountains, it would be done in the Franconia Notch Corridor.

After first being rejected on environmental grounds, extensive negotiation went on with all interested (environmental) groups. In November 1977, a formal agreement was signed by all parties involved in the negotiations and the nature of the compromise Parkway concept was publicly announced. The New Hampshire Department of Public Works and Highways and the New Hampshire Division Office of the Federal Highway Administration agreed that the composite design concept would be an acceptable one upon which to complete the final EIS. The design concept was considered to provide an improvement in traffic service while maintaining the environmental/recreational integrity of the corridor and enhancing Franconia Notch State Park. The Parkway would incorporate advantages of each of the major alternatives for the Franconia Notch Corridor presented in the draft EIS and in fact represented a composite of four-lane interstate, four-lane parkway, three-lane parkway and two-lane parkway sections.

II. DAM PROJECTS

Lower Churchill Hydro Project (Canada)

In accordance with the Federal Environmental Assessment and Review Process (EARP) a review was completed of a proposal to develop the hydroelectric potential of the Lower Churchill River (building power generating stations on the Lower Churchill River and associated transmission lines across Newfoundland and Labrador).

The proponent of the project, the Lower Churchill Development Corporation (LCDC) is a crown corporation. The federal agency involved in funding the LCDC, the Department of Energy, Mines and Resources, had requested the review in accordance with its responsibilities under the federal EARP.

The Environmental Assessment Panel was requested to consider both the transmission lines component and potential power generating sites at Muskrat Falls and Gull Island. Environmental Impact Statements were completed

by the proponent in early 1980. After soliciting comments from government agencies and the public, the Panel held public meetings in seven communities in Newfoundland and Labrador during September 1980.

After consideration of all information received, the Panel reached a number of conclusions and formulated certain recommendations. The Panel found that the project could be acceptable, provided that certain environmental and socio-economic conditions were met. However, owing to financial considerations, the proponent has postponed the project.

Vuotos Reservoir (Finland)

The planned Vuotos reservoir in northern Finland would be located in a bog and forest area. The purpose of the Vuotos reservoir was to increase the storage capacity of the Kemi River basin and consequently increase the production of the existing power plants. Use of the Kemi River for power production is hampered by great natural flow variations. The natural lakes and man-made reservoirs of Lokka and Porttipahta together represent a storage capacity of about one half the annual flow volume of the Lake Kemijärvi catchment area.

Preliminary investigations of the alternative reservoirs were carried out from 1952 to 1959 and maps of the reservoir area were prepared. Planning started in 1960. Two reservoir alternatives were examined - Vuotos and Keminhaara. Practical planning work was carried out under the supervision of the National Board of Waters. A planning committee, in which the National Board of Waters, the power company and experts in biology were represented, was set up to direct the work. In order to take regional interests into consideration, a council was called together to follow up and evaluate the planning work. Twenty local organizations were represented on the council.

The planning committee ordered over 20 investigations from specialists in different fields. These investigations dealt with archaeology, geology, fisheries, communal economy, nature, reindeer-keeping, game animals, water quality, labour problems, recreation, landscape, etc. The master plan of the Vuotos reservoir was published in December 1974. The planning committee recommended that planning of the more extensive Kemihaara reservoir should be discontinued. The recommendation was based on non-economic considerations; in monetary terms, no significant difference had been found between the two alternatives.

Comments concerning the master plan were invited from several authorities. In October 1975, the National Board of Waters recommended the building of the Vuotos reservoir to the Ministry of Agriculture and Forestry. In September 1980, a combined unofficial working group of the Ministries of Trade and Industry and Agriculture and Forestry as well as the National Board of Waters was set up on the recommendation of the Ministry of Finance with the aim of preparing a State Council decision of principle concerning the realization of the Vuotos reservoir project. The report was submitted to the Ministry of Agriculture and Forestry in May 1981. In September 1982, the decision was made by the State Council not to build the reservoir.

Ernstbach Dam (Federal Republic of Germany)

This case concerns the proposal to build a dam on the Ernstbach, a tributary of the Wisper River in a mountainous area in Hesse. The purpose of the dam would be to provide drinking water to the city of Wiesbaden and other heavily populated areas along the Rhine River. In March 1980 the plan approval authority for the project requested the Hessian Environmental Agency to prepare a comprehensive ecological study, although an EIA as such was not required by the plan approval procedure. This study was to be part of the information on which the authority would base a final decision whether or not to permit the dam.

The task of the study was to deal with all ecological aspects of the project in a comprehensive way taking into account previous studies. The study showed that construction of the dam would have significant and far-reaching negative impacts particularly on landscape and ecosystems and recreational opportunities. It was therefore recommended that before taking a decision, the project should be submitted to a "regional planning procedure". The regional planning procedure did not take place and it was decided to shelve the project indefinitely.

Kobbelv Hydro Power Project (Norway)

This hydropower study related to the planning and decision-making process for the Kobbelv Hydro Power Project located in Sjørfold and Hamøy municipality in Nordland county in Norway. The project is situated in a mountainous area with peaks at an elevation of 1,500 metres. Two national parks are located in the area. Because of the topography of the area, the development of the power potential is based on two different falls for the same power plant. The area has several small glaciers and many lakes located at an elevation of 600 and 700 metres. The fall from these lakes to the power station forms the upper fall. Reservoirs for the lower fall are located in Gjerdalen and Veikdalen, at an elevation of approximately 200 metres.

The main area of conflict between development and nature conservation was the two valleys rich in vegetation and serving as important habitats for both fish and wildlife (lower fall). The planning process for this hydropower project was done according to the Hydro Power Application Procedure. The EIA was integrated into the application procedure. The proponent (the Directorate of the State Power System) wanted to build both falls (upper and lower). However, findings in the EIA formed a basis for the argument for preserving the lower fall. Moreover, some error in the hydrological data was discovered which revealed the development of the lower fall to be less economical. The proponent then decided to withdraw the lower fall from the proposal. The hydropower project is now under construction.

Wheeling Creek Watershed Project (United States of America)

In 1966 Congress authorized the Wheeling Creek Watershed Plan. The purpose of the project was to reduce flooding in the city of Wheeling, West Virginia. It included a programme of conservation land treatment, six floodwater retarding dams, and one flood protection and recreation dam with the potential for industrial water supply. As of 1977, five of the

seven dams had been built and were providing over 50 per cent flood protection. The proposal to build the remaining two dams raised controversy and opposition because of the expected environmental impacts. An EIS was prepared in 1979 by the United States Soil Conservation Service (SCS) (the proponent) based on its NEPA guidelines. The reviewers (EPA) raised a number of concerns related to water quality issues and the failure of the EIS to address adequately the full range of alternatives. Given the reaction and the public opposition to the proposed project, the SCS decided to discard the original EIS and begin a new EIA process starting with scoping in order to identify all relevant impacts and alternatives to the project. On the basis of the new EIS, the SCS issued its "record of decision" on the Wheeling Creek Project in 1987 stating that a single-purpose flood control dam would be constructed. This alternative was environmentally preferable to the original proposal while at the same time providing the same amount of flood control protection.

Part four

ANALYSIS OF THE CASE STUDIES: CONCLUSIONS AND RECOMMENDATIONS

INTRODUCTION

The case-study information gathered by the task force participants has shown how in 11 individual cases (highways and dams) environmental aspects figured in the decision-making process in one way or another. The individual projects studied varied considerably in terms of their size, technical and geographical characteristics and environmental impacts. For example, although most of the dam projects were for hydro-electric power generation, one was related to flood control and another to water supply. Regarding the highway cases, some were planned in environmentally sensitive areas (national parks) whereas others were planned in (semi) urban areas.

Some cases represent examples of the application of EIA following certain formalized requirements whereas in other cases environmental studies were performed on an ad hoc basis. Some countries have had much more experience with EIA than is reflected in the particular case studies presented. For other countries experience is more limited and the case studies are more representative of that experience.

In many ways each case study represents a unique experience in assessing the environmental impacts of a particular project, in a particular place, at a particular point of time. This fact, coupled with the individual national approach to EIA, makes any kind of comparative analysis of experience a tenuous proposition.

None the less, a basic assumption of the task force participants was that, despite all the differences, certain basic similarities or key elements are responsible for a successful EIA wherever it is carried out and that a comparative case-study analysis can help in identifying those elements. Early in its deliberations the task force had agreed on a definition of a successful EIA as applied at the project level of decision-making:

"a successful EIA is one which ensures that all relevant impacts associated with the proposed project are adequately and fully taken into account in the decision-making process".

This definition contains two key elements of EIA:

- Information;
- Influence on the decision.

EIA, therefore, consists not only of the writing of a report through which information is provided to the decision maker, but also of procedural provisions to make sure that the decision maker takes the information adequately and fully into consideration. Broadly speaking, this means that an EIA-system should contain at least those process elements guaranteeing that the decision maker is provided with the proper information and that this information is taken adequately and fully into account when making a decision.

The general overall recommendation of the task force is, therefore, that, when applied to projects:

EIA SHOULD BE VIEWED AS AN INTEGRAL PART OF THE PROJECT PLANNING PROCESS BEGINNING WITH AN EARLY IDENTIFICATION OF PROJECT ALTERNATIVES AND THE POTENTIALLY SIGNIFICANT ENVIRONMENTAL IMPACTS ASSOCIATED WITH THEM AND CONTINUING THROUGH THE PLANNING CYCLE TO INCLUDE AN EXTERNAL REVIEW OF THE ASSESSMENT DOCUMENT AND INVOLVEMENT OF THE PUBLIC.

The following specific conclusions and recommendations are based primarily on the findings of the case studies. However, the information on the various national legal administrative systems for EIA, the opinions of the individual task force participants, as well as the results of interviews conducted in the process of information gathering, have all played an important role in the formulation of the recommendations.

The recommendations are meant to be broadly applicable, i.e. to a wide variety of project types (not only highways and dams). They are directed both to countries which have already initiated a system of EIA, and want to improve it, as well as to countries interested in establishing an EIA system.

The Conclusions and Recommendations have been divided into three categories:

- I. Conclusions and Recommendations related to the EIA process;
- II. Conclusions and Recommendations related to the content aspects of EIA;
- III. Conclusions and Recommendations regarding the link between the EIA and the decision.

The process aspects of EIA refer to a variety of activities aimed at ensuring the inclusion of environmental considerations in project planning. These range from the early steps involved in identifying potential environmental impacts through and including the monitoring of completed projects to determine the actual impacts which occurred. These aspects also include the roles of various actors in preparing, reviewing and participating in the assessment.

The content aspects of EIA refer to the actual environmental documentation prepared on a project. This documentation, in some cases an environmental impact statement (EIS), describes the existing environment, the proposed project, as well as the number and type of environmental impacts assessed and the manner in which that was done.

The role of EIA in the decision-making process refers to the influence of the EIA process (and content) in determining whether or not a project was constructed and if so, the extent to which its implementation reflected the findings of the EIA.

I. CONCLUSIONS AND RECOMMENDATIONS RELATED TO THE EIA PROCESS

A. Initiation of the EIA Process

The case study material reveals a variety of foundations for EIA processes (e.g. specific legislation, sectoral legislation, etc.). (See table 1).

In the United States cases, Wheeling Creek and Franconia Notch, the EIA were carried out in compliance with legal obligations (NEPA). In the Wheeling Creek case the original draft EIS was prepared in 1979 by the United States Soil Conservation Service (SCS) (the proponent) based on its NEPA guidelines. Given the reaction and public opposition to the proposed project, the SCS decided to discard the original EIS and begin a new EIA process. The case study material presented refers to the second draft and final EISs. In the Franconia Notch case, the Federal Highway Administration followed NEPA regulations and other environmental review requirements which apply to all federal agencies. The work on the EIS began in 1974.

Both Canadian case studies were carried out following the Environmental Assessment Review Process (EARP) established by the Federal Cabinet decision of 1973. In the case of Banff Highway the project proposal was highly contentious prior to the review; implementation was delayed for a number of years. The beginning of the EIA process which resulted in the EIS prepared for this project took place in 1978 with the completion of an Initial Environmental Evaluation (IEE) by the Department of Public Works. Following completion of the IEE and with the support of Parks Canada, Public Works referred the project to the Federal Environmental Assessment Review Office (FEARO) for review. Although the Lower Churchill Hydro Power project was under consideration before EARP became operational, a preliminary Environmental Overview on the transmission line component was produced in 1974 under a federal-provincial cost-shared agreement. In view of the federal involvement in the project, Panels were formed to review both the dam sites and the transmission lines.

For the Kobbelv Hydro Power project and Highway E.18, in Norway, sectoral legislation provided the basis for the EIA (respectively, the Water Regulations Act and the Highway Act). For the Highway E.18, the EIA was an integral part of the road master plan as of 1978. For the Kobbelv Hydro Power Project, the EIA was carried out on the basis of the Water Regulations Act in the planning phase which began in 1974. No separate EIS was produced but the information on environmental impacts was an integral part of the application for the project.

In the Ernstbach Dam case (Federal Republic of Germany) the EIA process was initiated in 1977 in the form of individual studies prepared in the context of a plan approval procedure. The controversial nature of this project prompted the plan approval authority to commission the Hessian Environmental Agency to prepare a comprehensive ecological study of the project in 1979. The task of the new study was to deal with all ecological aspects of the project in a comprehensive way, taking into account previous studies.

Table 1. Initiation of the EIA Process

	United States of America	Federal Republic of Germany	Canada	Norway	Finland	Netherlands
	Ha/ Db/	H D	H D	H D	H D	H
(a) (formal) EIA by specific law, order, etc.	x		x x			x
(b) (formal) EIA requirement by sectoral legislation				x x		
(c) Individual studies carried out on an <u>ad hoc</u> basis		x x			x x	

(a) (formal) EIA by specific law, order, etc.

(b) (formal) EIA requirement by sectoral legislation

(c) Individual studies carried out on an ad hoc basis

a/ H = Highway case study.

b/ D = Dam case study.

The Vuotos Reservoir case (Finland) already had a long history before environmental studies were initiated in 1972 during preparation of the master plan for the Vuotos Reservoir. The environmental studies were undertaken on the basis of a directive of the Office of the State Council concerning reservoir planning. The Directive was found to be necessary because of growing criticism over two other reservoirs built earlier in the same river catchment area. Over 20 separate investigations were commissioned from specialists. According to sectoral legislation (Water Act), environmental studies would have been required in later planning phases in order to apply for a permit from the Water Court.

Planning for Highway 5 in Finland began in 1964. The Public Roads Act included a general provision that adverse environmental impacts should be minimized in the planning and building of roads and highways. Environmental impacts were briefly described in the localization plan which was completed in 1982. The EIA on the highway was initiated in 1982 in conjunction with the localization plan which included a description and comparison of three alternative routes. There was strong opposition to the alternative preferred by the proponent because it would go through an environmentally sensitive area (an esker) as well as traverse an important recreational and ground water area. The Ministry of the Interior expressed the opinion that before taking a decision, a more detailed study of the impacts on the sensitive area should be made; three environmental studies were subsequently commissioned in 1983.

For the Wiesbaden By-pass proposal in the Federal Republic of Germany, the EIA was commissioned on an ad hoc basis. In 1979 the City of Wiesbaden commissioned two consultant firms jointly to prepare a study of both traffic and environmental consequences of the project. Specifically, the aim of the study was to compare the alternatives of a by-pass and no by-pass in a comprehensive way giving special attention to ecological aspects.

The Dutch Highway 69 case was carried out in the framework of a series of trial runs with EIA (1977 to 1979). These trial runs were voluntary following a procedure that was later incorporated into the legislation on EIA approved by Parliament in May 1986. This case study can be viewed as an experiment with EIA following the EIA requirement as incorporated in the legislation.

CONCLUSIONS ON THE INITIATION OF THE EIA PROCESS

1. THE EARLIEST PLANNING STEPS IN THE HIGHWAY AND DAM PROJECTS DESCRIBED IN THE CASE STUDIES TOOK PLACE IN THE 1960s AND EARLY 1970s BEFORE ENVIRONMENTAL CONSIDERATIONS AS SUCH WERE VIEWED AS NECESSARY ELEMENTS OF PROJECT PLANNING.
2. OWING TO THE VARIOUS WAYS IN WHICH GOVERNMENTS RESPONDED TO THE NEED TO CONSIDER ENVIRONMENTAL IMPACTS, EIA WAS UNDERTAKEN IN A VARIETY OF WAYS AND AT VARIOUS STAGES OF PROJECT PLANNING THROUGHOUT THE 1970s AND EARLY 1980s.
3. THE THREE BASIC WAYS IN WHICH AN EIA PROCESS WAS INITIATED IN THE CASE STUDIES WERE THROUGH:
 - (a) A GENERAL EIA REQUIREMENT SET IN EIA LEGISLATION OR OTHER LEGAL PROVISIONS.

- (b) A FORMAL EIA REQUIREMENT, AS A PART OF OTHER LEGISLATION.
- (c) ON AN AD HOC (i.e. CASE-BY-CASE) BASIS.
4. IN MOST OF THE CASES WHERE AN EIA PROCESS WAS INITIATED IN A FORMAL WAY (3 (a) and 3 (b)), THE RESULTANT ASSESSMENT WAS CARRIED OUT IN AN INTEGRATED FASHION AND PROVIDED A COMPREHENSIVE ANALYSIS OF THE ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED PROJECT.
 5. IN MOST OF THE CASES WHERE EIA WAS DONE ON AN AD HOC BASIS (3 (c)), SPECIFIC ENVIRONMENTAL IMPACTS WERE ASSESSED BY CARRYING OUT INDIVIDUAL ENVIRONMENTAL STUDIES.
 6. THE CASE STUDY MATERIAL REVEALED THAT THE NECESSITY FOR CARRYING OUT EIA FOR THE PARTICULAR PROJECT TYPE WAS NOT ALWAYS EVIDENT AND, AS A RESULT, THE ASSESSMENT ITSELF WAS OFTEN BEGUN RATHER LATE IN PLANNING WHEN, FOR EXAMPLE, PROJECT SITING DECISIONS HAD ALREADY BEEN MADE.

ALTHOUGH IT CANNOT BE TOTALLY SUBSTANTIATED BY THE CASE STUDY MATERIAL ITSELF, IT APPEARS THAT, WHERE AN EIA IS INITIATED ON A FORMAL BASIS, IT IS BETTER IF BEGUN AT AN EARLY STAGE OF PLANNING WHEN A RANGE OF ALTERNATIVES IS STILL OPEN.

RECOMMENDATIONS ON THE INITIATION OF THE EIA PROCESS

IT IS RECOMMENDED THAT:

1. FORMAL, OBLIGATORY PROCEDURAL ARRANGEMENTS FOR THE EIA PROCESS BE CREATED AND THAT, WHEN EIA IS DEEMED NECESSARY, IT BE APPLIED AS EARLY IN THE PLANNING STAGE AS POSSIBLE. PROCEDURAL ARRANGEMENTS FOR THE PROCESS COULD TAKE A VARIETY OF FORMS BASED ON, INTER ALIA:
 - A LEGISLATIVE REQUIREMENT;
 - AN EXECUTIVE ORDER;
 - A CABINET DECISION.
2. THE PROCEDURAL ARRANGEMENTS BE CLEARLY APPLICABLE TO CERTAIN TYPES OF PROJECTS. THOSE PROJECT TYPES (THE FIELD OF APPLICATION) COULD BE DESIGNATED IN A VARIETY OF WAYS, INCLUDING:
 - SCREENING CRITERIA OR GUIDELINES APPLIED TO PROJECTS ON A CASE-BY-CASE BASIS TO DETERMINE WHICH ONES SHOULD UNDERGO EIA;
 - A LIST OF SPECIFIC PROJECT TYPES WHICH, WHILE ALLOWING FOR EXCEPTIONS MUST ALWAYS (OR NEED NEVER) BE SUBMITTED TO EIA.

B. Responsibility for Preparing the EIS

In most cases the proponent was responsible for preparing the EIS or other environmental documentation. In several cases the proponent and the competent authority were one and the same agency. Private consultants (individual experts), consultant firms, universities and research institutes

often played an important role in the actual preparation of documents. In many cases the proponent relied on these groups or individuals to undertake the necessary data collection, field studies and preparation of the documents. In several cases, a working group and/or steering group was formed consisting of representatives of the proponent, the competent authority and the researchers. In some cases local elected officials and civil servants as well as the public were involved in a steering group.

CONCLUSIONS ON THE RESPONSIBILITY FOR PREPARING THE ENVIRONMENTAL IMPACT STATEMENT (EIS):

1. IN MOST CASES THE PROPONENT OF THE PROJECT WAS RESPONSIBLE FOR PREPARING THE EIS OR OTHER ENVIRONMENTAL DOCUMENTATION. IN MANY CASES THE PROPONENT WAS ALSO THE COMPETENT AUTHORITY.
2. A DISADVANTAGE WHEN THE PROPONENT PREPARES THE EIS MAY BE THAT INCOMPLETE OR BIASED INFORMATION IS PRESENTED WHICH MUST BE COUNTER-BALANCED AT A LATER STAGE OF THE EIA PROCESS BY AN OUTSIDE REVIEW.
3. IN ALL CASES, TO A GREATER OR LESSER DEGREE¹ OUTSIDE EXPERTS WERE INVOLVED IN THE ACTUAL PREPARATION OF THE EIS OR OTHER ENVIRONMENTAL DOCUMENTATION. THE TYPES OF EXPERTS INVOLVED WERE:
 - PRIVATE CONSULTANTS;
 - CONSULTANT FIRMS;
 - ACADEMICS (UNIVERSITIES);
 - MEMBERS OF RESEARCH INSTITUTES.

RECOMMENDATIONS ON THE RESPONSIBILITY FOR PREPARING THE EIS:

- IT IS RECOMMENDED THAT:
 1. IN ORDER TO ENSURE THAT ENVIRONMENTAL IMPLICATIONS ARE TAKEN FULLY INTO CONSIDERATION IN PROJECT PLANNING AND PREPARATION, THE PROPONENT, WHICH COULD ALSO BE THE COMPETENT AUTHORITY, MUST BE RESPONSIBLE FOR PREPARING THE EIS OR OTHER ENVIRONMENTAL DOCUMENTATION.
 2. PARTICULARLY WHERE OUTSIDE EXPERTS ARE INVOLVED IN PREPARING THE EIS OR OTHER ENVIRONMENTAL DOCUMENTATION, THE PROPONENT MUST ENSURE THAT THROUGH APPROPRIATE TERMS OF REFERENCE AND/OR STEERING MECHANISMS, THE RELEVANT DISCIPLINES ARE BROUGHT TOGETHER IN CARRYING OUT THE EIA.

C. Structure and format of the EIA process

The case study material reveals three approaches (see also table 2). First, there are those cases where an EIS in the strict sense of the word is produced. This was the situation in the Canadian and American cases and, on an experimental basis, for the Dutch highway case as well. Secondly, there are the case studies from the Federal Republic of Germany where various separate environmental studies prepared at the outset were combined at a later stage of the planning process. Lastly, as in the Norwegian and Finnish cases, environmental information had been integrated as a component into other

planning documents. Central to a consideration of this topic is how one determines the content of the environmental information to be produced for decision-making. The case study material shows that when a formal requirement exists to carry out an EIA for specific types of projects, those responsible for providing environmental information are, generally speaking, given guidance on the content of the EISs both in a general sense and a case-specific way. In the American EIA system, for example, the content requirements for EISs are specified in a minimal way by regulations of the Council on Environmental Quality (CEQ). Based on those regulations all federal agencies have issued their own specific NEPA guidelines. In addition, the "scoping" process can be used for determining the scope of issues and alternatives to be taken into account in an EIS. It provides an opportunity for ensuring that the study addresses the relevant alternatives and impacts.

The Wheeling Creek case provides a good example of a valuable scoping process. The original draft EIS prepared by the United States Soil Conservation Service (SCS) was based on its NEPA guidelines without scoping. Given the strong opposition to the proposed project, as described in that document, it was decided to start a new EIA process that included scoping. In preparing the second draft EIS, the SCS began by conducting two scoping meetings involving other State and federal agencies as well as environmental groups and local citizens. The purpose of the scoping meetings was to identify all reasonable project alternatives and the major environmental impacts associated with them. In this way the foundation was laid for the new draft EIS.

In the Canadian case studies, the Banff Highway and the Lower Churchill hydropower project, a FEARO Panel was appointed to determine the content of the EIS. In both cases, project specific guidelines were issued by the Panel. These gave detailed instructions on the items to be covered including project setting, description of the existing environment, environmental impacts and mitigating measures.

In the Norwegian Kobbelv Hydro case, the "terms of reference" for the EIS were guidelines for application as outlined in the Water Regulations Act. These guidelines described the content of the application, including a project description and an assessment of possible impacts. In the Norwegian Highway E.18 case, where the environmental information was included in the road master plan, the recommendations of the road directorate provided some indication as to the content of the EIS. Furthermore, an informal scoping activity took place to ensure that the study addressed the relevant alternatives and impacts.

In the Vuotos Reservoir case and the Highway 5 case in Finland, the content of the environmental information was determined on an ad hoc basis.

In the Wiesbaden By-pass case (Federal Republic of Germany), the study did not follow any specific content requirements of existing planning procedures. The actual content came about as a result of discussions and agreement between the local authorities and the consultants.

Table 2. Form and content

	United States of America	Federal Republic of Germany	Canada	Norway	Finland	Netherlands
	Ha/ Db/	H D	H D	H D	H D	H
(a) An EIS prepared	x		x x			x
(b) Environmental studies prepared and later on combined in another document		x x				
(c) Environmental component in other planning documents				x x	x x	
<u>Determination of the content</u>						
(a) Use of scoping	H D	H D	H D	H D	H D	H
(b) Generic guidelines	x			x		
(c) Project specific guidelines	x x			x x		x
(d) <u>Ad hoc</u>		x x			x x	

- (a) An EIS prepared
- (b) Environmental studies prepared and later on combined in another document
- (c) Environmental component in other planning documents

Determination of the content

- (a) Use of scoping
- (b) Generic guidelines
- (c) Project specific guidelines
- (d) Ad hoc

a/ H = Highway case study.

b/ D = Dam case study.

In the Dutch Highway 69 case, guidelines from the Ministry of Health and Environmental Protection provided guidance for the content of the EIS. In this regard Highway 69 is not representative of the existing Dutch EIA system. The existing legislation contains the following. As a result of consultation with the public and with input from the EIA Commission of Independent Experts, the competent authority had issued specific guidelines for the content of the EIS including the alternatives to be considered.

This raises an important element (sometimes referred to as "the heart of EIA") in the EIA process: the alternatives. (A discussion of the actual number and type of alternatives considered and the way in which they were compared is presented in section II below on page 51). In almost all cases alternatives were taken into account. Not only do their number and type vary but so does the way in which they are determined. In most cases the project proponent (i.e. the competent authority) had generated the alternatives. In some cases, alternatives suggested by others (e.g. the public) were taken into account (Highway 69, and Highway E 18).

CONCLUSIONS ON STRUCTURE AND FORMAT OF THE EIA PROCESS

1. THREE BASIC APPROACHES WERE TAKEN REGARDING THE FORM OF ENVIRONMENTAL DOCUMENTATION:
 - ENVIRONMENTAL IMPACT STATEMENTS;
 - SINGLE ISSUE ENVIRONMENTAL STUDIES AND COLLECTIONS THEREOF;
 - PARTS OF OTHER PLANNING DOCUMENTS.
2. ALTHOUGH THE PARTICULAR FORM OF THE ENVIRONMENTAL DOCUMENTATION AS SUCH APPEARED TO BE LESS IMPORTANT THAN ITS CONTENT, IN THE CASE STUDIES WHERE THE ASSESSMENT WAS IN THE FORM OF AN ENVIRONMENTAL IMPACT STATEMENT OR INCLUDED IN OTHER PLANNING DOCUMENTS, IT WAS MORE EFFECTIVE AS A DECISION-MAKING TOOL THAN WHERE SEPARATE STUDIES HAD BEEN CARRIED OUT.
3. IN THOSE CASES WHERE A FORMAL REQUIREMENT EXISTED FOR CARRYING OUT AN EIA PROPONENTS WERE GIVEN GUIDANCE WITH REGARD TO THE CONTENT OF THE DOCUMENT THEY HAD TO PRODUCE. THIS GUIDANCE VARIED FROM GENERAL GUIDELINES TO PROJECT-SPECIFIC GUIDELINES. IN ALL CASES THE EIS OR OTHER ENVIRONMENTAL DOCUMENT WAS REQUIRED TO CONTAIN AT LEAST THE FOLLOWING:
 - PROJECT SETTING (PURPOSE AND NEED);
 - DESCRIPTION OF THE PROPOSED PROJECT;
 - ALTERNATIVES;
 - DESCRIPTION OF THE EXISTING ENVIRONMENT;
 - ENVIRONMENTAL IMPACTS.

4. A SCOPING PROCESS WAS USED IN SOME CASES TO DETERMINE THE SPECIFIC CONTENT OF THE ENVIRONMENTAL DOCUMENTATION. IN THOSE CASES, AS A RESULT OF SCOPING, NEW ALTERNATIVES AND IMPACTS WERE IDENTIFIED WHICH PROVED TO BE KEY FACTORS IN REACHING THE DECISION. IN SEVERAL CASES WHERE SCOPING DID NOT TAKE PLACE, DELAYS OCCURRED ALONG WITH EXTRA COSTS BECAUSE OF TIME SPENT IN ASSESSING IMPACTS THAT EVENTUALLY PROVED INSIGNIFICANT.
5. THE PROCESS OF SELECTING ALTERNATIVES IS, IN MANY CASES, UNCLEAR. THE CASE STUDY MATERIAL SHOWS EXAMPLES OF CASES WHERE, IN A LATE STAGE OF THE EIA PROCESS, NEW ALTERNATIVES WERE SUGGESTED IN THE REVIEW AND PUBLIC PARTICIPATION PHASE AND TAKEN INTO ACCOUNT. THIS OFTEN CAUSED SOME DELAY.

RECOMMENDATIONS ON STRUCTURE AND FORMAT OF THE EIA PROCESS

IT IS RECOMMENDED THAT:

1. IN TERMS OF HELPING TO ENSURE THE BEST INTEGRATION OF ENVIRONMENTAL FACTORS IN PROJECT PLANNING AND DECISION-MAKING, THE FORMS OF A SEPARATE ENVIRONMENTAL IMPACT STATEMENT OR INCLUSION OF ENVIRONMENTAL DOCUMENTATION IN OTHER PLANNING DOCUMENTS SHOULD BE ADOPTED.
2. THE EIA PROCESS SHOULD CONTAIN A PROVISION FOR EARLY GUIDANCE ON WHAT SHOULD COMPRISE THE CONTENT OF THE ENVIRONMENTAL INFORMATION. THOUGH GENERIC GUIDELINES MIGHT BE USEFUL AS A FIRST CHECK-LIST, EACH INDIVIDUAL CASE HAS ITS OWN PECULIARITIES WHICH EIA OFFERS AN OPPORTUNITY TO IDENTIFY. SCOPING PROVIDES SUCH AN OPPORTUNITY. THE FINAL DETERMINATION OF THE CONTENT IN A SPECIFIC CASE SHOULD THUS BE MADE THROUGH A SCOPING PROCESS, IN ORDER TO IDENTIFY ANY SIGNIFICANT

ALTERNATIVES AND IMPACTS FOR CONSIDERATION AND ELIMINATE ALTERNATIVES AND IMPACTS NOT CONSIDERED SIGNIFICANT ENOUGH FOR CONSIDERATION.

3. A SCOPING PROCESS CONTAINS THE FOLLOWING ELEMENTS:
 - PREPARATION OF BACKGROUND INFORMATION ON THE PROPOSED PROJECT;
 - INVOLVEMENT OF INTERESTED PARTIES (OTHER THAN THE PROPONENT AND THE COMPETENT AUTHORITY) DEFINED IN CONFORMITY WITH NATIONAL LEGISLATION;
 - DOCUMENTATION OF THE SCOPING PROCESS.
4. THE CONCLUSIONS OF SCOPING SHOULD BE AN EXPLICIT PART OF THE EIA DOCUMENTATION.

D. Review and public participation

Review and public participation are generally considered to be important elements in the EIA process. The case study material provides many examples of the various forms they can take (see table 3).

Throughout the development of the EIA process in the Franconia Notch and Wheeling Creek cases a great amount of agency and public interest and involvement with the proposed action took place. In the Franconia Notch case the project team began working with representatives of interest groups and the local communities.

This resulted in changes to the alternatives studied and helped to identify key issues of concern. Public information meetings were held. The public was also kept informed through press announcements and newsletters mailed directly to interested people. The draft EIS was also circulated to federal, State and local agencies and to individuals and groups known to be interested in the project.

Written comments on the draft EIS were invited. Formal public hearings were held for the public to present its views on the project and the information in the EIS.

Another example of extensive review and public involvement is provided by the Wheeling Creek case. In addition to the scoping meetings, a public hearing on the draft EIS was held; prior to the hearing the EIS was distributed to all interested parties. The final EIS included letters commenting on the draft EIS along with a record of the public hearing. Most of the reviewing agencies, including the Environmental Protection Agency which continued to have reservations about the project, agreed that the project had fewer negative environmental impacts than the one originally proposed in the first draft EIS.

In the Canadian case studies on the Banff Highway and Lower Churchill Hydropower project, extensive panel review and public participation took place. In the Banff Highway case, public information folders were distributed to potentially interested parties. Afterwards the expert panel held a series of meetings with groups and agencies who expressed interest in learning about the nature of the review. The proponent held its own information sessions to explain the project to the general public. Public meetings on the proposal were scheduled by the panel to hear discussions on issues related to the project. This allowed the panel to obtain further information on potential impacts of the project. The public and agency input and the proponent's EIS formed the bases of the panel report to the Minister of the Environment. In the Lower Churchill Hydropower case, the public, federal agencies and the panel's technical experts commented on the EIS and made presentations during the public meetings prior to submission of the panel report to the Minister of the Environment. This input allowed the panel to establish the conditions necessary for ensuring the environmental and social acceptability of the project.

In the Dutch Highway 69 case, the Commission of independent experts thoroughly reviewed the EIS for its quality and relevance to the decision-making. The public was informed and could comment on the EIS, as it was published together with the planning document (routing memorandum). Hearings were held on the routing memorandum. During public participation another alternative was suggested which was investigated.

Also in the Norwegian case study Highway E.18, review and public participation took place which resulted in the formulation of a new alternative put forward by a group of residents and farmers with the support of the Country Agricultural Board.

Table 3. Review and public participation

<u>Review</u>	United States of America		Federal Republic of Germany		Norway		Finland		Canada		Netherlands	
	H	D	H	D	H	D	H	D	H	D	H	D
Special Panel										x	x	x
Inter-agency	x	x			x	x		x	x			
<u>Ad hoc</u>				x								
Public participation												
Hearings or other public meetings	x	x			x	x		x	x			x
Written comments	x	x				x					x	x

a/ H = Highway case study.

b/ D = Dam case study.

The Norwegian Hydro project case, Kobbely, was submitted to review with public participation. The Water Resources Department administered the review process that involved participants from the regular political sphere, as well as the spheres of administration and public utilities.

The public was informed by announcement in local newspapers about the beginning of the planning process and start of the review. In addition, the proponent arranged one open public meeting in the middle of the planning phase. The intent of that meeting was to inform people in the project area about the development plan.

In the Finnish Highway 5 case, the public would be formally involved in later planning phases. The public was informed but its influence on planning had been insignificant to date. The review by several governmental agencies of the three environmental studies resulted in a new alternative which was further developed. In the Finnish Vuotos Reservoir case, local interests were represented on the planning council which followed up and evaluated the preparation of the masterplan and the environmental studies. In addition, the public was involved in the planning and decision-making by means of requests for comments and opinions. Inter-agency review of the completed plan also took place. The case showed a very strong public input to decision-making although this was not linked directly to the "EIA" process. Local residents organized an informal movement to oppose the planned reservoir. In addition, a public meeting was held where government ministers were invited.

In the Wiesbaden By-pass case, apart from the review by the planning commission of the consultant's work, there was no review of nor public participation in the planning process. In the Ernstbach Dam case, the study was carried out as part of a plan approval procedure which included provision for inter-agency review and public participation. The study itself, however, was not subject to review either by other agencies or the public.

CONCLUSIONS ON REVIEW AND PUBLIC PARTICIPATION

1. IN ALMOST ALL CASES AN OUTSIDE/EXTERNAL REVIEW OF THE ENVIRONMENTAL INFORMATION TOOK PLACE.
2. THIS OUTSIDE REVIEW TOOK VARIOUS FORMS, FOR EXAMPLE INTER-AGENCY REVIEW, REVIEW BY A PANEL OF INDEPENDENT EXPERTS OR REVIEW BY A STEERING GROUP CONSISTING OF REPRESENTATIVES OF THE VARIOUS AGENCIES INVOLVED OR COMBINATIONS OF THE ABOVE.
3. IN MANY CASES, THE OUTSIDE REVIEW RESULTED IN THE CONSIDERATION OF NEW ALTERNATIVES AND HELPED IDENTIFY THE KEY ISSUE OF CONCERN.
4. IN ALMOST ALL CASES THERE WAS PUBLIC PARTICIPATION.
5. THE PUBLIC PARTICIPATION TOOK PLACE THROUGH INFORMAL PUBLIC MEETINGS, PUBLIC HEARINGS, THE POSSIBILITY OF SUBMITTING WRITTEN COMMENTS ON THE ENVIRONMENTAL DOCUMENTATION AND COMBINATIONS OF THE THREE.
6. AS WITH THE OUTSIDE REVIEW, THE PUBLIC PARTICIPATION OFTEN RESULTED IN SUGGESTIONS FOR NEW ALTERNATIVES TO BE CONSIDERED OR THE IDENTIFICATION OF KEY IMPACTS TO BE STUDIED.

RECOMMENDATIONS ON REVIEW AND PUBLIC PARTICIPATION

IT IS RECOMMENDED THAT:

1. IN ORDER TO AVOID INCOMPLETE OR INCORRECT INFORMATION IN THE EIS OR ENVIRONMENTAL DOCUMENTATION, IT SHOULD BE SUBMITTED TO SOME FORM OF OUTSIDE REVIEW.
2. THIS REVIEW SHOULD ADDRESS AS A MINIMUM THE ADEQUACY OF THE DOCUMENT IN RELATION TO THE DECISION AS WELL AS THE SIGNIFICANCE OF THE IMPACTS THAT WERE ASSESSED.
3. IN CASES OF POTENTIALLY SIGNIFICANT IMPACTS ON THE ENVIRONMENT, THE REVIEW SHOULD BE CONDUCTED BY MEANS OF EITHER AN INTER-AGENCY REVIEW PROCEDURE OR BY A PANEL OF EXPERTS OR A COMBINATION OF BOTH.
4. IN CONFORMITY WITH NATIONAL LEGISLATION, THE PUBLIC MUST BE INVOLVED IN THE REVIEW OF THE EIS.

E. Monitoring

None of the projects described in the case studies had been constructed at the time of writing. Of the four cases under construction (Banff Highway, Franconia Notch, Kobbelv Hydropower project, Wheeling Creek) monitoring programmes were being undertaken in three.

In the Banff Highway case, a special committee was established for ensuring the implementation of environmental studies, mitigation and enhancement measures. In addition, an environmental co-ordinator was designated for the project to ensure that construction operations were carried out using good environmental practices. The follow-up study underway indicated that this approach had been fairly successful in ensuring an environmentally sensitive design and minor disturbance during construction. The need to continue monitoring of mitigation measures was highlighted and some suggestions had been made for design changes to improve the effectiveness of these measures.

In the Franconia Notch case, the highway was under construction. The State of New Hampshire was committed to monitor certain construction impacts, such as stream quality and vibrations resulting from blasting. Results were not yet known.

In the Wheeling Creek case, the dam was under construction. Provisions for monitoring included (a) a long-term programme to evaluate the floodpool's effect on aquatic and terrestrial resources and (b) consultations with a landscape architect to help blend the dam and spillway into its surroundings.

Although in the Kobbelv Hydropower project monitoring studies had not yet been carried out, different governmental agencies had the possibility to establish monitoring programmes.

In two of the cases (Lower Churchill and Vuotos) studied, monitoring programmes would have been carried out if the decision to proceed with the project had been positive.

CONCLUSIONS ON MONITORING

1. THE PROVISION FOR, AND IMPLEMENTATION OF, MONITORING PROGRAMMES APPEARS TO BE ONE OF THE MOST NEGLECTED AREAS IN EIA.
2. MONITORING PROGRAMMES, PARTICULARLY WHEN THEIR DESIGN IS CAREFULLY LINKED TO THOSE IMPACTS WHICH WERE PREDICTED IN THE EIS OR OTHER ENVIRONMENTAL DOCUMENTATION, CAN SOMETIMES RESULT IN IMPROVEMENTS TO THE PROJECT ITSELF AND MOREOVER IMPROVE THE QUALITY OF FUTURE PREDICTIONS OF IMPACTS FOR SIMILAR PROJECTS.

RECOMMENDATIONS ON MONITORING

IT IS RECOMMENDED THAT:

1. MONITORING PROGRAMMES SHOULD BE VIEWED AS AN INTEGRAL PART OF THE EIA PROCESS WITH PROVISION MADE FOR THEM AT THE TIME THE DECISION ON THE PROJECT IS MADE.
2. A MONITORING STRATEGY SHOULD BE DEVELOPED EARLY IN EIA TO ALLOW BASE-LINE DATA COLLECTED DURING THE EIA PROCESS TO BE MADE COMPARABLE WITH MONITORING DATA COLLECTED AFTER THE PROJECT PROCEEDS. POST-PROJECT MONITORING WOULD ALSO ALLOW ANY UNPREDICTED EFFECTS TO BE IDENTIFIED AND HENCE MITIGATED.

F. Time and costs

From the case study information it became clear that, in general, EIA did not cause significant delays in the planning and decision-making process. Although the gathering of environmental information and processing of this documentation demanded a certain amount of time, its length was insignificant in relation to the total project planning. In some cases (e.g. Banff highway) the EIA helped to resolve issues that had been a source of public debate for years; as a result this accelerated the decision-making process.

Regarding costs, in most cases it was difficult to determine the amount as impact assessment was not calculated separately from other planning costs. For the same reason, in many cases it was impossible to determine the percentage of total project costs represented by the EIA. In the Federal Republic of Germany highway case, in the two United States cases and in the Canadian Banff highway case, this percentage could be indicated. In the Wiesbaden by-pass case, the EIA represented 0.08 per cent of the total project costs. In both United States cases, the EIA represented 3 per cent of the total project costs. The actual investment costs in those cases turned out to be lower than estimated before the EIA was carried out. The EIA resulted in an alternative that was cheaper than the original project proposal. In the Banff highway case, it amounted to 1 per cent of the total (a percentage higher than usual because of specific characteristics of the project).

CONCLUSIONS ON TIME AND COSTS

1. IN GENERAL, THE EIA DID NOT CAUSE SIGNIFICANT DELAYS IN PLANNING AND DECISION-MAKING.
2. COMPARED TO THE TOTAL LENGTH OF PROJECT PLANNING, THE TIME NEEDED TO CARRY OUT THE EIA IS RATHER INSIGNIFICANT.
3. FOR A VARIETY OF REASONS, NO SPECIFIC FIGURE CAN BE DETERMINED REGARDING THE AMOUNT OF TIME NEEDED TO CARRY OUT AN EIA.

FOR EXAMPLE:

THE TIME NEEDED IS LINKED TO THE PARTICULAR PLANNING PROCEDURE FOR THE TYPE OF PROJECT. THESE PROCEDURES VARY FROM COUNTRY TO COUNTRY;

- THE TIME NEEDED DEPENDS ON THE AVAILABILITY OF INFORMATION. (WHEN THE NECESSARY BASE-LINE DATA IS ON HAND, THE TIME NEEDED IS LESS THAN WHEN FIELD SURVEYS AND DATA GATHERING HAVE TO BE CARRIED OUT TO IDENTIFY, PREDICT AND ASSESS IMPACTS.)
4. WHEN AN EIA WAS INTEGRATED WITH OTHER PLANNING ACTIVITIES (FOR INSTANCE, ENGINEERING, FEASIBILITY, COST-BENEFIT ANALYSIS) THE TIME NEEDED WAS LESS AND THERE WAS LESS DELAY THAN WHEN IT WAS CONDUCTED SEPARATELY AND AFTER OTHER STUDIES HAD BEEN COMPLETED.
 5. THE CASE STUDY INFORMATION REVEALED THAT THE AVERAGE AMOUNT OF TIME NEEDED FROM THE INITIAL ENVIRONMENTAL ASSESSMENT TO THE COMPLETION OF THE EIS OR OTHER DOCUMENT RANGED FROM ONE TO ONE AND A HALF YEARS.
 6. NO GENERAL CONCLUSIONS CAN BE MADE ON THE ABSOLUTE OR RELATIVE (PERCENTAGE OF TOTAL INVESTMENT) COSTS OF EIS. SOME CASE STUDIES INDICATED THAT AN EXTENSIVE EIA COULD BRING ABOUT SAVINGS IN ORIGINALLY PLANNED INVESTMENTS.

RECOMMENDATION ON TIME AND COSTS

IT IS RECOMMENDED THAT:

1. EIA SHOULD BE INTEGRATED WITH OTHER PLANNING ACTIVITIES AS EARLY AS POSSIBLE IN THE PLANNING STAGE IN ORDER TO AVOID DELAYS AND TO KEEP COSTS AT A MINIMUM.

II. CONCLUSIONS AND RECOMMENDATIONS RELATED TO THE CONTENT ASPECTS OF ENVIRONMENTAL IMPACT ASSESSMENT

A. Description of the proposed activity and alternatives

In all the case studies, the proposed project was adequately described. All EISs or other environmental documents contained figures and maps allowing the reader to visualize the project, its elements, and the alternatives. Regarding the type of alternatives considered, the range was mostly limited to specific sites and locations. Neither alternative modes of transportation (highway cases) nor alternative sources of water supply or energy (dam cases) were given more than passing consideration (see table 4). Only in the Banff highway case and in Franconia Notch alternative were modes of transportation considered to some extent. In the Lower Churchill Hydropower project and the Wheeling Creek alternatives, possibilities beyond the jurisdiction of the proponent were considered. Information on the alternative selection process appears above.

B. Description of the existing environment

All EISs or other environmental documents contained a description of the existing environment. In terms of the amount of space and level of detail devoted to that description, there does not appear to be any differences between the project types or approaches to EIA in general. In most cases a special chapter dealt with the description of the existing environment varying in length from one half of the total EIS for the Ernstbach Dam to a short description in, for example, the Wheeling Creek project and the Highway E.18 proposal.

In several cases the description of the existing environment was combined with the discussion of project impacts on it (e.g. Highway 5 (Finland) and Lower Churchill Hydropower project (Canada)). In the Wiesbaden By-pass case, the existing environment was "compartmentalized" and described according to "landscape ecological units" which were developed specifically for that project.

Most of the following characteristics of the existing environment were described for both highway and dam projects:

- Flora
- Fauna
- Air quality
- Water quality
- Land use
- Geology
- Socio-cultural aspects
- Archaeology

Table 4: Number and types of alternatives

Alternatives	United States of America		Canada		Federal Republic of Germany		Norway		Finland		Netherlands
	H	D	H	D	H	D	H	D	H	D	H
Site alternatives	12	2	3	2	1	1	4	3	3	2	4
Sub-alternatives		18	0	2	2	0	13	0	4	0	1
O-alternative a/	x	x	x	x	x	-	-	-	-	-	x
Alternative modes of transport/water supply/electricity generation	x										

a/ do-nothing alternative

H = Highway case study

D = Dam case study

In addition, the highway cases also described the existing environment in terms of noise, recreation and accident situation. On the other hand, in the dam cases, bank stability and forestry were also included.

C. Description of the environmental impacts of the proposed project and alternatives

The information under this item has been divided into a number of sub-items: (a) impact identification, (b) data collection, (c) methods used for predicting impacts, (d) methods used for comparing the impacts of the alternatives.

1. Impact identification

From the case-study material, there appear to be three basic ways whereby impacts were identified:

(a) By following guidelines or checklists provided by the competent authorities (the United States and the Canadian cases and the Norwegian Kobbelv case).

(b) In an ad hoc manner in which the competent authority or specifically formed working groups (i.e. made up of different combinations of competent authority, proponent, other agencies, consultant representatives and in some cases representatives of local residents) identified the impacts to be assessed. (The cases from Finland and the Federal Republic of Germany.)

(c) A combination of (a) and (b) (the Dutch case, the Wheeling Creek case from the United States, and the E.18 highway case from Norway).

Tables 5 and 6 give an overview of the impacts identified in the highway and the dam cases.

2. Data collection

Usually the data were obtained from existing topographic and other maps, aerial photographs, information contained in previous studies on individual impacts, and flora and fauna inventories. In addition, but to a lesser extent, field surveys and inventories were carried out where the necessary data were either insufficient or unavailable.

3. Methods used for predicting impacts

Table 7 contains an overview of the methods used in the highway case studies. Table 8 does the same for dams. As these tables illustrate, in all cases (highways and dams) the fundamental basis for predicting environmental impacts appears to have been "best professional judgement" and/or "experience with previous (similar) projects". For the highway cases, to the extent that existing formalized, quantitative methods were used, they were applied regarding noise levels (all cases) and air quality (Franconia Notch case and the Highway 69). In one case a new method was developed to meet a particular demand of the project. This was the case in Highway 69 (Air quality model). In only one case (Wiesbaden By-pass) was a method applied (ecological effects analysis) to identify direct as well as indirect changes in the environment;

Table 5: Impacts identified in highway case studies

	Franconia Notch	Wiesbaden	E.18	H5	Banff	H69
Water quality	x	x		x	x	x
Vegetation	x	x		x	x	x
Fish	x	x		x	x	
Wildlife	x		x		x	x
Socio-economic aspects	x		x		x	
Safety	x		x	x	x	
Land-use	x	x	x	x	x	x
Visual aspects (aesthetics)	x	x	x	x	x	x
Noise	x	x	x	x	x	x
Air quality	x	x			x	x
Geology-terrain	x	x	x	x	x	x
Natural features	x	x		x	x	
Historical-archaeological aspects	x		x	x		
Wetlands	x					x
Risks						
Accident situation	x		x	x		
Recreation	x	x	x	x	x	x
Forestry		x				
Ecosystems		x				
Ground water				x		
Hydrology				x		

Table 6: Impacts identified in dam case studies

	Wheeling Creek	Ernstbach	Kobbelv	Vuotos	Lower Churchill
Water quality	x	x	x	x	x
Geology	x		x	x	x
Wildlife	x	x	x	x	x
Fisheries			x	x	x
Land-use	x	x		x	x
Socio-economic aspects	x		x	x	x
Archaeology	x		x	x	x
Climate	x	x	x	x	
Vegetation	x	x	x	x	
Landscape	x	x		x	
Recreation	x	x	x	x	
Air quality					
Forestry				x	x
Sediment transport				x	x
IBP sites					x
Natural areas	x			x	
Wetlands	x			x	
Ice régimes			x		
Mineral resources				x	
Reindeer keeping				x	
Bogs and peat				x	
Energy balance		x		x	
Noise		x			
Population				x	
Cultural heritage				x	

Table 7: Methods used for the prediction of impacts in highway cases

	Franconia	Wiesbaden	E.18	H5	Banff	H69
Best professional judgement	x	x	x	x	x	x
Previous experience	x	x	x	x	x	x
Noise models	x	x	x	x	x	x
Air quality models	x					x
Ecological effect analysis		x				
Accident models	x		x			x

Table 8: Methods used for the prediction of impacts in dam cases

	Wheeling Creek	Ernstbach	Kobbelv	Vuotos	Lower Churchill
Best professional judgement	x	x	x	x	x
Previous experience	x	x	x	x	x
Habitat evaluation procedure	x				x

to determine which environmental elements were likely to be affected most and to obtain developmental tendencies. In the case of one dam a particular formalized method was applied. The Wheeling Creek case provided an example of the use of the Habitat Field Evaluation Procedure (HEP) which was developed by the United States Fish and Wildlife Service. The HEP is a method for assessing fish and wildlife resources, identifying impacts on them and developing an appropriate mitigation plan.

4. Methods for comparing the effects of the various alternatives

In the highway cases, the alternatives were described and compared in tables on the basis of their environmental impacts. The way in which this was done varied. In some cases a kind of weighting and ranking took place whereas in other cases the comparison was based on a descriptive narrative of the impacts involved. In the Banff highway case, for example, the EIS summed up the various alternatives and their relative environmental merits. In the E.18 case, each impact was described, then ranked for each alternative. The ranking of the alternatives was based on a combination of descriptive elements and quantities. As an aid for the decision-makers, the impacts and alternatives were summarized in one table. In the Highway 5 case, the impacts of the alternatives were described and compared but not in a quantified manner. The EIS for Highway 69 contained tables with a descriptive comparison

of the effects of the alternatives, but no ranking was made. The most detailed (and quantitative) comparison of alternatives was given in the Wiesbaden By-pass case, where three alternatives were subjected to a "Utility analysis" on the basis of 27 criteria. An extensive description of the method is included in the case study appearing in Annex I.

Regarding the dam cases, in only one (Wheeling Creek) was a large number of alternatives compared in a comprehensive way according to the environmental impact of each. In addition to a descriptive comparison in the text, a comparison of the alternatives and their major environmental effects was presented in a table (see Annex I). For the Ernstbach dam no alternatives were considered. In the Kobbely case, although alternatives were taken into account, they were not compared according to their environmental impact. In the Vuotos case, a descriptive comparison of individual aspects of the alternatives was made and included in various studies and reports. In the Lower Churchill Hydropower case, neither the alternative dam sites nor the alternative transmission line corridors were compared in any formalized way (i.e. no weighting/scaling, no tabular comparison of the environmental impacts).

CONCLUSIONS ON CONTENT ASPECTS

1. ALL CASES CONTAINED A DESCRIPTION OF THE PROPOSAL PROJECT AND THE EXISTING ENVIRONMENT.
2. ALTHOUGH MOST CASE STUDIES CONSIDERED ALTERNATIVES TO THE PROPOSED PROJECT, THEIR RANGE WAS GENERALLY LIMITED TO SPECIFIC SITES AND LOCATIONS RATHER THAN ALTERNATIVE APPROACHES TO MEETING WATER/ENERGY OR TRANSPORTATION NEEDS.
3. IN SOME CASES THE EXISTING ENVIRONMENT WAS DESCRIBED IN A SEPARATE COMPONENT OF THE EIS OR OTHER ENVIRONMENTAL DOCUMENT WHEREAS IN OTHER CASES IT WAS LINKED TO THE DESCRIPTION OF THE EXPECTED ENVIRONMENTAL IMPACTS.
4. GENERALLY SPEAKING THE ENVIRONMENTAL IMPACTS MOST OFTEN ASSESSED IN THE CASE STUDIES WERE THOSE RELATED TO AIR AND WATER QUALITY, FLORA AND FAUNA, LAND USE, SOCIO-ECONOMIC ASPECTS.
5. THE SPECIFIC NUMBER AND TYPE OF ENVIRONMENTAL IMPACTS ASSESSED WAS DEPENDENT UPON THE PROJECT FEATURES AND THE PARTICULAR ENVIRONMENTAL CONDITIONS IN THE AREAS CONCERNED.
6. ENVIRONMENTAL IMPACTS WERE IDENTIFIED THROUGH THE USE OF CHECK-LISTS AND GUIDELINES, SCOPING PROCEDURES AND THROUGH INPUT FROM CONCERNED PARTIES OR THROUGH A COMBINATION THEREOF.
7. THERE IS LITTLE EVIDENCE THAT FORMALIZED QUANTITATIVE METHODS WERE USED FOR PREDICTING IMPACTS AND/OR COMPARING ALTERNATIVES.
8. "BEST PROFESSIONAL JUDGEMENT" AND "PREVIOUS EXPERIENCE" MOST OFTEN FORMED THE BASIS FOR ASSESSING THE SIGNIFICANCE OF THE ENVIRONMENTAL IMPACTS.

RECOMMENDATIONS ON CONTENT ASPECTS

IT IS RECOMMENDED THAT:

1. AN EIS OR OTHER ENVIRONMENTAL DOCUMENT SHOULD CONTAIN AT LEAST THE FOLLOWING ELEMENTS:
 - PROJECT SETTING (PURPOSE AND NEED)
 - A DESCRIPTION OF THE PROPOSED PROJECT
 - A DESCRIPTION OF THE EXISTING ENVIRONMENT
 - REASONABLE ALTERNATIVES, INCLUDING THE DO-NOTHING ALTERNATIVE
 - AN ASSESSMENT OF THE ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT AND THE ALTERNATIVES
 - SUMMARY.
2. IN ADDITION TO THE MINIMUM ELEMENTS, THE EIS SHOULD CONTAIN INFORMATION AS APPROPRIATE ON, INTER ALIA:
 - THE SCOPING PROCESS
 - A MONITORING PROGRAMME
 - MITIGATION MEASURES
 - GAPS IN KNOWLEDGE
 - UNCERTAINTIES
3. ALTHOUGH THE EIS SHOULD CONTAIN A DESCRIPTION OF THE PROPOSED PROJECT AND ALTERNATIVES AND THE EXISTING ENVIRONMENT, THIS SHOULD BE LIMITED TO THOSE ELEMENTS NECESSARY FOR ASSESSING THE ENVIRONMENTAL IMPACTS.
4. THE EIS OR OTHER ENVIRONMENTAL DOCUMENT SHOULD ASSESS, AS A MINIMUM, THE DIRECT AND INDIRECT IMPACTS OF THE PROPOSED PROJECT, AND ITS ALTERNATIVES, ON THE BIO-PHYSICAL AND SOCIO-ECONOMIC ENVIRONMENT. 3/

THE SPECIFIC TYPES AND NUMBER OF IMPACTS TO BE ASSESSED ARE DEPENDENT ON THE INDIVIDUAL PROJECT AND THE ENVIRONMENT AND CAN BE BEST DETERMINED THROUGH SCOPING.
5. WHEREVER APPROPRIATE, FORMALIZED QUANTITATIVE METHODS SHOULD BE USED TO PREDICT ENVIRONMENTAL IMPACTS. IN EVERY CASE BEST PROFESSIONAL JUDGEMENT SHOULD PREVAIL AND THE UNDERLYING ASSUMPTIONS OF THE METHODS USED AND THE JUDGEMENTS MADE CLEAR.

III. CONCLUSIONS AND RECOMMENDATIONS REGARDING THE LINK BETWEEN THE EIA AND THE DECISION

In only five of the case studies did the decision-making processes result in a decision to construct the project.

In the Franconia Notch case, the final decision on the project was taken in 1979. In that year it was decided to construct Interstate 93 through Franconia Notch State Park (USA) in accordance with the design concept agreed on by state agencies and environmental groups. The project was under construction at the time of writing.

In 1982 the United States Soil Conservation Service issued its "Record of Decision" on the Wheeling Creek project. The Record stated that a single-purpose flood control dam will be constructed. It also pointed out those measures which will be undertaken to minimize adverse effects on the natural environment. Following the issuance of the Record of Decision, an outline for a mitigation plan was submitted by the Soil Conservation Service to the design engineer for the project. It covered 22 points to be taken into account (e.g. limitations on construction activities, specifications for drains, instructions for re-vegetation).

In the Banff Highway case, the report of the panel (to the Canadian Ministers of Environment and of Public Works) concluded that the project could proceed subject to certain conditions and recommendations outlined in its report. The main conditions of approval related to the requirement for under/overpassing and fencing to isolate the highway from wildlife. The panel also recommended that a special committee be established for ensuring the implementation of environmental studies, mitigation and enhancement measures identified by the proponent in the EIS and at the public meetings. In addition, the panel recommended that an environmental co-ordinator be designated for the project to serve as a day-to-day contact for park wardens and other inspectors and to ensure that construction operations were carried out using good environmental practices. Road construction was underway at the time of writing and due to be completed in 1986.

The fourth case study where the decision to build was taken was the Kobbelv Hydropower project. The decision made by Parliament was in accordance with the proponent's development plan. This plan contained the following design changes in relation to an earlier development plan (in the application but after environmental studies):

- Development of the lower fall was excluded (rich vegetation and important habitats for fish and wildlife were thereby retained);
- The decision was taken not to build the Reinoksvaten power plant;
- The generating potential of the Kobbelv Hydropower plant was increased from 270 to 300 MW.

The project was under construction at the time of writing. Unlike the Canadian and United States examples, it was difficult to determine if the design changes in this case were in response to the findings of the EIA. Even before the EIA-process began, some participants in the planning process had argued for preserving the lower fall from hydropower development. Findings in

the EIA later provided support for this argument. In addition, the Hydrological Department in the Water Resources Directorate had discovered some fault in the hydrological data which made the development of the lower fall less economical. Therefore it is impossible to say whether the decision was based on environmental grounds, financial considerations or a combination of the two.

In the Finnish Highway 5 case, the decision was taken in late 1984 to continue project planning on the basis of an alternative that would be more expensive but which would preserve the environmentally sensitive esker area. This alternative was not one of those originally considered but emerged rather as a result of the EIA review phase.

In four cases the decision was taken not to build. Although in the Lower Churchill Hydropower project, the panel reported to the Canadian Minister of the Environment that construction and operation of the project would be acceptable provided that certain environmental and socio-economic conditions were met, the proponent decided, however, not to construct the project for financial reasons.

In the case of the Vuotos Reservoir in Finland, the State Council made a decision not to build the reservoir. The project was rejected because of environmental issues and public opinion in spite of the fact that, economically, the project would have been profitable. The environmental studies prepared on the project had two kinds of impacts on planning and decision-making. First, the recommendations to discontinue planning for the alternative Kemihaara reservoir and to continue planning for Vuotos were based on the findings in the environmental studies. Second, the environmental studies were responsible for forming public opinion against the reservoir. The environmental studies were, therefore, indirectly responsible for the rejection of the project.

In the Ernstbach Dam case, the decision was made not to proceed with the project. The decision was based partly on environmental grounds but it is not known specifically what role the comprehensive ecological study played in the decision. The study concluded that the construction of the dam and its secondary installations, as well as provisions for purification treatment, constituted "interference with nature and landscape" as outlined in the relevant legal provisions.

In the Wiesbaden By-pass case, the decision not to proceed with the project was taken based both on transport and traffic policy considerations as well as environmental reasons. In terms of the environmental reasons, the decision reflected the findings of the study.

In the two remaining cases no decision had yet been taken.

For Highway E.18 in Norway, the parliament had agreed in principle on one of the corridors and stated that this corridor should form a basis for the future E.18 in the study area. For two out of three major parts of this corridor, road master-plans had been approved accordingly. The remaining part will have to be the object of a new master-planning/EIA process. A decision was expected in 1987.

In the Dutch Highway 69 case, the final decision was expected to be taken in mid-1985. In this case it was clear from the beginning that this trial run EIS would not formally contribute to the decision-making process. However, the EIS played a role as part of the routing memorandum in the decision-making process. In the public participation phase of the routing memorandum and EIS a new alternative was suggested.

CONCLUSIONS ON THE ROLE OF EIA IN THE DECISION-MAKING PROCESS

1. ONLY THE AMERICAN CASES SHOW A CLEAR LINK BETWEEN THE EIA FINDINGS AND THE DECISION. 4/ IN MANY OF THE OTHER CASE STUDIES ENVIRONMENTAL CONSIDERATIONS HAD OBVIOUSLY PLAYED A ROLE. THE DIRECT LINK BETWEEN THE EIA AND THE DECISION WAS NOT CLEAR-CUT, HOWEVER.
2. IN MOST OF THE CASES WHERE AN AFFIRMATIVE DECISION TO CONSTRUCT THE PROJECT WAS TAKEN, THE EIA PROCESS INFLUENCED THAT OUTCOME. ITS INFLUENCE WAS REFLECTED IN THE CHOICE OF ALTERNATIVE AS WELL AS IN DESIGN AND MITIGATION MEASURES WHICH WOULD OTHERWISE NOT HAVE BEEN CONSIDERED.
3. IN THE CASES WHERE THE DECISION WAS TAKEN NOT TO PROCEED WITH THE PROJECT, ALTHOUGH ENVIRONMENTAL CONSIDERATIONS PROBABLY PLAYED A ROLE, IT WAS NOT CLEAR HOW DECISIVE THEIR ROLE WAS IN RELATION TO OTHER CONSIDERATIONS.

RECOMMENDATION ON THE LINK BETWEEN EIA AND THE DECISION-MAKING PROCESS

IT IS RECOMMENDED THAT:

1. ANY EIA PROCESS SHOULD CONTAIN A MECHANISM FOR ENSURING THAT ITS FINDINGS ARE ADEQUATELY TAKEN INTO ACCOUNT IN THE DECISION-MAKING PROCESS.
2. WHERE APPROPRIATE, THE WAY IN WHICH THE FINDINGS ARE TAKEN INTO ACCOUNT SHOULD BE DOCUMENTED.

Notes

1/ In the American system, the term "lead" agency refers to the agency responsible for preparing the EIS as opposed to reviewing it or co-operating on it in an advisory capacity.

2/ Esker: long ridge of post-glacial gravel.

3/ Impacts on the bio-physical environment include, inter alia, impacts on: human health and safety, the quality of air, water and soil, survival of flora and fauna and their habitats, the cultural heritage, land use, etc.

Impacts on the socio-economic environment include, inter alia, impacts on human settlements, lifestyles, employment, etc.

4/ This was so because at the time the case studies were conducted, only the EIA system of the United States of America had a requirement that the decision must reflect the findings of the EIA. Since then Canada (1984) and the Netherlands (1985) have instituted similar requirements.

ANNEX I

ENVIRONMENTAL IMPACT ASSESSMENT FOR SELECTED CASE STUDIES

Highways

CASE 1. THE BANFF HIGHWAY IN CANADA

The main elements of the study are summarized as follows:

Project title:	Banff Highway/Canada
Type of project:	Infrastructural project in ecologically sensitive area
Project characteristics:	27 km highway in national park area
Proponent:	Public Works, Canada
Competent Authority:	Public Works, Canada Parks, Canada
Main environmental impacts involved:	<ul style="list-style-type: none">- Wildlife- Vegetation- Visual aspects- Land use (recreation)
Decision:	Decision to build; mitigation measures (isolate highway from wildlife) included

I. GENERAL INFORMATION ON THE PROJECT

This project shows the application of EIA to an infrastructure project in a particularly ecologically sensitive area. Proposals to expand the existing two-lane Trans Canada Highway into a four-lane limited access highway within the boundaries of Canada's best known national park were reviewed extensively with public consultation.

Environmental and other interest groups raised a number of issues related to conservation and multi-jurisdictional responsibilities which were addressed in reports completed by an independent panel of experts. Particular emphasis was placed on such matters as the need for the project, possible alternatives, park planning, social considerations, as well as the particular environmental impact of the project.

Special mitigation measures were proposed to deal with impacts on mountain sheep, fish and other wildlife in the area. Innovative design and special attention to aesthetic factors would minimize impacts on sensitive habitats.

The project proposal was highly contentious prior to the reviews and so implementation was delayed for a number of years. Construction is now underway.

II. PLANNING PROCESS FOR HIGHWAYS

Trans Canada Highway (TCH) was built under the authority of the Trans Canada Highway Act which provided general standards for its design and construction. Although Transport Canada is involved in planning transportation facilities on a national basis, Public Works Canada is the department responsible for administration of the Trans-Canada Highway Act and, as the federal Government's construction agency, they had completed the TCH section within the boundaries of Banff National Park in 1960.

Public Works Canada's environmental assessment process is also part of the department's 10-stage Project Delivery System (PDS) which examines projects through 10 stages of development from "Identification of needs and opportunities" (stage 1), to "Evaluation" of the completed project (stage 10). Although Preliminary Environmental Screening could be completed or partially completed in Stage 1 of the PDS, it and the other three levels of assessment are normally all completed in Stage 2 during the "Options analysis and selection".

The unusual situation of having a road of national importance run through a national park is subject to a National Parks policy which "accepts, as one of the facts of economic life, that transportation routes through the mountain parks are required in the national interest".

While new construction on the TCH within the Park remains the responsibility of Public Works, Parks Canada operates and maintains the highway. Any highway modifications proposed by Public Works are reviewed by Parks Canada as a matter of policy in order to ensure that the spirit of the National Parks Act is maintained.

III. INITIATION OF THE EIA PROCESS

The beginning of the EIA process which resulted in the EISs prepared for this project took place in 1978 with the completion of an Initial Environmental Evaluation (IEE) by Public Works. Following completion of the IEE and with the support of Parks Canada, Public Works then referred the project to the Federal Environmental Assessment Review Office (FEARO) for review. Prior to the initiation of the formal EIA process, other environmental studies had nevertheless been undertaken.

As early as 1972, the Department of Public Works had commissioned an Environmental Impact Study to examine the implications of adding two lanes to the highway in the first 13 kilometres from the park's east gate. This study compared alternative routing on the basis of environmental impacts. Analysis included a new corridor to the north of the existing highway (as well as the original routing proposed by the Department in 1968 between the highway and the railway). It concluded by preferring other alternatives (adjacent to the existing railway or road). A 1974 Parks Canada planning study addressed alternative corridors along the TCH through the National Park, concurring with the Public Works environmental study up to 13 km, considering environmental preferences beyond that point and recommending more detailed studies, particularly for the segment from 13 km to 27 km, in order to choose an alternative either south or north of Vermillion Lake. Following a Parks

Canada public participation programme, concern was expressed about environmental impacts and, with the mid-1970s oil crisis, 1975 traffic decreased over 1974 so that the proposal was shelved until 1978 when, in response to resumed traffic growth, Public Works completed the IEE for 0 km to 13 km. Transport Canada in its 1978 Pacific Rim Highway Access Study analysed the traffic load on the TCH and alternative routes outside the park and concluded that twinning (i.e. adding two lanes) of the TCH was needed.

IV. RESPONSIBILITY FOR PREPARING THE EIS

Public Works Canada contracted with a private consulting firm, Thurber Consultants Limited, to prepare the EIS. Thurber assembled and co-ordinated a study team to prepare the necessary documentation. The team was comprised of specialists from the private sector and Public Works Canada.

Thurber is an engineering firm. The team, however, included experts in the fields of climatology, land-water resource use, socio-economics, tourism and recreation, air quality, noise, aquatics, hydrology and vegetation.

V. CONTENT REQUIREMENTS FOR THE EIS

A FEARO panel was appointed to review the environmental consequences for the Banff project; in September 1978 the panel issued guidelines for the preparation of an Environmental Impact Statement (EIS). The Guidelines (a 14 page document) covered the following topics:

1. OVERVIEW SUMMARY
2. THE PROJECT SETTING
 - 2.1. Declaration and objective
 - 2.2. Need
 - 2.3. Alternatives
 - 2.4. Associated projects
3. THE PROPOSAL
 - 3.1. General layout
 - 3.2. Pre-construction details
 - 3.3. Construction details
 - 3.4. Operation and maintenance
 - 3.5. Abandonment

4. DESCRIPTION OF EXISTING ENVIRONMENT AND RESOURCE USE

4.1. Climate

4.2. Terrain

4.3. Hydrology

4.4. Flora

4.5. Fauna

4.6. People

4.7. Land, water and resource use

5. ENVIRONMENTAL IMPACTS AND MITIGATING MEASURES

5.1. Climate

5.2. Terrain

5.3. Hydrology

5.4. Flora

5.5. Fauna

5.6. People

5.7. Land, water and resource use

6. RESIDUAL IMPACTS

7. ANNEXES

VI. DESCRIPTION OF THE PROPOSED PROJECT AND ALTERNATIVES

The project proposed by Public Works Canada was to make improvements to the Trans-Canada Highway through Banff National Park in two phases (a) East Gate to 13 km, and (b) 13 to 27 km. The existing highway is a rural, paved, two-lane undivided highway with a design speed of 113 km/hr and a posted speed of 100 km/hr. The total width of the pavement is 13.4 m which includes two driving lanes each 3.7 m wide and paved shoulders each 3.0 m wide. The width of the right-of-way is 61 metres.

The EIS for the first phase essentially considered construction of two additional lanes paralleling the existing highway, resulting in a four-lane, divided highway with limited access.

Other alternatives called for by the Guidelines (and discussed in the EIS) included: use of other corridors and modes of travel, separate routing of through traffic and park traffic, postponement and the no-build alternative.

VII. DESCRIPTION OF THE EXISTING ENVIRONMENT

In 1885, following construction of the Canadian Pacific Railways across Canada, the federal Government set aside a 26 km² area of the Rocky Mountains, including Banff Hot Springs, as Canada's first National Park. Over the years the area of the Park has changed and today Banff National Park covers 6,358 km² including part of the Bow River Valley through which both the railway and the TCH pass.

The biogeoclimatic zone (montane forest) in which the project is located is comprised of dry grassland and savannah near the valley bottoms, and Douglas fir, lodgepole pine, white spruce and aspen forest in the lower valley slopes.

Areas with the most environmentally sensitive terrain are the natural slopes adjacent to the proposed highway. These slopes are steep, sparsely vegetated with many gullies and often eroded.

The portion of the Bow River and various creeks within the project area contain a number of fish species, mostly trout. Wildlife in the area includes beaver, coyote, weasel, mink, deer, moose, elk and bighorn sheep as well as over 200 species of birds and 27 species of small mammals.

The Bow Valley has been an important site of human activity. Archeological evidence indicates the presence of prehistoric people. Modern man, however, has left more tangible evidence of his presence. In addition to the town of Banff, the remains of coal mines and settlements are apparent.

During the summer the population of Banff is greatly increased with a seasonal influx of visitors and employees. Total summer population estimates range between 10,000 and 20,000.

VIII. SCOPING

No official scoping took place to determine alternatives or major impacts. The guidelines developed by the panel were derived from a highway impact "check-list" rather than scoping.

IX. DESCRIPTION OF THE ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT AND THE ALTERNATIVES

In the EIS the proponent discussed several alternatives to twinning (construction of an additional two lanes) and provided a detailed environmental comparison for alternative routings it considered feasible within the Park.

These involved a possibility of running the route parallel to the railway rather than the existing roadway for 7 km from the east gate and routing it south of the Vermillion Lakes (on the opposite side of the existing road). In the comparison of impacts of alternatives to twinning (for example traffic diversion, use of other modes, construction of new routes) general environmental impacts and service levels were compared in tabular form.

The EISS summed up the various alternatives proposed during the years of planning for this project and the relative environmental merits of the options not previously rejected. For the section from 0 km to 7 km, this involved either paralleling the railway or the highway. The effects on hydrology, vegetation, fish, wildlife, land use, visual impact and noise were described and a comparison made in tabular form. Environmental comparisons were made for the sections from 7 km to 13 km (the railway and highway are adjacent) where an option involving some railway relocation was proposed. For both cases, the effect of use of a narrow median was compared. Similarly, routings south or north of the Vermillion Lakes were compared in the section from 13 km to 27 km. The option eventually chosen involved the least environmental impact whereas the original (1968) proposal would have had the highest impact.

The proposed highway construction alignment avoided infringing on the sensitive Vermillion Lakes by closely following the existing highway alignment. However, re-routing of Chinamans Creek was necessary and involved the disturbance of a water body containing a high number of fish and a large diversity of species.

The loss of the most valuable terrain (wetlands) was limited to 0.4 hectares by appropriate routing but the overall loss of montane zones habitat was about 1 per cent of the total within the Bow Valley.

Alternatives considered in trying to reduce the loss of habitat were reducing the width of separation between opposing lanes of traffic and close placement of fencing along the side of the highway. This involved trade-offs between aesthetic and habitat losses, resolved on a site-specific basis. It was decided, for example, at a point between 0 km and 13 km, to reduce the width of the median strip and thereby to preserve a stand of trees on the side of the highway which serve to shelter an elk habitat.

It was noted that alternatives involving construction away from the existing highway would have created a new area of disturbance. Construction of the additional two lanes adjacent to the existing highway also simplified mitigation of impacts on wildlife (with fencing and underpasses). The alignment alternative chosen involved disturbance of a number of south-facing slopes requiring special vegetation techniques.

X. REVIEW/PUBLIC PARTICIPATION

Following the request by Public Works Canada for a formal environmental review in 1978, a panel of experts was appointed to review the environmental consequences and evaluate the significance of the project. The five members of the panel included members from the Federal Environmental Assessment Review Office, Environment Canada, Parks Canada as well as a professional engineer and a member of the Faculty of Environmental Design from the University of Calgary. The panel secretariat attempted to ensure that all persons and organizations having an interest in the project received the necessary information to assist them in making their views known to the Panel.

In the fall of 1978, public information kits containing guidelines for preparation of an EIS, biographies of panel members, information on EARP and

Figure 1

COMPARISON OF ENVIRONMENTAL IMPACTS OF ALTERNATIVE
SCHEMES IN PRESENT CORRIDOR

RESOURCE	ALTERNATIVES					
	0 to 7 km			7 to 13 km		
	A	B	M	B	C	M
Hydrology	●	•	•	•	•	•
Vegetation	●	●	●	●	●	•
Fish	•	•	•	●	●	•
Wildlife	●	•	●	•	●	●
Sociology (including safety)	•	•	●	•	•	●
Land use (including recreation)	●	•	•	•	●	•
Visual	●	•	●	•	●	●
Noise	•	•	•	•	•	•

Note: The larger the circle the more adverse the impact.

Alternative B is the preferred route.

ALTERNATIVE SCHEMES IN PRESENT CORRIDOR

Scheme

Description

0 km - 7 km

- A Parallel to railway
 B Parallel to existing highway - wide median
 C Parallel to existing highway - barrier median

7 km - 13 km

- C Moving the railway - new east-bound lanes on old railway line
 B Parallel to existing highway on north side - minimum median
 M Parallel to existing highway - barrier median

the nature of the panel review were distributed to potentially interested parties. A series of meetings was then held with groups and agencies who expressed interest, to explain the nature of the review. As a result of requests made during these contacts, copies of previous studies were made available for review pending receipt of the EIS.

Comments on the EIS and on the project were also solicited through media advertisements throughout Alberta and notice of the public review was mailed to householders in Banff, Canmore and Lake Louise. Copies of the EIS were placed in viewing centres and summaries of the EIS sent directly to interested parties. Fifteen written submissions were received and distributed to interested parties prior to the public meetings.

In late May 1979 the proponent held information sessions in Calgary and Banff in order to explain the project to the general public. Brochures explaining the project and the review were distributed and comments solicited. Information from Public Works Canada was also handed out at the Park's East Gate during May. This stimulated a number of comments and further requests for information on the project.

Public meetings on the proposal were scheduled by the panel to hear discussions on issues related to the project. This allowed the panel to obtain further information on potential impacts of the project. Notices of the meetings, as well as procedures and schedules were advertised and mailed to interested parties.

Afternoon and evening sessions were held in Calgary on 12, 13 and 14 June 1979 and in Banff on 19, 20 and 21 June 1979. Sessions were devoted to the project as a whole: transportation analysis; impact on fish and wildlife, and their habitat; general impact on park environment; impact on area communities and planning; and socio-economic issues. The final session let participants present closing statements summarizing their position concerning the project, taking into account information presented by others during the meetings. With the exception of the final session, the panel, proponent, other intervenors, and the audience had the opportunity for a question and answer period after each presentation, and to make short statements concerning presentations made.

Public Works Canada, as the proponent, was represented throughout the meetings by senior departmental officials and by the private consultants that had prepared the EIS. An official of the United States Forest Service also made a presentation at the request of the proponent. Representatives of the media were present throughout the public meetings.

Other agencies providing representatives for all sessions or for a specific issue included those from municipal, provincial and federal governments. Representatives of environmental, transportation and business groups also made presentations as did other individuals interested in the project.

A total of more than 40 written submissions was received by the panel from intervenors. In addition, the proponent tabled further information including two addenda to the EIS on the matter of associated projects, and on

proposals to mitigate wildlife and erosion problems. A compilation of comments from the proponent's public information programme questionnaire was tabled.

In all, over 50 presentations were heard by the panel. Transcripts of the proceedings (1,000 pages) were made available through the Federal Environmental Assessment Review Office (FEARO). A similar review accompanied the process for the second EIS prepared for phase II - 13 km to 27 km.

XI. DECISION

The Report of the Environmental Assessment Panel concluded that:

1. The need for additional highway capacity had been clearly demonstrated,
2. There were no viable alternatives to the project as proposed that would reduce negative environmental impacts,
3. The proposal was compatible with national, provincial, regional and park plans and policies,
4. The proposed project could be constructed and operated with acceptable environmental disturbance, and
5. The residual overall environmental impact of the proposed project would not be significantly detrimental.

The panel, therefore, concluded that the project to twin the TCH could proceed subject to certain conditions and recommendations which it outlined in its report. The main conditions of approval related to the requirement for under/overpasses and fencing to isolate the highway from ungulates. There was also a requirement to relocate Chinaman Creek. There was an overriding need to ensure that the project resulted in an environmentally acceptable and aesthetically pleasing highway, consistent with park values. Innovative techniques and careful attention to design and construction operations were required to ensure that this was accomplished.

The panel also recommended that a special committee be established for ensuring the implementation of environmental studies, mitigation and enhancement measures that were identified by the proponent in the EIS and at the public meetings. In addition, the panel recommended that an environmental co-ordinator be designated for the project to serve as a day-to-day contact for park wardens and other inspectors and to ensure that construction operations were carried out using good environmental practices. Road construction was underway at the time of writing and due to be completed in the fall of 1985.

XII. MONITORING

The follow-up study indicated that the inter-departmental committee structure and on-site co-ordination had been fairly successful in ensuring an environmentally sensitive design with only minor disturbance during

construction. Use of the under-passes by animals was enumerated and vehicle/wildlife accidents reduced as a result of the mitigation measures. The need to continue monitoring of wildlife mitigation measures was highlighted and some suggestions made for design changes to improve the effectiveness of the fencing and under-passes.

The realignment of Chinaman's Creek had been successfully carried out and resumption of sports fishing would be permitted once fish stocks were fully re-established. During construction some difficulties were noted with placement of culverts and sedimentation.

Measures to re-vegetate disturbed terrain were underway. Experimental measures were being used at one construction site to determine the best techniques to obtain self-sustaining plant growth. Initial difficulties had also been reflected elsewhere in Alberta owing to poor growing conditions during that season.

A problem with project monitoring that had emerged concerned attitudes towards environmental management. The Environmental Co-ordinator and the Environmental Sub-committee clearly identified poor attitudes of field staff as being one of the major contributors to problems of culvert installation.

XIII. TIME COSTS

The proponent in the Banff Highway case found it difficult to separate costs, as many of the environmental studies would have been required during planning even without EIA. However, based on a total project cost of \$65 million and engineering studies at approximately 20 per cent of the capital costs, it was apparent that the most conservative figure for EIA would be in the order of 1 per cent of total costs.

Concerning time, the EIA process did not cause delays to this project. Indeed, the EIA helped resolve an issue that had been a point of public debate for 10 years. The time-table for the EIA process for phase I, 0 km to 13 km, was as follows:

Early 1978	- EAI conducted by Public Works
May 1978	- Request to FEARO for a formal review
September 1978	- EIS Guidelines issued
February 1979	- EIS completed
May-June 1979	- Public hearings held
October 1979	- Panel report issued

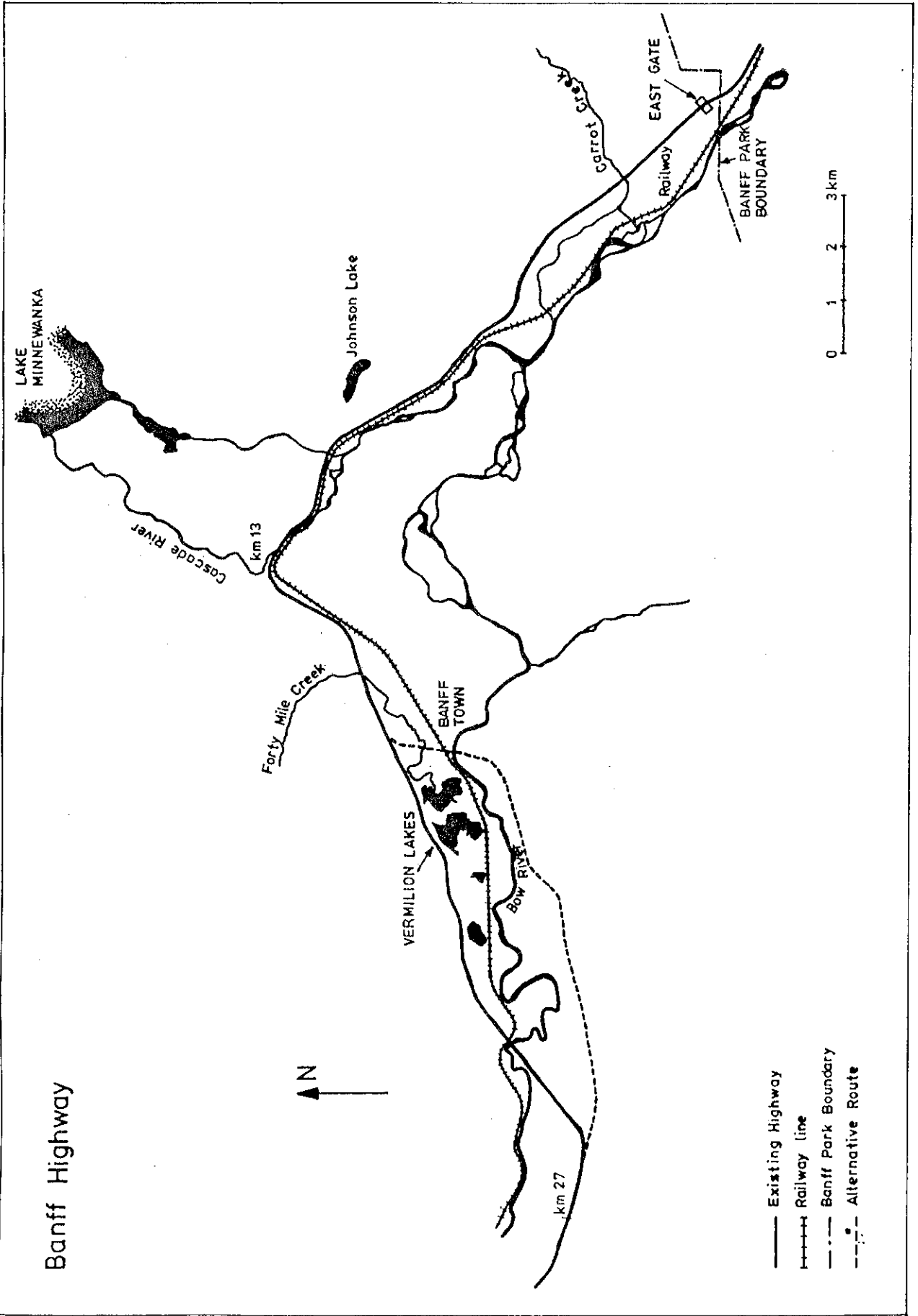


Figure 2

CASE 2. HIGHWAY 5 IN FINLAND

The main elements of the study are summarized as follows:

Project title:	Highway 5 between Vuorela and Siilinjärvi (Finland)
Type of project:	New section of one of the main national roads
Project characteristics:	15 km highway segment through esker area
Proponent:	National Board of Roads and Waterways (subordinated to the Ministry of Communications)
Competent authority:	National Board of Roads and Waterways
Main environmental impacts involved:	<ul style="list-style-type: none">- Landscape and land use- Ground water- Nature and geological value of the "esker area"
Decision:	Decision to proceed with a new alternative leaving the esker area untouched.

I. GENERAL INFORMATION ON THE PROJECT

This highway study related to the planning and decision-making process of a new section of one of the main national roads in Finland. Highway 5 stretches from Helsinki to the north via the town of Kuopio and the municipality of Siilinjärvi to the town of Kemijärvi. The case-study deals with a 15 km segment of the highway near Siilinjärvi.

Planning of that section of the highway had started 20 years earlier, in 1964. Owing to the numerous junctions the driving speed on the highway was slow and the number of accidents quite high. Traffic was predicted to increase from 9,000 vehicles per day to 15,000 or 17,000 vehicles per day in the year 2000. This necessitated planning.

II. PLANNING PROCESS FOR HIGHWAYS

The planning of highways in Finland is regulated by the Act concerning Public Roads. The Act includes a provision that "a road be located and constructed in such a way that the adverse effects of the road and the traffic to the environment are minimized". The National Board of Roads and Waterways (NBRW), subordinated to the Ministry of Communications, and its Districts, is responsible for developing traffic conditions and for the planning, constructing, improvement and maintenance of public roads.

The planning of a road starts when a proposal, usually made by a municipality, is submitted to the NBRW. The practical planning work is done by the Roads and Waterways Districts in co-operation with municipalities and other appropriate parties. Planning is reviewed and supervised by the NBRW which also sets out general guidelines for road planning. In the guidelines practical instructions define the procedures and investigations to be undertaken in various planning phases. Environmental aspects also are dealt with but no detailed instructions are given of how the environmental effects should be considered or taken into account (e.g. in the comparison of alternatives). In 1982 the NBRW approved a policy paper on environmental aspects in roads and waterways construction and management. The NBRW has also published other studies and guidelines concerning environmental protection but they have not been officially approved.

Road and highway planning can be divided into several phases. Before project planning, the traffic and road network plans are drawn up. Project planning usually includes four phases and starts with a localization plan which includes alternative locations or corridors for the new road. The next phase is a so-called preliminary or general plan. Planning proceeds with more detailed road plans and construction plans.

A localization plan includes examination of alternative corridors from the point of view of technical, cost and environmental aspects. The planning process is illustrated in figure 3.

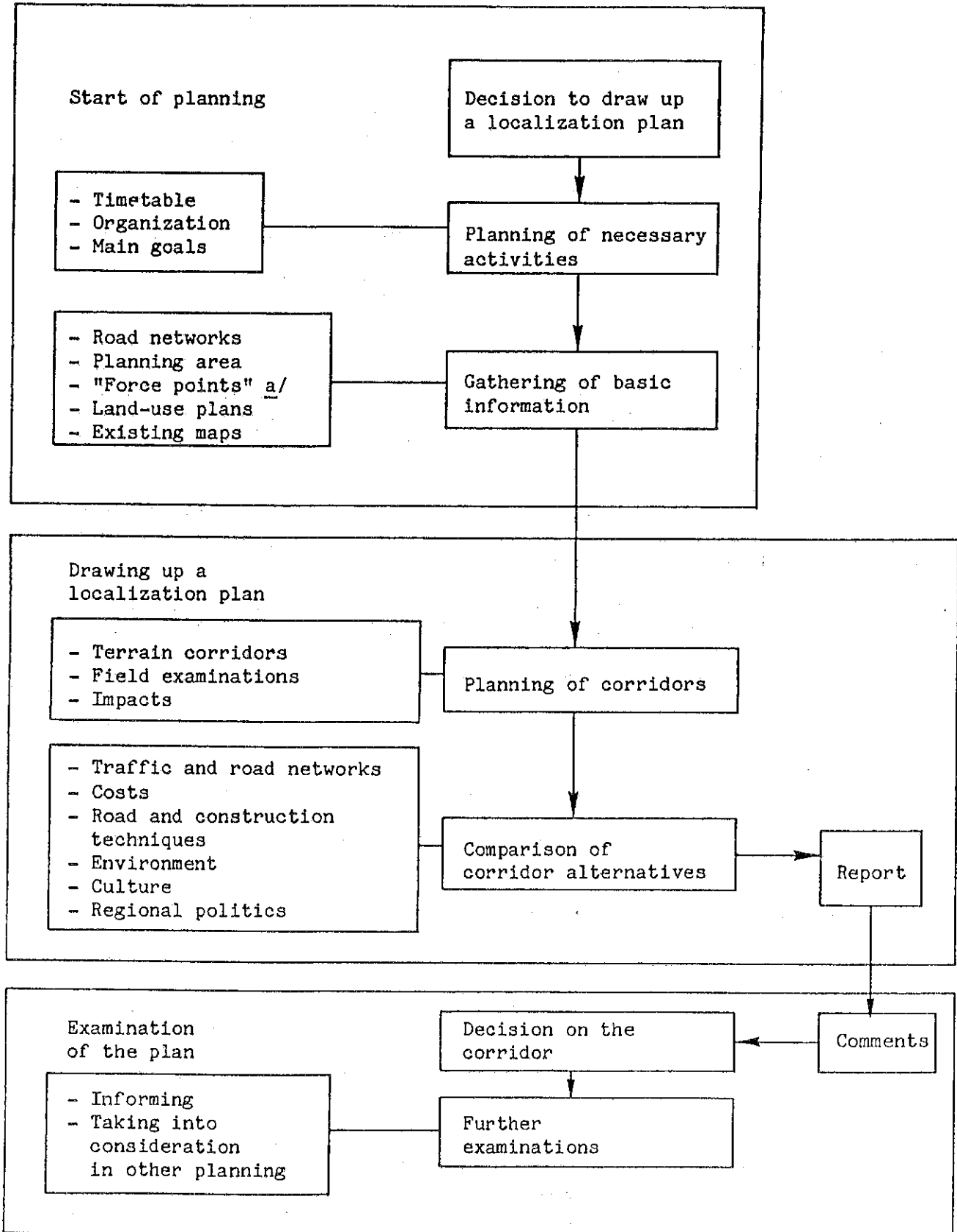
According to the general guidelines for road planning mentioned above, the public, municipalities, concerned agencies and other interested parties are informed during the planning. In the comparison of alternatives, the following should be taken into account:

- Impacts on road management (construction, improvement and maintenance costs)
- Impacts on traffic (service, safety, driving and accident costs)
- Environmental impacts (noise, pollutants, landscape, nature, objects to be protected)
- Impacts on the traffic system as a whole
- Impacts on community structure, location of activities and land use.

The plan usually consists of several separate reports combined with pictures, drawings and maps. Comments are requested from concerned agencies. The decision on the localization plan is made by the NBRW. If the plan concerns a highway, comments from the Ministry of Communications are also requested.

A general plan is a plan with more detailed information about environmental effects and measures to minimize the adverse effects. Alternatives are identified and compared. Special attention is paid to construction, environmental and cost aspects. The procedure is much like the procedure for localization planning. Again, the public is informed, comments are invited and, in the case of a highway, the plan is sent for comment to the Ministry of Communications. The NBRW takes the decision on further planning.

Figure 3



a/ "Force points" are points through which the road has to be aligned (they determine the route to some extent).

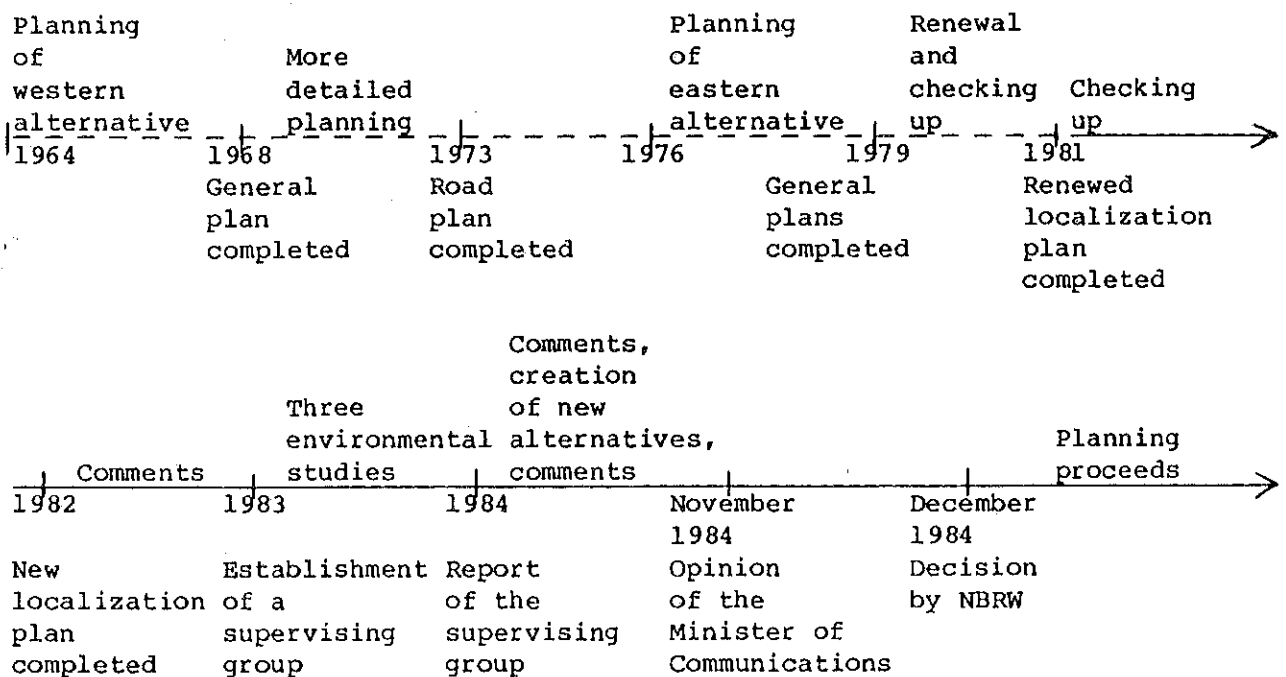
Road plans and construction plans are the basis for detailed construction. A road plan is an administrative document based on the Act concerning Public Roads. (Other plans have no legal basis.) During planning a so-called road meeting is arranged in order to hear comments from land-owners and others who may be concerned.

The completed plan is sent to the provincial government which requests comments from the municipalities. Before commenting, the municipalities also give those whose interests or rights might be involved an opportunity to react to the plan. In addition, the NBRW distributes the plan for comments to concerned agencies and communities.

The road plan concerning the construction of a new road is approved by the Ministry of Communications. Plans concerning the improvement of old roads are approved by the NBRW. The construction plan is approved by the Roads and Waterways District. Preparation of the plan is supervised by the NBRW.

The planning process for Highway 5 followed the planning system described above. With regard to the planning of this part of Highway 5, a schedule was drawn up.

Schedule of the Vuorela-Siilinjärvi highway project



III. INITIATION OF EIA PROCESS

In Finland there is no systematic EIA-procedure for highways. However, for large, important projects, environmental questions are studied in the planning process. Suggestions for measures to be taken are drawn up, taking into account environmental conditions.

The planning of Highway 5 between Vuorela and Siilinjärvi started as early as 1964. A localization plan was drawn up by the NBRW in 1982. The localization plan included a number of separate studies. It described former

phases of the planning, positions taken earlier with regard to the planning, the need for the new road and a description and comparison of alternative routes. Three alternatives were studied: to repair the existing highway or to construct a new highway either to the west or to the east of the existing highway. The localization plan included a description of the environmental impacts of the three alternatives described. The localization plan was sent for comment to the provincial government, the Regional Planning Association, the Water District, the municipality of Siilinjärvi, the Ministry of the Interior, the Ministry of Agriculture and Forestry, the National Board of Railways and the National Board of Aviation.

Most of the commentators objected to the alternative preferred by the NBRW. The NBRW preferred the western alternative because of its lower costs and for technical reasons.

The western alternative, however, would go through an esker area (long ridge of post-glacial gravel) included in the National Esker Preservation Programme and also cross an important recreational and ground-water area.

The Ministry of the Interior expressed the opinion that before taking a decision, a detailed study should be made of impacts on the esker area. If it revealed that problems with the landscape, recreation and ground-water protection could be solved, the Ministry would accept the western alternative. On the basis of the statement by the Ministry of the Interior, the NBRW ordered three environmental studies which were carried out between July and November 1983. These studies dealt with three sub-alternatives of the western alternative and their environmental aspects.

These studies were reviewed by a supervising group which concluded that no acceptable solution for the highway could be found in the area. A new alternative was developed and planning proceeded. The decision on the location alternatives was taken in December 1984.

From this short description it becomes clear that although there was no EIA in the strict sense, "environmental aspects" were indeed considered in the localization plan and later in the three environmental studies carried out for sub-alternatives of the western alternative.

The following information outlines the EIA-aspects of the localization plan and the three environmental studies.

IV. RESPONSIBILITY FOR PREPARING THE "EIS"

The localization plan was drawn up by the NBRW which can be identified as the proponent for the project.

In order to study the environmental effects, a working group was formed by the NBRW. There were seven members in the working group. Four of them were engineers (two from the Roads and Waterways District of Kuopio, one from the Regional Planning Association of Pohjois-savo and one representing the municipality of Siilinjärvi). Two of them were architects (one from the provincial government of Kuopio and one from the municipality of Siilinjärvi). One was a biologist (from the provincial government of Kuopio).

The three environmental studies commissioned by NBRW were carried out by expert consultants. The studies dealt with three sub-alternatives to the western alternative and concentrated on ground-water protection, land use and landscape, as well as nature and the geological value of the esker.

The three consultants who did the environmental studies were: (a) a consultant firm "Soil and Water"; (b) an architect consultant firm; (c) two experts from a university. "Soil and Water" is a consultant firm specializing in water supply and water protection, especially regarding ground water. A hydrologist, a geologist and a specialist in ground-water techniques were also involved in the study. The study on land use and landscape was carried out by two architects and a natural scientist. The study on nature impacts and the geological value of the esker was carried out by two experts from a university (geographers specialized in esker research in Finland).

The NBRW also created a supervisory group for the three studies. This group consisted of representatives from the Ministry of the Environment, the National Board of Waters and the NBRW. Three of the members of the supervising group were engineers and three were natural scientists.

V. CONTENT REQUIREMENTS FOR THE ENVIRONMENTAL PART OF THE LOCALIZATION PLAN AND THE THREE ENVIRONMENTAL STUDIES

When comparing the three alternatives in the localization plan, the following aspects were studied:

- Ability to function
- Safety aspects
- Construction costs
- Traffic costs
- Effects on land use
- Environmental impacts (such as effects to protected areas, landscape, ground water and noise).

This was in accordance with the general guidelines for road planning issued by the NBRW.

The basis for the terms of reference for the environmental studies was the statement of the Ministry of the Interior requesting further studies. The Ministry stated that "before taking a decision on the alternatives, a study on questions dealing with landscape, recreation and ground-water protection should be made. The study should be ordered from qualified experts and financed by the NBRW. If the study revealed that the aforementioned questions could be satisfactorily solved in the esker area, the Ministry would accept the western alternative".

The consultant firm "Soil and Water" was to examine how the planned highway in the esker area would affect the ground-water reservoir and the geological formations which are considered as monuments. Measures to protect ground water were also to be studied.

The task of the architect firm was to study the effects of the highway on landscape and land use including effects on recreation. The consultant was also to study the possibilities for preserving the esker area and developing recreation in the area.

The two experts in esker research were to examine the effects of the highway on the geological, natural geographical, biological, historical and archaeological value of the esker as well as on the landscape. They were also to make proposals for minimizing adverse effects to the area.

VI. DESCRIPTION OF PROPOSED PROJECT AND ALTERNATIVES

There were three main alternatives in the localization plan: the western, eastern and existing highway alternatives. The route of each alternative, the junctions and connecting roads to be constructed as well as the activities, settlements, industrial plants, etc. situated near the highway were described. Other alternatives had also been studied during planning but they were rejected for financial or technical reasons or because they would have had significant adverse effects on land use and the existing settlements. The selection among alternatives was made by the NBRW.

The selection process can be described as follows. The planning of the highway started in 1964 on the initiative of the municipality of Siilinjärvi: it was suggested that the NBRW draw up a plan to improve the highway on the western side of the existing road. Later an eastern alternative was also developed because of the changed land-use needs of the municipality. The selection of the final three alternatives (western alternative, existing road, eastern alternative) was based on calculations of construction and traffic costs and technical examinations.

For the later three environmental studies, sub-alternatives of the western alternative (alternatives A, B, C and afterwards D) were developed in order to satisfy the needs of various interested parties. Alternative A was the most economical one (interest of NBRW). B was created in response to the needs of industry and to improve access to the centre of the municipality. Problems with the esker preservation a/ were the main reason for developing alternative C. Alternative D was created on the basis of the three environmental studies concerning the effects of alternatives A, B and C and after negotiations with the municipality of Siilinjärvi, the Regional Planning Association and the provincial government.

VII. DESCRIPTION OF THE EXISTING ENVIRONMENT

In the localization plan the description of the existing environment was quite general in nature and was combined with the description of the effects. In the three environmental studies the descriptions were much more detailed.

The study area was in the middle part of the province of Kuopio in the municipality of Siilinjärvi. To the east it bordered existing highway 5 and the centre of Siilinjärvi. To the north it touched on the small Kumpunen road and to the south the large agriculture area of Kasurila.

The area is part of a wider gravel and sand area created during the ice age. Significant for its geological value and landscape, it is included in the National Esker Preservation Programme. It is also indicated under nature

protection and recreation in the regional and local land-use plans. Moreover, it is a significant ground-water area with two ground-water withdrawals.

In the middle section of the area there is a winter sports centre. In addition, there is a nature trail network, a part of which is lighted. The area is also used to teach biology and geography to schoolchildren.

Central parts of the area remain in a natural state or only slightly affected by man. The built areas (a hospital and residential areas) are situated on the edge of the area. In the north-eastern part of the area, there is a gravel pit, from which gravel has been taken for many years. Following a general description, the geological, hydrological and biological (vegetation) features and landscape aspects in the area were described.

VIII. DESCRIPTION OF THE ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT AND THE ALTERNATIVES AND COMPARISON

This topic can be divided into three sub-items:

- (a) Impact identification
- (b) Methods for predicting impacts
- (c) Methods for comparing the environmental effects of the various alternatives.

As far as the localization plan is concerned the impacts were identified by the working group created by the NBRW. As is generally the case, the identification of impacts was carried out on an informal ad hoc basis.

With regard to the three environmental studies, impacts were identified during the preparation of the terms of reference by the consultant, the supervising group and the NBRW.

As for (b) and (c), except for noise prediction, there were no formal methods used to predict environmental effects of the various alternatives in the localization plan. The method for noise prediction was the traffic noise calculation model, prepared as a joint Nordic project. For assessing the significance of the predicted noise, the values were compared with the maximum noise levels accepted in the Helsinki area. Noise was found to be a problem only in the existing road alternative (about 100 houses would suffer from outdoor noise above 60 dB).

Further predictions were based on the examination of maps and land-use plans and other existing information. The amount of agriculture, forest and esker areas and the number of estates subject to loss or disturbances was calculated but not actually compared per alternative. In addition some visual representations were made.

As far as the three environmental studies were concerned: in the study regarding effects on landscape and land use, no formal methods for prediction of impacts, or for comparison of alternatives were used. First, a landscape analysis was made on the basis of existing maps, aerial photographs and miniature models of the alternatives and field examinations. A map was drawn up for the essential landscape elements. The land-use plans in the area were

also briefly described. The impacts of each alternative were described and the impacts of the alternatives were compared. The conclusion of the study was that each alternative was acceptable.

The study on ground water began with the collection of the existing material (inventory of gravel and sand deposits made by the Geological Survey Institute; inventory of ground-water reservoirs made by a consultant and the National Board of Waters and the planning material received from the National Board of Roads and Waterways). During the field examination representatives from the municipality of Siilinjärvi, the Water District and the Roads and Waterways District were interviewed. In addition, experts in geology and esker preservation were interviewed. Changes imposed by the highway were predicted using an elementary mathematical two-dimensional model. No formal method was used for comparison. The impacts of the alternatives were described and compared but not in a quantified manner.

All the alternatives would go through important ground-water areas and the protection zones around them. The ground-water recharge area would be reduced because of cuttings to be made in the esker. Protective measures (plastic, clay, etc. layers on both sides of the highway) would further reduce the recharge area. The quality of the ground water would not change if the suggested protective measures were taken.

The conclusion of the study was that alternative C was preferable to the other alternatives.

In the study which dealt with the nature and the geological value of the esker, a formal esker classification method was used. The method, constantly being refined, was developed by two experts in esker preservation. b/ The classification method used in this highway case is a modification of the method described in the article cited in the footnote. Critical factors in the classification were the geological, geomorphological, biological, landscape ecological, historical and archaeological significance of the area and its multiple-use value.

The evaluation of the significance of the esker was made according to the criteria laid down in the Sand and Gravel Extraction Act (the Soil Act) - namely, beautiful scenery, significant aesthetic value of nature, special natural phenomena, the possibility of detrimental changes to the water balance - and the criteria laid down in the Building Act - productivity of renewable resources and importance for recreation. First the significance of the special natural phenomena was assessed on the basis of geomorphological and biological criteria attributing points on a scale from 0 to 9 according to various sub-criteria. The points were summed up in order to give a value of 1 to 3 to the significance of the esker as a special natural phenomenon.

The esker area was then given a value from 1 to 3 according to the other above-mentioned criteria (3 = very significant). The values were summed up in order to obtain the final significance ranking (classification I to III). It was found to be I = highly significant.

"Highly significant" means that the area should be used for nature and landscape conservation and multiple uses consistent with its carrying capacity. No gravel extraction should be allowed in the area.

The conclusion of this study was that all the alternatives were incompatible with the preservation and multiple-use objectives of the area. Alternative C would be least harmful but it was still not recommended.

IX. REVIEW AND PUBLIC PARTICIPATION

The localization plan including general environmental studies was sent for comment to the provincial government, the Regional Planning Association, the Water District, the municipality of Siilinjärvi, the Ministry of the Interior, the Ministry of Agriculture and Forestry and the National Board of Aviation.

Most reviewers objected to the western alternative preferred by the NBRW. The Ministry of the Interior expressed as its opinion that before deciding on the localization alternatives, a more detailed study on the impacts to the esker area should be made. On the basis of this comment, the NBRW ordered the three above-mentioned environmental studies.

The three environmental studies were reviewed by the supervising group. In the short report by the group it was concluded that no acceptable solution for the highway could be found in the area. The report by the supervising group was sent for comment to the municipality of Siilinjärvi, the provincial government, the Regional Planning Association, the Water District and the Roads and Waterways District.

In the comments regarding the three environmental studies, the study dealing with landscape and land use was criticized as being considered too theoretical. Moreover the conclusion (whereby each western sub-alternative was acceptable and would not cause too much damage to landscape or recreation) was regarded as incorrect. In the opinion of the municipality of Siilinjärvi, alternatives A and C were out of the question from the point of view of land use and the existing built environment. From the point of view of land use, alternative B would be the best one but at the same time most detrimental to recreation and land use. The municipality suggested that the other previously studied alternatives which would locate the route closer to the existing road should be re-examined.

The provincial government consistently preferred the eastern alternative because of the harmful environmental effects, land-use aspects and the increase in the calculated construction costs of all the western alternatives. (The study of ground water revealed that the costs of ground-water protection had been considerably underestimated.)

In the opinion of the Regional Planning Association, the eastern alternative was still preferable although a new alternative closer to the existing road could be studied. The Association opposed the western alternatives because of their inherent adverse environmental effects and increased construction costs.

The Water District preferred the existing road alternative or the eastern alternative. The reason was the risk to ground water despite the protective measures to be taken.

The Roads and Waterways District preferred alternative B because of its lower cost and also from the point of view of traffic and land-use aspects.

The public had not yet been formally involved. The public would have the opportunity to comment on the highway plan in later stages of the planning. However, many articles had appeared both in local and national newspapers - so information was widespread. The municipality of Siilinjärvi had informed the elected local government officials and arranged public meetings for local residents. The local people were mainly concerned about their own estates and the possibility of increased traffic noise. The influence of the public on planning had been so far insignificant. According to the Act concerning Public Roads, all those who might be affected must be given the opportunity to comment on the more detailed road plan drawn up in later planning phases.

On the basis of the comments from the above-mentioned agencies on the three environmental studies and further negotiations with them, a new alternative D was developed. Alternative D began at the same southern point as the other western sub-alternatives A, B and C but joined the existing highway before the esker area, passing the centre of Siilinjärvi only a short distance west of the existing highway. The study on alternative D was a technical one with calculations of costs. It was based on maps and field examinations. No environmental aspects were studied or described. The study was made by a consultant firm specialized in road planning. Alternative D was found to be more expensive than the other western sub-alternatives.

Again, comments on alternative D were requested from the same agencies as had been asked to comment on the three environmental studies. The municipality of Siilinjärvi had stated that alternatives A, B and C were out of the question for environmental reasons and because of land-use aspects. Both the eastern alternative and alternative D could be accepted. The provincial government preferred the eastern alternative but considered alternative D to be the best western alternative as it would leave the esker almost untouched. The provincial government stated that environmental studies, especially concerning noise and landscape, should be made before proceeding with alternative D. The Regional Planning Association still preferred the eastern alternative. It was of the opinion that alternative D would prevent the development of recreation in the area. It would also direct all traffic through the centre of Siilinjärvi, causing significant changes in land-use and street plans in the centre. The opinion of the Water District was that planning could proceed with alternative D as problems with ground-water protection could be satisfactorily solved. The Roads and Waterways District maintained its preference for alternative B. B was viewed as the best for financial reasons (lowest costs) and because of land-use and traffic aspects.

On the basis of all the background information and all the comments, the NBRW prepared a report (14 September 1984) to the Ministry of Communications asking for the Ministry's opinion. In the report the NBRW suggested that alternative B be chosen as the basis for further planning because of the lower costs and land-use and traffic aspects despite its adverse effects on the esker area. Should the Ministry (after possible negotiation with the Ministry of the Environment) find alternative B unacceptable for environmental reasons, the NBRW would propose alternative D although the construction costs would be higher by about 28 million Finnish marks.

X. DECISION

In the negotiations between the two ministries, alternative B was deemed unacceptable because of its adverse effects on the esker area. Alternative D was preferred as it would leave the esker untouched. The opinion of the Ministry of Communications was that planning should proceed with alternative D. The Ministry delivered its opinion to the NBRW in November 1984; in December 1984 the NBRW decided to proceed with alternative D.

XI. TIME/COSTS

The cost of the three environmental studies were insignificant compared with other planning costs, being about FIM 142,000 (USD 22,530). In order to compare the costs of environmental studies and planning costs, one could mention that the costs for creating the last alternative D (ordered from a consultant firm where only technical aspects and costs were studied) were about FIM 50,000 (USD 7,900). The costs of the environmental studies prepared for the localization plan in 1982 cannot be estimated since the studies were carried out by a working group composed of representatives of various agencies.

The construction costs of the alternatives and sub-alternatives would be the following: (in millions of Finnish marks):

- the western sub-alternative A - FIM 133
B - FIM 131
C - FIM 139
D - FIM 159
- the existing road - FIM 173
- the eastern alternative - FIM 159.

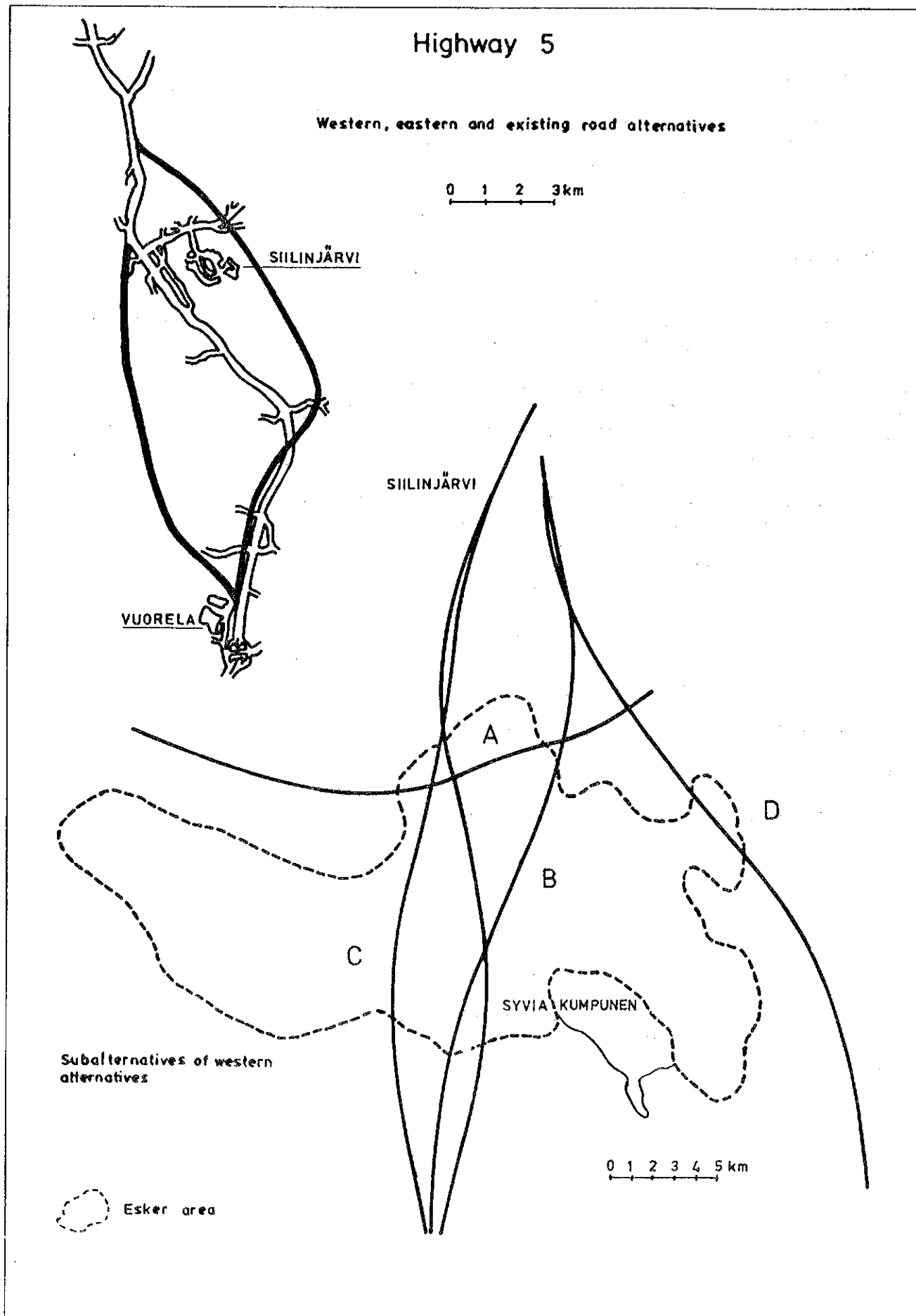
The extra environmental studies and their review delayed planning by about one year. Bearing in mind that the total time for planning was 20 years, the delay was relatively insignificant.

Notes

a/ The western alternative would have bisected an esker area (long ridge of post-glacial gravel) in the National Esker Preservation Programme.

b/ "Assessment of glaciofluvial landscapes in Finland for Nature Conservation and other multiple use purposes", Osmo Kontturi and Ari Lyytikäinen.

Figure 4



CASE 3. THE WIESBADEN BY-PASS IN THE FEDERAL REPUBLIC OF GERMANY

Project title: Wiesbaden Western By-pass
(Federal Republic of Germany)

Type of project: Western by-pass for the City of Wiesbaden
(re-routing) north-south traffic around the
western edge of Wiesbaden

Project characteristics: 4.5 km highway segment, mostly in urban area

Proponent: City of Wiesbaden

Competent authority: City of Wiesbaden

Main environmental impacts
involved:

- Changes in land-use
- Traffic noise impacts
- Air quality impacts
- Changes in city and micro-climate

Decision: Provisional decision taken not to proceed
with the project

I. GENERAL INFORMATION ON THE PROJECT

This project involved the planning of a western by-pass for the City of Wiesbaden, the capital of the State of Hessen. The purpose of the by-pass was to re-route north-south traffic now traversing the city to go around the western rim of Wiesbaden. Recognition of the need for the highway dates from the mid-1950s. One of the first steps taken towards realization of the road was in 1959 when an engineering firm undertook an initial traffic analysis for the City of Wiesbaden. The by-pass later became a part of the "Joint Traffic Plan" in 1963 and the Wiesbaden zoning plan of 1970. (The zoning plan is essentially a map of the city showing planned infrastructural changes; the by-pass is included on this map.)

In 1973, a preliminary traffic analysis was undertaken for the project. At the end of 1976 a new tunnel alternative was developed and presented informally to the city. At that time the city fathers decided on the need for an overall look at the environmental consequences of building versus not building the project and hired an independent contractor to undertake the necessary analysis.

II. PLANNING PROCESS

The study was undertaken for the updating of the City of Wiesbaden's zoning plan (Flächennutzungsplan). Such a plan serves as the basis for the elaboration of one or more building schemes (Bebauungspläne) of the community. The provisions of the zoning plan are specified in a detailed way. They are legally binding on everyone. In this case, the zoning plan would have also served as a basis for the plan approval procedure required for road construction.

The procedural steps for elaborating a zoning plan, as laid down in the Federal Building Act (Bundesbaugesetz), are mainly the following:

- (a) A formal decision by the Community Council to set up such a plan;
- (b) Early involvement not only of various authorities and agencies whose range of competences may be affected by the planning, but also of the public, in order to have planning intentions discussed;
- (c) Preparation of a draft zoning plan which will be made available to the public for their comments;
- (d) Consideration, in the finalizing of the plan, of all comments received;
- (e) A formal decision on the finalized plan, by the Community Council;
- (f) Approval of the plan by the competent higher State authority (Regierungspräsident);
- (g) Publication, e.g. in the community's official gazette, of the higher State authority's approval.

III. INITIATION OF THE EIA PROCESS

In 1978 the City of Wiesbaden commissioned two consultant firms (the Arbeitsgemeinschaft Ingenieurssozietät BGS of Frankfurt and the Electrowatt Ingenieursunternehmung AG of Zurich) jointly to prepare a study of both traffic and environmental consequences of the project. The study was to compare the alternatives of "by-pass" and "no by-pass" in a comprehensive way, giving special attention to ecological impacts.

IV. RESPONSIBILITY FOR PREPARING THE EIS

The actual study (Westumgehung Wiesbaden: Gutachten über Verkehr und Umwelt, January 1979) was undertaken by a team of two engineers and three natural scientists from the two consulting firms involved. In order to facilitate co-operation among the consultants, other experts and the city's political factions, a special commission was set up to supervise the work. The commission was made up of representatives of the Wiesbaden City Council (all three political parties represented) as well as city and provincial authorities for construction, transportation and environment. A number of meetings was held between the commission and the consultants. These meetings served initially to identify the goals of the work. As results were obtained these were also discussed along with proposals for their evaluation and the necessity for further investigation. Co-ordination talks of this kind were also held with community representatives involved and the regional planning authority of the area in question.

V. CONTENT REQUIREMENTS

The study undertaken was ad hoc in nature. Thus it did not follow any specific content requirements of existing planning procedures. The actual content of the study (as described below) evolved as a result of discussion and agreement between the consultants and the specially formed commission.

The content of the study was broken down in the following way:

- A. Introduction
- B. Analysis of the situation
 - 1. Structure of the planning area
 - 2. Traffic situation
 - 2.1 Traffic volumes for representative streets and junctions (intersections)
 - 2.2 Traffic beginning and ending in the area in question and through-traffic
 - 2.3 Comparison with earlier surveys
 - 3. Ecological situation
 - 3.1 Ecological landscape units
 - 3.2 City and microclimate
 - 3.3 Ecological relevance matrix
 - 4. Analytical results
- C. Comparison of alternatives
 - 1. Alternatives
 - 2. Transportation effects
 - 2.1 General
 - 2.2 Route characteristics; travel time matrix
 - 2.3 Theoretical foundations of traffic allocation
 - 2.4 Regional displacements as a result of the western by-pass
 - 2.5 Status quo allocation
 - 2.6 Prognosis of ability of existing network to accommodate traffic increase
 - 2.7 Comparison with 1973 traffic analysis
 - 3. Ecological effects
 - 3.1 Changes in land use
 - 3.2 Traffic noise impacts

3.3 Air quality impacts

3.4 Changes in city and microclimate

4. First conclusions

D. Assessment of alternatives

1. Ecological effects analysis

1.1 Quasi-dynamic system model

1.2 System simulation

1.3 Interpretation

2. Utility analysis

2.1 Utility analysis as decision-making tool

2.2 Planning goals

2.3 Goal output

2.4 Goal weighting

2.5 Results of the utility analysis

E. Conclusions and recommendations.

VI. DESCRIPTION OF THE PROPOSED PROJECT AND ALTERNATIVES

Although the original instruction given to the consultants related only to the "width" and "without" alternatives, the actual study examined three alternatives, 0, 0⁺ and 1. They were defined as follows:

- Alternative 0 - the present road system with no extensions;
- Alternative 0⁺ - improvement (widening) of several existing roads (e.g. the Goerdelerstrasse) instead of the proposed by-pass;
- Alternative 1 - the proposed by-pass (together with some related changes in the existing road system).

VII. DESCRIPTION OF THE EXISTING ENVIRONMENT

The study divided the description of the existing environment into two general sections: the traffic situation and the ecological situation. Under "traffic situation", a number of existing north-south roads were studied to determine their traffic loads and the "goal" of the traffic involved, i.e. what percentage of traffic was going to the inner-city versus the outlying areas of Wiesbaden. (The most heavily travelled streets carried

1,300 vehicles per hour during the morning rush period). Comparison with a 1970 traffic count showed that, as of 1978, traffic had increased by 30 per cent to 50 per cent on two main arteries.

The "ecological situation" was described in terms of ecological landscape units (ELUs). In examining the area through which the proposed by-pass would proceed, it was discovered that the route could be divided into six distinct areas, or units, each of which exhibited homogenous ecological characteristics. The main factors used to determine the ecological unit were soil type, natural and potential vegetation and present land use. Information for dividing the route into units was obtained from various topographical and land-use maps, the Wiesbaden zoning plan and field investigations.

The six units were described as follows:

- ELU 1: From the southern beginning of the route, Saarstrasse to Holzstrasse - "weekend gardens", nurseries, fields, but little housing.
- ELU 2: From Holzstrasse to Dotzheimerstrasse - combination residential and industrial area, few green areas.
- ELU 3: From Dotzheimerstrasse to north of the athletic fields - residential area, playing fields, "weekend gardens".
- ELU 4: From north of the athletic fields of the "Cloister Mill" - residential areas, "weekend gardens", nurseries.
- ELU 5: From the forested "Hügelrücken" (Aarstrasse) to the northern end of the route - forests, agriculture, recreation areas.
- ELU 6: Wiesbaden inner-city - residential, business, transport.

ELUs 1 through 5 proceed from the southern to the northern terminus of the proposed route. ELU 6 comprises an area equal to and immediately east of the first five ELUs. The microclimate of the entire area was described in terms of temperature, wind, precipitation, humidity, etc.

Ecological relevance matrix

In order to show the most important direct and indirect effects of the proposed by-pass, an ecological relevance matrix was prepared for each ecological landscape unit (ELU) (see tables 1 and 2). These matrices identify a total of 23 elements or influence-factors which are divided into six groups. The presentation of the possible reciprocal actions between these groups can be used to identify the "chain reaction" effect that usually takes place when a "disturbance" (such as the building of a new highway) occurs. The 23 matrix elements are used both as "rows" (horizontal) and "columns" (vertical) in the matrix in such a way that the elements and influence factors of the rows stand for the active side in a possible relationship while the elements and influence factors of the columns represent the passive side. The intensity of the relationship between any two factors depends upon the specific conditions in the particular area (ELU) being described.

The magnitude of the possible relationships is described in a four-step scale:

- (0) No relationship (the elements have no effect on each other or are not present in the particular situation)
- (1) Weak relationship
- (2) Medium relationship
- (3) Strong relationship.

In addition to the step scale, a plus or minus sign is given to signify if the relationship is a positive or negative one. Table 2 shows a filled-in matrix for ELUs 1 and 4 which were combined because of their similarities. It illustrates the kinds of relationships that describe the area. The matrix should be read row-by-row from left to right. Thus taking the example of the biotic element "forest" (row 6), one sees that if the amount of forested area is increased, it will have a weak (1) but positive (+) influence on surface water (quality), groundwater (quality and quantity), the city (microclimate) and fauna (the species spectrum). A medium-positive (+2) relationship exists for the visual landscape while the effect on noise and air pollutants (carbon monoxide, particulates, etc.) is "weak-negative" (-1), i.e. slightly reduced. Ecological relevance matrices were completed for each ELU or combination thereof.

VIII. DESCRIPTION OF THE ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT AND THE ALTERNATIVES AND COMPARISON

A. Identification of impacts

Along with "transportation effects", four types of "ecological effects" were assessed for each alternative. They were (a) changes in land use, (b) traffic noise impacts, (c) air-quality impacts and (d) changes in city and microclimate.

In order to determine the extent to which land would be taken for the by-pass, the amount (in hectares) was calculated for various land-use types in each of the landscape ecological units. Topographical maps, the Wiesbaden Zoning Plan and other references provided the base-line data. The types of land uses identified were:

- Forests
- "Weekend gardens"
- Grassland
- Farm land
- Industrial/commercial areas
- Nurseries

Table 1: Classification of the elements and influence factors of the relevance matrix with descriptions

Abiotic elements	Soil characteristics	pH, humus, ventilation
	Surface water	pH, quality, quantity
	Ground water	pH, chemical elements, level
	City/microclimate	Temperature (frost), wind, precipitation, humidity, inner-city fresh air supply
Biotic elements	Natural vegetation	Vegetation present, relationship to potential natural vegetation
	Forest	Groundcover, structure, number of species
	Grassland	Groundcover, structure, number of species
	Fauna	Species spectrum, number of individuals
Land-use	"Weekend gardens"	Groundcover, general effects
	Nurseries	Groundcover, general effects
Human settlements and recreation	Residents	Number, well-being
	Recreation seekers	Number, type of recreation and possibilities
	City character	Effect on well-being
	Landscape character	Effect on well-being
Traffic	Total traffic	Cross-sectional volume
	% lorries	Percentage per cross-section
	Average speed	Extent
Further man-made influences	Highway construction	By-pass, Goerdlerstrasse
	Noise	Traffic noise, noise levels
	Air pollutants	CO, NO, HC, particulates
	Other pollutants	Dust, salt, rubber residuals, chemical pollutants
	Land severance	Effects of increase/decrease
	Visual impact	Effects of increase/decrease

Table 2: Relevance matrix of ecological landscape units 1 and 4

Active elements and factors of influence	Abiotic elements			Biotic elements			Land use		Human settlements and recreation			Traffic		Further man-made influences			Visual impact					
	Soil characteristics	Surface water	Ground water	City climate/microclimate	Natural vegetation	Forest	Grassland	Fauna	"Weekend gardens"	Nurseries	Residents	Recreation seekers	City character	Visual landscape character	Percentage of lorries	Average speed		Highway construction	Air pollutants	Noise	Other man-made influences	Land severance
Soil characteristics	+2	+1		+2				+1														
Surface water		+1		+2				+2			+1											
Ground water	-1	+1		+1	+1	+1																
City climate/microclimate				-1				-1	-1		-1											
Natural vegetation		+1	+1		+2			+2					+2									
Forest	+1	+1	+1		+1			+1					+2									
Grassland		-1	+1		+1			+1					+1									
Fauna										+1												
"Weekend gardens"	-1	-1	+1		+2			+2		+1	+1	+1										
Nurseries	-2	-1						-3														
Residents		-2																				
Recreation seekers	-1	-1			-1	-1	-1															
City character										+1	+1											
Visual landscape character										+1	+2	+1										
Total traffic																						
Percentage of lorries																						
Average speed																						
Highway construction		-2	-1					-2	-3													
Noise																						
Air pollutants	-1				-1	-1	-1	-1	-2	-2	-2	-1										
Other pollutants	-2																					
Land severance								-1		-2	-2											
Visual impact																						

1 = Weak relationship
 2 = Medium relationship
 3 = Strong relationship

+ = "Parallel" relationship (elements acting in the same direction)
 - = "Opposite directions" relationship (elements acting in opposite directions)

- Parks
- Playgrounds/athletic fields
- "Mixed areas"
- Residential areas

It was determined that almost two-thirds (14.1 hectares) of the land taken by the planned by-pass (alternative 1) would be in the "weekend garden" category. Given an average garden size of 400 m², this would mean the loss of approximately 350 gardens. According to the City of Wiesbaden, these gardens, for the most part, are used by individual families. Assuming an average family size of three persons, 1,050 people would be directly affected by their loss. (A further 700 persons listed as occasional visitors could be added to that number). The gardens were also determined to have a certain recreational value (Erholungswert) for an unquantifiable number of hikers and strollers. The by-pass would also result in a loss of 4.9 hectares of forest, whereas the remaining categories combined would suffer a total loss of 4.5 hectares. Alternative 0⁺ would result in a loss of only one type of land - 1.5 hectares of "weekend gardens".

A comparison of the three alternatives in terms of traffic noise showed that for alternative 1, a reduction in noise level of 2 to 6 dB(A) could be expected mainly at the northern end of the by-pass. In other sections no noticeable reduction in noise could be achieved.

On the other hand, several communities (e.g. Klarenthal) located near the proposed by-pass would experience a significant increase in noise levels. It was assumed, however, that mitigation measures in the form of noise barriers could reduce the impact.

Alternative 0⁺ would result more in a transposition of noise levels from one area to another rather than an overall reduction or increase. In this regard the community of Klarenthal would be exposed to increased noise levels. For alternative 0⁺ as well, some reduction could be achieved with installation of noise barriers. The study pointed out, however, that for certain areas neither alternative would result in a significant reduction of noise levels. A "noticeable" reduction could take place only through a 50 per cent reduction in traffic frequency or a reduction in the percentage of truck traffic.

Automobile emissions would be most drastically reduced at the northern end of the planned by-pass. The "EIS" assumed a reduction of 30 per cent in that area. Any reduction in the more heavily burdened south-western end of the highway would not exceed 10 per cent. Air quality impacts were of major importance owing to the existing wind patterns (west to east) in the area which would transport any increased pollutant levels to the inner city of Wiesbaden. Alternative 0⁺, as in the case of noise levels, would result more in a transposition or transfer of pollutants rather than an overall reduction or increase. Here again the community of Klarenthal would experience increased pollutant levels but not, according to the study, to a significant degree.

Alternative 1 would have a direct effect on the city climate. This would occur because of the "fresh air stream" (Frischlufffluss) in the Wellritz Valley. Detailed characteristics of this flow have been recorded by the Hessian State Agency for Environment. The increased pollutant levels from the proposed by-pass would be transported to the city centre. Although wind currents are not constant it could be assumed that 20 per cent of the days in a year would experience such "air transport".

B. Data collection

The information required for the study was gathered primarily from land-use plans, various maps (water quality, topographic, etc.) traffic-noise surveys, aerial photographs and several field surveys undertaken by the consultants themselves.

C. Methods for predicting and assessing impacts and comparing alternatives

Two methods were used both to assess the impacts and to compare the alternatives (a) an ecological-effects analysis and (b) a utility analysis.

(a) Ecological-effects analysis

Proceeding from the ecological relevance matrix described above, an ecological-effects analysis was undertaken to identify which elements in which ecological landscape unit (ELU) would be influenced by the project and to what extent. The results were presented qualitatively and quantitatively. As could be expected, the analysis showed distinct differences in potential ecological effects of the three alternatives. Whereas alternative 0 would have no effect, alternatives 0⁺ and 1 would have definite negative impacts. The extent to which individual elements would be affected varied according to the ELUs. In general, however, the study concluded that whereas a small improvement in the centre city air-quality situation might be obtained by constructing the by-pass, any benefit would be at the expense of the other ELUs which would experience serious negative ecological impacts.

In order to provide a more detailed foundation for this prediction, the results of the ecological effects analysis were incorporated into the "goal achievement scale" prepared for the utility analysis.

(b) Utility analysis

The study pointed out that although the transportation and ecological effects of the proposed project could be both quantitatively and qualitatively determined in an objective fashion, the weighing of transportation advantages versus ecological disadvantages was subject to value judgements. For that reason it was deemed necessary to utilize a transparent and well-delineated evaluation procedure which would allow both the experts in various disciplines and the politicians with differing values to reach consensus.

To meet this need a utility analysis was undertaken. The analysis was broken down into the following steps:

- Formulation of a goals' scale along with evaluation criteria for determining their achievement;
- Determination of the effects of the alternatives;
- Determination of the "goal yields" (outputs) through a scaling of effects;
- Weighting of the evaluation criteria;
- Calculation of the partial utility, total utility and ranking of alternatives;
- Sensitivity analysis.

The analytical steps are presented in a simplified form in figure 1. The effects of the alternatives are derived from the evaluation criteria in the "goal achievement scale" (see figure 1) then investigated and assessed. For each evaluation criterion, the extent to which each alternative meets the particular goal must be determined. For example, for the goal "reduction of traffic noise", the evaluation criterion is "traffic noise" itself. The lower the actual noise levels, the higher the "goal yield" (output) is.

For quantifiable criteria the determination of the "goal yield" follows a formula. For nonquantifiable criteria, such as "planning flexibility" or "quality of city character", a qualitative determination is made. The "goal yield" is described with a grade or rating on a scale of 0 to 10. As a result of the ratings or grades, a ranking of alternatives with regard to each criterion can be made.

Since the planning goals (see figure 5) at the beginning of the assessment have differing significance, the criteria are weighted in that 100 points, corresponding to individual preferences, are distributed among the 27 criteria. These weights represent the significance that an individual goal has with respect to all the other goals. The multiplication of the grade and the weight produces the "partial utility" which an alternative possesses with regard to a particular criterion. Adding the "partial utilities" yields the "total utility" of a particular alternative. The alternative with the highest "total utility" is viewed as the most advantageous.

The utility analysis done as part of the overall planning process was carried out by the consultants, representatives of Wiesbaden metropolitan agencies and representatives of political parties on the special supervisory commission. The list of specific primary goals to be included in the "goals achievement scale" was decided upon after consultation with, and the agreement of, experts from various disciplines and the political representatives of the commission.

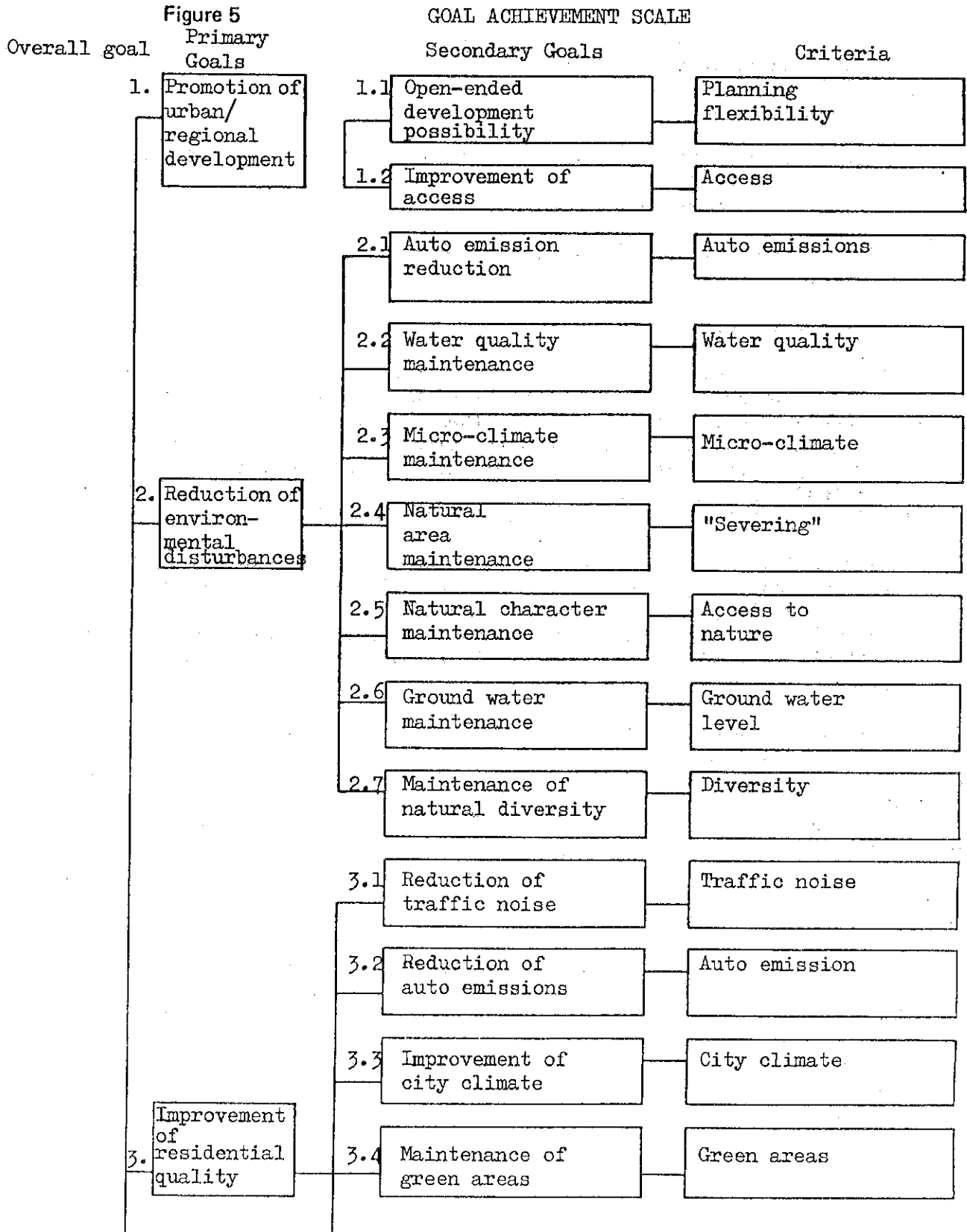
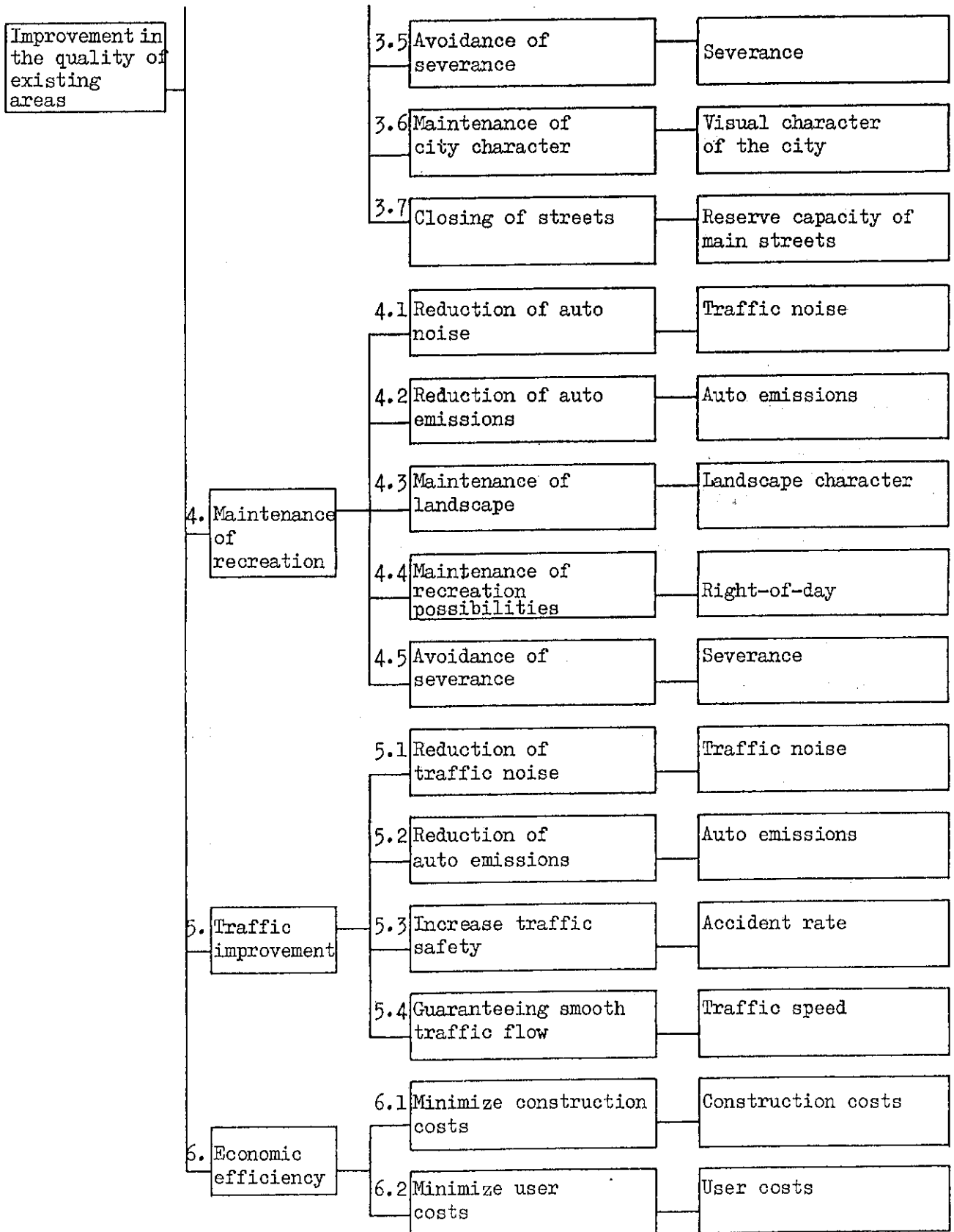


Figure 5 (continued)



Under the overall goal of "Improvement in the quality of existing areas", six primary goals were decided upon:

- (a) Promotion of urban/regional development;
- (b) Reduction of environmental disturbances;
- (c) Improvement of residential quality;
- (d) Maintenance of recreation;
- (e) Traffic improvement;
- (f) Economic efficiency.

Secondary goals and evaluation criteria were established for each of these primary goals (see figure 5) and a short general description of each was included in the study.

In order to systematize the evaluation procedure, a formalized indicator sheet was prepared for each secondary goal. It contained information in the following 10 categories;

- Name of the secondary goal and criterion (indicator),
- Short description,
- Type of assessment (quantitative or qualitative and its description),
- Method of measurement,
- Areas to which the evaluation criteria apply (ELUS 1 THROUGH 6),
- Data base,
- Explanation of the measurement and assessment,
- Scaling: presentation of the "goal yield" for each alternative,
- Additional comments,
- References.

Table 3 depicts the indicator sheet which was prepared for secondary goal 2.7, "Maintenance of natural diversity". It shows the "goal yields" for each criterion per alternative.

Table 3. Utility analysis Wiesbaden By-passIndicator sheet for sub-goal 2.7

Sub-goal	Maintenance of natural diversity												
Criterion (indicator)	Diversity (ecological variety)												
Brief description	Change in ecological variety. The biotope value according to Bechet (1976) is used as a standard measure.												
Registration	<p>quantitatively:</p> $BW = \frac{\sum_i (F_{N_i} \cdot g_{N_i})}{F_G}$ <p>where: BW = Biotope value F_{N_i} = Area of land use "i" g_{N_i} = Weight factor (ecological value) of an area of land use "i" F_G = Overall area</p>												
Measurement	<ul style="list-style-type: none"> - Planimeter affected areas, divided according to their different kinds of land use. - Calculate biotope value according to Bechet (1976). 												
Regions	Ecological units 1, 2, 3, 4, 5												
Data base	<ul style="list-style-type: none"> - Map of reference areas (researchers' own survey) - City zoning plan - Infrared false-colour aerial photographs 												
Explanations	The biotope value or, respectively, the ecological variety have been determined according to the method of Bechet (1976). Thus, to each kind of land use, a weight factor (ecological value) has been assigned, this factor being a composite of the items <u>richness in species</u> , <u>structure of vegetation strata</u> , <u>naturalness of vegetation</u> , <u>micro-climate</u> , and <u>human influences</u> . The biotope value then gives a measure for the ecological variety of an overall area.												
Scaling	<table> <tr> <td><u>Planning case</u></td> <td>0</td> <td>0+</td> <td>1</td> </tr> <tr> <td>Goal achievement</td> <td>6</td> <td>6</td> <td>4</td> </tr> <tr> <td>Measuring unit (scalar)</td> <td>19.0</td> <td>18.9</td> <td>17.8</td> </tr> </table>	<u>Planning case</u>	0	0+	1	Goal achievement	6	6	4	Measuring unit (scalar)	19.0	18.9	17.8
<u>Planning case</u>	0	0+	1										
Goal achievement	6	6	4										
Measuring unit (scalar)	19.0	18.9	17.8										

(c) Goal weighting

In giving "weights" to the six primary goals, a total of 100 points was divided among the six by the six members of the consultant team and the 15 members of the commission. After adding the weights given by all the "assessors", the results showed the following order of importance (see also figure 6 above).

<u>Primary goal</u>	<u>% weight</u>
No.3 Improvement of residential quality	37.5%
No.4 Maintenance of recreation	19.5%
No.5 Traffic improvement	17.9%
No.2 Reduction of environmental disturbance	17.0%
No.1 Promotion of urban/regional development	6.3%
No.6 Economic efficiency	2.3%

D. Results of the utility analysis

By multiplying the "goal yield" by the "weight", a "partial utility" was obtained for each secondary goal. By adding the "partial utilities" a "total utility" was obtained for each alternative. The "partial utilities" for the secondary goals and the "total utilities" for each alternative are presented in table 4.

Based on the results of the utility analysis, the major conclusions of the study were:

(a) Although the consultants tended to weigh the primary goals and alternatives somewhat differently than the commission, the overall results showed no distinct advantage of one alternative over another (i.e. 617 points for alternative 0; 628 points for alternative 0⁺; 618 points for alternative 1).

(b) Looking only at primary goals 1 (promotion of urban/regional development), 3 (improvement in residential quality) and 5 (traffic improvement) results in a 30 per cent greater utility for alternative 1 (i.e. for building the by-pass). Considering only primary goals 2 (reduction of environmental disturbances), 4 (maintenance of recreation) and 6 (economic efficiency) results in a 30 per cent greater utility for alternative 0 (i.e. not building the by-pass).

The study concluded, therefore, that if transportation goals were to be given priority, the by-pass should be built; if environmental goals were given priority, it should not be built.

In presenting these conclusions, the study revealed a central conflict inherent in EIA and decision-making, i.e. that of conflicting development goals. The "best" solution in terms of minimizing environmental impact may not be the "best" solution in terms of attaining some other development goal,

Table 4. Partial utilities of the alternatives

Primary goals	0		0+		1	
	Commission	ϕ	Commission	ϕ	Commission	ϕ
1	20.2	11.0	15.6	18.5	46.6	36.3
2	110.1	140.7	125.4	125.4	82.7	92.8
3	208.4	237.6	223.0	230.1	255.9	262.2
4	155.2	172.8	164.0	160.3	111.2	116.0
5	85.8	62.7	74.3	80.3	121.3	105.2
6	18.0	10.5	14.2	13.2	6.3	5.2
Utility	597.7	635.3	614.2	627.8	624.0	617.7

for example, in the case of highways, that of transport efficiency. A "good" EIA, however, clearly delineates the solutions, pointing out for the decision-maker their advantages and disadvantages.

As a decision to build the by-pass would meet "traffic goals" but not "ecological goals", the study recommended the construction of an improved by-pass. This would minimize environmental impact. The suggested improvements included design changes for the coupling of the by-pass at its northern and southern termini (including the construction of a tunnel for reducing climate impacts) as well as design changes to a middle section which would pass through the Wellritz Valley in EGU 4.

IX. REVIEW AND PUBLIC PARTICIPATION

Apart from the review by the commission of the consultants' work, no review of, or public participation in, the planning process took place.

X. DECISION

The city of Wiesbaden decided not to proceed with the project. The decision was based both on traffic and transport policy considerations as well as on environmental considerations. With respect to the environmental reasons, the decision reflected the findings of the study.

XI. MONITORING

As the project was not built, no monitoring took place.

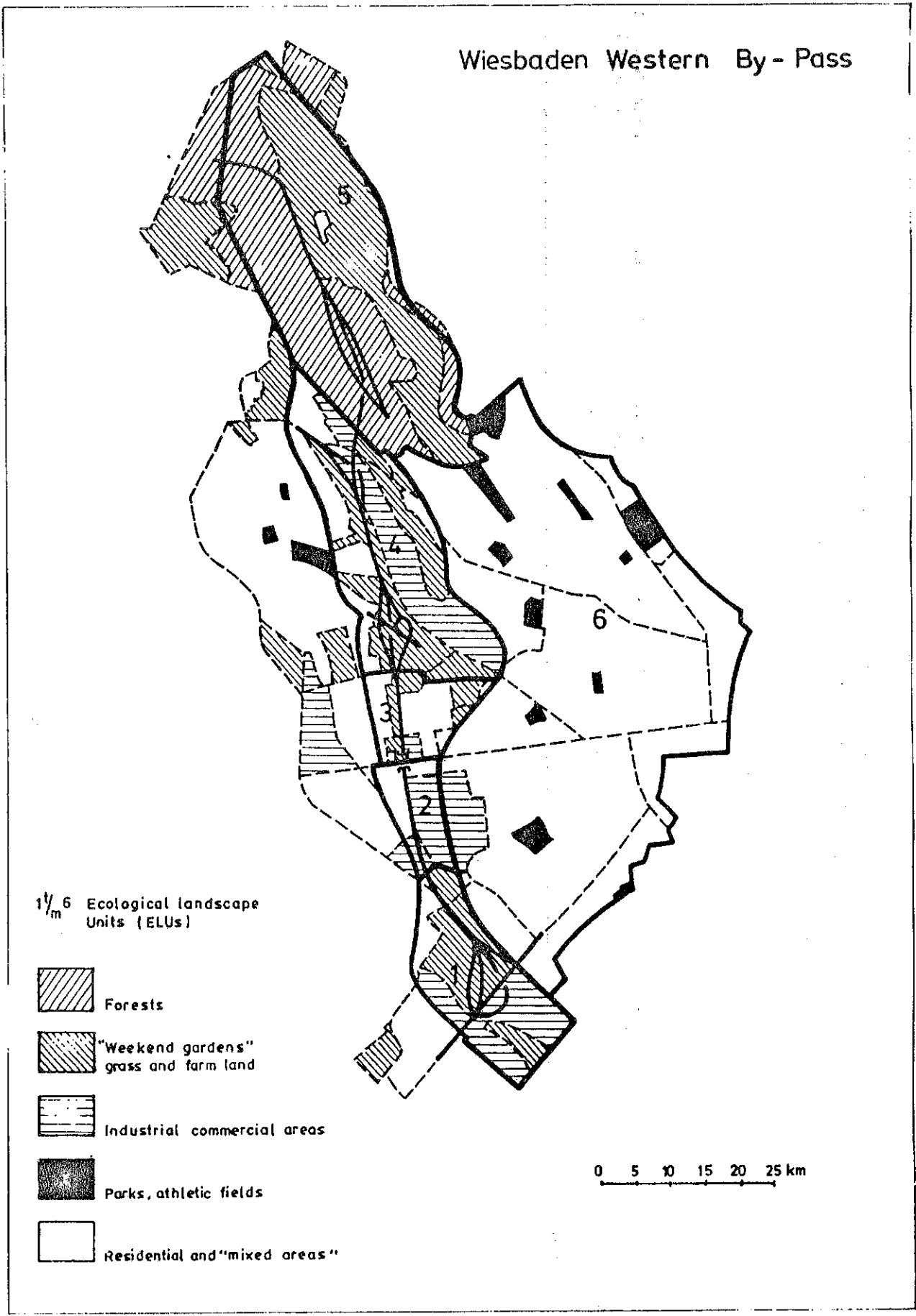
XII. TIME/COSTS

The costs of building the by-pass were estimated at DM 130 million. Inclusion of the suggested tunnel would increase the costs by DM 30 million. The cost of the environmental study was DM 120,000 or 0.08 per cent of project costs. One year elapsed between the time the consultants were commissioned and the completion of the study.

Time schedule for the Wiesbaden by-pass
(Federal Republic of Germany)

Wiesbaden zoning plan 1970	preliminary traffic analysis 1973	new tunnel alternative developed 1976	start environmental study 1978	environmental study completed 1979
----------------------------------	-----------------------------------------	---------------------------------------------	--------------------------------------	------------------------------------------

Figure 6



CASE 4. HIGHWAY 69 IN THE NETHERLANDS

The main elements of the study may be summarized as follows:

Project title:	Highway 69 between Eindhoven and the Belgian border (The Netherlands)
Type of project:	New section of national highway
Project characteristic:	15 km highway segment (semi) urban/agricultural area
Proponent:	Department of Public Works of the Ministry for Transport and Public Works + regional office
Competent authority:	Minister for Transport and Public Works
Main environmental impacts involved:	- Condition of the abiotic and biotic environment (nature and landscape) - Human health and well-being (noise risks) - Land use
Decision:	No decision yet

I. GENERAL INFORMATION ON THE PROJECT

The present link between Eindhoven and the Belgian border which passes by Aalst/Waalre and Valkenswaard is formed by National Highway 269/69. This double-lane road also has a local traffic function. As the traffic volume (17,000 to 20,000 vehicles per day) had exceeded the highest admissible level (8,000 to 10,000 vehicles per day), highway improvement was sought.

The National Highway Plan 1968 (Rijkswegenplan) and the Plan for Future Traffic and Transport (Structuurschema Verkeere en Vervoer) included the proposal to build a motorway from Eindhoven to Valkenswaard to the Belgian border. The rationale for building this highway was to reduce traffic-flow disturbances and accidents.

II. PLANNING PROCESS FOR HIGHWAYS

The planning process for this highway has followed the Dutch highway planning system. The decision-making process is based partly on legal procedures and partly on informal (not legally prescribed) procedures. The Plan for Future Traffic and Transport forms the basis for the long-term planning of highways. It contains a network of both existing and future highways.

A decision on a specific route would be taken following an informal routing procedure (tracéprocedure):

- The department of Public Works drafts a routing memorandum (tracé nota) in consultation with the regional and specified agencies concerned. This memorandum contains a study on various aspects associated with the construction of a national highway, namely:
- Traffic aspects
- Planning aspects
- Aspects concerning the living environment
- Nature and Landscape aspects
- Agricultural aspects
- Construction costs.

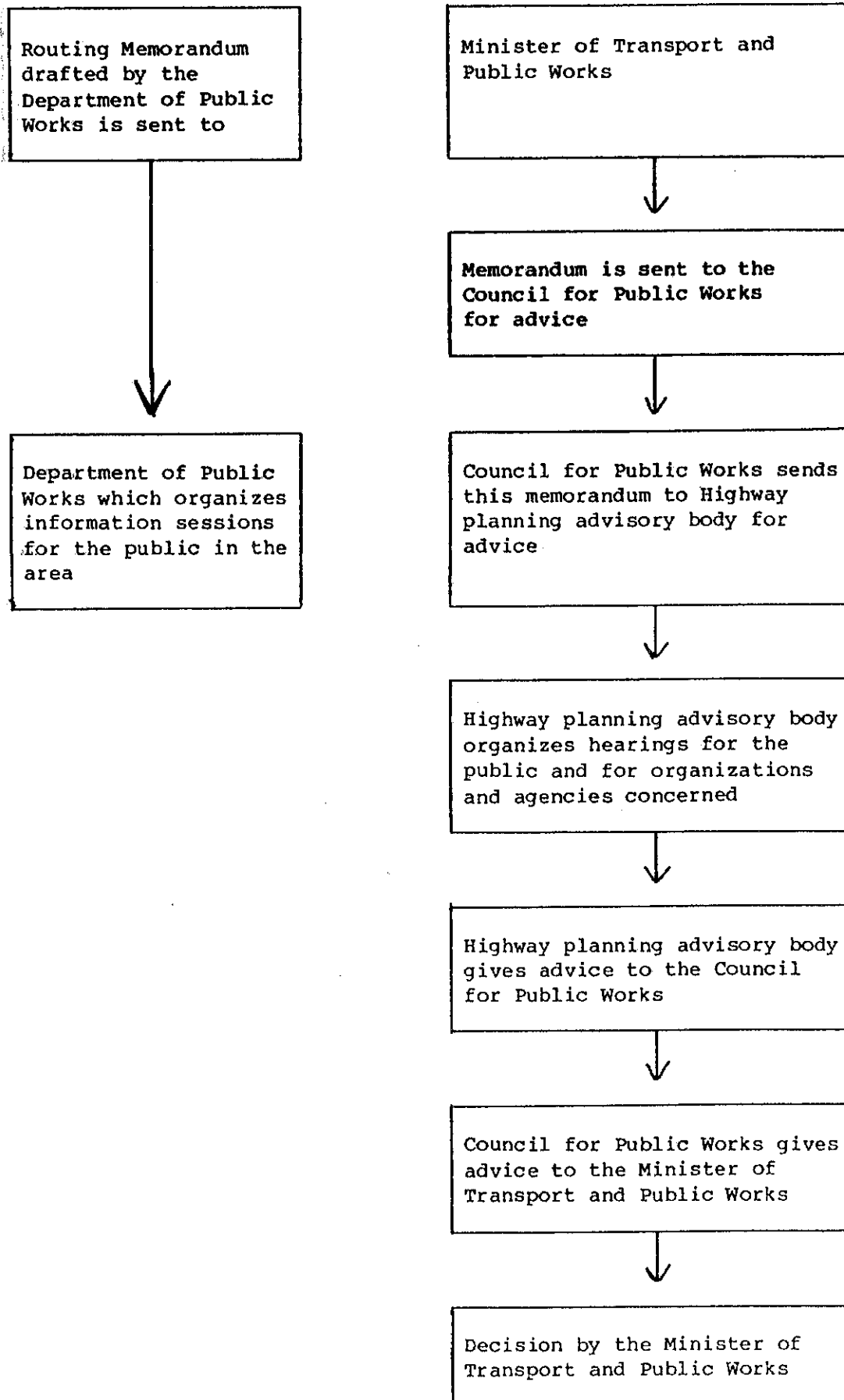
The routing memorandum deals with the consequences of the various options. The routing memorandum is sent to the Minister for Transport and Public Works who sends it to the Council for Public Works for advice. The Council for Public Works publishes the memorandum and sends it to the Highway Planning advisory body for advice. The Highway Planning advisory body (consisting of representatives of various interested parties) organizes hearings for the public and for organizations and agencies concerned. On the basis of the public input, the highway planning advisory body gives advice to the Council for Public Works. The Council for Public Works gives advice to the Minister for Transport and Public Works. On the basis of the advice from the Council for Public Works, the Minister for Transport and Public Works takes a decision concerning the choice of route.

Once determined, the route must be included in the relevant municipal and regional land-use plans. For this purpose there is a legally defined procedure which gives certain rights (e.g. right of appeal) to those affected.

III. INITIATION OF THE EIA PROCESS

In the years preceding the formulation of the draft legislation on EIA in the Netherlands, several so-called "trial runs" were carried out in order to gain experience with the application of EIA that could be helpful for its formalized introduction. In those years (1977 to 1979) EIA was done on a voluntary basis following a procedure later incorporated into the "governmental standpoint" (1979) and slightly modified in the draft legislation (1981). For the purpose of experiments with EIA, the Ministry of Health and Environmental Protection had published a report containing procedural and content requirements. It was entitled "Preliminary study on trial runs with EIA and complementary research" (VAR 1977/21). One of the trial runs was on highway 69.

The National Highway Plan 1968 and the Plan for Future Traffic and Transport recorded the proposal to construct a motorway from Eindhoven to Valkenswaard to the Belgian border (national highway 69). High priority had been accorded to this road.



In the meantime, the Department of Public Works had drafted a routing memorandum containing a description of various aspects of construction of the highway: traffic, planning, the living environment, nature and landscape, agriculture, and construction costs. In December 1977, DHV Consulting Engineers and Twijnstra Gudde Management Consultants (TG) were assigned by the Minister of Health and Environmental Protection to assist the Department of Public Works (proponent) with the EIA of the proposed extension of national highway 69 in the framework of the trial runs.

It was decided to integrate the EIA into the routing memorandum. This meant that the routing memorandum would pay more attention to environmental aspects than usual. As mentioned above, the EIA procedure followed in this trial run differed somewhat from the procedure laid down in the draft legislation.

IV. RESPONSIBILITY FOR PREPARING THE EIS

The Department of Public Works delegated the supervision of the Environmental Impact Statement (EIS) to a steering group. This steering group consisted of representatives of:

- The Department of Public Works, Main Directorate;
- The Department of Public Works, North Brabant Directorate;
- Ministry of Health and Environmental Protection;
- Regional Environmental Inspectorate North Brabant (advisory);
- DHV and TG (consulting firms).

The actual preparation of the EIS was done by a working group composed of representatives of the:

- Department of Public Works, North Brabant Directorate;
- DHV, TG, consultants;
- Regional Environment Inspectorate North Brabant (advisory).

The consulting firm involved traffic experts, experts in air pollution, soil and ground-water protection, noise, risk assessment and nature protection.

The EIA working group was directed by the steering group. In addition, the chairman of the EIA working group was also a member of a separate working group involved in compiling the routing memorandum in which the EIA was to be integrated. The EIA working group prepared proposals concerning the method of work as well as the form and content of the EIS, for consideration by the steering group at regular meetings.

V. CONTENT REQUIREMENTS

The above-mentioned "Preliminary study on trial runs and complementary research", commissioned by the Ministry of Health and Environmental Protection, contained content requirements for the EIS.

The report listed the following items for EISs to be drawn up within the framework of the trial runs:

- Summary and conclusions
- Description of the purpose of the proposed project
- Description of the proposed project and alternatives
- Description of the existing environment
- Description of impacts on the environment
- Description of environmental risks
- Gaps in knowledge and information
- Procedures.

VI. DESCRIPTION OF THE PROPOSED PROJECT AND ALTERNATIVES

In the EIS four options were described:

- Option 0, consisted of the existing routing of national highway 269/69 with a small deviation within the built-up area of Valkenswaard and small traffic improvements; possibilities were studied concerning an extension of public transport within the framework of the studies for the routing memorandum, but these were not deemed relevant to a further evaluation from the point of view of the environment.
- Option 1, a new route to the west of Waalre and through Valkenswaard directly to the east of the Dommel river.
- Option 2, a new route running in a wide arc to the west along Waalre and Valkenswaard.
- Option 3, a new route situated between options 1 and 2.

Maps showing the variants were included (scales 1:25,000 and 1:10,000).

The selection of the alternatives to be taken into account was made by the proponent (Department of Public Works). The proponent (being in fact the same ministry as the competent authority) identified the four variants. No specific guidelines were formulated for the content of the EIS as far as alternatives were concerned, nor were the EIA Commission, a/ the advisers or the public formally involved in identifying alternatives

After compilation of the EIS, the EIA Commission declared in its review document that the statement did not contain reasons for the choice of alternatives. The Commission regretted that the so-called "active zero-alternative" had not been taken into account (see under REVIEW below). The bill under consideration in Parliament, however, proposed a slightly different procedure. Before the proponent starts preparing the EIS, consultations take place among the competent authority, advisers and the public. As a result of that consultation, and with input from the EIA Commission which will review the statement once it is prepared, the competent authority would issue specific guidelines for the content of the EIS including alternatives which have to be taken into account.

Even in the case described, there were some informal contacts between the local public, environmental organizations and the Department for Public Works concerning the alternatives to be taken into consideration.

VII. TYPE OF ALTERNATIVES

Only highway routes were described as alternatives. No other mode of transport was taken into account as an alternative solution.

VIII. DESCRIPTION OF THE EXISTING ENVIRONMENT

The section of the report describing the existing environment was limited to 20 pages. It contains a description of the environment; its history; present and future physical planning situation; water management; environmental condition of the air; environmental condition of the surface water, soil and groundwater; noise; description of existing roads and use of existing roads; management and maintenance of existing roads; environmental effects of the existing roads (air quality, surface water, soil, ground water, noise, biotic environment) and present means and measures to limit environmental effects.

The description of the existing environment relied upon available data. For the current pollution and noise levels, little information was available. The existing data needed extensive elaboration for inclusion in the EIS. The study area comprised semi-urban as well as areas of agricultural and natural historical value.

IX. DESCRIPTION OF THE ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT AND THE ALTERNATIVES AND COMPARISONS

This topic may be divided into three sub-items:

(a) Impact identification

(b) Methods for predicting impacts

(c) Methods for comparing the environmental effects of the various alternatives.

A. Impact identification

On the basis of the content requirements formulated in the above-mentioned "Preliminary study on trial runs and complementary research", the working group in charge of the preparation of the EIS identified the effects to be described in the EIS. The following types of (environmental) effects were include:

- (a) Condition of the abiotic and biotic environment, "subdivided" into:
 - (i) soil (and groundwater)
 - (ii) surface water (including water quantity management)
 - (iii) air
 - (iv) nature (flora and fauna)
 - (v) landscape.
- (b) Human health and well-being
 - (i) noise
 - (ii) risks.
- (c) Land use

B. Methods for predicting impacts

The methods used for impact prediction: consisted of those listed under points a, i, ii, iv, v above. The effects on surface water, soil and ground water were only hinted at (i.e. described but not quantified). No useful model was available for describing or quantifying the distribution of these types of effects. It was assumed that the consequences of options 1, 2 and 3 would, in general, be greater than of option 0, particularly because of the larger amount of road salt that would have to be used. Trees and shrubs close to the road might suffer particularly from the splashing of salt. Furthermore, it was expected that there would be a local shift in the kind and composition of flora along the sides of the road. The consequences of the use of salt for living organisms in the smaller rivers could not be determined because the salt concentrations could not be calculated.

[a, iii] For measuring CO-concentrations along a highway, a special method had been developed (Schorling method). The Schorling method is a simplified version of complicated models. It is a very rough method. In the EIS it is even stated that the results of the use of this method should not be given too much weight. The emission values for air pollution appeared to be so low at longer distances (2 km) that this kind of information would play no role in the choice of route. Only the short-distance effects would be significant but the available method of calculation of the immission appeared to be too general for use as a basis for describing effects. Conclusion drawn: the carbon monoxide concentrations during the rush hour, for example, in the centre of Aalst, would be considerably lower with options 1, 2 and 3 than option 0.

[b, i] Noise estimations were based on noise prediction models. The study showed that the introduction of a new route would mean some reduction in the noise level along the present route. On the other hand, it would mean an increase of about 30 per cent in the number of dwellings suffering more noise than is acceptable according to present threshold limits. This increase would be borne entirely by the dwellings along the new route in spite of the noise-abatement measures in the built-up areas of Waalre and Valkenswaard. Under option 2, no noise-abatement measures would be necessary in the built-up areas to keep the noise nuisance below threshold values. Option 1 would require a noise screen or wall 4 metres high near Waalre and a 2 metre screen or cutting near Valkenswaard. Option 3 would require a screen of at least 4 metres near Waalre and Valkenswaard. It is not certain that such screens would actually be constructed. This would depend on the financial implications and consequences for the landscape. However, all the demands concerning noise abatement would have to be satisfied. It should be noted that the noise standards applicable during the night were used.

[b, ii] To obtain an impression of the risks from transport of hazardous substances, various options were tested for such hazards as explosions, fire, toxic gases and spills of toxic liquids. The latter could possibly pollute ground water and surface water. In the case of explosions, the present route (option 0) was particularly unfavourable because it would go through built-up areas. Option 2 was most favourable because it would be furthest away from populated areas. Risk of damage to the biotic environment owing to explosions was relatively low. Regarding fire, option 0 was again unfavourable because of the danger of damage in built-up areas. Option 0 would appear also to be most sensitive regarding forest and moorland fires, because of the extent to which this option was routed through forest and moorland. Option 1 seemed to be the most favourable but there were no great differences in this respect among the options, including option 0. The residential area was more or less equally sensitive to effects of toxic gases and fuels as to fire. The most sensitive was option 0 while the least sensitive was option 3. Option 3 was somewhat more favourable than option 1 because it would skirt the built-up area of Valkenswaard. Sensitivity of the biotic environment greatly depends on the nature of a given gas so that little could be said about possible effects.

Rapid clean-up measures can often limit the extent of soil and ground water pollution. Surface waters present greater problems. Such pollution would usually have little effect on the residential areas, but could be serious for the biotic environment. Under option 0 the probability of spillage into surface water appeared lowest, while the differences between options 1, 2 and 3 were not very clear at that stage of planning. In this case, the severity of possible consequences would depend on the nature of the material.

The probability of an accident occurring with transport of hazardous materials at a total intensity of 8×10^5 transport vehicles per year (about 3,000 per working day) over a 10 km stretch of road is approximately once in 25 years. For the existing road (option 0), the general probability of an accident is about four times as high as in the case of a new motorway. Thus it may be concluded that the probability of accidents with dangerous loads at equal goods traffic intensities is considerably higher for the existing road than for the new. The possibilities of taking measures to combat the

consequences of such accidents are limited. The measures mainly involve catching the spillage e.g. by allowing it to drain off an impermeable road surface into drainage ditches lined with clay.

Drainage ditches should be capable of being closed off very rapidly and emptied through separable storage holes or pumping units. Specialized organizations exist that can be called in for advice and support after accidents. It would be particularly useful to have plans ready for such emergencies. Transport of dangerous loads through built-up areas can be prevented by means of routing regulations, but alternative routes must then be provided (for example, options 1, 2 or 3).

The effects on the use of land could not be predicted accurately, but it may be assumed that the consequences of options 1, 2 and 3 would be more extensive than those of option 0. The drainage ditches would accelerate the run-off of water in a few places, which may mean a lowering of the water table by a maximum of about 10 cm. This will have small-scale effects, though at present these cannot be envisaged. The water tables would remain practically unchanged. In a few places the current of small rivers might be altered as a result of options 1, 2 and 3. The stage of planning was such that one could only say that options 1, 2 and 3 would probably be less favourable than option 0.

C. Methods for comparing the environmental effects of the various alternatives

Regarding the methods for comparing the environmental effects of the various alternatives, the EIS contains tables with a descriptive comparison of the effects of the various alternatives. However, no ranking was made, nor were explicit recommendations given concerning the best environmental alternative.

X. REVIEW AND PUBLIC PARTICIPATION

The EIA Commission, made up of independent experts, thoroughly reviewed the EIS for its quality and adequacy. This review resulted in the following finds:

- The EIA Commission missed the description of the so-called "active zero-alternative" i.e. the alternative describing the situation in which no new highway would be built but a solution would be sought through other traffic regulatory measures.
- The EIA Commission suggested a more extensive description of the purpose and rationale of the proposed activity in relation to the alternatives to be taken into account.
- The effects were not described in a balanced and integrated manner. The effects on nature and landscape, for example, were not included in the summary.
- Information was not specific enough to assess the effects on the natural environment in the immediate surroundings for the different alternatives.

- The information on noise did not include the situation regarding noise in the rural areas (only in the built-up areas).
- As the area is one of drinking-water supply, the EIA Commission was of the opinion that the EIS should describe the patterns of ground-water flow in order to be able to investigate whether ground-water quality could be damaged by the proposed activity.

The review group consisted of:

- A physician
- A ground water expert
- An air quality expert
- A traffic expert
- An accoustics expert
- Two biologists
- A psychologist.

As this EIA was one of the so-called trial runs carried out on a strictly voluntary basis, there was not formal public participation concerning the EIA. However, there was a possibility for the public to be informed and to comment on the EIS. The document was published together with the routing memorandum. Hearings were held in 1978 on the content of the routing memorandum, including the EIS. During public participation, it was suggested that another alternative be studied: the possibility of building a new road located in the abandoned railway corridor between Eindhoven and Valkenswaard. An additional memorandum was prepared for that option and additional information gathered by a consulting firm. The main environmental aspect investigated was noise. The conclusion was drawn that the new option was more favourable in this respect (noise) than options 0, 1, 2 and 3.

XI. DECISION

In this case it was clear from the beginning that this trial-run EIS would not formally contribute to the decision-making process. The EIS was, however, taken into account to a certain extent and, as part of the routing memorandum, it played a role in the decision-making process. As mentioned above, in the public participation phase of the decision-making process, the suggestion was put forward to study another alternative (abandoned railway line). The Highway Planning Advisory Body concurred with this suggestion and reported to the Council for Public Works that the decision on highway 69 could not be taken on the basis of the available information.

The Council for Public Works agreed to have an additional memorandum prepared comparing option 1 with three abandoned railway line alternatives (A, B, C).

In November 1983 the Minister for Transport and Public Works decided on the southern part of the highway from Aalst/Waalre to the Belgian border. Option 1 was chosen. With regard to the northern part of the highway between Eindhoven and Valkenswaard, a memorandum was being prepared by the Department of Public Works to compare options 1 and B/1. This memorandum would be subject to public participation. The decision was expected in mid-1985.

XII. TIME COSTS

The cost of preparing the EIS was 335,000 guilders for consulting firms. As this was a trial run, the Ministry for Environment paid the costs of the preparation of the EIS. The Department of Public Works contributed in-kind. To a certain extent, the EIA (in particular the compilation of the EIS) sped up the normal decision-making process concerning the routing memorandum.

Note

a/ This was a group of independent experts

Time schedule for Highway 69
 (The Netherlands)

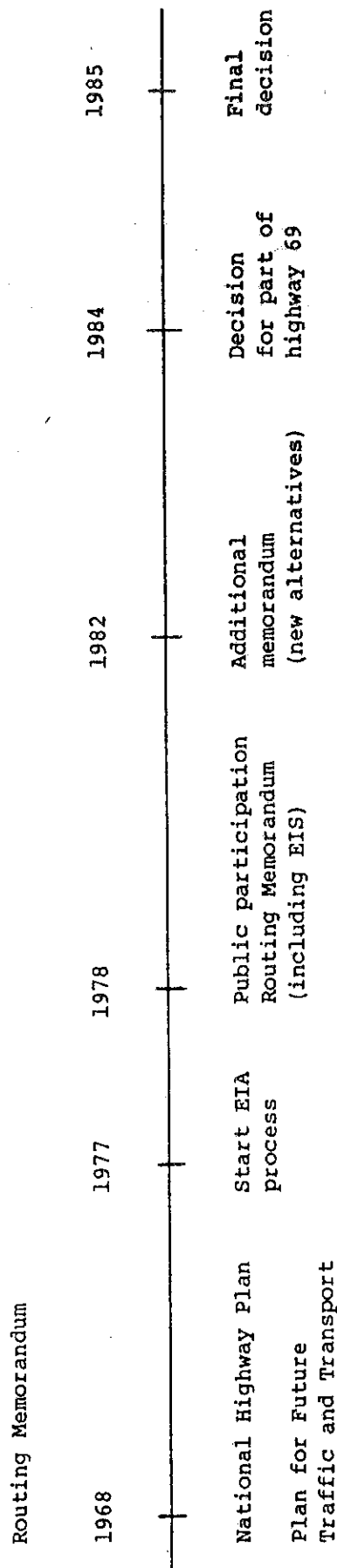
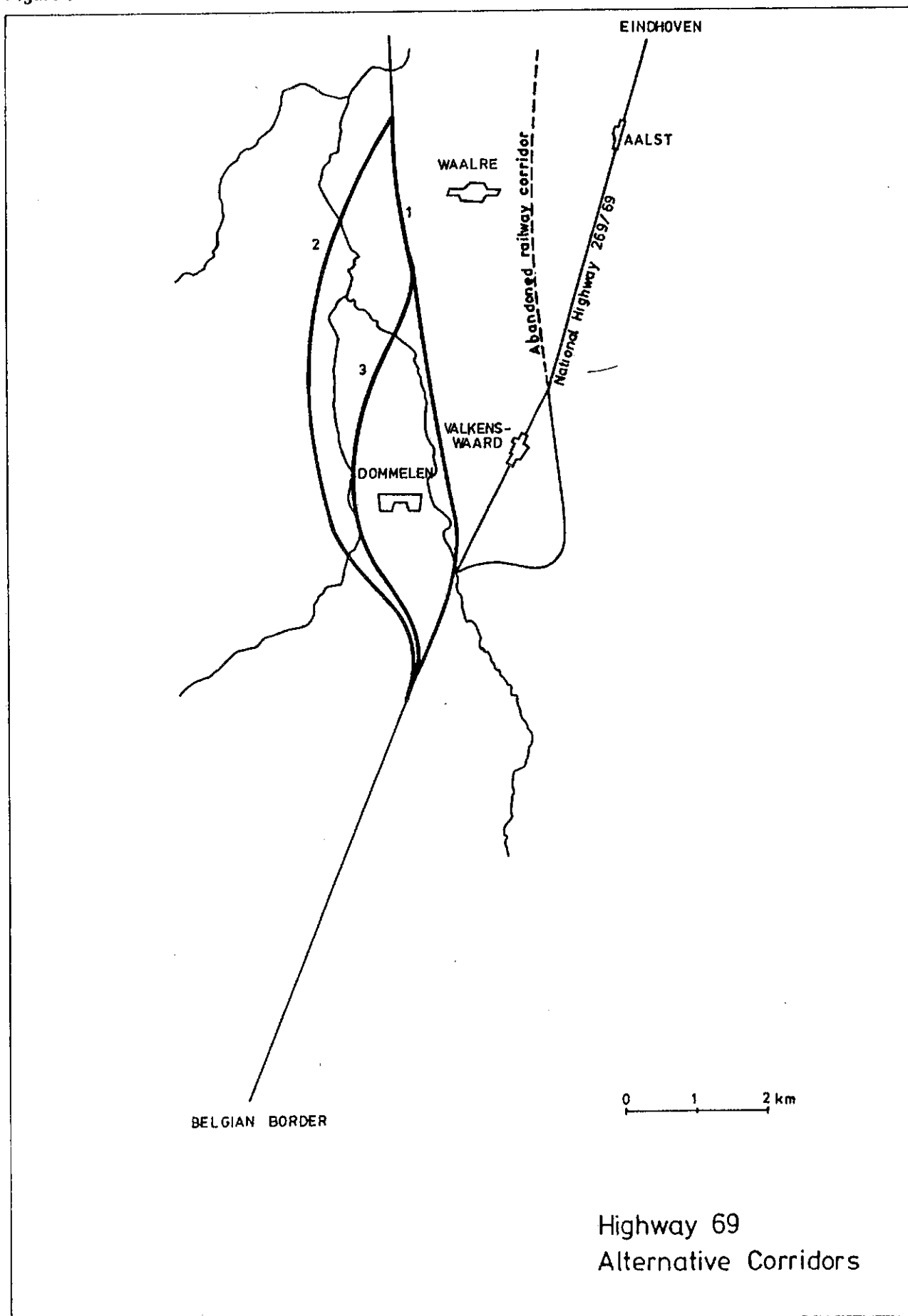


Figure 7



Highway 69
Alternative Corridors

CASE 5. HIGHWAY E-18 IN NORWAY

The main elements of the study are summarized as follows:

Project title:	E-18 Vestfold (Norway)
Type of project:	New part of one of the main national roads in Norway
Project characteristics:	20 km highway segment in a semi-urban agricultural area
Proponent:	County Road Director
Competent authority:	Road Directorate (Decision appealed to Ministry of Transport and "called in" to the Parliament)
Main environmental impacts involved:	<ul style="list-style-type: none">- Land use- Accidents- Noise- Recreation- Historic sites- Agriculture
Decision:	Parliamentary decision on a corridor. Further planning has commenced on a part of the corridor. On other parts, master road plans have been approved.

I. GENERAL INFORMATION ON THE PROJECT

This highway study relates to the planning and decision-making process of a new part of one of the main national roads in Norway. It considers approximately 20 km of alternative corridors for the E-18, located in the county of Vestfold about 100 km south of Oslo on the western part of the Oslo-fjord. The road section under consideration will also be part of the main connection between the cities in the county.

The new section of the E-18 will replace traffic from an existing two-lane road. Today the E-18 goes through a semi-urbanized area, with about 540 houses located less than 100 metres from it. It also passes through areas of prime agricultural land and areas of great historic interest. The average daily traffic is between 10,000 and 12,000 vehicles rising to about 20,000 in summer. The existing E-18 serves local, regional and national traffic and gives direct access to numerous single houses.

In general, the rationale for building the new section of the E-18 seems to be primarily to reduce accidents, to provide a better environment for people living adjacent to the existing E-18 and to reduce traffic flow disturbances and increase the speed of long distance (regional) motor traffic on the E-18.

II. PLANNING PROCESS FOR HIGHWAYS

The planning process for this highway followed the regulations under the Norwegian Road Act. The new planning regulations (1980) address the need for impact assessments. The Ministry of Transportation and the Road Directorate pointed out that impact assessments formed a basis for proposals for selection of routes and route standards.

The Road Directorate has issued recommendations regarding the content, presentation and formal requirements for road master planning in the form of a handbook. A Road Master Plan should consist of the following three major items:

Part I: A description of the proposal(s) including assessments and evaluations (EIA is included here).

Part II: A volume containing all the maps (road lines, base-line maps, etc.).

Part III: A volume containing the process documents, including statements from affected authorities and interest groups. The view of office of the County Road Director (CRD) a/ in these statements should also be included.

The highway planning process goes through the following steps:

(a) The CRD (with or without the use of consultants) prepares Parts I and II. The CRD co-operates with appropriate authorities and interest groups. The CRD gives its recommendation(s) on the choice of alternatives.

(b) Parts I and II are formally drawn up and are sent to appropriate authorities and directly affected interest groups.

(c) All responses are presented in Part III, together with the CRD's responses. The CRD also considers possible changes of the plan and makes recommendations on the choice of alternatives.

(d) Parts I, II and III are sent to the board of the affected municipality for formal concurrence.

(e) The municipal board decides on the choice of alternatives after which the CRD makes a final recommendation.

(f) Parts, I, II and III and a letter explaining the plans as well as public and municipal opinions are sent from the CRD to the Road Directorate (RD).

(g) The RD considers the proposal, assessments and opinions expressed, and makes one of the following decisions:

- Accepts the CRD's recommendation. Detailed planning may commence.

- Accepts other alternative included in the planning process. Detailed planning may commence.
- Rejects all the alternatives considered. The documents are returned to the CRD with a request for further planning.

(h) Opponents to the RD's decision may request that the decision be made by the Ministry of Transportation.

(i) The decision of the Ministry of Transportation is final, unless the case is "called in" by Parliament. If so, Parliament makes the decision.

III. INITIATION OF THE EIA PROCESS

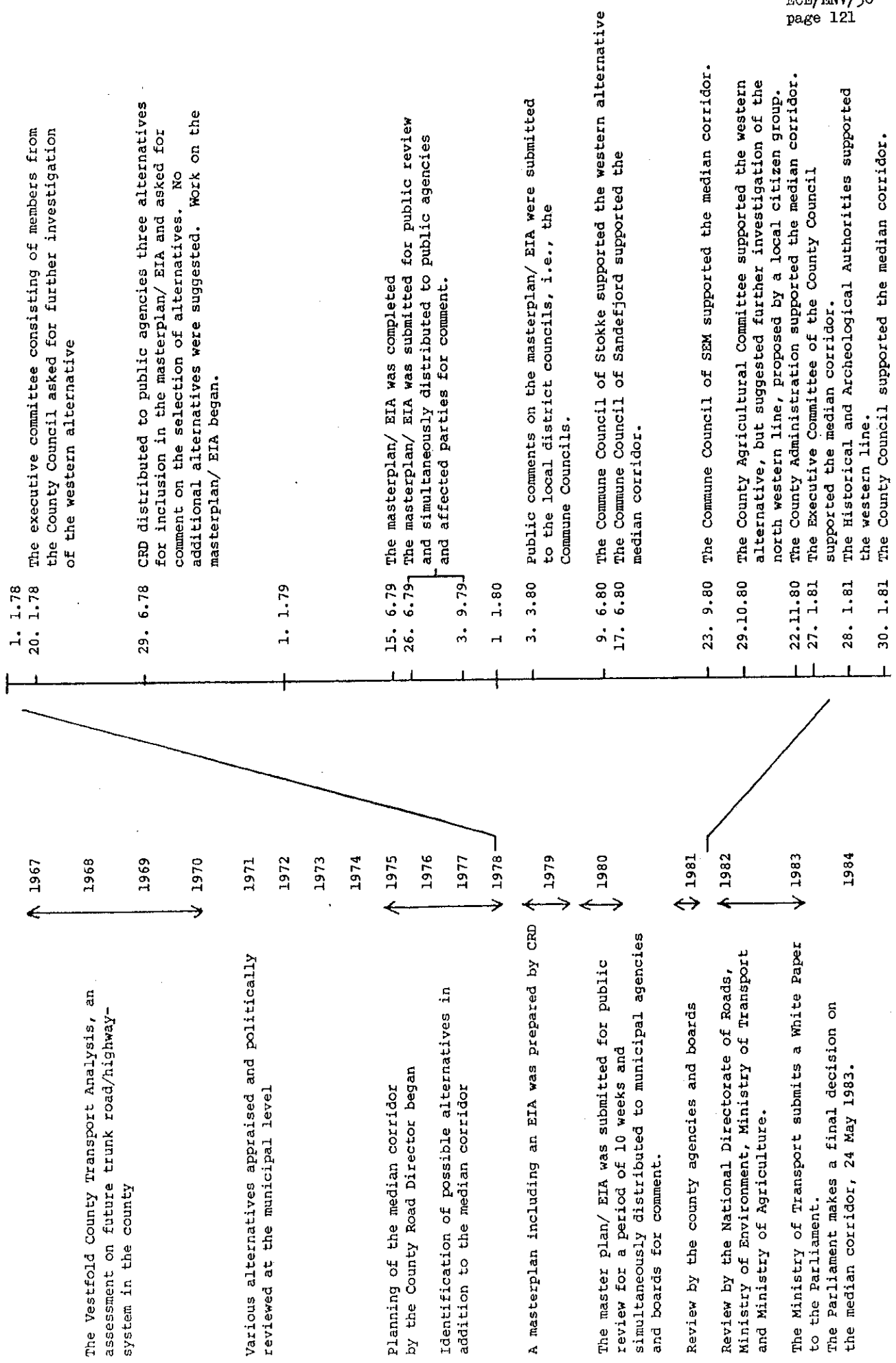
The planning process of this part of Highway E-18 started in the early 1970s after an extensive "Transport Analysis" of the county, presented in 1970. The "Transport Analysis" which contained preliminary assessments of some main alternatives created a basis for further development of alternatives. It recommended that a future road line for the E-18 be found in the median corridor, close to the existing E-18. Both eastern and western corridor alternatives were rejected. In the period from 1971 to 1975 the CRD concentrated most of its work on the development of specific alternatives within the median corridor. The CRD forwarded different detailed alternatives of the E-18 within the median corridor to the three directly affected municipalities, the County Agricultural Board and the County Development Office. The reactions revealed a variety of opinions as well as serious objections to the frame defined by the median corridor. In 1977, the County Agricultural Board asked specifically for an EIA on the E-18. In 1978, the CRD stated that there should be an EIA for all major alternatives and that it should be included in the Road Master Plan (see time-table drawn up for this project).

IV. RESPONSIBILITY FOR PREPARING THE "EIS"

The CRD was given the responsibility for the preparation of the "EIS". A major part of the practical work as well as necessary co-ordination was conducted by the CRD's own project team. A reference group was formed in 1978 by the CRD to give advice during the planning and assessment of the major alternatives. This group included:

- The Major and Chief Technical Administrator in the municipalities directly affected
- The Chief County Planner
- The Chief of the Agricultural Administration in the county
- Representatives from the CRD.

This was not a "working group" formed to prepare the "EIS". Rather, it reacted to proposals and documents from the CRD. In addition, and on an ad hoc basis, the Road Directorate assisted the CRD with some technical calculations (balance of the road profiles, estimates of construction costs).



1. 1.78 The executive committee consisting of members from the County Council asked for further investigation of the western alternative

20. 1.78

29. 6.78 CRD distributed to public agencies three alternatives for inclusion in the masterplan/ EIA and asked for comment on the selection of alternatives. No additional alternatives were suggested. Work on the masterplan/ EIA began.

3. 1.79

15. 6.79 The masterplan/ EIA was completed

26. 6.79 The masterplan/ EIA was submitted for public review and simultaneously distributed to public agencies and affected parties for comment.

3. 9.79

1. 1.80

3. 3.80 Public comments on the masterplan/ EIA were submitted to the local district councils, i.e., the Commune Councils.

9. 6.80 The Commune Council of Stokke supported the western alternative

17. 6.80 The Commune Council of Sandefjord supported the median corridor.

23. 9.80 The Commune Council of SEM supported the median corridor.

29.10.80 The County Agricultural Committee supported the western alternative, but suggested further investigation of the north western line, proposed by a local citizen group.

22.11.80 The County Administration supported the median corridor.

27. 1.81 The Executive Committee of the County Council supported the median corridor.

28. 1.81 The Historical and Archeological Authorities supported the western line.

30. 1.81 The County Council supported the median corridor.

1967

The Vestfold County Transport Analysis, an assessment on future trunk road/highway-system in the county

1968

1969

1970

Various alternatives appraised and politically reviewed at the municipal level

1971

1972

1973

1974

Planning of the median corridor by the County Road Director began

1975

1976

Identification of possible alternatives in addition to the median corridor

1977

1978

A masterplan including an EIA was prepared by CRD

1979

1980

The master plan/ EIA was submitted for public review for a period of 10 weeks and simultaneously distributed to municipal agencies and boards for comment.

1981

Review by the county agencies and boards

1982

Review by the National Directorate of Roads, Ministry of Environment, Ministry of Transport and Ministry of Agriculture.

1983

The Ministry of Transport submits a White Paper to the Parliament.

1984

The Parliament makes a final decision on the median corridor, 24 May 1983.

Furthermore, the CRD funded the necessary archeological work and assessment under the auspices of the central archeological authorities. The table provides an overview of the expertise that was directly involved.

Source	Expertise
CRD's office	Civil engineering-transportation experts
Road Directorate	Civil engineering, soil and subsoil expertise. Estimation of construction costs
County Agricultural Board	Expertise on assessment and evaluation of agricultural land
Norconsult A/S	Consultants expertise on transportation forecast and traffic assignment
Oldsakssamlingen University	University expertise on historic sites and historic matters

V. CONTENT

As indicated above, the "EIS" was to be included in the Road Master Plan (Part I). According to the recommendations of the Road Directorate, Part I should be divided into the following chapters:

- A. Preface
- B. Introduction
- C. Summary and conclusions
- D. Relationships to other planning
- E. Problem analysis
- F. Goals and objectives
- G. An overview and description of alternatives
- H. Overview of individual impacts to be considered:
 - Expenses (construction, maintenance, financing, etc.)
 - Resources b/
 - Environmental impacts c/
 - Safety impacts

- User impacts (transportation costs, separation/fencing effects, conditions for pedestrians and cyclists etc.)
- Flexibility, freedom of choice in future
- Impacts on housing, employment and business
- Relations to other planning or plans

I. General evaluation and comparison of impacts. The handbook recommends that the impacts be related to the following major interest categories:

- Local community
- Society as a whole
- Road user's interest

It was furthermore recommended that all the impacts be presented in a comprehensive overview. Matters or concerns which could not be quantified should, as far as possible, be ranked in relation to each alternative. Quantifiable impacts should be presented in the terms that most adequately reflect that specific impact.

J. The CRD's evaluation and recommendation on the choice of alternative.

The "EIS" numbered 120 pages. Impact prediction and comparison of alternatives and impacts were presented in one chapter (70 pages). The EIS was accompanied by an illustrated report forming an integral part of the Master Plan.

VI. DESCRIPTION OF THE PROPOSED PROJECT AND ALTERNATIVES AND THE SELECTION PROCESS

The standard (road-type) of the proposed E-18 section was:

- Exclusive use for motor traffic
- Design speed of traffic set at 100 km/h with assumed speed of traffic at 80 km/h
- Highest class of Norwegian two-lane highways
- Mainly two-level intersections, no direct access
- A width of 10 m with possibility of widening it into a four-lane highway in the future.

In the Transport Analysis (1970) which preceded the Road Master Plan process, three corridors were taken into account; the median corridor close to the existing E-18, an eastern corridor and a western corridor. Both the eastern and western corridors were rejected. The eastern corridor was rejected because it conflicted with the objectives in the regional land-use

plans. The western alternative was rejected partly because of a weak potential for alleviating traffic on the existing E-18 and partly because the corridor would conflict with the plan for a major regional settlement in the area of Gjennestadbyen.

In the period from 1971 to 1975 sub-alternatives were developed to the median corridor (i.e., that closest to the existing E-18).

In the Master Plan/EIS, three major alternatives were considered:

- Alternatives within the median corridor
- The western alternative (approximately 2 to 3 km west of the median corridor or existing E-18)
- The combined alternative, following the median corridor in the southern part and the western alternative in the northern segment of the road.

The western and combined alternatives were included following a request from the municipality of Stokke in 1977 to consider them. This request was supported by the County Agricultural Board. In general terms the western alternative coincides with the western corridor as analysed in the Transport Analysis of 1970.

The CRD gave extensive consideration to sub-alternatives to the median corridor. In five subsections, two or three alternatives were evaluated (see table). In the end, the CRD identified a preferred route within the median corridor and used it as a basis for comparison with the other major alternatives.

During the public review in the affected municipalities, a special alternative was suggested in the northern part of the planning area. A group of residents and farmers put it forward with the support of the County Agricultural Board. This alternative is the North-West Line (NWL).

In table 5 the sub-alternatives are presented within the median corridor and some of their quantified impacts.

Following the assessment of sub-alternatives in the median corridor, the CRD recommended the following:

Bjørnum-Hordalen	:	Alternative 1
Tassebekk-Furulund	:	Alternative 1
Furulund-Ekely	:	Alternative 1
Ekely-Fyllpa	:	Alternative 2

On the basis of this configuration, the median corridor was compared with the other major corridor alternatives.

VII. TYPE OF ALTERNATIVE

Only highway routes were described as alternatives. No other modes of transport or the "do-nothing" alternative were considered.

Table 5

Sections and alternatives	Construction costs Millions Kroner	Consumption of cultivated and arable land (1,000 m ²)	Residences to be removed	Residences less than 100 metres from E-18	Noise, number of weighted residences above 55dB(A)
Bjørnum-Hørdalen					
Alternative 1	9.6	27	0	1	1
Alternative 1b	14.3	38	0	0	0
Tassebekk-Furulund					
Alternative 1	18.5	62	2	20	97
Alternative 2	19.9	76	1	17	79
Alternative 3	20.1	59	3	27	95
Bjørnerød-Furulund					
Alternative 1	34.0	105	2	27	504
Alternative 4	52.0	76	1	10	426
Furulund-Ekely					
Alternative 1	27.5	135	2	7	163
Alternative 2	26.5	131	2	7	104
Alternative 3	49.5	129	8	79	231
Ekely-Fyllpås					
Alternative 1	116.0	253	6	87	547
Alternative 2	71.5	247	10	103	632
Alternative 3	78.0	211	7	87	566

VIII. DESCRIPTION OF THE EXISTING ENVIRONMENT

The following aspects were taken into account in the description of the existing environment: morphology, topography, geology, flora, fauna/wildlife, endangered species, natural resources, air, noise, socio-cultural aspects, economic aspects (road use costs/consumption costs), land use, recreation facilities, cultural resources, landscape, accident situation, risks.

IX. SCOPING

Scoping is the process for determining the scope of issues and alternatives to be taken into account in an EIS. It provides an opportunity for ensuring that the study addresses the relevant alternatives and impacts. Although scoping took place in the E-18 case, it was neither formalized nor was it documented in the Master Plan report. In general, the scoping work

associated directly with the presented Master Plan took place within the reference group. The group's participants represented the major interests directly involved in the county's decision-making process.

X. DESCRIPTION OF THE IMPACTS OF PROJECT AND ALTERNATIVES AND COMPARISON OF THE ALTERNATIVES

This topic can be divided into three items:

- (a) Impact identification
- (b) Methods used for predicting impacts
- (c) Methods used for comparing the environmental effects of the various alternatives.

The general recommendations from the Road Directorate provided guidance on the impacts that should be taken into account in the "EIS". The following types of environmental effects are included:

- (a) Land utilization
- (b) Accidents
- (c) Noise
- (d) Recreation areas affected
- (e) Protected areas (natural and historic)
- (f) Areas of zoological and hunting interest
- (g) Removal of houses
- (h) Additional aspects of natural and human environment
 - residences less than 100 m from E-18
 - adaptation of the road to the landscape
 - separation (fencing) effects of the E-18

Air impacts were considered only generally. Owing to the location of the road, residences and climatic conditions, the CRD regarded air impacts as being insignificant. To be complete, the following "non-environmental" aspects should be added: costs, users interests, flexibility, agricultural trade, business and services.

The following methods were used for impact prediction:

- (a) For the prediction of future traffic density the California method of traffic assignment was used. This is an assignment method developed in the United States in the 1960s.

(b) For the prediction of noise a standard noise prediction handbook has been widely used in Norway. Based on estimates of peak hour traffic, speeds and the standard situations of road and terrain cross-section, one may predict expected noise levels dB(A) and present them in graphic drawings.

(c) As far as the prediction of future traffic accidents was concerned, a distinction was made between the construction period and the operational period. All the forecasts were based on empirical knowledge of accident frequencies (number of accidents per million vehicles per km). The reasons for choosing a specific method or technique were not made explicit in the documents.

No special methodology was used for the comparison of the effects of the various alternatives. Each impact was either quantified (number of residences less than 100 m from the E-18 etc.) or ranked. All the rankings (between the alternatives) were usually based on a combination of descriptions and elements of quantification. Each impact was described and thereafter ranked for each alternative. As an aid to decision makers, the impacts and alternatives were summarized in one table, containing only the basic information indicated above.

Table 6 summarizes some of the quantified impacts of the four major alternatives:

Table 6

Alternatives	Construct- ion costs Millions Kroner	Consumption of cultivated and arable land	Number of residences to be removed	Number of residences less than 100 m from E-18	Noise, number of weighted residences above 55dB(A)
Median corridor	262	486	9	137	1.290
Western alternative	299	298	2	74	1.211
Combined alternative	325	369	3	99	1.317
North-west Line	321	261	?	?	?

XI. REVIEW AND PUBLIC PARTICIPATION

The following groups reviewed the report (i.e. the "EIS" integrated in the Master Plan) at the county level:

- The public (prior to the review by other authorities)
- The Central Authority on Historic Conservation Matters
- The Chief County Administrator
- All affected municipalities
- The County Transportation Council
- The County Agricultural Council
- The Federal Administrator of the County
- The County Council

The various authorities made the following major points during the review at the county level:

(a) Municipality of Stokke: Supported the western alternative, giving priority to preserving agriculture and cultivated land.

(b) Municipality of Sandefjord: Supported the median corridor. Pointed out that the western alternative will not efficiently replace traffic from the existing E-18.

(c) Municipality of Sem: Supported median corridor. Preferred alternative 3 west of Sembyen (section Ekely-Fyllp ).

(d) County Agricultural Board (CAB): Supported the western alternative. CAB, however, expressed strong interest in the north-west line. Furthermore, the CAB argued that the technical solution of the western alternative was, in principle, unnecessarily expensive.

(e) The County Board: Supported the view of the County Transportation Board. The formal points were:

- (i) The median corridor should be chosen for the new E-18.
- (ii) Between Ekely-Fyllp : alternative 3 (adjusted) should be followed.
- (iii) Between Klinestad-Tassebekk: alternative 1 should be followed.
- (iv) Between Tassebekk-Ekely: there should be a further development of alternatives in the area of the existing E-18. In this task, emphasis should be put on agricultural interests.

(f) The County's Office for Nature Conservation and the Office of the County Governor supported the western alternative in principle. They underlined the need for the preservation of historic sites and geological formations together with concerns for nature conservation, wildlife habitats and the need for preserving prime agricultural land.

(g) The public: Upon announcement in local newspapers, the documentation on the E-18 was made available to the public. Two public meetings were held in the affected municipalities. Within the general public two major groups were active: landowners (including farmers), and residents in areas close to the E-18 alternatives. Issues raised at the public meetings were used by the authorities involved in their evaluation of alternatives. An informal study-group co-operated with the County Agricultural Council during and after the formal public review. Thereafter, the Council forwarded a completely new alternative to the northern part of the session (NWL). d/ This alternative was not a part of the general public review concluded earlier in 1979. However, authorities directly involved had commented on the alternative before the CRD had forwarded the Master Plan including the EIS to the Road Directorate. The CRD commented on the new alternative (unfavourably), but did not revise any part of the Master Plan/EIS.

The CRD still favoured the alternatives in the median corridor, even after the review at the county level (ending 1981). This review in total lasted approximately one and a half years of which the review by the public authorities represented the most time. However, the CRD concluded that the recommended alternative in the median corridor between Tassebekk and Ekely should be the object of further examination. In its recommendations to the County Board, the CRD stated that new routes using more of the existing E-18 in this area could help preserve cultivated land.

After the review at the county level, the Master Plan including the "EIS", review comments, and the CRD's recommendation were sent to the Road Directorate. The Directorate forwarded the Master Plan/EIS to the Ministry of Transportation which conducted a review in co-operation with the Ministry of Environment and the Ministry of Agriculture. The above-mentioned new alternative was included in the discussions and was to be presented to the Parliament as part of the White Paper.

In the review at the central Government level the following points were made. The Road Directorate (RD) pointed out that the choice must be made from among the western alternative, north-west line and the median corridor. The RD supported the views expressed by the CRD and recommended that the median corridor be chosen, based on CRD's assumptions of sub-alternatives within the median corridor. The RD only referred to CRD's assumptions regarding the choice between the sub-alternatives within the median corridor. Thus RD, in its conclusion, was only concerned about the major choice between the western alternative, north-west line and the median corridor. The RD forwarded its recommendation to the Ministry of Transport. The RD deleted one of the three major alternatives included in the Master Plan (alternative-combined-alternative) when it forwarded its recommendations to the Ministry of Transport in 1981. As a result, the White Paper contained three alternatives for the E-18: the two remaining from the Master Plan EIS and the new proposal. The Cabinet then considered the various positions in November 1982. The Cabinet's conclusion was to instruct the Ministry of Transport to draft a White Paper, concluding that alternatives within the median corridor should be chosen.

XII. DECISION

The Parliament agreed in principle on one of the corridors. This followed the proposal from the CRD and the Ministry of Transport. The Parliament was divided in majority and minority positions. A clear majority made the following decision on 24 May 1983: "The median corridor should be the basis for the future E-18 in the middle of Vestfold".

In its recommendation, the Ministry of Transport suggested that, if such a decision were made, Master Plan decisions should also be made for the sections Klinestad-Tassebekk and Ekely-Fyllp  in collaboration with the Ministry of Agriculture and the Ministry of Environment. The sections between Tassebekk and Ekely and between Fyllp  and Gulli should be subject to further planning. The Ministry of Transport underlined the great emphasis to be put on agricultural as well as on other protection interests in further planning between Tassebekk and Ekely. Furthermore, this decision implied that the sections Klinestad-Tassebekk and Ekely-Fyllp  would be given high priority, with construction to be completed by 1990. Priority between these two sections should be decided upon by the county.

The parliamentary suggestion that a specific part of the corridor should be the object of further road master planning meant that the status as of November 1984 was:

1. Between Klinestad-Tassebekk, a Master Plan had been formally accepted, following alternative 1.
2. Between Ekely-Fyllpås a Master Plan had been formally accepted, following alternative 3 (slightly modified).
3. Between Tassebekk-Ekely a new round of road master planning had commenced. A special Reference Group was established with representatives from the affected municipality of Stokke (five representatives), the county administration, the County Governor's office (by an environmental expert), the County Agricultural Board and the Central Authority for Preservation of Historic Objects. The CRD administers this Reference Group. At present, a total of 12 new alternatives had been generated, mostly west of the existing E-18. The CRD was expected to go through a full Master Plan EIA exercise, and planned to present the complete Master Plan/EIA document in 1986 with a decision expected in 1987.

No monitoring or related information gathering programmes had been forwarded at the time of writing.

XIV. TIME/COSTS

With impact assessments integrated into planning and decision-making, the question of extra costs is difficult to answer. Based upon the assumptions of the co-ordinator in the CRD's office, the following rough estimate could be made: the complete report, including work with the alternatives in the period from 1975 to 1979 totalled seven or eight man-years. EIA costs, however, cannot be assessed separately.

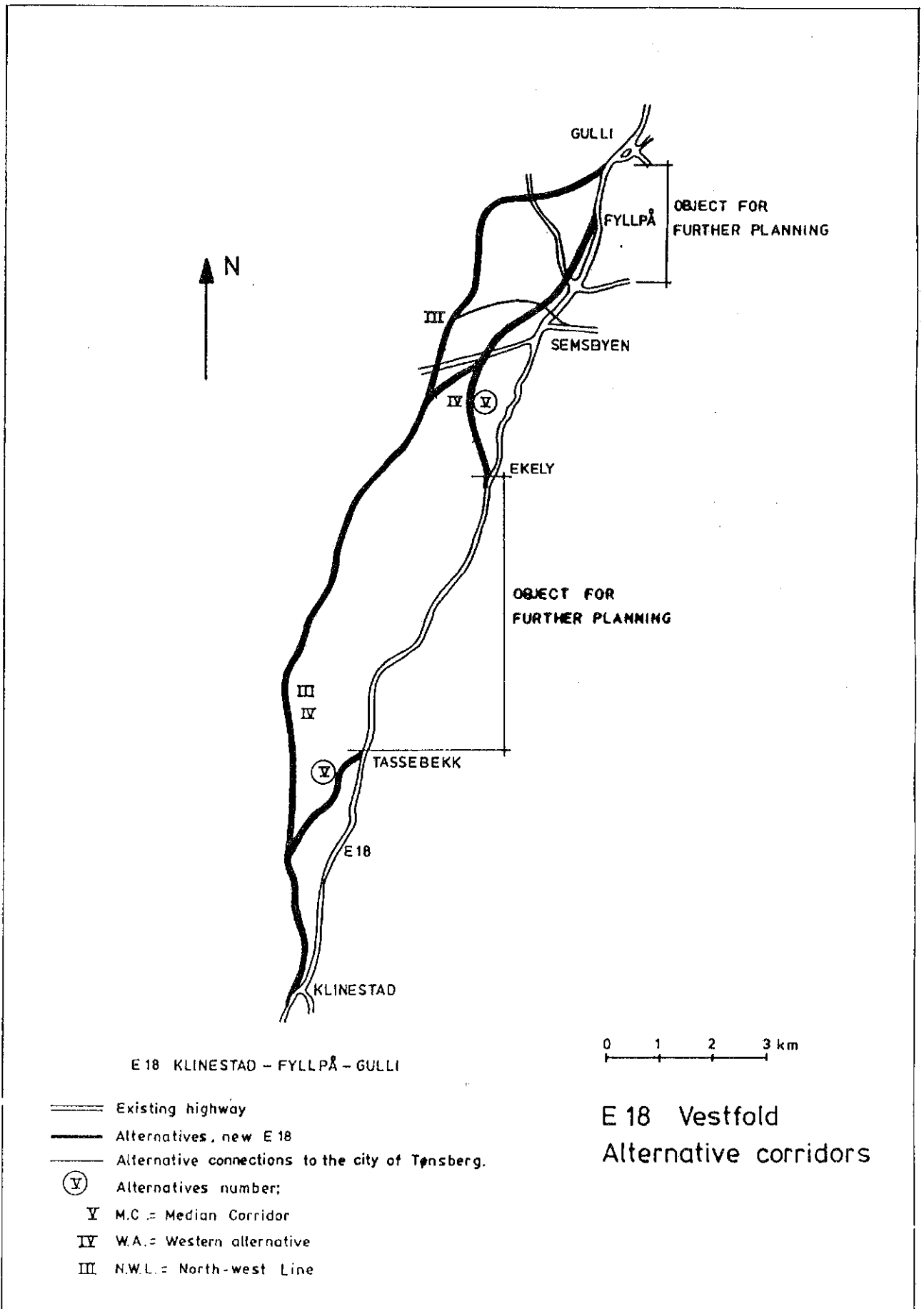
Most of the "consultants" involved were actually public authorities from other offices. The majority of these services did not involve monetary costs for the CRD. The costs for the enterprise of Norconsult A/S could be specified. However, their study was about traffic forecasts and traffic assignment on alternative routes. This work was as relevant for the planning side as for the EIA side of the Master Plan report. Regarding time aspects, the following observations can be made. No statements or "signals" were received from participants to the effect that the EIA part of the planning was responsible for any delay.

Few people challenged the predictions of the EIA. Arguments and opposition was, to a great extent, related to the value based interpretation of impacts. Thus, most of the EIA work seems to have been necessary as a basis for a rather time-consuming and complex decision-making process.

Notes

- a/ This is a regional office of the (central) Road Directorate.
- b/ Resource impacts include:
- Use of agricultural land
 - Use of forest land
 - Groundwater and drinking water resources
 - Ground resources (rock, soil, clay, etc.)
 - Enclosure of land/restraints on land use
 - Removal of houses
 - Consumption of motor fuel
- c/ Environmental impacts include:
- Specially defined objects formally protected or regarded as having "protection potential"
 - General protection concerns such as the conservation of major undeveloped natural areas, adaptation of the road to the landscape, and the conservation of characteristic areas or objects in the natural environment
 - The specific interests of outdoor recreation, including areas designated for this purpose
 - The general concerns of outdoor recreation
 - Noise
 - Other kinds of pollution
 - Cultural and historical concerns
 - Separation- ("fencing"-) effects in general.
- d/ See also under "Alternatives".

Figure 8



CASE 6. FRANCONIA NOTCH HIGHWAY IN NEW HAMPSHIRE
UNITED STATES OF AMERICA

Project title: Franconia Notch (USA)
(Interstate 93)

Type of project: New part of Interstate Highway System in the
White Mountains region of New Hampshire

Project characteristics: 18 km interstate segment through important
recreation and tourism area (state park)

Proponent: New Hampshire Department of Public Works and
Highways and United States Highway
Administration

Competent authority: New Hampshire Department of Public Works and
Highways and United States Highway
Administration

Main environmental Geology/soil
impacts involved: Stream-crossing and impacts on wetlands

Decision: Decision to construct Interstate 93 through
Franconia Notch State Park

I. GENERAL INFORMATION ON THE PROJECT

The project proposed involved construction of a highway serving to complete the Interstate Highway System in the White Mountains region of New Hampshire. It consisted of a 12-mile interstate highway segment. The proposed interstate would replace an existing two-lane highway. The need for highway improvement was evident from past and projected future traffic volumes, past and projected capacity of the highway and "sufficiency" of the existing highway, that is, the condition of the highway in terms of width, curves, grades and surface conditions.

The project area is an important recreation and tourism resource. The proposed highway would carry through traffic as well as recreational traffic in the Franconia Notch State Park. This interstate segment is unique in that 45 per cent of the projected traffic would be park visitors. Several unique geological formations in the park attract visitors. The project was needed to improve traffic circulation within the park as well as to improve movement of through traffic.

II. PLANNING PROCESS FOR HIGHWAYS

Planning, construction and maintenance of highways is the responsibility of the States. The Federal Aid Highway Act, as amended, has established a programme of federal financial assistance for highway planning and construction. This programme is funded by a federal tax on gasoline. Although States have the primary responsibility for constructing highway projects, the Federal Highway Administration is responsible for the review and approval at key stages of project development.

The Interstate 93 project is part of the interstate system, a network of limited access highways linking cities and other important destinations. Federal aid covers approximately 90 per cent of the construction costs of interstate highway projects. Highway projects are developed through studies conducted at both the State and metropolitan area levels. These studies include inventories of existing facilities and travel, and prediction of future traffic volumes. Once the need for a project is determined, location studies are made to determine which location or corridor will provide the maximum amount of service. After location determination, the project is advanced through the basic design stage and, finally into the plans, specification and estimate (P, S and E) stage.

When the design is completed, the State highway agency awards the construction contract and supervises construction. Formal federal approvals are made at the location, design and P, S and E stages and the project is monitored during the construction. The Federal Highway Administration must consider the environmental impacts of highway projects it proposes to fund under the National Environmental Policy Act (NEPA) and other environmental review requirements which apply to all federal agencies. Thus NEPA requires EIA to be part of highway planning. In addition, legislation establishing the federal aid highway programme requires consideration of the social, economic and environmental effects of highways. These reviews are combined in a single process. Highway legislation also provides special protection for public parks, wildlife refuges, and historic sites.

Federally aided highway projects are generally prepared by State or local agencies although EISs are the ultimate responsibility of the Federal Highway Administration. Under this arrangement a draft EIS is prepared early in the development process by the State or local agency in consultation with the Federal Highway Administration. The draft EIS is circulated to concerned agencies and the public for comment. A waiting period of at least 45 days is allowed for review and comments. Public hearings are held as required by the Federal Aid Highway Act. The public hearing on the draft EIS is incorporated into the location hearing.

The final EIS, also prepared by the State or local agency in consultation with the Federal Highway Administration, incorporates comments, indicates their disposition and shows which of the alternatives discussed in the draft EIS has been selected. Final EISs are approved by Federal Highway Administration Regional Administrators. For major projects, agreement to the approval is required by the headquarters of the Federal Highway Administration. Once approved the final EIS is filed with the Environmental Protection Agency and made available to the public and other federal agencies for review. During the 30-day review period no further project actions may be taken. The presentation of the final EIS coincides with the design approval hearing.

III. INITIATION OF THE EIA PROCESS

The New Hampshire Department of Public Works and Highways selected a route for Interstate 93 through Franconia Notch State Park in 1958. Because of State and local concern about environmental impacts of the highway, in 1966 the Governor of New Hampshire appointed a task force to advise the highway agency on the scenic and recreational values of the area. Among issues raised at that time were the possibility of landslides, damage to park scenery, and

adverse impacts on recreation in the park. The park has a number of unique geological formations which attract many tourists. In 1970 the Secretary of the United States Department of Transportation indefinitely postponed approval of construction of I-93 through Franconia Notch State Park because of impacts on the park.

In 1973 the United States Congress passed legislation which allowed the Secretary of Transportation to approve construction of a parkway type of highway through Franconia Notch State Park. The Secretary was authorized to approve unique highway design standards to protect the environment, Franconia Notch State Park and the safety of road users. Design standards for interstate highways require at least four lanes of roadway. This legislation would allow construction of less than four lanes as well as changes to standards for lane width, etc. In 1974 work began on the environmental impact statement.

IV. PREPARATION OF THE EIS

The Federal Highway Administration and the State Department of Public Works and Highways were joint lead agencies and responsible for preparing the EIS. The environmental impact assessment team consisted of: highway engineers; park planners; geologists; biologists; economists; archaeologists; water quality specialists; and air quality specialists.

Much of the assessment was performed by private contractors, with guidance and oversight provided by the State highway agency and the Federal Highway Administration. The State Division of Parks and Recreation which manages Franconia Notch State Park was consulted. During preparation of the draft EIS the highway agency and the Federal Highway Administration co-ordinated with other state and federal agencies. These agencies provided input in their areas of expertise. The public was involved through workshops, information meetings and meetings with local officials and representatives of environmental groups.

V. CONTENT OF THE EIS

Based on the guidelines prepared by the Department of Transportation (DOT) and the Federal Highway Administration (FHWA) following the CEQ guidelines of 1973, the following format was given for the EIS;

- (a) Cover sheet
- (b) Summary
- (c) Environmental context (existing conditions)
- (d) Environmental impacts of the proposed action
- (e) Adverse environmental impacts which cannot be avoided
- (f) Alternatives to the proposed action

- (g) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity
- (h) Any irreversible and irretrievable commitment of resources for the proposed action

VI. DESCRIPTION OF THE PROPOSED PROJECT AND ALTERNATIVES

In the draft EIS, several alternative routes were described. In addition, several alternative roadway configurations (that is, number of lanes, median lines, etc.) for the route through the park were described. A preferred alternative was not identified in the draft. Information on alternative designs was more detailed than in an average EIS, because design was an important factor in protecting the park. A large number of factors influenced the location of all roadway alternatives addressed in the draft EIS. They included physical and man-made features, access requirements, roadway objectives, normal engineering and safety standards related to interstate and other highways. The proposed Franconia Notch Parkway concept was distinct from other alternatives presented in the draft EIS for the Franconia Notch Corridor. In reality the concept represented a composite of these alternatives.

The final EIS identified the preferred route and described the selected design concept. A four-lane expressway was proposed outside the park boundary; inside the park, a four-lane "parkway" with grass shoulders was proposed, tapering to a two-lane undivided parkway in the most environmentally sensitive areas of the park. Access to specific recreation areas was described. The EIS included a schematic drawing of the roadway concept and access to park facilities. Mitigation measures were discussed such as following natural ground contours as much as possible, lowering the speed limit, minimizing changes to streams and existing drainage patterns, providing noise abatement where needed and controlling soil erosion during construction.

VII. SELECTION PROCESS

The draft and final EISs described the planning process which analysed some 13 routes and combinations of routes identified by the state highway agency. Possible corridors were limited because of the mountainous terrain. Analysis of traffic engineering, construction cost and environmental factors resulted in the elimination of all but three corridors. Three routes were studied in detail including the route along existing Route 3 through Franconia Notch State Park and two routes which avoided the Park (Bog Pond Corridor and Kinsman Notch Corridor). The EIS discussed alternatives of not building the proposed highway but upgrading the existing highway (US Route 3). Relying on other modes of transport was briefly described. The draft EIS examined three different roadway configurations for the Franconia Notch route: a four-lane interstate (divided freeway) design, four-lane parkway design, and a two-lane parkway design.

Following a detailed review of the draft EIS and the comments, opinions and public testimony heard during the draft EIS review period, the New Hampshire Department of Public Works and Highways made its corridor location decision. On the basis of transportation, cost and environmental factors, as well as widespread public opposition, the Bog Pond and Kinsman Notch Corridors were rejected. These corridors would have involved more

serious impacts on the natural environment. Furthermore, they would not have diverted enough traffic to relieve existing Route 3 through the park. The New Hampshire Department of Public Works and Highways decided that, if anything were to be done to complete I-93 through the White Mountains, it would be done in the Franconia Notch Corridor. However, there was substantial opposition to construction of a four-lane roadway through Franconia Notch State Park.

During late summer and early fall of 1977 negotiations were held with the New Hampshire Department of Public Works and Highways, the State Division of Parks and Recreation, United States Representative James Cleveland's Administrative Assistant, and representatives of the Appalachian Mountain Club, the Society for the Protection of New Hampshire Forests and the Notch Alternative Route Committee. Participants from the three environmental groups represented the White Mountain Environmental Committee. The purpose of the discussions was to determine whether a roadway concept could be developed that would meet the primary objectives of the various parties concerning the outcome of the I-93 project in the White Mountains. On 18 November 1977 a formal agreement was signed by all parties involved in the negotiations and the nature of the compromise parkway concept was publicly announced. The New Hampshire Department of Public Works and Highways and the New Hampshire Division Office of the Federal Highway Administration agreed that the composite design concept would be an acceptable one upon which to complete the final EIS. The design concept provided an improvement in traffic service while maintaining the environmental/recreational integrity of the corridor and enhancing Franconia Notch State Park.

The parkway, as described more fully in the final EIS, incorporated advantages of each of the major alternatives for the Franconia Notch Corridor presented in the draft EIS; in fact as stated above, it represented a composite of four-lane interstate, four-lane parkway, three-lane parkway and two-lane parkways sections. Under the proposal, four-lane divided sections with wide medians would be located at the southern and northern ends of the existing I-93 gap. The road would then progressively narrow as the more sensitive portions of Franconia Notch were approached, ultimately becoming a two-lane road between the Lincoln/Franconia town line and New Hampshire Route 18. Various design measures would improve traffic efficiency and safety on the proposed road and significant improvements would be made to Franconia Notch State Park.

Essentially, the proposed concept was a compromise between the two most popular alternatives that emerged during the draft EIS review period: the four-lane parkway presented in the draft EIS and a two-lane parkway.

VIII. DESCRIPTION OF THE EXISTING ENVIRONMENT

The existing environment was described in the EIS as an area of approximately 160 square miles. The description included physical characteristics, population characteristics, economic factors, community facilities and the transport network of the region. More detailed information on the environmental setting of each of the three alternative corridors was included in an appendix. Some of the data used for the description of the existing environment were available from county and State agencies. Since much of the project area was within the White Mountains National Forest, some

data were available from the United States Forest Service. Other information such as water quality data had to be specifically gathered for the project analysis.

IX. DESCRIPTION OF THE ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT AND THE ALTERNATIVES AND COMPARISON

This topic can be divided into three sub-items:

- (a) Impact identification
- (b) Methods used for predicting impacts
- (c) Methods used for comparing the environmental effects of the various alternatives.

(a) Impact identification

The following probable effects of the proposed Franconia Notch Parkway and the alternatives were addressed in the impact statement:

- (i) Traffic and transportation
- (ii) Natural features
 - Geology, soils, topography, hydrology, biology, man-made features
 - Land acquisition
 - Relocation of households, businesses, and public buildings
 - Public utilities and facilities
 - Land use and land value
 - Economic, historic, archaeological
 - Paleontologic and other cultural resources
 - Open space and visual quality, man-caused features
 - Air quality
 - Water quality
 - Noise levels.

A key issue for the Franconia Notch route was its potential impact on geological resources, especially a rock formation known as the Old Man of the Mountain. There was concern that rock blasting for highway construction would cause vibrations damaging the Old Man, which is several thousand feet away from the proposed highway. Stream crossing and impacts to wetlands were also important issues.

The identification and analysis of effects were based on the inventory and baseline studies conducted within each corridor and the surrounding region. Identified effects were generally broken down into several categories: direct and indirect, short-term (i.e. construction-related) and long-term, etc. Effects were generally identified by using acetate overlays on the location drawings for the proposed parkway. In some cases, notably certain hydrology, cultural and land-use effects assessments were marked directly on the location drawings.

(b) Methods used for predicting impacts

For each discipline a brief introduction was generally followed by a table summarizing, by time period, the probable gross effects of the proposed parkway. Gross means total effects prior to implementation of mitigation and enhancement measures. A description of the identified probable effects followed including, as appropriate, their extent, the significance of the affected element, interrelationships with other impacts, and the severity of the effect. Proposed mitigation and enhancement measures (which are legally binding) were discussed immediately following the specific effects to which they applied. Much of the prediction of impacts was performed by private contractors, with review by the State and federal highway agencies.

Geology, soils, topography

As far as direct effects were concerned, according to existing information no significant or unusual geological or soils problems were anticipated. Direct effects on sand and gravel deposits, agricultural land and unique geological features were expected to be slight. No formal method was used for predictions. Regarding indirect effects, i.e. effects on the Old Man of the Mountain, geological investigations were performed which determined that the blasting would not cause damage to the Old Man; however, a commitment was made to develop a detailed blasting plan and to monitor the impacts of blasting.

Stream-crossing and impacts to wetlands

Another important issue was impacts on wetlands. The EIS described water quality changes, impacts on biota, erosion and sedimentation control measures to be taken during construction and commitments to minimize altering of stream channels. All effects were summarized in a table. Best professional judgement was used for most predictions.

Air quality impacts

To assess probable air quality effects, existing background air quality and meteorology in the corridor were examined, the base year and future air quality levels (expressed as CO concentrations in ambient air) were calculated from emission factors for this pollutant with traffic flow data for peak fall weekends. The significance of these air quality levels related to applicable air quality standards and regulations. Carbon-monoxide concentrations were determined for a typical cross-section of the road through Franconia Notch, using the Egan-Mahoney (EGAMA) dispersion model. Techniques and results of the analysis were described in a technical appendix.

Water quality

The probable significant water quality effects were summarized in a table. Use of the proposed parkway could result in increased concentrations of heavy metals in surface water. Best professional judgement and mathematical calculations were used for predictions.

Noise

Noise impacts were predicted through use of a model. The assessment of noise impact related to the proposed Franconia Notch Parkway involved the following basic steps:

- (i) Identification of existing land uses which may be affected by noise from traffic on the proposed alignment;
- (ii) Prediction of highway noise levels in various sensitive areas at representative locations;
- (iii) Determination of existing noise levels for activities or developed land;
- (iv) Comparison of predicted noise levels for the proposed parkway with existing noise levels and with design noise levels.

The comparison was summarized for nine locations. A map showing contours of noise levels was included in the EIS. Noise and air quality analyses were performed with modelling techniques recommended by the Federal Highway Administration.

Park facilities

The EIS also included information on access to, and impacts on, park visitor attractions. The highway was planned together with planned improvements to park facilities.

(c) Methods for comparing the environmental effects of various alternatives

One chapter of the final EIS was devoted to a description of the alternatives considered in detail in the draft EIS that were not selected as the specific proposed action. The alternatives were described fully and the associated effects (both beneficial and adverse) presented in tables and text. In the final EIS the key trade-offs and commitments associated with each alternative were highlighted. Discussed in this context were: the "Relationship between local short-term use of man's environment and the maintenance and enhancement of long-term productivity" and "irreversible and irretrievable commitments of resources".

Comparative tables of beneficial and unavoidable adverse effects were presented, preceded by an explanation of the format and content of the tables. The alternatives were then presented in the same order as in the draft EIS. For each alternative, the description and scheme were followed by summary chapters discussing trade-offs and resource commitments.

The proposed Franconia Notch Parkway concept was a composite of the various alternatives: incorporating four-lane interstate, four-lane parkway and two-lane parkway sections. The concept took advantage of the benefits of the various alternatives while avoiding some of the most significant environmental park/recreation shortcomings of a four-lane highway. Consideration of the alternatives was useful in providing information necessary for the corridor and design selection decision, which was the primary function of the EIS process for this project. From a transportation perspective, the New Hampshire Department of Public Works and Highways believed a four-lane highway was needed. However, the Department agreed to the compromise solution because of the threat of litigation on environmental grounds and the risk that the court might prevent construction of a four-lane interstate highway.

X. REVIEW AND PUBLIC PARTICIPATION

Throughout the development of the draft EIS and indeed for many years prior, there had been a great amount of agency and public interest and involvement with the proposed action. Recognizing the importance of obtaining public comment before the original corridor elimination recommendations could be finalized, for two months following the public informational meeting on 12 December 1974, an intensive programme of public involvement was carried out. The project team began working with representatives of interest groups and the local communities potentially affected by the surviving corridors.

During preparation of the draft EIS, a number of agencies, local officials, and environmental groups were invited to provide input to the project planning and analysis. This co-ordination resulted in changes to the alternatives studied, and helped to identify key issues of concern. Not only were public information meetings held, but the public was also kept informed through press announcements and newsletters mailed directly to interested people.

The draft EIS was circulated to federal, State and local agencies and to individuals and groups known to be interested in the project. Written comments on the draft EIS were invited. Formal public hearings were held for the public to voice its opinion on the project and on information contained in the EIS. The fame of Franconia Notch and the Old Man of the Mountain attracted considerable public interest. Comments were received from 12 federal and State agencies, several local government bodies, 10 organized interest groups and 158 individuals. The public hearing resulted in additional comments. A number of those commenting identified a preference. The majority favoured building in the Franconia Notch Corridor. The two preferred alternatives were a two-lane parkway and a four-lane parkway. Following a review of the comments, the highway agency decided to select the Franconia Notch Corridor if I-93 were to be completed.

As mentioned previously, late in 1977 negotiations were held between the New Hampshire Department of Public Works and Transportation, the State Division of Parks and Recreation, the United States Congressman for the area, and representatives of three environmental groups (White Mountain Environment Committee). The purpose of the discussion was to determine whether a road should be built and what design concept would meet the various objectives of the parties. A formal agreement was signed by all parties involved in the negotiations. It described the design concept for the highway and for

improvements which the State would make to park facilities. In most highway projects, the State selects its proposed highway corridor based upon information in the EIS and comments received on the EIS. However, because the I-93 project was so controversial, the State selected to negotiate with key parties in making its selection.

After the State (New Hampshire) had selected the design concept, it prepared the final EIS in co-operation with the Federal Highway Administration. Upon completion of the document, the final EIS was submitted to the Highway Administration for review. The final EIS was reviewed by the headquarters and the Office of the Secretary of Transportation before the EIS was approved in early 1979. After approval of the EIS, it was made available to agencies and the public for 30 days before the Federal Highway Administration approved the routing of I-93 through Franconia Notch. In this case the EIS process identified the need for the highway agency, the affected State park agency, and the environmental groups to work together to identify an acceptable compromise solution.

XI. DECISION

The final decision on the project was to construct Interstate 93 through Franconia Notch State Park, in accordance with the design concept agreed upon by State agencies and the White Mountain Environment Committee.

XII. MONITORING

The project was under construction at the time of writing. The State was committed to monitoring certain construction impacts, such as stream quality and vibrations resulting from blasting.

XIII. TIME/COSTS

The EIS and environmental studies cost \$US 2 million. This cost is higher than a project which does not involve serious environmental impacts. Environmental studies comprised 3.3 per cent of the total project planning, engineering and construction costs of \$61 million. Review by the Federal Highway Administration and Department of Transportation involved approximately two and a half man-years of staff time, or \$250,000.

After initiation of the environmental studies in 1974, it was nearly five years before environmental documents were approved and a decision taken to construct I-93. Engineering required another five years. The EIS per se did not delay the project. However, the major controversies relating to environmental issues did delay the project. The project had been well into the design stage when the Secretary of Transportation made the decision to postpone approval of I-93 in 1970.

Time schedule of the Franconia Notch Highway

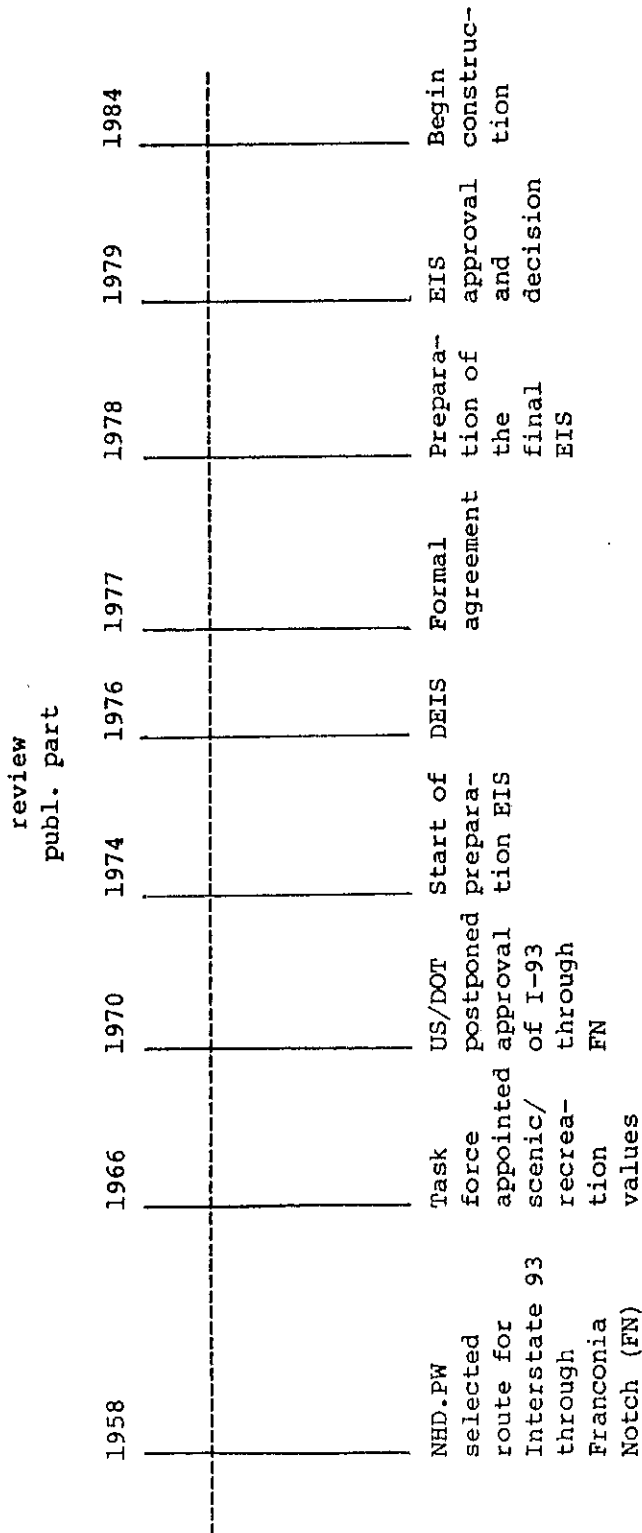


Figure 9



DAMS

CASE 7. LOWER CHURCHILL HYDRO PROJECT IN CANADA

The main elements of the study are summarized as follows:

Project title:	Lower Churchill Hydro-Electric Power Project (Canada)
Type of project:	Power generating stations on the Lower Churchill river and associated transmission lines across Newfoundland and Labrador
Project characteristics:	Gull Island 1700 MW, Muskrat Falls 600 PW
Proponent:	Lower Churchill Development Corporation (LCDC) (Crown Corporation)
Competent authority:	Department of Energy, Mines and Resources
Main environmental impacts involved:	<ul style="list-style-type: none">- Terrestrial habitat- Wildlife- Forestry- Fisheries- Recreation and tourism
Decision:	The proponent postponed the project (for financial considerations)

I. GENERAL INFORMATION ON THE PROJECT

The Lower Churchill Hydro project involved a proposal to build power generating stations on the Lower Churchill River and associated transmission lines across Newfoundland and Labrador. The proponent of the project, the Lower Churchill Development Corporation Limited (LCDC) is a crown corporation whose shares are owned by Canada and the Province of Newfoundland and Labrador. LCDC's responsibilities are specific to this project.

The federal agency involved in the funding of the project, the Department of Energy, Mines and Resources (the initiator), had requested a formal review under the Environmental Assessment and Review Process (EARP). In accordance with its responsibilities for the administration of EARP, the Federal Environmental Assessment Review Office (FEARO) established a panel to review the environmental and socio-economic consequences of the project. Environmental impact statements were completed by the proponent in early 1980.

Public and government agency participation was solicited during the panel review stage; public meetings on the project were held in September 1980. The panel found that the project could be acceptable, provided certain environmental and socio-economic conditions were met. Owing to financial considerations, the project has not been realized.

II. PLANNING PROCESS FOR HYDRO-ELECTRIC PROJECTS

The planing of hydro-electric projects in Canada may vary depending on whether they are initiated by the federal or a provincial government. This project represents a special case as both levels of government were involved. Towards the end of 1978, the Governments of Canada and the Province of Newfoundland and Labrador created the Lower Churchill Development Corporation (LCDC) with 51 per cent of the shares owned by the Province and 49 per cent by Canada through the Department of Energy, Mines and Resources. The mandate given to LCDC by both Governments was: to select the best initial project (Gull Island or Muskrat Falls); to finalize project design; to determine the cost of the project; to establish a construction timetable; to prepare plans for financing the project and marketing the power; and finally, to complete necessary environmental and social studies.

III. INITIATION OF THE EIA PROCESS

Although this project was under consideration before EARP became operational, a preliminary Environmental Overview on the transmission line component was produced in December 1974, under a federal-provincial cost-shared agreement. In view of the federal involvement in the project, panels were formed to review both the Gull Island site and the transmission lines (the formal EIA process was initiated by the federal Department of Energy, Mines and Resources). The Environmental Overview, together with a project description and policy statement, was subsequently submitted as an Environmental Impact Statement (EIS) for the transmission lines component. Guidelines for the preparation of an EIS for a power generating station were issued following a public Panel Workshop held in Happy Valley - Goose Bay and Churchill Falls during June 1978. With the creation of LCDC, the proposal was modified to include a power generating station at Muskrat Falls; with the referral of this site for review under EARP, panels previously reviewing separate components were amalgamated to allow for review of the total Lower Churchill project by one panel.

IV. PREPARATION OF THE "EIS"

Two sets of documents were submitted by the proponent to FEARO: (a) an Environmental Impact Statement and addendum to the transmission line portion of the project and (b) an Environmental Impact Statement on the power sites at Gull Island and Muskrat Falls on the Churchill River. Each EIS was based on a number of individual studies and reports carried out by private consultants for the proponent. They were: the transmission line EIS; two stream monitoring studies; a biophysical assessment; a socio-economic study; and a study on International Biological Programme sites. Studies conducted in conjunction with the power generation site EIS included one on fisheries resources of tributaries of the Lower Churchill River, a biophysical study, various wildlife and avian studies, and a socio-economic and reservoir preparation study.

V. CONTENT REQUIREMENTS FOR THE ""EIS"

There were no EIS guidelines for the transmission line component of the project as the original overview study (1974), which was later submitted as the EIS, preceded the establishment of EARP. The guidelines issued by the FEARO panel for the power generation site component in August 1978 comprised a 26-page document covering the following topics:

1. Overview Summary
2. The project setting
 - 2.1. Declaration
 - 2.2. The need
 - 2.3. Alternatives
 - 2.4. Associated projects
3. The proposal
 - 3.1. General layout
 - 3.2. Construction details
 - 3.3. Operation and maintenance
 - 3.4. Abandonment
4. Description of existing environment and resource use
 - 4.1. Climate and air quality
 - 4.2. Terrain
 - 4.3. Water
 - 4.4. Flora
 - 4.5. Fauna
 - 4.6. People
 - 4.7. Land, water and resource use
5. Environmental impacts
 - 5.1. Climate and air quality
 - 5.2. Terrain
 - 5.3. Water
 - 5.4. Flora
 - 5.5. Fauna
 - 5.6. People
 - 5.7. Land, water and resource use
 - 5.8. Combined impacts
6. Mitigating measures for major impacts
7. Residual impacts
8. Annexes

VI. DESCRIPTION OF THE PROPOSED PROJECT AND ALTERNATIVES

In the EIS prepared on the generation facilities component of this project, two alternative sites (Muskrat Falls and Gull Island) were identified and assessed. In addition, four other alternatives - a hydro site in Newfoundland; fossil fuel generation; nuclear generation; and "do nothing" - were identified but rejected for financial and/or environmental reasons and not submitted to detailed assessment.

A. Muskrat Falls alternative

The Muskrat Falls project would involve a dam consisting of a spillway and flanking dykes. A power-house would be located at the bottom of the rock knoll to the north of the falls. Intake tunnels through the knoll would feed three initial generating units and one future unit. A natural dam, between the rock knoll and the north shore of the river, would be stabilized as part of the construction work. The normal reservoir elevation would be 39 m above sea level; discharge would be into the Churchill River close to sea level. The power-house would contain three generating units providing a total installed capacity of 618,000 kilowatts.

B. Gull Island alternative

At Gull Island a rockfill dam would be located at the head of Grizzle Rapids with diversion tunnels on the north bank and flip bucket spillway and power-house on the south bank. Water intake to the power-house would be from the approach channel, via penstocks to drive six generating units. The normal reservoir elevation would be 123 m above the level of the Muskrat Falls reservoir. It would contain six generating units providing a total installed capacity of 1,698,000 kilowatts.

C. Transmission line alternatives

The power generated from either or both dam sites would be transmitted via two \pm 400 KV, 800 MW, bipolar transmission lines to a converter station at Stoney Brook, a distance of approximately 470 miles from the Gull Island site. From there one \pm 400 KV, 800 MW, bipolar line would carry the power the remaining 200 miles to the Holyrood converter station on the Avalon Peninsula. The transmission line corridor would be 350 feet wide for the double line and 150 feet wide for the single line. In order to facilitate crossing the Strait of Belle Isle between Labrador and Newfoundland, two cable switching stations would be required. Two alternative methods for crossing the Strait were also considered. One would involve laying six oil-filled cables on the bottom of the Strait at a minimum depth of 210 feet with access provided by drilled adits on either side of the crossing. The second alternative was to build a tunnel 60,000 feet long, 14 feet wide and 17 feet, 6 inches high under the Strait to connect with vertical shafts at either side. This second alternative was discarded early in the planning process. Two major route alternatives were considered south of the Strait of Belle Isle between Grand Falls and Clarenville. Alternative 1 would parallel the existing 230 KV AC line from Grand Falls to Baie D'Espoir and from there to the Avalon Peninsula where the city of St. John's is located. The second alternative would parallel another transmission line (138 KV) from Grand Falls to Clarenville via Gamder. The combined length of all lines would be approximately 2,000 km.

VII. DESCRIPTION OF THE ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT AND THE ALTERNATIVES AND COMPARISON

This topic may be divided into three sub-items:

- (a) Impact identification;

- (b) Methods used for predicting impacts;
- (c) Methods used for comparing the environmental effects of the various alternatives.

(a) Impact identification

The EIS prepared on the power generation sites identified and assessed the following types of impacts: site facilities; archaeological; shoreline; sediment transport; forestry; International Biological Programme sites; terrestrial habitat; wildlife; resource use; social; economic; service infrastructure; and combined impact (reservoir preparation).

These impacts were briefly discussed along with potential mitigation measures in the EIS as well as in a number of technical appendices.

The initial "environmental overview" on the transmission line component had identified and assessed the following types of impacts: climate; topography and geology; wildlife; fisheries and limnology; vegetation; forestry; recreation and tourism; and archaeology.

The "environmental policy statement addendum" prepared on the transmission line component addressed a number of impacts which required further information, such as socio-economics, archaeology, hydrology, terrain sensitivity, forestry, wildlife and recreation.

(b) Methods used for predicting impacts

Generally speaking, no formalized methods were used for identifying or assessing environmental impacts. Previous experience and "best professional judgement" usually provided the basis for determining the importance or extent of any particular impact. Information was obtained from existing sources or through field studies carried out by consultants acting alone or in conjunction with the proponent. These included the following.

Site facilities impact

A specific study was undertaken by consultants to LCDC to identify appropriate precautionary and rehabilitation measures to take at each dam site. This assessment used air photos and available biophysical mapping to produce a set of recommendations for the construction campsites, borrow pits and spoil disposal areas.

Land capability ratings for forestry, wildlife and recreation

The addendum to the EIS for transmission lines included an inventory of "land capability ratings". The information, presented in a series of tables, was extracted from a series of 1:250,000 maps published by Environment Canada as part of the Canada Land Inventory. The purpose of the inventory was to provide a reliable, but very broad assessment of the quality, quantity and distribution of the natural resources of Newfoundland. Individual land capability ratings for forestry, wildlife and recreation were made for each 10-kilometre segment of the proposed transmission line route. The ratings (high, moderate or low) were based on an index which divided land capability

Time schedule for the Lower Churchill Hydro Project
(Canada)

Preliminary environmental overview on transmission-line component	1974			
Guidelines for the EIS for the power generating station	1978			
"environmental policy statement" addendum	1979			
EIS issued	April 1980			
Public hearings	September 1980			

for each characteristic into seven classes. The classes for forestry, for example, ranged from Class 1 (lands having no important limitations to the growth of commercial forests) to Class 7 (lands having severe limitations which preclude the growth of commercial forests). Similar classes have been established for wildlife and recreation.

Transmission Facilities Socio-Economic Impact Study

This study had three major purposes: to provide information on the project design, costs and benefits to the local public; to provide an objective prediction of both the potential, beneficial and adverse impacts which could result from project development; and to provide recommendations on how the project could proceed if approved in order to maximize local socio-economic benefits and minimize socio-economic costs. The first step was to identify and review all relevant previous studies. These included not only the previous engineering and socio-economic studies in the area conducted for LCDC or other potential industrial developments, but also government, regional or community planning, wildlife, forestry and fisheries studies, federal or provincial statistical reports, historical documents, tourism and journalism articles. These were supplemented by contacts with university, municipal, provincial, federal and local citizen information sources. Several trips to communities along the transmission corridor were made to update and complete these statistical sources. Impact predictions and suggested mitigating measures were made based on information supplied by the proponent and through a review of comments made during the base-line data collection surveys and during public hearings held in a number of communities. The socio-economic impacts were identified. They concerned the creation of construction and related jobs, potential Indian land claims and archaeological sites. The report proposed a number of recommendations and mitigation measures related to these impacts (e.g. the implementation of a local hiring practice and training programmes).

Stream monitoring study

The objective of the stream monitoring study was to provide a base-line description of relevant physical and biological parameters of selected rivers or brooks, representative of Labrador and Insular Newfoundland, which would be transected by the proposed Lower Churchill project transmission lines. The study had two principal components: hydrological and biological. The scope of the hydrology work carried out included observations or measurements of the following: stream discharge, stream cross-sections, water slope, sediment particle size, flood levels and bank slopes. The biological work that was carried out contained observations or measurements of the following parameters: water quality, benthic and plankton and bird and mammal species utilizing the adjacent habitat. The work was done by two consultant firms which fielded a team of four biologists, a hydrologist, a chemist and a fisheries technician.

Climate conditions

In recognition of the difficult climatic loadings anticipated for sections of the transmission line route between Gull Island and St. John's, meteorological studies were initiated in 1973 and continued through 1980. These studies were mostly based on existing climatological records of the weather stations located throughout the area, supplemented by storm damage

reports and contacts with personnel having firsthand experience with wind and icing in those regions. It was readily apparent that existing data was not available from the remote areas most susceptible to high winds and/or icing and a programme of data collection was established in 1974. This Climatological Monitoring Programme (conducted by Newfoundland and Labrador Hydro) incorporated seven programmes designed to collect raw data; the objective was to optimize transmission line design parameters and route selection for the transmission system. The seven programmes included: (i) the installation and monitoring of Passive Ice Meters (PIM) installed at 30 locations throughout the province; (ii) Rosemount Ice Detectors installed at 3 locations on the island; (iii) 22 test tower sites located primarily on the Great Northern Peninsula and in Southern Labrador; (iv) anemometers located at 4 locations; (v) a salt contamination programme monitoring the effects of salt contamination on test insulator installations at 13 locations throughout the Island and Labrador; (vi) a study of the extent of salt corrosion on transmission line hardware/conductor at 6 stations located primarily on the Great Northern Peninsula; and, (vii) the investigation into the behaviour of 3 alternate routes across the Long Range Mountains.

Wildlife reconnaissance

Two studies related to wildlife were carried out by consultant firms for the proponent. The first was an assessment of the wildlife activity along the Gull Lake - Strait of Belle Isle section of the proposed transmission line. The objectives were (a) to assess wildlife, particularly caribou, use of the area of the proposed route and (b) to determine the number of bald eagle and osprey nests along the proposed right-of-way. The work was carried out using animal and animal track observations recorded during aerial surveys and through interviews with knowledgeable persons. The assessment indicated relatively low ungulate and furbearer populations within the study area. Moose were concentrated in a favourable habitat in a western section of the route, furbearers were scattered throughout the route. Small bands of caribou were reported near the headwaters of several rivers. No bald eagle or osprey nests were observed. The objective of the second study was to provide a preliminary assessment of caribou movement patterns in and near the Lower Churchill Valley. The same research method was used - aerial surveys of animals and animal counts - as in the first study. The study found no evidence to indicate that there was or is regular and/or significant movement of caribou across the Lower Churchill River during the spring or any other time of the year.

Fish studies

Two types of studies on fish were conducted by a private consulting firm for the LCDC. The first, carried out in several phases over a two-year period concerned "Specific Impacts of the Lower Churchill Project on Fish of the Churchill River". The report discussed the following concerns:

- The impact of reservoir water level fluctuations, specifically drawdowns, and sedimentation on fish reproduction;
- The impact of entrainment of fish into the generating system;

- The impact of gas bubble disease;
- The impact of generating station operations on downstream water temperatures;
- The problem of sedimentation and concentration of mercury.

The second study was a "Review of Proposed Mitigation/Compensation for Impacts of the Lower Churchill Project - Generation Facilities on Fish of the Churchill River". Specific measures considered included:

- The provision of fish passage at barriers on tributary river systems (rejected for economic and other reasons);
- Reservoir restocking;
- Generating station modifications.

(c) Methods used to compare the effects of alternatives

Neither the alternative dam sites nor the alternative transmission line corridors were compared in any formalized way (i.e. no weighting/scaling, no tabular comparison of environmental impacts). A discussion of transmission line corridor alternatives was included in the "Environmental Policy Statement Addendum" as a result of an instruction from the review panel that: "The exact route proposed should be described on a section-by-section basis with site specifics for critical areas (river crossings, wildlife habitat, forestry, etc.). The alternatives considered and the mitigation measures proposed should be provided".

VIII. REVIEW AND PUBLIC PARTICIPATION

Following the release of the EIS for the transmission lines in November 1978, notices of the review were placed in urban newspapers and sent to rural householders along the proposed route. Copies of the EIS were placed in viewing centres across the province and sent to individuals. Visits were also made by the panel secretariat to communities where interest had been expressed, in order to explain the review process. Following the identification of deficiencies in the EIS by government agencies, interest groups and the general public, the panel, in March 1979, requested the proponent to provide further information. Many of the studies described above came about as a result of that request.

Visits to various communities were also made by the proponent in the fall of 1979 to provide information on the project. In December 1979, LCDC submitted an addendum to the transmission line EIS. This addendum together with the EIS for the power generating site submitted in April 1980 were reviewed by interested parties. All related project documents were widely publicized. As a result of EIS documentation review for the power generating sites and transmission lines, a total of 24 written submissions were received.

On the basis of interest expressed by various communities, and discussions between community representatives and the panel secretariat, the location and the timing of the public meetings were decided by the panel.

Notices of the meetings were advertised and mailed to interested parties. Procedures for the meetings were also made available to interested parties in advance.

In order to hear the views of the residents of the smaller communities who had expressed interest in the review, the panel held meetings in Flowers Cove, West St. Modeste and North West River. At the community meetings a wide range of concerns and views were presented to the panel.

Two days of public meetings were also held in St. John's and four in Happy Valley - Goose Bay. In St. John's, the sessions held allowed both technical agencies and the public to make presentations. In Happy Valley - Goose Bay, detailed discussions on various technical issues took place. Issues discussed included socio-economic impact of the project as well as environmental issues related to the transmission lines and the power generating sites. A session to hear general concerns of the community was also held. At the final session, participants presented closing statements summarizing their position regarding the project, taking into account information presented by others during the meeting. With the exception of the final session, the panel, proponent, participants and the audience were given an opportunity to ask questions after each presentation.

LCDC was represented by senior officials throughout the meetings, assisted during the technical sessions by consultants who had helped prepare the EIS documents. Representatives of the media were present throughout the public meetings, with the exception of West St. Modeste.

Representatives of the federal Departments of Environment, Fisheries and Oceans; and Energy, Mines and Resources as well as a number of public groups and local residents participated in the meetings at Hally Valley - Goose Bay and/or St. John's. The Government of the Province of Newfoundland and Labrador, although supporting the review, indicated that representatives of provincial departments would not participate at the meetings.

A total of 133 presentations were heard by the panel. Naskapi/English translation service was provided during the meetings at Sheshatshit and Hally Valley - Goose Bay. Transcripts of all meetings were made and are available through the Federal Environmental Assessment Review Office. Forty-five written submissions were received by the panel during and after the public meetings. In addition, the proponent provided further information in response to comments received by the panel. A list of those who made presentations or submitted briefs was contained in an appendix to the panel report. From an evaluation of the EIS documentation, the written submissions, and other information presented, tabled or obtained from questions and answers at the public meetings, the panel acquired a thorough understanding of the issues related to the potential impacts of the project.

IX. DECISION

In its report of December 1980, the Environmental Assessment Review Panel concluded that:

(a) Development of this indigenous renewable energy source is a rational choice to meet demonstrated needs.

(b) Construction and operation of the project will be acceptable provided certain environmental and socio-economic conditions are met.

(c) Opportunities exist to construct portions of the project in an alternative manner which may have greater long-term resource benefit.

(d) Future development in Labrador can be assessed for potentially significant effects separately from consideration of the Lower Churchill project. The Panel therefore concluded that the project may be allowed to proceed subject to conditions presented in a list of recommendations.

Those recommendations were:

(a) Erosion below Muskrat Falls must be monitored and mitigation measures implemented if results reveal a problem.

(b) A long-term monitoring programme must be formulated to identify opportunities for mitigation and compensatory measures for fisheries resource losses in the proposed reservoir areas.

(c) Mitigation and compensatory measures must be negotiated for fisheries resource losses in the area of the proposed reservoirs, based on results from long-term monitoring studies and actual post-flooding impacts.

(d) Monitoring of mercury levels in fish in the reservoirs, and downstream should be carried out as part of the post-flooding programme.

(e) Financial compensation must be negotiated for any fishing income losses that cannot be replaced by use of other areas while construction of the submarine cable crossing under way.

(f) Further studies on moose and their habitats should be carried out and measures implemented to mitigate impacts in the proposed reservoir areas.

(g) Financial compensation must be negotiated where it can be established that trapping income has been unavoidably lost as a result of flooding.

(h) Clearing should be carried out in selected areas along the perimeter of both reservoirs to protect options for uses other than power generation.

(i) A detailed plan should be developed delineating the areas to be cleared and specifying the procedures to be used in reservoir clearing.

(j) Compensation should be negotiated where use of existing forestry resources is precluded by the proposed transmission lines.

(k) Residents of the area should be given opportunities to acquire skills needed for jobs on the project through provision of suitable training courses.

(l) Sufficient information should be given to agencies far enough in advance to enable them to provide additional services required because of the project.

(m) Representatives of community groups should be invited to participate on community liaison committees which should endeavour to optimize community benefits from the project.

(n) Living accommodation for single status workers should be located on site at both Gull Island and Muskrat Falls in order to reduce social disturbance to existing communities.

(o) Successful policies implemented elsewhere and involving resource development in areas inhabited by native peoples should be reviewed for possible application to this project.

(p) Steps should be taken to reduce cultural conflict through a programme to sensitize workers to the native cultures of Labrador.

(q) An individual with experience in communicating with native peoples should be appointed to deal with matters affecting the Indians and Inuit.

(r) Adequate staff for surveillance and enforcement during construction should be provided for the proponent and appropriate authorities.

The Panel also recommended that:

(a) The opportunity for salvage of saleable timber to be flooded should be considered by the appropriate provincial resource management authorities in light of declining provincial inventories, future market options and cost-benefit analysis.

(b) The opportunity to use existing transmission line routes between Grand Falls and the Avalon Peninsula should be given further consideration by provincial policy-making authorities.

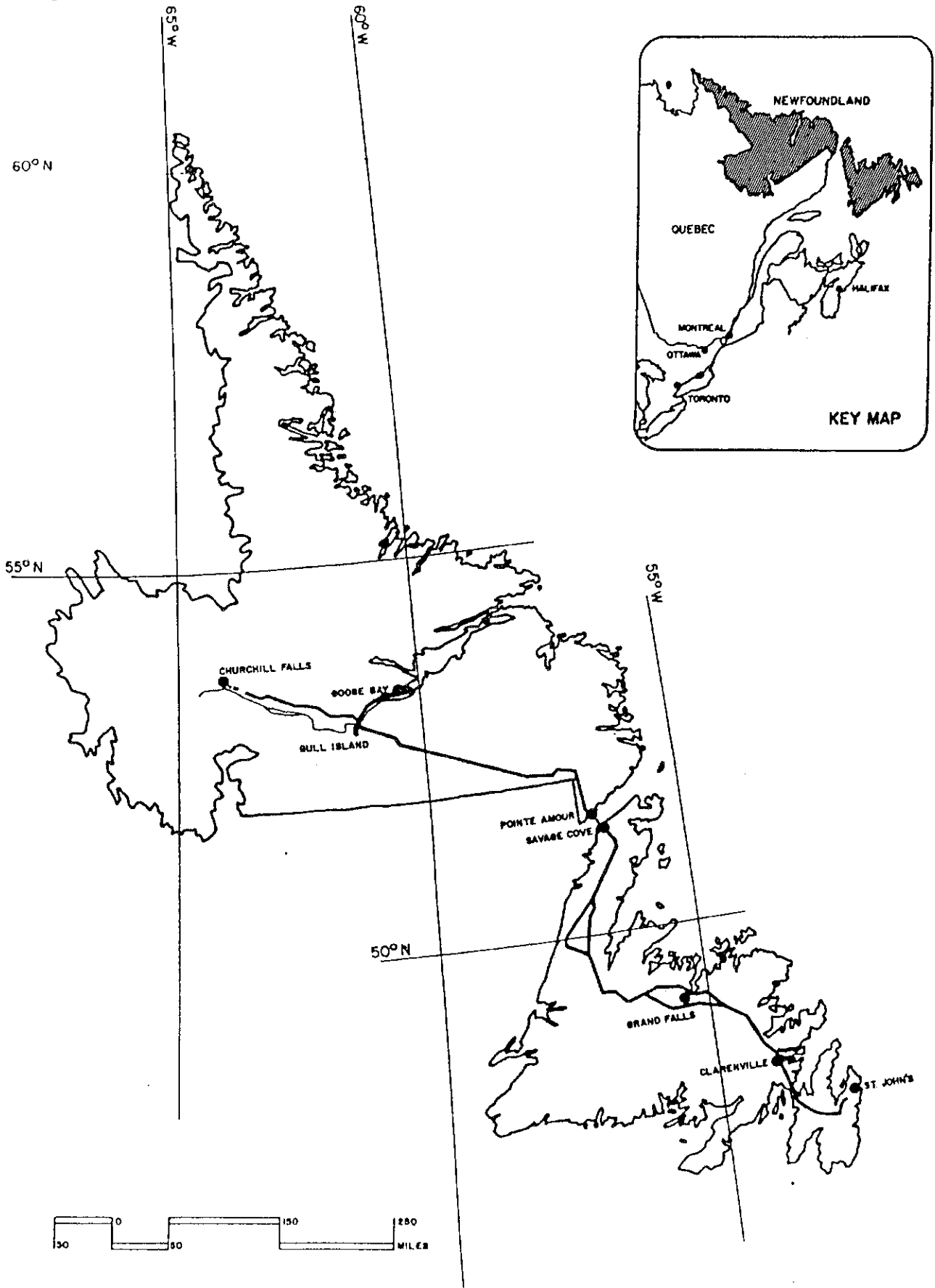
(c) Any specific future industrial development proposals in Labrador should be fully assessed by the appropriate authorities, with particular attention to the potential for negative impacts on native cultures, prior to any irrevocable decisions.

Owing to financial considerations the proponent has postponed the project.

X. COSTS

The EIS and related studies for the dam sites cost \$1 million as compared with \$7 million for feasibility studies for engineering and other preliminary planning. The cost of the two dam sites (and associated transmission lines) was estimated in 1980 at \$4.3 and \$3.2 billion. Costs of the review itself were \$100,000.

Figure 10



CASE 8. THE VUOTOS RESERVOIR IN FINLAND

The main elements of the study are summarized as follows:

Project title:	Vuotos Reservoir (Finland)
Type of project:	Reservoir construction in the Kemijoki River Basin in northern Finland
Project characteristics:	Purpose of the reservoir is to increase the storage capacity of the Kemi River basin and consequently to increase the production of existing power plants
Proponent:	Kemijoki Oy (power company) National Board of Waters (subordinate to Ministry of Agriculture and Forestry)
Competent authority:	State Council
Main environmental impacts involved:	<ul style="list-style-type: none">- Nature- Fisheries- Reindeer keeping- Bogs and peat- Water quality- Population
Decision:	Decision of principle <u>not</u> to build the reservoir

I. GENERAL INFORMATION ON THE PROJECT

This reservoir study concerned planning and deciding on the Vuotos Reservoir for northern Finland in the Kemijoki river basin. The purpose of the reservoir would be to increase the storage capacity of the Kemi river basin and consequently to increase the production of existing power plants. Use of the Kemi River for power production was hampered by the large variations in natural flow. The natural lakes and the man-made reservoirs of Lokka and Porttipahta represent a storage capacity of only about one half of the normal flow volume of the Lake Kemijärvi catchment area. More storage was deemed necessary to even out the flow and thus avoid by-passing at the power plants. The reservoir would primarily improve power production at the existing plants but also reduce flood peaks in Lake Kemijärvi and along the entire Kemi River.

Preliminary investigations were made in the reservoir area as early as 1952. Planning started in 1960. Two reservoir alternatives were examined - Vuotos and Kemihaara. According to the Vuotos alternative, waters would be gathered exclusively from the catchment area of the upper Kemi River. In the Kemihaara alternative, additional waters would be taken from the Luiro River watershed below Lokka Reservoir.

II. PLANNING PROCESS GENERAL INFORMATION

The water administration in Finland was reorganized in 1970 when the National Board of Waters (NBW) was established to direct and supervise water administration. This is a central office under the Ministry of Agriculture and Forestry, and now also partly subordinate to the Ministry of the Environment.

In the field of water administration there are four main types of plans:

- (a) Planning of national objectives and strategies of water use and water pollution control;
- (b) Regional water resources development plans;
- (c) General water use and water pollution control plans;
- (d) Project plans A, project master plans, and project plans B.

The Water Act and Water Decree include regulations only for the last planning phase, i.e. the project plan (B) which is the basis for applying for a licence from the water court. The regional plans, general plans and project master plans provide general guidance but have no legal status. There are no overall content requirements for project master plans delineated on a case-by-case basis by the National Board of Waters.

In the case of big projects with wide-reaching impacts, a project master plan is drawn up. Usually water authorities take responsibility for planning and act as a proponent when applying for a licence from the water court. A project master plan is the basis on which the State Council gives the NBW permission to apply for a licence from the water court. In the case of the Vuotos Reservoir, the State-owned water power company (Kemijoki Oy) was the party which would apply for the permit from the water court, not the National Board of Waters. Thus the decision of the State Council would not have been necessary. However, the company wanted financial contributions from the State and also the Ministry of Agriculture and Forestry and found that the Vuotos project would have such significant and wide-reaching impacts that a State Council "decision in principle" on whether or not to implement the project was necessary.

The studies carried out in preparing project master plans usually aim to set only general conditions for implementing a project. After a decision is taken to implement the project, more detailed planning with more detailed studies begin in order to draw up a project plan.

The project plan is the basis for applying for a licence from the water court. In matters of sufficient importance, the water court sets in motion a special inspection procedure to deal with the application. The purpose is to prepare the decision of the water courts in the matter. The inspection board is composed of an engineer appointed by the National Board of Waters and two persons of trust from the municipality in question. At the request of the engineer the National Board of Waters may assign one of its staff with special knowledge of, for example, fish biology, limnology, process technology or landscape planning, to assist in the inspection. The water court may

assign its own legal secretary or other expert to assist in the inspection. The inspection board examines project plans and clarifies the nature and extent of the damage which may be caused by the project. Both the legal conditions of the licence and the licence terms are clarified.

All those whose rights or interests are concerned must have an opportunity to comment or present demands at both the opening session and at the inspection session held later. In their official capacity, the members of the inspection board must also take into account losses resulting from the project for which no compensation has been demanded. The inspection concludes with a statement issued by the inspection board. The statement is on display in the municipal offices of the area in question for a set period of time. Within a specified period, the parties involved have an opportunity to comment and make suggestions to the water court with references to the statement. The parties involved can appeal against the decision of the water court.

III. PLANNING PROCESS FOR THE VUOTOS PROJECT

For the Vuotos Reservoir only a project master plan was prepared. It included information on planning principles, the reservoir area, water regulation calculations, construction plans, impacts, comparison of alternatives and recommendation of the planning committee.

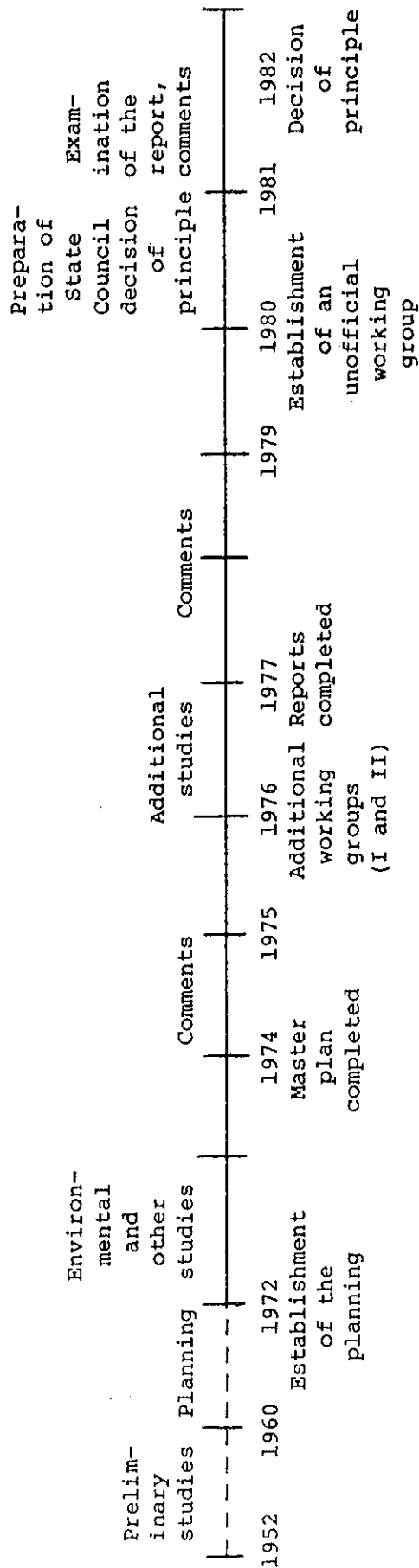
The master plan of the Vuotos Reservoir was published in December 1974. The planning committee recommended that planning of the more extensive Kemihaara Reservoir be discontinued. In October 1975, the National Board of Waters recommended the construction of the Vuotos Reservoir to the Ministry of Agriculture and Forestry. Following completion of the master plan, additional studies were carried out from 1975 to 1981 on the basis of the Vuotos Reservoir alternative. In 1976, two working groups were established. The first was to examine what the contribution of the State should be and how potential ore deposits could be exploited if the project were carried out. The second group was to examine how to organize the resettlement of inhabitants dependent on an aboriginal livelihood (reindeer-keeping, fishing, hunting and berry picking). In 1980, an unofficial working group was established representing the Ministry of Trade and Industry, the Ministry of Agriculture and Forestry and the National Board of Waters. This group carried out the preparatory work for the State Council which was to take the "decision in principle". In September 1982 the State Council made a "decision on principle" and decided not to build the reservoir. With regard to the Vuotos Reservoir planning, the following time schedule had been drawn up.

IV. INITIATION OF THE EIA

Preliminary investigations were carried out during the period 1952 to 1959 and maps of the planning area were prepared. The environmental studies started in 1972 during the preparation of the master plan for the Vuotos Reservoir.

The studies were deemed necessary because of the environmental effects connected with two other reservoirs, Lokka and Porttipahta, built earlier in the same river catchment area. Owing to criticism of those reservoirs, the Office of State Council issued a directive concerning reservoir planning. The directive was addressed to the power company Kemijoki Oy, which had constructed

Time schedule of the Vuotos project
(Finland)



them, together with the water authorities. The directive was also sent for notification to the National Board of Waters and other concerned parties. The directive was found to be necessary because of the growing criticism of the Lokka and Porttipahta Reservoirs. After the construction of the reservoirs the water quality in the river had been impaired downstream of the reservoirs and the projects had caused adverse effects on fisheries, recreation, landscape and waterway traffic.

In order to determine whether the criticism was justified, the Office of State Council invited comments from various parties and decided that, indeed, the criticism was well-founded. On the basis of information received, the Office of State Council decided to take into account in the future experience gained from the construction of the two reservoirs. The main content of the directive, therefore, was that the State should support new reservoirs only on the condition that multiple-use aspects and former experiences be taken into account in early planning phases and in co-operation with authorities responsible for environmental matters. In addition, during the planning and implementation of new reservoirs, the rights and needs of local (and native) peoples must be given particular attention.

The release of the directive resulted in the preparation of quite detailed environmental investigations during the early planning phases of the Vuotos Reservoir. It is perhaps too much to say that the directive created in EIA obligation for hydropower projects in general but it did cause a change in reservoir planning practice.

In 1972, a planning committee on which the National Board of Waters, the power company (Kemijoki Oy) and biology experts were represented was set up to direct the planning work. To take regional interests into consideration, a council was formed to follow up and evaluate the planning work. Twenty local organizations were represented on the council. The planning committee ordered over 20 investigations from specialists in various fields. These investigations were carried out for the master plan.

V. RESPONSIBILITY FOR PREPARING THE "EIS"

No EIS in the strict sense of the word was prepared in this case. Several environmental studies, however, were carried out before, during and after the preparation of the master plan. The investigations and those responsible for them were:

- Effects of damming the reservoir (Oy Vesi-Hydro Ab)
- Archeology (Museum Agency)
- Geology (Imatran Voima Oy and Geological Research Institute)
- Evaporation (National Board of Waters)
- Fisheries (Kala-ja Vesitutkimus Oy)
- Communal economy (Mr. T. Hannula from the Finnish Communal Union)
- Indemnities and ownership (Kemijoki Oy)

- Nature (Prof. Ruuhijarvi, University of Helsinki)
- Mineral resources (Rautaruukki Oy)
- Reindeer-keeping (Mr. Helle, M.Sc.)
- Land clearing (National Board of Waters; Kemijoki Oy)
- Architectural history (Urban Planning Institute of Oulu University)
- Building costs (Kemijoki Oy)
- Game animals (Dr. Pulliainen, University of Helsinki)
- A study of bogs and peat (Mr. Karesniemi, Civil Eng;
Oy Vesitekniikkka Ab)
- Cost of roads (Lapland district of the National Board of Roads and
Waterways)
- Long-term forecasting of inflows (Mr. Gürer, Tech.lic. National Board
of Waters)
- Flood control (National Board of Waters)
- Labour problems (Kemijoki Oy)
- Timber floating (Working group)
- Water quality (Mr. Vogt, M.Sc.)
- Recreation and landscape (Mr. Vogt, M.Sc.)
- Water power calculations (Kemijoki Oy, Ministry of Trade and Industry)
- Population study (Prof. Asp and Mr. Jarvikoski, M.Sc., University of
Turku)

The consultants were selected by the planning committee which also prepared the terms of reference. Working groups in which local people were also represented were established to supervise those studies which were most important from their point of view (population study, study of fisheries and study of reindeer-keeping). All the studies were supervised by the planning committee. In order to include local and regional concerns in the planning stage, the above-mentioned council followed and evaluated the planning work.

After completion of the master plan, additional studies were carried out on the basis of the Vuotos Reservoir alternative. They were:

- Possibilities for relocation of inhabitants from the Vuotos area
(district head office, L. Jaatinen)
- Water quality estimates (Mr. O. Nenonen)

- Cost estimate of the Vuotos Reservoir and power station (Kemijoki Oy)
- Profitability of the Vuotos Reservoir (Imatran voima Oy)
- Effects of the Vuotos project on employment (National Board of Waters).

VI. CONTENT REQUIREMENTS

As there were no specific legislative or administrative content-requirements for a project master plan, the investigations mentioned above were initiated by the planning committee where the National Board of Waters, the power company and biology experts were represented. This planning committee determined what specific environmental impacts needed to be studied.

VII. DESCRIPTION OF THE PROPOSED PROJECT AND THE ALTERNATIVES

The proposed activity was described in the master plan as well as in some of the separate investigations. Two alternatives were studied. In the Vuotos Reservoir alternative, waters were to be harnessed exclusively from the catchment area of the Upper Kemi River. In the Kemihaara Reservoir alternative, additional waters were to be utilized from the Luiro River watershed below the Lokka Reservoir. In addition to the area of the Vuotos Reservoir, the Kemihaara Reservoir alternative comprised an equally large area downstream from the Luiro River. Surface areas of the reservoirs at the highest water level would be about 221 km² for Vuotos and 326 km² for Kemihaara; the net volume being 1,020 million and 1,245 million cubic metres, respectively. The overall range of water level fluctuations in the Vuotos Reservoir would be 9.5 metres and in the Kemihaara Reservoir 6.5 metres. Both the Vuotos and Kemihaara Reservoir areas are dominated by peatlands. The portion of dry heathland forest is approximately 10 per cent with a predominance of coniferous trees.

The alternatives were selected by the power company. Aerial photographs were taken, field examinations carried out and maps drawn up in order to find suitable reservoir sites. These preliminary studies were made before project master planning began (1952-1960) and they concentrated on site selection. The master plan included a description of the catchment area and of the existing and potential water regulation arrangements. More detailed descriptions of certain sections of the environment were included in the individual investigations. No description of the expected development without the project was included.

VIII. DESCRIPTION OF THE ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT AND COMPARISON

This topic can be divided into three sub-items:

- (a) Impact identification;
- (b) Methods used for predicting impacts;
- (c) Methods used for comparing the environmental effects of the various alternatives.

(a) Impact identification

The planning committee representing the National Board of Waters, the power company and biology experts directed the investigations to be included in the master plan. The basis for the impact identification was former experiences with, and investigations of, the most significant impacts of reservoirs.

Potential effects were identified with regard to:

- Physical environment (geology, mineral resources);
- Fisheries, reindeer-keeping, game animals;
- Nature, bogs and peat;
- Water quality, inflows, flood control;
- Archeology, architectural history;
- Recreation;
- Landscape;
- Population.

(b) Methods used for predicting impacts

The studies on archeology and geology were inventories based on existing information and preliminary field examinations. A more detailed study programme was drawn up for possible further planning.

The study on fisheries was based primarily on existing material. In addition, fishermen were interviewed and preliminary field examinations were made (the latter were done in order to draw up a more detailed investigation programme). Prediction of the value of fisheries was based simply on information regarding size of the area of the reservoir alternatives and the existing water area, the surface of the catchment by hectare and the price of the fish per kilogram. Another prediction was made using production capacity instead of catch in the calculations. The value was calculated separately for the one- to three-year period and the four- to 13-year period after the construction of the reservoir. The values in Finnish marks were compared. Methods for predicting impacts on fisheries have been further developed since then and are constantly being improved.

The purpose of the nature study was to survey and give a description of the general features of nature in the reservoir area with special emphasis on vegetation, so that aspects of nature conservation would be considered by decision makers. The study would also form a basis for further investigations and planning connected with the reservoir. General methods for nature inventories were used (field examination with the aid of aerial photographs and maps). The alternatives were compared from the point of view of nature conservation (that is, which significant areas would be destroyed by each alternative).

In the study on reindeer-keeping, the amount of grazing land to be inundated was calculated. Because of the reduced grazing land, the number of reindeer would decrease. The detrimental impacts to be compensated were calculated (in national currency) on the basis of the damage to the grazing land, difficulties of rearing animals (for instance the reindeer would move further afield and would be more difficult to herd together) and the structures (fences, huts, etc.) to be destroyed.

The study on architectural history concerned the village of Luiro which was to be inundated by the Kemihara alternative. The study was based on literature, material obtained from the National Board of Waters and the Statistical Centre and also field examinations. The study included inventories and descriptions of the existing situation. No formal methods were used.

The study on game animals was also based on former investigations and field examinations (inventories of the number of game animals and their most important breeding and habitat areas). Hunters were also interviewed. The prediction of impacts was based on experience obtained from the Lokka and Porttipahta Reservoirs. The value of the catch of game animals was calculated on the basis of interviews (number of catches) and the price on various game animals.

The purpose of the investigation on bogs and peat was to determine the quality of the reservoir base and its special features regarding peatland. From the field study results the range of peatland and the thickness of peat layers was determined and the peat masses were calculated. Laboratory investigations were made to determine those physical and chemical properties of peat samples that were deemed significant from the point of view of water quality changes.

In predicting peat upheaval, the following were taken into account:

- (a) Peat quality, physical properties of peat, and special factors determined by the plants of which the peat is composed;
- (b) Special features of rimpi-bogs, narrow ridges or "cords" of peat, and buoyancy;
- (c) Bog depth and stratification of peat.

For each sampling point, a forecast value was calculated on the basis of the above-mentioned factors for peat upheaval as well as the thickness of the peat layer expected to rise. With the help of aerial photographs, the forecast was generalized over wider areas of maps. According to susceptibility to upheaval, the forecast was divided into three risk groups and the area for different risk groups calculated. Precautionary measures to reduce harmful effects were proposed.

The purpose of the study on long-term forecasting inflows was to predict spring, summer, autumn and winter inflows to the planned reservoir. The predictions were made using linear multiple regression techniques. The inflows were predicted separately for the Kemihara river basin and the Luiro river basin.

In the study on water quality, the existing situation was described. The impacts (the changes in various parameters describing water quality) were then predicted on the basis of former investigations made about other reservoirs (including Lokka and Porttipahta) separately for periods of one to three years, 20 years, and over 50 years after construction. Impacts on the use of the watercourses were also studied. Alternatives were compared but no formal method was used. Measures to minimize the harmful effects were then suggested. Methods for forecasting water quality have been highly developed since 1974 when this study was made.

The study on recreation (including berry picking, mushroom gathering, etc.) was based on interviews and existing material obtained in former investigations. The possible effects were described and the alternatives were compared (not ranked) but no formal methods were used. Measures to minimize the harmful effects were suggested.

The study on landscape included an inventory of the elements of the existing landscape, prediction of the landscape after the construction of the reservoir and suggestions for measures to minimize detrimental effects. In order to determine the areas which should be cleared from the point of view of landscape aspects, a simple method was used. The distances that could be seen by the human eye from various points of the reservoir shoreline and roads were calculated and a map was drawn up. These areas were suggested for clearing.

The goal of the population study was to determine the attitudes of local people to the project, their living conditions and the impacts on the population. The study was based on interviews.

(c) Methods used for comparing the environmental effects of the various alternatives

Although alternatives were compared, no formal, quantitative method was used for comparing their effects.

IX. REVIEW AND PUBLIC PARTICIPATION

The environmental studies were included in the master plan for the Vuotos Reservoir. During the preparation of the plan, the members of the council (representing the local interests) and the planning committee had the opportunity to comment on the plan and on the investigations included in it. The council met on several occasions to discuss the planning work at different stages. Members of the council also took part in the direction of the various stages of the planning work. The National Board of Waters, however, was the actual decision maker.

After completion, the plan was sent for comment to the municipalities in the area, to several authorities and other parties who might be concerned. Over 20 comments were submitted to the National Board of Waters. Later, in the course of the process, comments were made by the Ministry of Agriculture and Forestry (the National Board of Waters is subordinate to that Ministry) and by the Ministry of Trade and Industry. Summaries and analyses of the environmental studies and of the comments were included in the material prepared for the State Council.

In addition to creation of the environmental council, the general public and various interested parties were included in planning and later decision-making by means of distribution of information and requests for comments and opinions. In this context, the role of the parishes in the area was significant. In addition to the National Board of Waters, information was distributed by the power company Kemijoki Oy which, for example, provided detailed information (in autumn 1981) to the parish councils and directly to the households in the area.

The plan for a reservoir plan raised opposition among local people. Experiences from the two earlier reservoirs and the environmental studies made for the Vuotso Reservoir project had shown evidence of adverse effects on water quality, fisheries, nature, reindeer-keeping and other matters essential to the lifestyles of the local people. In addition, people were afraid that all the benefits of the reservoir would go to the south (to the power company). The people realized that their present way of life would change dramatically and that some of them would have to move away from their home district.

The local people organized an informal movement to oppose the planned reservoir. A public meeting took place where ministers were also invited. As a result of this meeting, the local people created a commission and three subcommissions in each municipality affected by the project. The commission gathered information on the project, informed local people, wrote articles in newspapers and organized visits of delegations to the decision makers. The activity of the local commission showed the decision makers that opposition to the project came not only from environmentalists in southern Finland but also from the local people who would be affected by the project.

X. DECISION

In September 1982, the State Council made a "decision of principle" not to build the reservoir. Briefly, it can be said that the project was rejected because of environmental issues and public opinion in spite of the fact that economically the project would have been profitable. The ultimate reasons for the decision were political, however. The State Council also decided that committees and working groups should be created to develop the planning area on the basis of its natural resources.

The environmental studies had two different kinds of impacts on planning and decision-making. Firstly, the recommendation of the planning committee that the planning of the alternative Kemihaara should be discontinued while the Vuotos should be selected for further planning was based on the findings in the studies (environmental reasons). Secondly, the environmental studies were partly responsible for forming public opinion against the reservoir. It could be said that the environmental studies were indirectly responsible for the rejection of the project.

XI. MONITORING

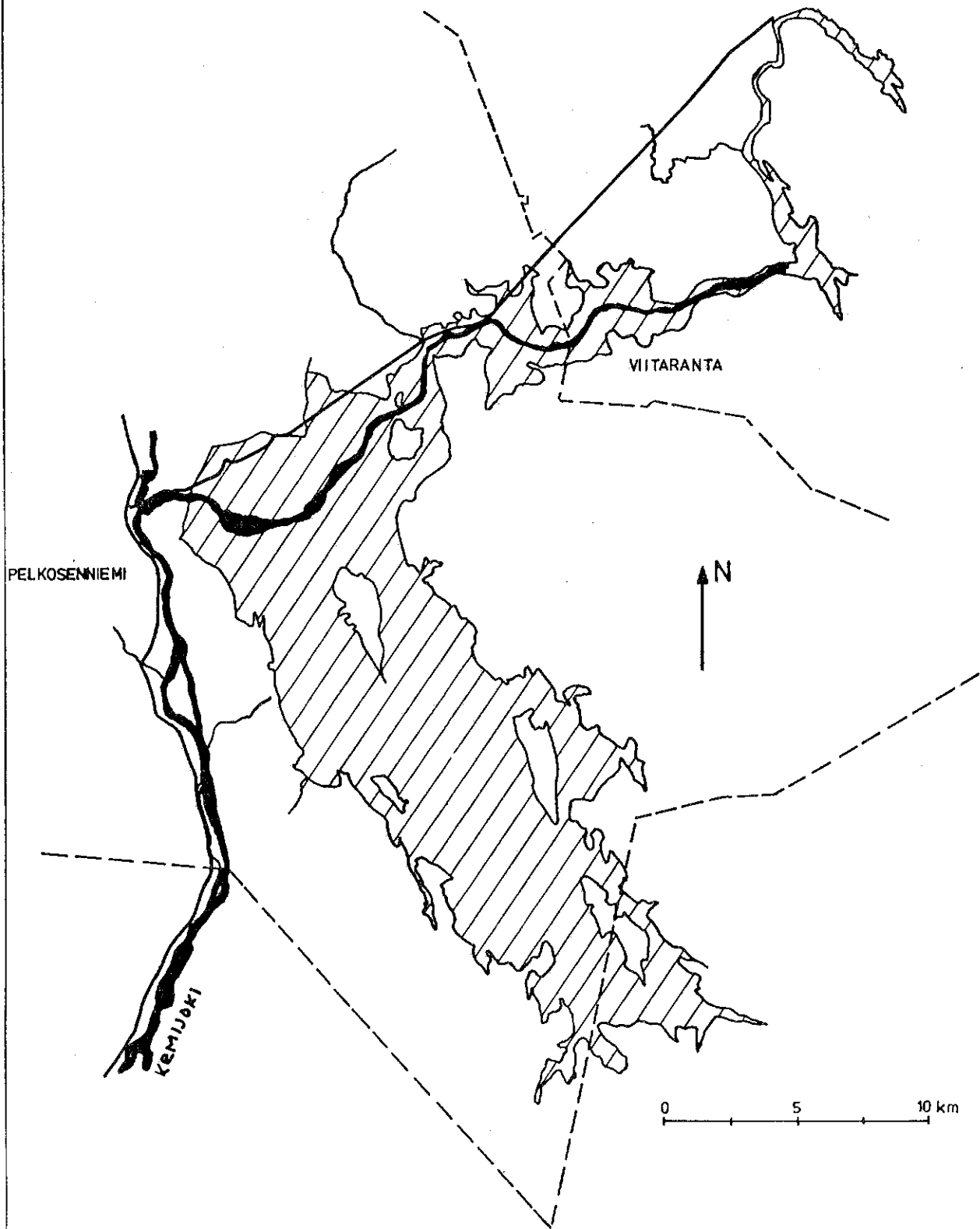
Monitoring studies would have been carried out according to a monitoring programme had the reservoir been built.

XII. TIME/COSTS

The time schedule shown reflects the time used in the various planning phases. It took some 20 years from the start of planning to the decision. The influence of the environmental studies on planning time, therefore, was insignificant.

The cost of the planning of the Vuotos Reservoir was approximately FIM 4 million during 1952 to 1975 (preparation of the master plan) and about FIM 17 million during 1976 to 1981. As the costs of realization of the project were estimated to be FIM 360 million, the planning costs were about 6 per cent of the costs of realization of the project (all the costs are based on 1975 prices; the cost of realization of the project based on 1980 prices would have been about FIM 500 million). The cost of the environmental studies was only a small part of the planning costs but the studies were not calculated separately.

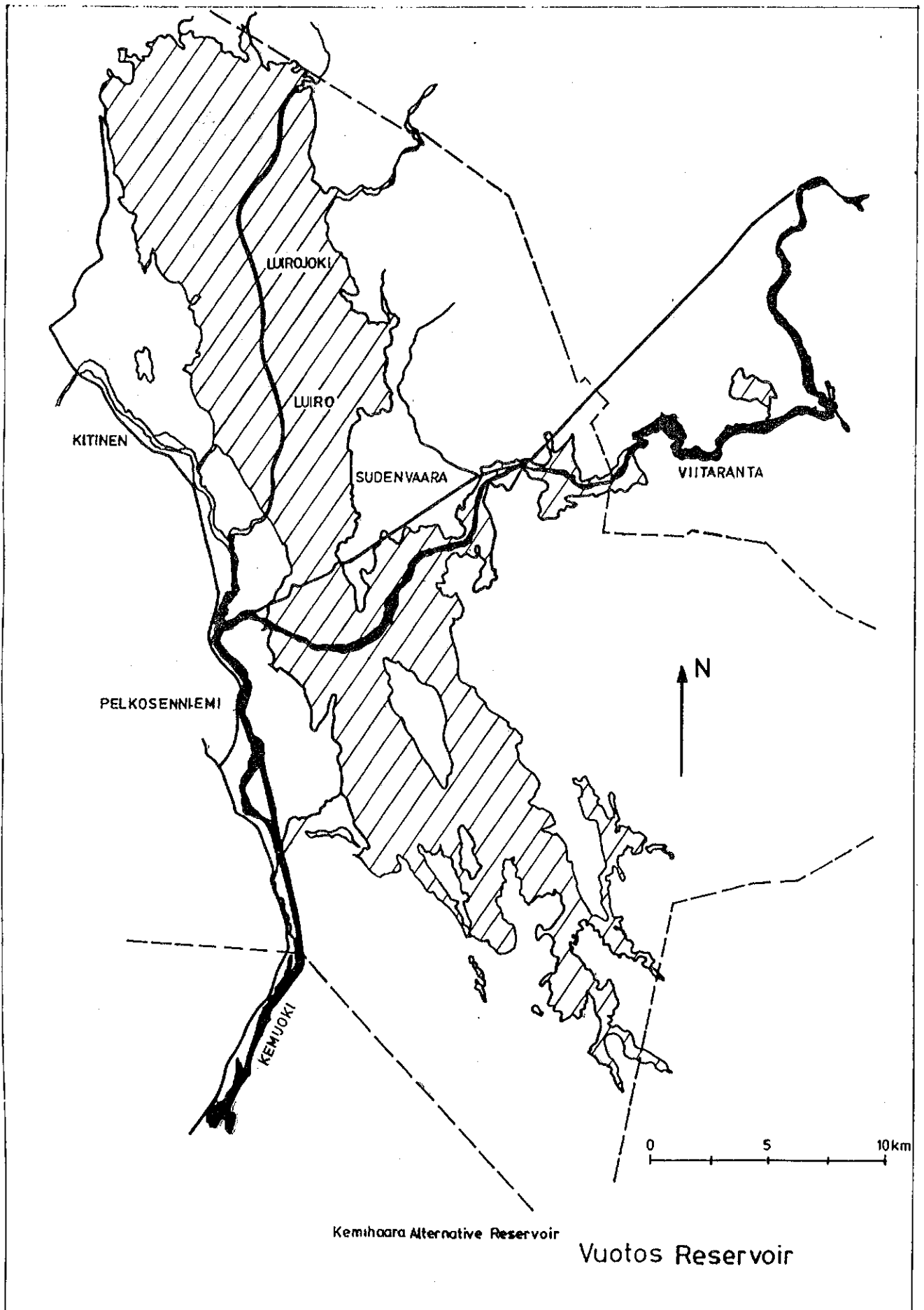
Figure 11a



Vuotos Alternative Reservoir

Vuotos Reservoir

Figure 11b



CASE 9. THE ERNSTBACH DAM IN THE FEDERAL REPUBLIC OF GERMANY

Project title: Ernstbach Dam (Federal Republic of Germany)

Type of project: Dam on the Ernstbach River for drinking water supply to the City of Wiesbaden.

Project characteristics: Dam shaped as a curved concrete structure 89 metres high and 415 metres wide that would supply 14,000 cubic metres of water per day. The drainage area of the dam would be approximately 35 square kilometres.

Proponent: Water supply company
(Wasserversorgungsunternehmen)

Competent Authority: Regierungspräsident (Länder level)

Main environmental impacts involved:

- Landscape factors
- Land-use patterns
- Protected areas

Decision: Not to proceed with the project.

I. GENERAL INFORMATION ON THE PROJECT

This case concerned the proposal to build a dam on the Ernstbach, a tributary of the Wisper River, in a mountainous area of Hesse known as the Hintertaunus. The site of the dam would be about 25 kilometres west of the city of Wiesbaden. The dam itself would be a curved, concrete structure 89 metres high and 415 metres wide, to be constructed at the point where the Ernstbach joins the Wisper. Its purpose would be to provide drinking water to the city of Wiesbaden and other heavily populated areas along the Rhine River (an estimated 14,000 cubic metres of drinking water per day could be supplied by the project). The drainage area of the dam would be approximately 35 square kilometres of unpopulated hills and valleys of which 82 per cent is covered in forest.

As part of the "plan approval process" for the project, which was formally initiated in 1977, several individual environmental studies were carried out. In March 1980, the plan approval authority for the project (Der Regierungspräsident in Darmstadt) requested the Hessian Environmental Agency to prepare a Gesamtökologisches Gutachten or comprehensive ecological study (hereafter referred to as "the study") on the project. The study, which was completed a year later, recommended that the project be submitted to a "regional planning procedure" (Raumordnungsverfahren) before the "plan approval" was decided upon. The regional planning procedure, however, did not take place and it was decided instead to "shelve" the project indefinitely. The extent to which the findings of the study contributed to that decision is not known.

II. PLANNING PROCESS

Regulations governing water supply management in the Federal Republic of Germany are contained in the Federal Water Management Act (Wasserhaushaltsgesetz) as well as in the various Water Acts (Wassergesetze)

of the Länder (states). Additional principles of water management are laid down in the federal and Länder planning laws, and the regional plans of the Länder. In Hesse, these are the Hessian land-use programme (Raumordnungsprogramm), the State development plan (Landesentwicklungsplan), and the regional land-use plans (Regionale Raumordnungspläne). These documents define, for example, certain areas as "priority areas for water management". Those directly responsible for water supply are individual communities and the "water supply companies" (Wasserversorgungsunternehmen) which are also responsible for maintaining drinking water quality.

Under the Federal and the Hessian Water Acts, surface water development activities such as the Ernstbach Dam require a plan approval which is basically governed by the provisions of general administrative procedure law. The plan approval procedure can be described briefly as follows:

(a) The proponent submits the project plan to the competent State authority (Regierungspräsident);

(b) This authority then invites comments from all other authorities and agencies whose range of competence may be affected by the project.

(c) The project plan is made available, for one month, to the public in each community probably affected by the project. During that time, and for two weeks afterwards, anyone concerned can submit objections to the project.

(d) The competent authority then discusses at a hearing all objections and comments submitted. In this hearing the proponent, as well as other authorities and persons concerned (including, in particular, those having objected to the project) may take part.

(e) The competent authority then decides on whether or not to approve the plan. Its decision is sent to the proponent and the persons concerned (including, in particular, those which have objected to the project).

A plan approval substitutes all other permits, licences, etc. that may be required for the project under other laws.

III. INITIATION OF THE EIA PROCESS

The EIA process was initiated in March 1980, within the context of the plan approval procedure required for the project. The plan approval authority commissioned the Hessian Environmental Agency to prepare a comprehensive ecological study of the project. This was to be part of the information basis for the authority's final decision on whether or not to permit the dam. The plan approval authority had previously commissioned from university scientists and specialized State agencies other studies on special ecological aspects (soil impacts; sociology of agricultural plants; forest hydrology; fishery ecology; soil science/ecology). It was the task of the new study to deal in a comprehensive way, with all ecological aspects of the project, taking the previous studies into account.

IV. RESPONSIBILITY FOR PREPARING THE EIS

Various co-ordination talks were held between the experts and agencies mentioned. In these discussions, the Wiesbaden Agency for Water Management

also took part. Environmental impact assessments, as such, are not explicitly required by a plan approval procedure. However, given the controversial nature of the project, the plan approval authority decided to commission a comprehensive ecological study and the job was given to the State environmental agency. This was the first study of its type which had been undertaken by the agency. The report itself was directed by a staff biologist.

V. CONTENT REQUIREMENTS

In determining the content of the study, the State environmental agency followed provisions set forth in the Federal and Hessian Nature Protection Acts. These Acts, while not explicitly requiring the preparation of environmental impact statements, set out a number of goals and principles for nature protection. Article 6 of the Hessian Act also sets conditions related to "permits for interventions" (Genehmigung von Eingriffen). In particular, the Act prohibits actions or activities whose negative impacts on the natural environment cannot be avoided or mitigated. If, however, in an individual case, the concerns of nature conservation and landscape protection are seen, in the interest of the common good, as secondary to other demands on nature and landscape, the action or activity may be permitted as far as necessary.

Based on this and other sections of the two Acts, the Hessian Environmental Agency determined the scope of the study and structured its content according to the following sections:

- Analysis of the project area,
- Landscape factors, land-use patterns and protected areas,
- Negative environmental impacts of the project,
- Possibilities for mitigation,
- Recommendations,
- Conclusion and final appraisal.

VI. DESCRIPTION OF THE PROPOSED PROJECT AND ALTERNATIVES

As stated under "General Information on the project", the purpose of this activity was to build a dam on the Ernstbach approximately 520 metres above its juncture with the Wisper River. The structure itself would be 89 metres high and 415 metres wide. The dam would create a reservoir with a surface area of 1.5 km² and a volume of 42 million m³. In order to avoid eutrophication and short-circuit currents to the flooding tower, a second smaller barrier would be built in front of the dam which would have a height of 26.5 m and a length of 168 m.

In addition to these two structures, a series of tunnels were planned from the upper reaches of the Wisper and several tributaries to the basin in front of the dam. This work would also entail the construction of four so-called "water frames" (Wasserfassungen) at various points on the Wisper tributaries. An appendix to the study contained statistics on these various project elements. In addition, the project envisioned a number of secondary

installations including 13 catchment basins, two precipitation overflow basins, two pump stations and two water purification units. The study was commissioned to deal only with the ecological impacts of the project as proposed by the proponent. No other alternatives were identified or assessed.

VII. DESCRIPTION OF THE EXISTING ENVIRONMENT

The existing environment was described in two sections of the study. The first described generally the natural characteristics of the project area known as the Hintertaunus, basically a mountainous, forested area with elevations of 500 to 600 metres. There the Wisper and its tributaries such as the Ernstbach have formed deep valleys, many with 300-metre steep forested cliffs. The area that would be flooded by the dam was primarily forest with scattered amounts of meadowland and very little agriculture. For the most part, it was unpopulated.

The second section of the study related to a description of the existing environment. It was divided into three parts: landscape factors, land-use patterns and protected areas.

Landscape factors comprised the following elements:

- (a) Geology;
- (b) Soils (general description);
- (c) Assessment of the suitability of the area for agriculture and forestry;
- (d) Climate and water;
 - air temperature,
 - precipitations,
 - evaporation,
 - surface run-off,
 - natural drainage patterns.
- (e) Vegetation;
- (f) Wildlife;
- (g) Visual landscape character (description based on a criteria catalogue and key for the analysis of visual landscape character).

Land-use patterns dealt with the following elements:

- (a) Settlements (housing) (1.9 per cent of the total area);
- (b) Highway traffic;
- (c) Landfills;

- (d) Agricultural areas (15 per cent of total area);
- (e) Forested areas (82 per cent of total area; 97 per cent of the Ernstbach Valley);
- (f) Hunting;
- (g) Fishing.

Under protected areas, the study described those areas which had a designated protected status as a nature or biotope protection area or protection stemming from fisheries or water rights. Except for one side of the Herzbach valley, the entire project area is included in the "landscape protection area" Taunus as well as in the Taunus Nature Park.

In addition to the above three categories, the study also described the existing "burdens" (Vorbelastungen) on the natural environment. These included ambient air quality, precipitation, eutrophication, infrastructure, etc.

VIII. DESCRIPTION OF THE ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT AND THE ALTERNATIVES AND COMPARISON

This topic can be divided into three sub-items:

- (a) Impact identification;
- (b) Data Collection;
- (c) Methods used for predicting impacts.

(a) Impact identification.

The study identified the following types of impacts:

- 1. Ecology
 - 1.1. climate
 - 1.2. water
 - 1.3. impact from air and waterborne pollutants
 - 1.4. energy balance
 - 1.5. noise
- 2. Use of natural resources
 - 2.1. non-renewable resources
 - 2.2. renewable resources
- 3. Landscape impacts

4. Impacts on the suitability of the area for recreational purposes.

These impacts were determined according to issues already identified in previous studies as well as the professional judgement of the study's co-ordinator. No guidelines or checklists were used to identify the impacts.

(b) Data collection

The data used in the study were obtained from existing maps (e.g. hydrological maps, maps of valuable biotopes in Hesse) field surveys and information contained in previous studies on individual environmental impacts (e.g. drainage patterns, effects on land use). Researchers also carried out their own additional field surveys.

(c) Methods used for predicting impacts

No formalized, quantitative or qualitative EIA methods were used to predict or assess impacts.

The conclusions drawn in the study regarding the significance and extent of the identified impacts were based on the professional judgement of the authors and the results of other studies.

The study concluded that the construction of the dam and its secondary installations, as well as secondary installations for purification treatment and reintroduction, each constitute "interference with nature and landscape" as outlined in the relevant legal provisions. The study thus concluded that the proponent had not made it clear why the project was necessary. An evaluation of the impacts showed that concern for nature and landscape conservation was more important than water supply. The study therefore recommended that a regional planning procedure (Raumordnungsverfahren) be carried out before a plan approval decision was reached. As no alternatives to the project were considered, no comparison of impacts took place.

IX. REVIEW AND PUBLIC PARTICIPATION

The study was carried out as part of a plan approval procedure which included provision for inter-agency review and public participation. The study itself was not subject to review either by other agencies or the public.

X. DECISION

The decision was made not to proceed with the project. The decision was based partly on environmental grounds but it is not known specifically what role the study played in reaching the decision.

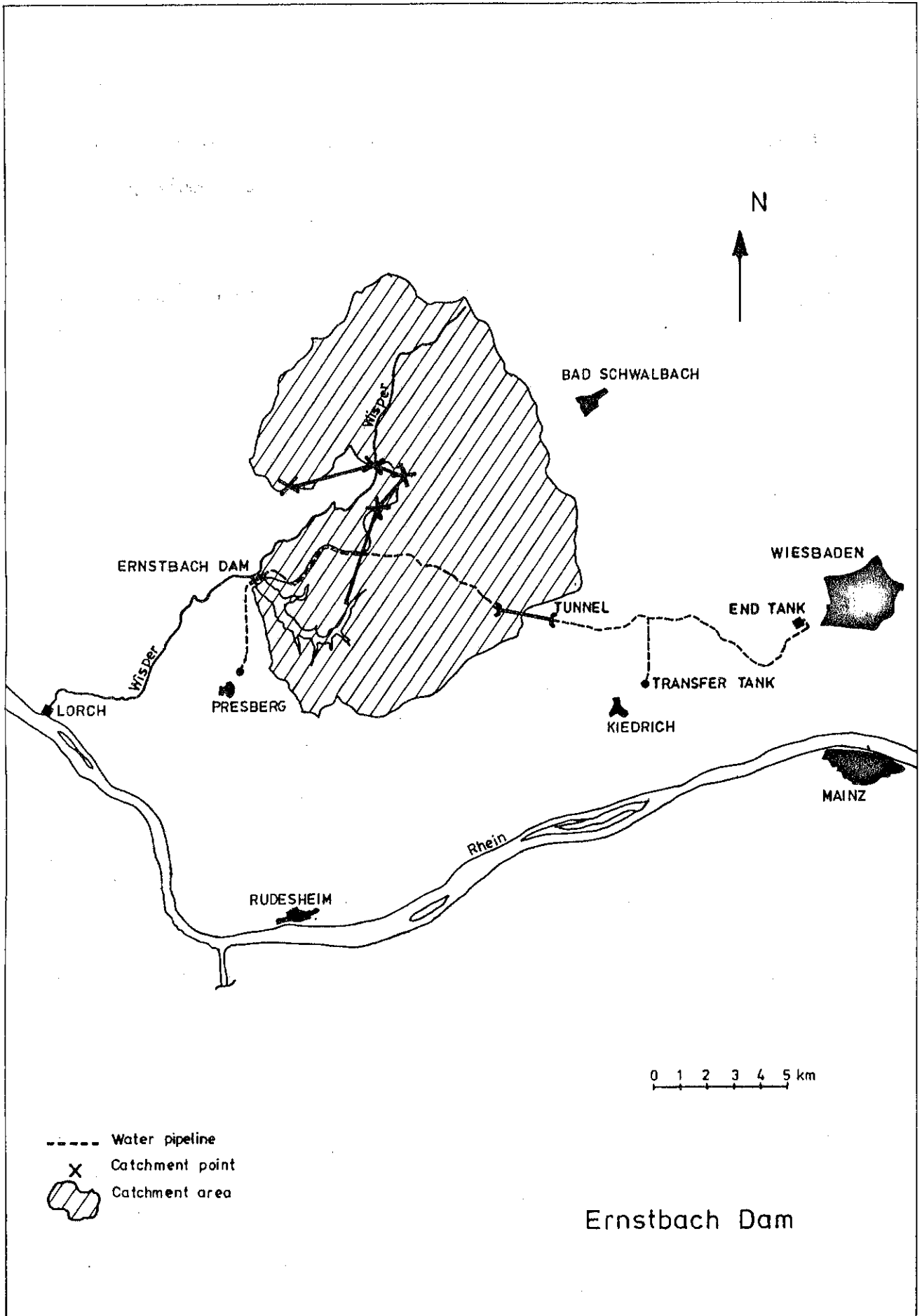
XI. TIME AND COSTS

The study took approximately one year to complete. The cost is not known as it was conducted "in-house" by the State environmental agency and thus was assumed under general administrative and personnel costs.

Time schedule for the Ernstbach Dam
(Federal Republic of Germany)

Initiation plan approval process 1977 _____	Request to prepare "EIS" 1980 _____	EIS completed 1981
Several individual environmental studies		

Figure 12



CASE 10. THE KOBBELV HYDRO POWER PROJECT IN NORWAY

The main elements of the study are summarized as follows:

Project title:	Kobbelv Hydro Power Project (Norway)
Type of project:	Reservoir building for power generating purpose
Project characteristics:	300 MW
Proponent:	Directorate of the State Power System
Competent authority:	Parliament
Main environmental impacts involved:	<ul style="list-style-type: none">- Physical environment- Fish and game- Natural science- Cultural heritage
Decision:	Decision to build the reservoir (with some modifications)

I. GENERAL INFORMATION ON THE PROJECT

This hydropower study relates to the planning and decision-making process of the "Kobbelv hydropower project" in Sjørfold and Hamarøy municipality of Nordland county in Norway. The project is situated in a mountainous area with peaks at an elevation of approximately 1,500 metres. Two national parks are located in the area, Rago (Norway) and Padjelanta (Sweden). There are few roads in the area and for this reason not many visitors.

Because of the topography of the area, the development of the electric power potential is based on two different falls for the same power plant. The area has several small glaciers and many lakes at an elevation of between 600 and 700 metres. The drop from these lakes to the power station forms the upper falls. Reservoirs for the lower falls are located in Gjerdalen and Veikdalen at an elevation of approximately 200 metres. These areas have rich vegetation and are important habitats for both fish and wildlife. The main area of conflict between development and nature conservation lies therefore in the two valleys. The power station is located on the east side of Kobbvatnet. Two alternative sites were investigated but the east location was found preferable.

II. PLANNING PROCESS

The planning process for this hydropower project was carried out according to the Hydro Power Project Application Procedure referred to in the Water Act, the Regulation of Watercourse of 1917. There may be some changes in the procedure as this Act is now under revision. The Kobbelv Hydro Power Project, however, followed the procedure as described below.

The Hydro Power Project Application Procedure in Norway consists of four phases:

(a) Pre-planning phase - The proponent gathers hydrological and geological data to prepare engineering feasibility studies.

(b) Planning phase - An information notice to the public is published. It contains a short description of the project. A special information brochure is distributed to the households in the project area. The application is prepared and environmental impact studies are conducted. No separate EIA-report is produced. However, the results from the impact studies are presented as part of the application.

(c) Review phase - To start the review phase, a notice of the application is published and an information brochure is distributed to the households in the project area. The review process is administered by the Directorate of Water Resources. This directorate is also responsible for preparing the recommendation by the Norwegian Water Resources and Electricity Board (NWREB).

(d) Decision phase - Based on a hearing of the recommendation made by NWREB, the Ministry of Petroleum and Energy prepares a report to Parliament. The final decision is made by Parliament.

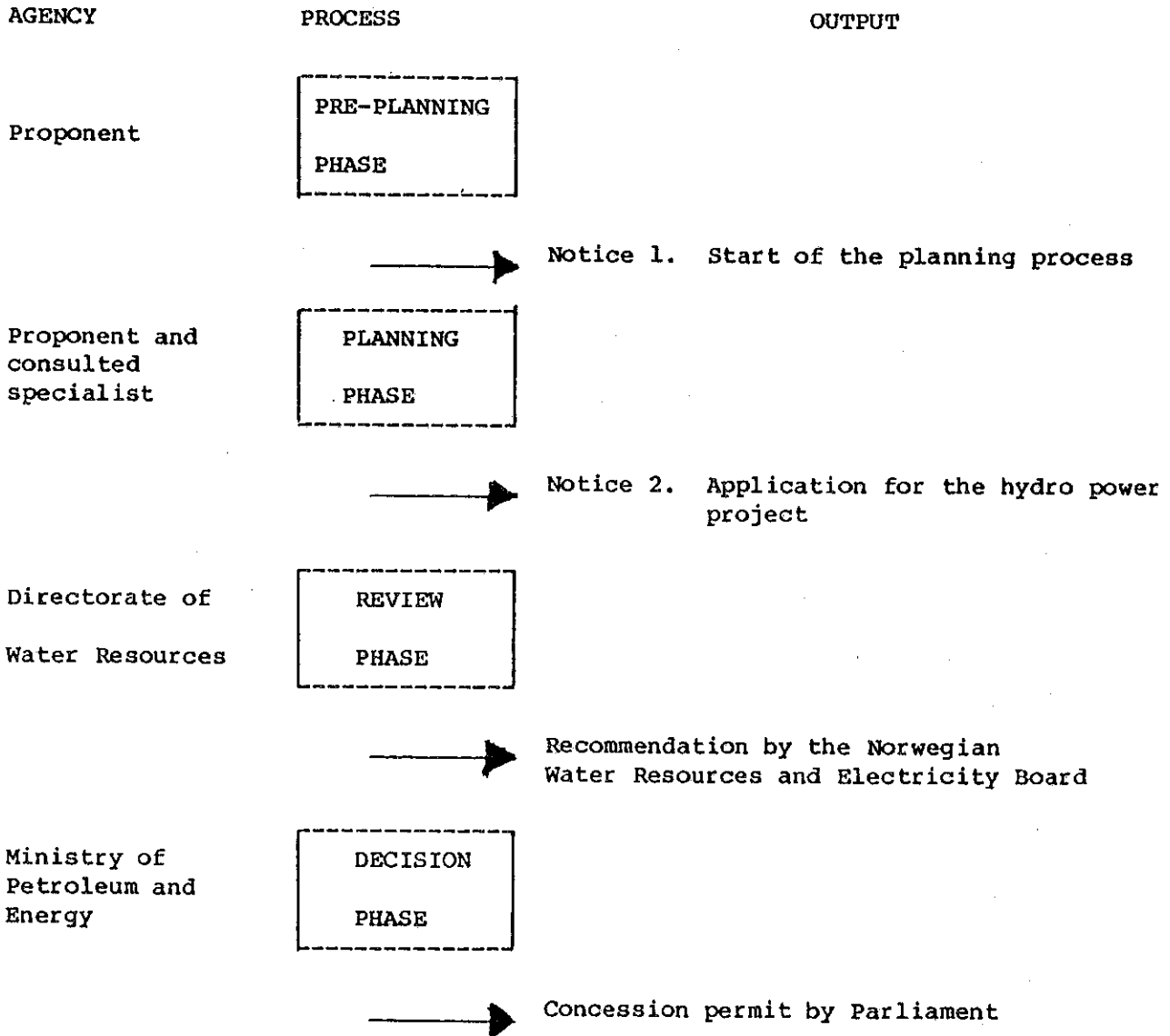
Figure 13 summarizes the Hydro Power Project Application Procedure in Norway, the agencies involved and the output.

With regard to the Kobbelv Hydro Power Project a time schedule was drawn up (see figure 13).

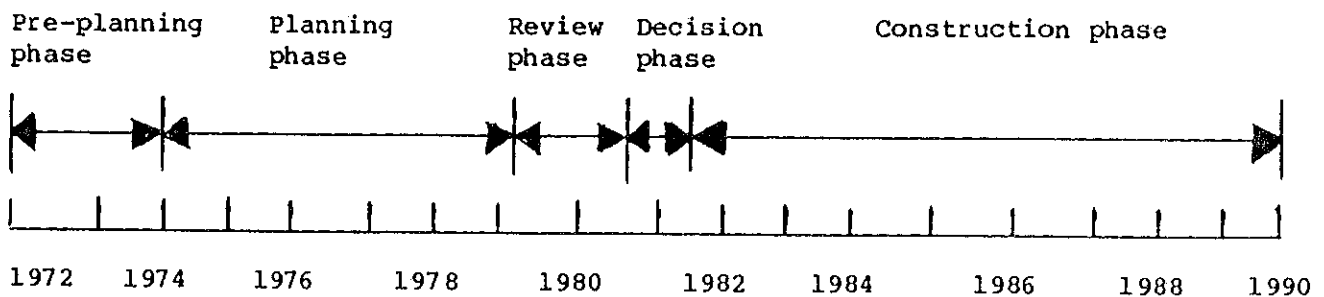
III. INITIATION OF THE EIA PROCESS

The EIA process was initiated in the planning phase by the proponent, in this case, the Directorate of the State Power System. When announcing the beginning of the planning process, the proponent had available a preliminary hydro power development plan for Kobbelv. With reference to the guidelines, as outlined below under Content Requirements, the proponent started negotiations with consultants, governmental institutions and university departments on the costs and terms of reference for different studies. In the political sphere "Sørfold kommune" (the local authority directly affected by the hydropower plan), the Council of Regional Planning in Salten and the Nordland County Committee for Outdoor Recreation as well as various organizations dealing with issues related to fish, game and protection of the environment against hydropower development expressed the need for environmental impact studies.

FIGURE 13



Time schedule for Kobbelv Hydro Power Project



IV. RESPONSIBILITY FOR PREPARING THE EIS

The proponent is responsible for preparing the application, including the EIA results. Most of the actual studies, however, were carried out by various consultants. Even though the Directorate of the State Power System (proponent) is the largest electricity company in Norway, very few impact studies were carried out by the company itself. The proponent gave little management or supervision to the consultants. Nevertheless, the engineering feasibility studies were mainly prepared by in-house resources. Six different types of resources were identified as potential preparers of environmental studies:

- (a) Private consultants (PC)
- (b) University departments (UD)
- (c) Research institutes (RI)
- (d) Governmental institutions (GI)
- (e) Other institutions (OI)
- (f) Proponent (P).

The governmental institutions involved were the Hydrological Department within the Water Resources Directorate (which runs a hydrological data base) and the Directorate for Wildlife and Freshwater Fish. Other institutions refer to the County Museum in Nordland which carried out impact studies on the cultural heritage in connection with the Kobbelv project.

The following is a list of the agents responsible for the different impact studies

- (a) Physical environment
 - Climate condition (RI)
 - Hydrological condition (P)
 - Water temperature (GI)
 - Ice régimes (GI)
 - Slope stability and erosion (PC)
 - Groundwater (RI)
- (b) Fish and game (GI)
- (c) Natural science
 - Wildlife (GI)/(UD)

- Freshwater biology (UD)/(RI)
- Vegetation (UD)
- Geomorphology (UD)

(d) Cultural heritage (OI).

V. CONTENT REQUIREMENTS

The terms of reference for the "EIS" were the "Guidelines for Applications" referred to the Water Regulation Act of 1917, paragraph 5, issued by the Directorate of Water Resources (1974). These so-called guidelines describe the content of the application. The application contains both a project description and an assessment of possible impacts. Summary of the guidelines:

(a) Project description

Under project description, the guidelines describe how the engineering feasibility study must be carried out. This includes a description of the need for hydrological and geological data, maps and different investigations. The application must contain calculations of costs and a detailed project description. Operation rules for reservoirs and a plan for implementation must also be included.

(b) Project benefits

Electricity production is the main benefit. The production must be calculated both for the project as a whole and for different parts. In addition, other benefits such as flood reduction, new roads and social-economic benefits in the project area must be briefly described.

(c) Impacts on public utilities

The guidelines describe 11 subjects for which impact studies normally must be carried out. In special cases, however, the Directorate of Water Resources can decide to apply impact studies to subjects other than those listed. The 11 are: transport; log driving; fish; reindeer; wildlife; vegetation; geology; landscape; cultural heritage; outdoor recreation; climate.

(d) Impacts on private interests

The proponent must try to contact landowners that might be affected by the project. If possible he or she must list their names and try to identify possible impacts on each property. Impacts to be identified are as follows:

- Calculation of productivity classes of areas that will be destroyed;

- Specifications of buildings that will be destroyed;
- Description of changes in working conditions in agriculture, forestry and local tourism;
- Description of impacts caused by changes in ground-water levels;
- Description of impacts caused by changes in ice conditions;
- Description of impacts on existing infrastructure in the project area;
- Description of changes in local industries based on allocation of natural resources in the area.

(e) Minimal instream flows

A proposal for operation rules of minimal instream flows must be included in the application.

(f) Hydropower potential

A calculation of the hydropower potential in the water course together with specifications of existing instream flows must be included in the application.

(g) Project participants

The application must contain information about owners of water rights who want to participate in the project.

(h) The proponent's comments

The proponent must comment on statements made during the planning phase; both comments and statements must be included in the application.

VI. DESCRIPTION OF PROPOSED PROJECT AND ALTERNATIVES

The Kobbelv Hydro Project development plan of September 1978 was presented in the application. The application was prepared according to the guidelines. This plan had two power plants, Reinoksvatnet and Kobbelv. Further investigations had to be carried out to determine whether the Reinoksvatnet power plant would be a profitable investment.

In addition to this plan, the proponent carried out engineering feasibility studies on two other sites for location of the Kobbelv power plant:

- Power station south of Kobbvatnet
- Power station with outlet to Leifjorden.

The total number of plan alternatives was therefore three, all of them location alternatives. The selection of the alternatives was based mainly on technical and economic evaluation. One may say that the proponent identified the alternatives. No other participant seemed to have been involved in identification of alternatives. No scoping process took place.

VII. DESCRIPTION OF THE EXISTING ENVIRONMENT

The environment was defined implicitly as natural/physical. This was in accordance with the guidelines. The description was based on inventory studies related to wildlife, freshwater biology, vegetation and geomorphology. Cultural heritage was also included under the "environment". The inventory described the resource value of the area influenced by the hydropower project in order to make recommendations on whether to preserve part of the area.

VIII. DESCRIPTION OF THE ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT, THE ALTERNATIVES AND COMPARISON

This topic may be divided into three subitems:

- (a) Impact identification
- (b) Methods used for predicting impacts
- (c) Methods used for comparing the environmental effects of the various alternatives.

A. Impact Identification

The guidelines describe the impacts to be taken into account in the "EIS". (See Content Requirements above).

Effects were identified as follows:

- (a) Physical environment
 - Climatic condition
 - Hydrological condition
 - Water temperature
 - Ice régimes
 - Slope stability and erosion
 - Groundwater
- (b) Fish and game

(c) Natural science

- Wildlife
- Freshwater biology
- Vegetation
- Geomorphology

(d) Cultural heritage

- Archaeology
- Lapp heritage sites
- General heritage sites
- Cultural history

B. Methods used for predicting impacts

Impacts were described using a verbal presentation related to different geographical areas (no quantification).

C. Methods used for comparing the environmental effects of the various alternatives

The application contained only a description of impacts of the proposed plan. There were no separate assessments of impacts of other alternatives. Only engineering feasibility studies were carried out for the two other alternatives.

IX. PUBLIC PARTICIPATION

Planning phase

The public was informed by announcements in local newspapers about the beginning of the planning process and start of the review. In addition, the proponent arranged one open public meeting in the middle of the planning phase. The object of that meeting was to inform people in the project area about the development plan. The response from the public resulted in only one formal request from people living in the northern part of "Sørfold kommune" who wanted to have a guarantee concerning establishment of employment opportunities.

X. REVIEW

Review phase

Before announcing an application or entering into the review phase, the application is first reviewed by the Directorate of Water Resources to see if it satisfies the guidelines.

The Water Resources Directorate is divided into five departments:

- Water Resources Department
- Hydrological Department
- Water Resources Development Department
- Environmental and Landscaping Department
- River Maintenance Department.

The Water Resources Department administers the review phase and is also responsible for co-ordinating the internal review of the application within the directorate. This department also administers the hearing process. In this case the Hydrological Department carried out investigations on hydrological data and discovered some faults. The changes in the hydrological data made development of the lower fall less economical. This was the most important point.

During the review phase the following agencies, institutions and organizations commented on the development plan:

Regular political sphere:

- Sørfold Local Authority
- Hamarøy Local Authority
- Nordland County Council
- Nordland County Committee for Outdoor Recreation
- Nordland County Committee of Forest
- Nordland County Committee of Agriculture

Administrative sphere:

- Chief Regional Commissioner
- Regional Commissioner for breeding of reindeer
- Directorate for Wildlife and Freshwater Fish
- Norwegian State Pollution Control Authority
- Ministry of Fishery
- Ministry of Agriculture
- Ministry of Environment

Public utility sphere:

- Environmental preservation organizations
- Fish and game organizations
- Recreation organizations

Based on the impact studies, several participants in the review phase argued for taking the lower fall out of the development plan.

XI. DECISION

The proponent presented the new development plan of January 1981 with the following changes in relation to the Hydro Power Project development plan of 1978:

- Development of the lower fall had been excluded
- The decision was taken not to build the Reinoksvatnet power plant
- The maximum water level of the Reinoksvatnet Reservoir was lowered 5 metres to an elevation of 680 metres
- The generating potential in Kobbelv hydropower plant was increased from 270 to 300 MW.

The final decision by Parliament was in accordance with the January 1981 development plan. Even before the "EIA-process" started, some participants in the planning phase argued for preserving the lower fall against hydropower development. Findings in the EIA formed a basis for this argument. On the other hand, the Hydrological Department in the Water Resource Directorate had discovered some faults in the hydrological data which made the development of the lower fall less economical. Based on this fact and the arguments for preserving the lower fall, the proponent decided to take the lower fall out of the plan. This decision was made at the end of the review phase and solved the main conflict between those arguing for preservation and those arguing for development. In this situation it was quite easy to reach a final decision and the application passed the decision phase rapidly. Some participants argued unsuccessfully for preserving the whole area by enlargement of Rago National Park.

XII. MONITORING

The hydropower project was under construction at the time of writing and will be built as planned. Monitoring studies had not yet been carried out. If the conditions set up for the concession so permit, different governmental agencies will have the right to establish monitoring programmes. All programmes must be paid by the proponent. In the Kobbelv Hydro Power Project the following rights exist:

- The Directorate for Wildlife and Freshwater Fish can set up monitoring programmes for species that would be affected by the project.

- The Water Resources Directorate can set up a programme for maintenance of threshold construction at the downstream face of dams.
- The Ministry of Petroleum and Energy can set up monitoring programmes for hydrological observations and for studies of changes in the ice régimes in Leirfjorden.
- The Ministry of Environment can set up a programme for water quality monitoring.

The agencies are given responsibility to take decisions on the needs and the size of the different programmes, but, of course, negotiations with the proponent are necessary before decisions can be made.

XIII. TIME/COSTS

The time taken for different phases was as follows:

Pre-planning phase: 24 months (approximately)

Planning phase: 63 months

Review phase: 20 months

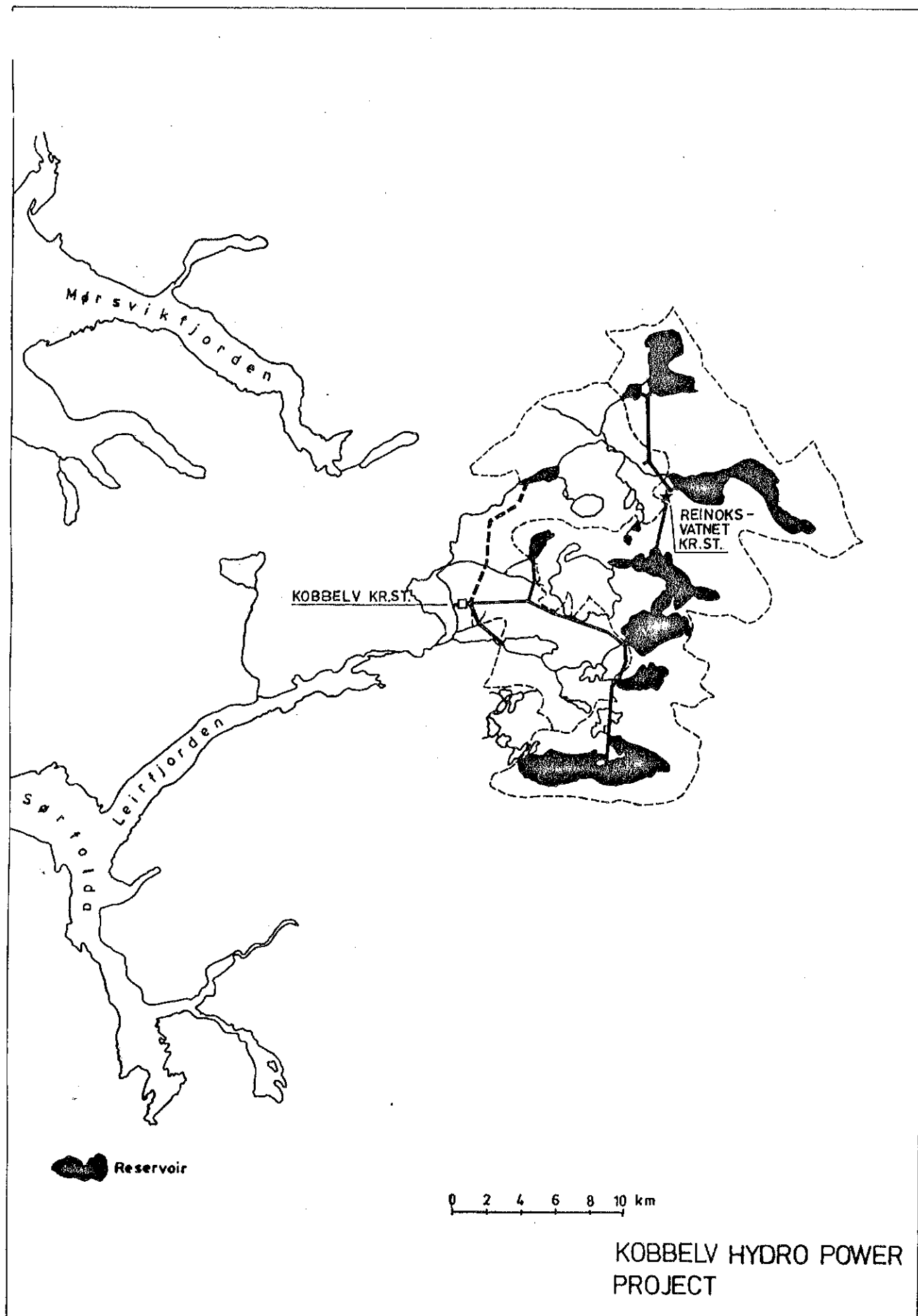
Decision phase: 7 months.

See also the time schedule in figure 13.

Compared to other hydropower project application procedures, the time taken in the planning phase was quite long, in the review phase a little less than normal but in the decision phase quite short. As several factors affected this situation, it is difficult to isolate the EIA-process from other elements or determine whether it did or did not streamline the decision-making process. Very few participants in the review phase expressed any dissatisfaction with the EIA results. This may signify that the EIA-process was done in accordance with the guidelines and that the participants were satisfied with the results. One could possibly say that the EIA did not cause any delay in the decision-making process given the existing guidelines.

No data were available for calculating the extra costs for the EIA process. The total planning costs in the period from 1 January 1973 to 30 June 1981 have been calculated as 12.7 million Norwegian kroner. The costs of the EIA amounted to 2.5 million Norwegian kroner. The total project costs by 1 June 1981 were calculated at 1,740 million Norwegian kroner.

Figure 14



CASE 11. THE WHEELING GREEK DAM IN WEST VIRGINIA,
UNITED STATES OF AMERICA

This describes a case study of environmental impact assessment for the Wheeling Creek Dam in West Virginia (United States of America). The main elements of the study are summarized as follows:

Project title: Wheeling Creek Watershed Project (USA)

Type of project: Construction of a floodwater retarding dam

Project characteristics: Construction of a single-purpose floodwater retarding structure with a "dry" reservoir (i.e. no permanently flooded area) together with an emergency spillway system consisting of a 250-foot wide concrete chute spillway

Proponent: United States Soil Conservation Service

Competent authority: United States Soil Conservation Service

Main environmental impacts involved

- Vegetation
- Wild life
- Aquatic resources

Decision: Decision to build a single-purpose flood control dam

I. GENERAL INFORMATION ON THE PROJECT

The Wheeling Creek Watershed Plan was authorized by the United States Congress in 1966 in response to a concerted drive by local political entities to reduce flooding in the city of Wheeling, West Virginia. The city of Wheeling and suburban areas were subject to flood damages from Wheeling Creek. In addition to damage to residences and industrial/commercial buildings, roads and bridges also were often damaged. The Wheeling Creek Watershed Commission requested the United States Soil Conservation Service to provide federal assistance to help protect homes, businesses, roads and bridges against flood damage at an acceptable level of flood damage protection.

The original Wheeling Creek Watershed Plan included a programme of conservation land treatment, six floodwater retarding dams, and one flood protection and recreation dam. The major beneficiary of the proposal for seven dams was the city of Wheeling, West Virginia, located several miles downstream from the various dam construction sites.

As of 1977, five of the seven dams had been built and were providing over 60 per cent flood protection. The proposal to build the remaining two dams, one upstream in Enlow Fork Valley, Pennsylvania, and the second upstream site at Dunkard Fork Valley, Pennsylvania, provoked controversy and opposition because of the environmental impacts on natural resources which would have resulted from the Enlow Fork impoundment. Of only slightly lesser concern were the impacts on cultural and social resources from a dam on Dunkard Fork.

The opposition focused on the proposal to impound Enlow Fork and increase the originally proposed 52-acre permanent pool to 122 acres to provide a water supply for a steel company proposing to begin coal mining in the valley. The United States Environmental Protection Agency, United States Fish and Wildlife Service, the Pennsylvania Fish and Game Commissions and organized local citizen groups opposed any type of "wet dam" impoundment on the basis of projected environmental impacts and a failure to determine project need or assess alternatives to achieve project purposes. As a result of the controversy created by the original draft Environmental Impact Statement prepared in 1979, studies by the Soil Conservation Service (SCS) were conducted in co-ordination with federal, State and local agencies, organizations, and individuals. All local, State, and federal agencies with water and land resource concerns contributed to the formation and review of the alternatives in a second formalized environmental impact assessment process which was completed in 1982.

The resultant preferred alternative as decided by the Wheeling Creek Watershed Commission was the construction of a single-purpose flood control dam (PA-648) on the Enlow Fork of Wheeling Creek. According to the proponent, this "dry" dam (no permanent pool of water impounded behind it) would not have significant adverse impacts on water quality, air quality, archeological or historic sites, a deer wintering area, threatened or endangered species, or wetlands. The multi-purpose dam (PA-650) on Dunkard Fork of Wheeling Creek was eliminated from the work plan.

II. PLANNING PROCESS

The Small Watershed Programme is administered by the Soil Conservation Service (SCS), an agency of the United States Department of Agriculture. The "Watershed Protection and Flood Prevention Act of 1954" (PL 83-566) authorizes the Soil Conservation Service to provide technical, financial and credit assistance to local project sponsors, for watershed planning and programme development for the conservation of soil and water resources. Local organizations are responsible for the initiation and development of projects. Close co-operation and assistance of local, State and federal agencies is encouraged. To be eligible for federal assistance, a watershed project must not exceed 101,000 hectares (250,000 acres) in size, nor include any single structure which provides more than 12,500 acre-feet of floodwater detention capacity, nor more than 25,000 acre-feet of total capacity.

The Service's small watershed programmes have produced nearly 1,300 watershed projects in hundreds of localities throughout the United States. These projects have developed water and related land resources of a watershed up to 250,000 acres in size for the purposes of providing water supply, recreation, fish and wildlife habitat, irrigation, flood control to protect agricultural land and rural and urban communities and to halt unchecked soil erosion and excessive water runoff. These are mostly multi-purpose projects approved for operations in every state. The watershed plans are funded with local and federal dollars and the projects are planned jointly by State and local interests as well as the Federal Government. Assistance is provided by the Soil Conservation Service's four technical regional offices, the SCS State Conservationist and the local SCS "extension service", or field office located in nearly every county of the United States. The orientation of the Soil Conservation Service small watershed programme had been, historically, to apply structural solutions to soil and water resource problems. There is now a

growing awareness that structural "solutions", inappropriately applied, may mean the unnecessary impoundment, diversion and channelization of free flowing streams. Such physical alterations of water and soil in a single watershed project may result in the conversion of hundreds of acres of wetlands to surface water, the permanent loss of miles of streams, the inundation and loss of hundreds of acres of bottomland hardwood forests to be replaced by a man-made reservoir, and reduction of instream flows so severe as to impact negatively on water quality and fisheries. Snagging and clearing operations also contribute significantly to the loss of riparian habitat.

Federal and state resource management agencies, the project's local sponsor and private citizens in an affected community work together in the EIA process to attempt to minimize the environmental impacts of small watershed projects.

III. INITIATION OF THE EIA PROCESS

The original draft EIS was prepared in 1979 by the Soil Conservation Service for the Wheeling Creek Watershed Commission (the proponent) based on NEPA guidelines. It proposed two multi-purpose dams to be constructed in south-western Pennsylvania. Located in rural Washington and Greene counties, the dams were to provide flood control and recreation benefits on Dunkard Fork (dam PA-650) and flood control and water supply benefits on Enlow Fork (dam PA-648). Both these watercourses are tributaries of Wheeling Creek.

The United States Environmental Protection Agency (EPA) reviewed the draft EIS and rated it a "3" (inadequate). In its written review, EPA raised a number of concerns related to water-quality issues and the failure of the EIS to address the full range of alternatives. Regarding water quality, the EPA was particularly concerned about the probable degradation of water re-entering the watershed and the impact of degraded water flowing into the proposed impoundments. Such degradation, according to EPA, could be expected from a combination of sources including effluents from a sewage treatment plant required by proposed recreational facilities for one of the dams, erosion of steep valley slopes, roadway run-off of automotive hydrocarbons through increased traffic, etc.

The Environmental Protection Agency also felt that the water supply benefits of one of the dams (PA-648) had not been fully discussed in the draft EIS. Co-ordination with other agencies had revealed that the United States Steel would be the prime sponsor and user of the water supply facility. As their support would be contingent upon unrestricted use of the impoundment water, this use would preclude reliable water supply for other users. EPA assumed that United States Steel's use of the water would be for one of their coal mines located nearby and that such use would degrade the quality of the water prior to its re-entry into Enlow Fork. No mention was made in the draft EIS as to the use of water, treatment of water, or eventual water quality after use.

EPA also considered the draft EIS incomplete with inadequate information relative to the available alternatives. It believed that dry dam construction, floodwall or levee construction, or non-structural methods might be individually, or in some combination, feasible.

However, EPA was not the only reviewer which reacted negatively to the draft EIS. State and local entities, as well as citizens' groups responded adversely to the EIS because of its inadequate assessment of impacts and alternatives. According to state and local entities, all alternatives for water supply had not been evaluated and the need for completing the project had not been justified. Given the reaction and public opposition to the proposed project, the SCS decided to discard the original EIS and begin a new EIA process, starting with scoping, in order to identify all relevant impacts and alternatives to the project. The following information refers to the second draft and final EISs and accompanying review.

IV. RESPONSIBILITY FOR PREPARING THE EIS

As the lead federal agency for this project, the United States Soil Conservation Service (SCS) was responsible for preparing the EIS. (The SCS could be viewed as both "proponent" and "competent authority" for the project). SCS carried out archeological and aquatic studies to describe the environment and potential impacts for some alternatives. Not evaluated were the impacts of "dry dams" or terrestrial or aquatic resources. Except for a "Terrestrial Biological Survey of the Wheeling Greek Watershed" undertaken by a private consulting firm, the actual preparation of the EIS document was undertaken by SCS's State Conservationist's Office in Harrisburg, Pennsylvania. A list of preparers, along with information on their training and experience was included in the draft EIS.

V. CONTENT REQUIREMENTS

The content requirements for EISs are laid out in a minimal way by the Council on Environmental Quality's (CEQ) regulations. The SCS, like all federal agencies, has issued its own specific procedures. a/ Those regulations point out that when an EIS is required, its format and content should give full consideration to the guidance and requirements of the CEQ regulations. The results of scoping are to determine the content of the EIS and the amount of detail needed to analyze impacts.

In addition to the minimum requirements of the CEQ regulations, EISs should include:

- A brief description of public participation activities of agencies, groups, and individuals during the environmental evaluation;
- A description of the hazard potential of each alternative, including an explanation of the rationale for dam classification and the risk of dam failure from overtopping for other reasons;
- Information identifying any approved regional plans for water resource management in the study area and a statement on whether the proposed project is consistent with such plans;
- All federal permits, licenses, and other entitlements that must be obtained; and

- A brief description of major environmental problems, conflicts, and disagreements among groups and agencies and how they were resolved. Unresolved conflicts and the SCS's proposal for resolving the disagreements before the project is implemented are to be summarized.

The SCS NEPA regulations also contain a flow chart showing the way in which EIA is incorporated into project planning. In preparing the second draft EIS, the SCS began by conducting two scoping meetings. The first, held in March 1980, was with federal and State agencies and included representatives from the Wheeling Creek Watershed Commission (sponsors), Pennsylvania Game Commission (PGC), the Pennsylvania Fish Commission (PFC), the West Virginia Department of Natural Resources, the United States Fish and Wildlife Service (FWS), the Pennsylvania Department of Environmental Resources (Pa.DER), the United States Environmental Protection Agency (EPA), and United States Army Corps of Engineers. A second scoping meeting was held later with environmental groups (e.g. the Sierra Club and the Association of Rural Conservation) and local citizens.

In addition, SCS conducted a tour of the watershed for EPA officials and discussed potential environmental impacts with them. Several field tours were conducted with the Pennsylvania Game Commission, United States of Fish and Wildlife Service and Association of Rural Conservation in order to identify resource concerns and to show locations of proposed dams. The purpose of the scoping meetings was to identify all reasonable project alternatives and the major environmental impacts associated with them. This was done in the form of an "Impact Matrix of Alternatives" which became the basis for the draft EIS.

VI. DESCRIPTION OF THE PROPOSED PROJECT AND ALTERNATIVES

A total of seven individual alternatives or combination of alternatives within the jurisdiction of SCS were described in the draft EIS. They were:

- (a) No project (i.e. "do-nothing")
- (b) Dam PA-648
- (c) Dam PA-650
- (d) Dams PA-648 and 650 (original work plan)
- (e) Dam PA-648 and Nonstructural
- (f) Dam PA-650 and Nonstructural
- (g) Nonstructural

A. "Dry" dams

Both alternative dams would be "dry" and have similar features as follows: The dam would be compacted earth and rock embankment with no permanent pool of water behind the dam. The material for the dam would be obtained from the excavated emergency spillway. The embankments and excavated spillway areas would be seeded to adaptable vegetation. Each dam would have spillway or outlet systems to regulate the release of water and protect the dam from overtopping. A principal spillway is a conduit system (reinforced

concrete pipe) through a dam. Conduits are supplied by a riser (vertical conduit inlet structure), with one or more openings (stages) that allow water to enter and flow through the system. The principal spillway stage or crest elevation is at the sediment pool level for a single-purpose floodwater retarding dam with an open drain at stream level to allow passage of mean flow and passage of fish. The principal spillway flow, plus reservoir storage, controls the run-off.

There is an emergency spillway system which protects the dam by passing flows in excess of the 1 per cent chance (100-year) storm run-off. Each dam would have a combination of spillway capacity and flood storage capable of handling the run-off from the probable maximum precipitation of a six-hour rainfall of about 23 inches. Based upon historical seismic activity, the watershed is in a low earthquake hazard zone so that no special design features would be needed to compensate for earth movement.

B. Nonstructural

The nonstructural alternative refers to a number of actions which would provide flood protection to residents and businesses in the project area without actually involving construction of a dam. Specifically, it would entail the following: Four residences where floodwater depths are three feet or greater (high-risk zone) and two businesses would be repositioned outside the "one per cent chance of occurrence" flood plain. Some 113 residential buildings would be flood-proofed by methods including raising the buildings, construction of utility rooms above flood level for basement utilities, closure of low apertures and installing sewerline check valves. Eighteen commercial buildings would be floodproofed by the previously identified methods, or a concrete floodwall, or sealing existing masonry walls, or, in unique situations, demolition. Landscaping would be part of floodproofing methods, as needed. Left unprotected would be 607 residences and 39 commercial buildings. Streets, bridges, utilities would also be subject to flooding. The unprotected residences and commercial buildings would be provided flood damage reduction through a Wheeling Creek Watershed Commission co-ordinated plan involving a floodwarning system, flood insurance, and low interest loans for flood-proofing measures.

C. Alternatives not within the jurisdiction of SCS

In addition to the seven alternatives listed above, the draft EIS also gave consideration to alternative outside SCS jurisdiction. They included flood insurance programmes, disaster assistance to business, flood preparedness and planning. The EIS also provided information on other alternatives (e.g. diking, the construction of "wet" multi-purpose dams, water supply for coal mine, etc.) which had been eliminated.

D. Preferred alternative

The recommended plan in the draft EIS was for the construction of only Dam PA-648. This dam would be located on Enlow Fork, approximately 5,000 feet upstream of the confluence with Robinson Run. The site would control 48.5 square miles of drainage area and would mean the relocation of one home in the floodpool. The structure itself would be a single-purpose floodwater retarding structure with a "dry" reservoir. The reservoir would be kept "dry" by a 72-inch diameter opening at stream grade which would maintain the mean

annual flow within the stream channel upstream of the dam. This would eliminate the 52-acre wet sediment pool. When stream flow exceeds the reservoir drain capacity, the water would be impounded behind the dam. The maximum floodpool size would be 210 acres. A 72-inch diameter concrete conduit would serve as the principal spillway. The emergency spillway would consist of a 250-foot wide concrete chute spillway in the right abutment.

VII. DESCRIPTION OF THE EXISTING ENVIRONMENT

The Wheeling Creek Watershed is located in southwestern Pennsylvania and northern West Virginia. It has a drainage area of 191,180 acres (299 square miles). The area had a 1980 population of about 81,500 about 90 per cent of whom were concentrated in the city of Wheeling, West Virginia. The hilly topography and poor transportation facilities had historically kept the rest of the watershed relatively isolated. In the rural areas of the watershed the primary economic activities have been coal mining and agriculture.

Enlow Fork (site of the preferred alternative) runs through an area with a mixture of openland, cropland and woodland. In spring, Enlow Fork attracts groups of local residents, naturalists and birding enthusiasts who observe birds migrating through the area and the spring flowers in blossom. The area also provides incidental recreation such as biking, walking, jogging, etc. The most intense recreation use is stream fishing, especially for trout in the spring.

A little less than one fourth (26 pages) of the draft EIS was devoted to a description of the existing environment. It included the following topics: land, climate, flood event, air quality, surface water, groundwater, water quality, aquatic resources, vegetation, natural areas, wildlife and habitat, wetlands, archeological and historic concerns, landscape and recreation, social and economic resources, land-use, soils, plant management.

VIII. DESCRIPTION OF THE ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT, THE ALTERNATIVES AND COMPARISON

A. Identification of impacts

The draft EIS discussed the environmental impacts of the alternatives for an individual dam, nonstructural measure, or no project. The effects of a combination of dams or dam and nonstructural measures were judged to be cumulative for all resources except social and economic ones. The social and economic resources receive various levels of flood damage reduction from combinations of alternatives. The social/economic impacts are variable for each alternative and are reflected in different benefit-cost ratios, number of homes or businesses relocated or floodproofed, remaining damages and charges in the tax base.

The impacts associated with the preferred alternative were as follows:

- Vegetation (cleaning and construction, flooding, effects of sediment, mechanical damage, downstream effects);
- Wildlife and wildlife habitat (construction, flooding effects);

- Aquatic resources (construction, flooding, downstream);
- Landscape quality and recreation;
- Air quality;
- Archeological and historic resources;
- Economic and social;
- Land-use, soils and plant management (effects on wildflower display)

B. Data collection

For the most part, the data used to describe the environmental situation and potential impacts was drawn from existing sources such as flora and fauna inventories of the region, soil/geological studies, topographical maps, etc. For two types of impact, archeological/historic and fisheries and water quality, SCS hired private consultants to undertake field studies.

C. Methods for predicting and assessing impacts

Generally speaking, no formalized, quantitative methods were used to predict or assess environmental impacts. Judgements were based rather on "previous experience" or "best professional judgement". An example of the former can be found in the discussion on sediment effects on vegetation. The EIS states that "Observations of a United States Army Corps of Engineers 'dry' dam near Honesdale, Pennsylvania and SCS constructed 'dry' dams in New England indicate that the sediment will be deposited fairly evenly over the valley floor and stay well vegetated". Regarding the latter, in discussing archeological and historic resources it was stated that, "Dr. Barry Kent, State Archeologist, Pennsylvania Historical and Museum Commission, concurs with the opinion that construction of the dam and resulting storm events are not considered to have a significant effect on archeological sites in Enlow Fork Valley".

An example of a formalized method which was used is the "Habitat Field Evaluation Procedure" (HEP) which was developed by the United States Fish and Wildlife Service. The HEP is a method for assessing fish and wildlife resources, identifying the impacts on them and developing an appropriate mitigation plan. The HEP does not list specific habitat nor species types. Rather, it describes an evaluation method to be carried out by a qualified study team, supplemented by adequate maps and reference material.

For the Wheeling Creek project, representative wildlife species were selected as the basis for the evaluation of each habitat type at sites PA-648 and PA-650. The evaluations were carried out by a 13-member team (primarily biologists) from the Soil Conservation Service, the Pennsylvania Game Commission and the West Virginia Department of Natural Resources. (The United States Fish and Wildlife Service, the author of the HEP, did not participate because they were totally opposed to any type of construction in the area). The team rated the year-round habitat value of each field for the

selected wildlife species. All ratings were based on a scale of 0.1 through 1.0 being unsuited habitat and 1.0 being the best possible habitat. All team ratings were combined to give an average rating and all fields of a particular habitat type were combined. The acreage and interspersion data were incorporated in order to determine the average habitat type unit value.

The following are the Habitat Units (HU) of the dam sites:

	<u>Acres</u>	<u>HU</u>	<u>Maximum HU</u>
PA-648	30	19.0	30
PA-650	34	21.5	34

D. Methods for comparing alternatives

In addition to a descriptive comparison in the text, a comparison of the alternatives and their major environmental effects is presented in a table (table 7).

IX. REVIEW AND PUBLIC PARTICIPATION

In addition to the scoping meetings described above (one of which involved citizens' groups and the general public), a public hearing on the draft EIS was also held. Prior to the public hearing, the EIS was distributed to all interested parties. These included 9 federal agencies, 10 state agencies, 4 county governments, 5 community offices, 4 planning commissions, 3 conservation districts, 13 public interest organizations, 4 private corporations and 45 individuals who had expressed an interest in the project. The availability of the statement was also made known to the public through a news release to local newspapers in the area. The public hearing was held on 20 August 1981. All comments received by 8 September 1981 were considered in the final EIS.

The final EIS, issued in early 1982, included an appendix on public hearing statements. Many of the statements raised similar issues concerning the project, the impacts described or policy considerations, while some statements merely expressed a preference for one of the alternatives. In order to consolidate the responses and eliminate the need to respond to the individual statements, various issues were attributed to each statement. Each of these issues was investigated and a response given. Copies of all comment letters were also included in the appendix along with the SCS response to them.

Those responding in writing including eight federal agencies, 6 state agencies, 2 local communities, 3 county governments, 5 public interest groups and 10 individuals. Although a few voiced support for the project, most were in disagreement either with the selected alternative or the need for the project in general. Many pointed out discrepancies in the EIS and called for monitoring and mitigation measures for the project, should it be implemented. In responding to the letters, the SCS clarified the points raised and defended its preferred alternative as the best "trade-off" between providing adequate flood control and minimizing environmental impact. It did agree to a mitigation plan for the project (see "Decision" below). Most of the reviewing agencies, even those such as EPA who continued to have reservations about the project, agreed that the project had fewer negative environmental impacts than the one originally proposed in the first draft EIS.

Table 7
IMPACT MATRIX OF ALTERNATIVES

	NO project	PA-648	PA-650	PA-648 and PA-650	PA-648 and Nonstructural	PA-650 and Nonstructural	Nonstructural
I. LAND USE							
Prime agricultural land	PA-648 - 33 ac. of 166 ac. temp. flooded PA-650 - 135 ac. of 234 ac. temp. flooded	112 ac. temp. flooded	234 ac. temp. flooded	346 ac. temp. flooded	112 ac. temp. flooded	234 ac. temp. flooded	No effect
Farmland of Statewide importance	PA-648 - 15 ac. of 47 ac. temp. flooded	19 ac. temp. flooded	24 ac. temp. flooded	43 ac. temp. flooded	19 ac. temp. flooded	24 ac. temp. flooded	
Potential natural area	PA-648 - 34 ac. of 200 ac. temp. flooded PA-650 - 0 ac. 144 ac. temp.	-25 ac. dam 144 ac. temp.	0 ac.	-25 ac. dam 144 ac. temp. flooded	-25 ac. dam 144 ac. temp. flooded	0 ac.	
II. CULTURAL							
Archaeological and Historic	PA-650 18 arch. sites 6 historic sites PA-648 2 arch. sites	Not significant	Salvage 3 arch. sites arch. sites Remove hist. Flood 15 arch.	Salvage 3 arch. sites Flood 15 arch. sites Remove historic sites Flood 15 arch.	Not significant	Salvage 3 arch. sites Flood 15 arch. sites Remove hist. sites	Not significant
III. ECONOMIC							
B:C Ratio (\$)	N/A	1.9 to 1.0	1.5 to 1.0	1.1 to 1.0	1.0 to 1.0	1.5 to 1.0	2.9 to 1.0
Net benefits		\$254 000	\$238 300	\$82 100	\$10 000	\$223 800	\$147 300
Level of Protection (%)	(62%) $\frac{2}{3}$	71% (89%)	90% (96%)	99.9%	84% (94%)	92% (97%)	32% (74%)
Remaining damages	\$675 400	\$198 500	\$67 300	\$600	\$107 200	\$54 500	\$461 300
Cost (\$1 000)		\$922	\$2 755	\$3 677	\$2 963.3	\$2 928.6	\$469.4
Local PL-566		\$7 328	\$10 562	\$17 890	\$15 493.3	\$11 256.2	\$1 877.4
Total		\$8 250	\$13 317	\$21 567	\$18 456.6	\$14 184.8	\$2 346.8
Effect on tax base (\$)	N/A	-\$1 000	\$2 000	\$3 000	-\$193 000	-\$15 800	-\$12 000
IV. SOCIAL							
Relocations							
Wheeling: Homes					165	11	4
Businesses					0	0	2
Dam-site Homes	N/A	1	12	13	1	12	0
Floodproofed Homes and Businesses	N/A	N/A	N/A	N/A	79 houses 5 businesses	18 houses 3 businesses	113 houses 18 businesses

Table 7 (continued)

	Present conditions at project site	No project	PA-648 Single Purpose	PA-650 Single Purpose	PA-648 Single Purpose PA-650 Single Purpose	Nonstructural b/
V. FISH - WILDLIFE						
(1) Temp. Flooding						
Bottomland forest	34 ac. PA-648	No effect	128 ac.	181 ac.	309 ac.	No change
Upland forest	Not flooded	No effect	16 ac.	37 ac.	53 ac.	
Agricultural and openland	59 ac. PA-648 93 ac. PA-650	No effect	66 ac.	172 ac.	238 ac.	
(2) Construction						
Bottomland forest	155 ac. PA-648 185 ac. PA-650	No change	-5 ac. for dam	-4 ac. for dam +4 ac. for mitigation	-9 ac. for dams	
Upland forest	47 ac. PA-648 55 ac. PA-650	No change	-20 ac. for dam +35 ac. mitigation	-18 ac. for dam +18 ac. mitigation	-38 ac. for dams +53 ac. mitigation	
Open and agricultural land	98 ac. PA-648 175 ac. PA-650	No change	-5 ac. for dam -35 ac. mitigation	-12 ac. -22 ac. mitigation 34 ac. net loss	-17 ac. for dams -47 ac. for mitigation 64 ac. net loss	
Aquatic resources	PA-648, 23 000 good quality bass stream PA-650, 30 000 feet good quality bass fishery	Decrease in water quality	-530 feet	-710 feet of stream	-1 240 feet of stream	
Wildlife resources	High-quality forest land Moderate to low-quality agricultural and open land	No change	-30 ac. agricultural and open land	-34 ac. Of agricultural and open land	Net -64 ac. of agricultural and open land	
Plant resources	High-quality spring wild-flower display in 170 ac. bottomland forest area	No Change	Probable shift toward flood tolerant species. Possible change in the spring wild-flower display.	Probable shift toward flood-tolerant species.	Probable shift toward flood-tolerant species. Possible change in the spring wild-flower display.	
Wetlands	None	No change	No change	No change	No change	

a/ (%) The level of protection in parentheses reflects the alternative plus dams built.

b/ Impacts of nonstructural measures in combination with structural measures are the same as for structural measures alone.

X. DECISION

In May 1982, the SCS issued its "record of decision" on the Wheeling Creek project. Although the SCS issued the "record of decision", the decision itself was made by the Wheeling Creek Watershed Commission based upon the EIS, and the considerations of federal, state, local agencies and groups.

The five page "record of decision" document describes the history of project planning and the measures taken to comply with national environmental policies. The "record" states that PA-648, a single-purpose flood control dam will be constructed. It indicates, however, those measures which will be undertaken to minimize adverse effects on the natural environment. These include:

- (a) Leaving existing vegetative communities in the floodpool;
- (b) Installing reservoir drain to prevent permanent impoundment of water and reduce the frequency and duration of floodpool inundation;
- (c) The Wheeling Creek Watershed Commission would purchase and/or gain "conservation easements" for 361 acres that include a potential natural area and a significant archeological site for management by a conservation organization;
- (d) Installing conduit and reservoir drain allowing passage of fish;
- (e) Constructing a series of stream deflectors for the fishery;
- (f) Long-term monitoring of terrestrial and aquatic communities in the floodpool; and
- (g) Establishment of grass and legumes on the dam and spillway to protect them from erosion and provide food for wildlife.
- (h) Elimination of construction of PA-650 from work plan.

Following the issuance of the "record of decision", an outline for a mitigation plan was submitted by SCS to the design engineer for the project. It covered 22 points to be taken into account (e.g. limitations on construction activities, specifications for drains, instructions for re-vegetation) and, for each, the name and address of the State or federal agency "contact person" co-ordinating the implementation of the mitigation plan.

XI. MONITORING

The dam is now under review for construction permits from the Commonwealth of Pennsylvania and United States Army Corps of Engineers (404). Provisions for monitoring include (a) a long-term programme (including sediment surveys) in order to evaluate the floodpool's effect on aquatic and terrestrial resources and (b) consultation with a landscape architect to help blend the dam and spillway into its surroundings.

XII. TIME COSTS

The time involved from the first scoping meeting for the revised draft EIS until completion of the final EIS was 26 months. From the beginning of the planning dated at the start of deliberations on the original EIS a total of six and one-half years transpired. The total cost for the EIS (outside consultants included) was \$US 250,000 or approximately 3 per cent of the total cost of the project estimated to be \$US 8,250,000.

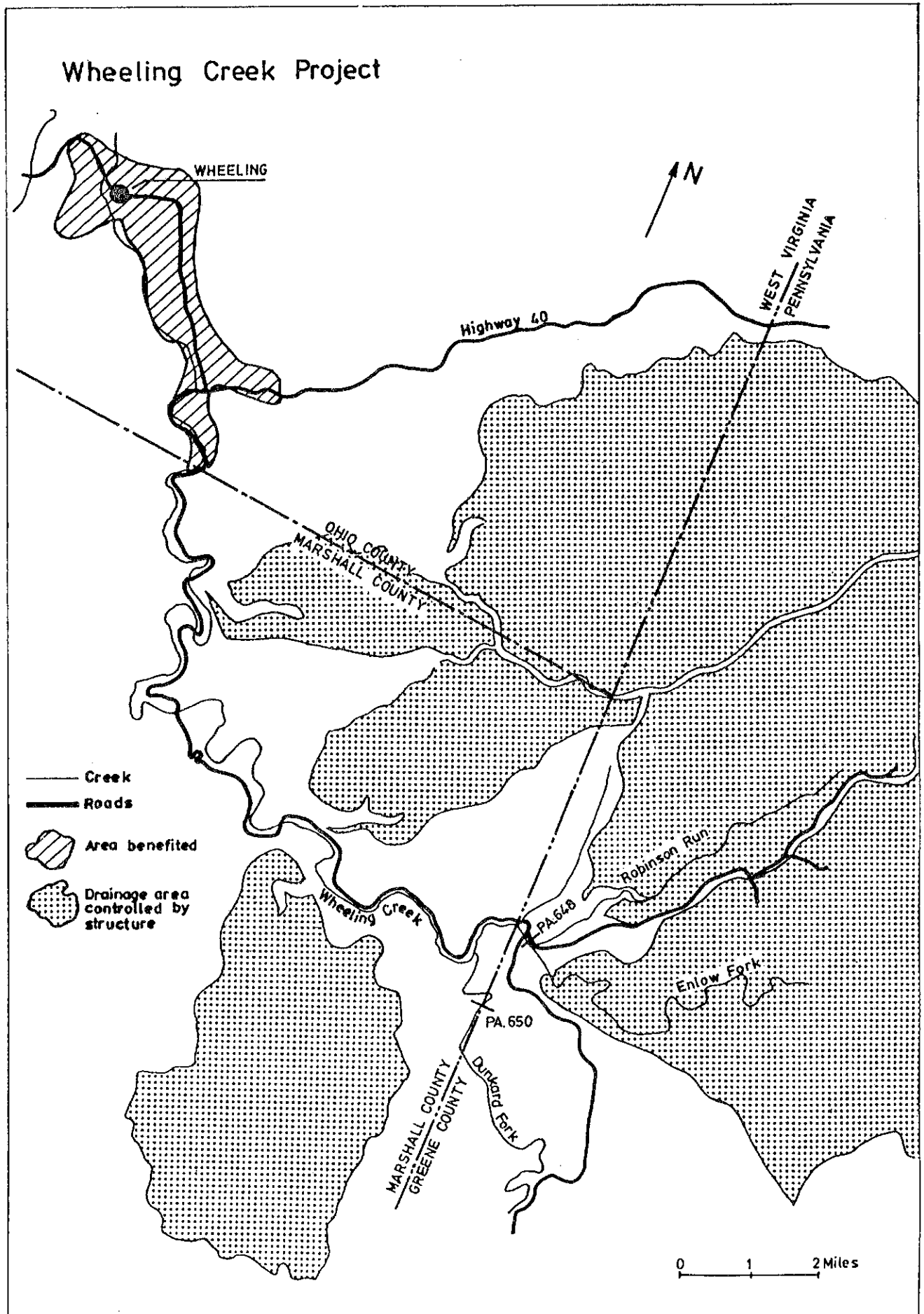
Time schedule for the Wheeling Creek Project

1975	1976	1977	1978	1979	1980	1981	1982
December: first public meeting	Field studies, meetings with federal, state, local agencies to assess impacts			July: draft EIS issued; November public hearing	Scoping for revised draft EIS: meetings with agencies	July: revised draft EIS issued August: public hearing	March final EIS issued; May: record of decision issued

Notes

a/ Soil Conservation Service, Compliance with NEPA - 7 CFR Part 650
 (United States Federal Register, Vol.44, No.169, pp.50576-50587).

Figure 15



ANNEX II

LEGAL AND ADMINISTRATIVE SYSTEMS FOR ENVIRONMENTAL IMPACT ASSESSMENT

INTRODUCTION

Part two contains information on the national legal/administrative environmental impact assessment (EIA) systems of countries which provided case studies. In order properly to understand the case study material, it was necessary to review the legal/administrative setting for EIA in the participating countries. Some countries which did not provide such material, nevertheless, informed the task force of their legal/administrative system for EIA or their plans to establish such a system. That information is given below.

I. CZECHOSLOVAKIA

Czechoslovakia has no general formalized requirement for EIA. However, environmental consequences are already taken into account when development plans of the national economy are elaborated as well as when new activities are planned. The basis for that form of environmental impact assessment is given in the Law No. 50/1976 on Physical Planning and the Building Code (the Building Act), the Decree of the Federal Ministry for Technical and Investment Development No. 163/1973 and the respective implementation regulation No. 152/1978 on the Documentation of Buildings. The above-mentioned Law and Decrees are applicable to all new building starts. The activities resulting from these regulations are comparable to an EIA system. For the time being the Czechoslovakian Socialist Republic does not plan to establish a general formalized EIA system. The existing system is explained below.

FIELD OF APPLICATION

The Building Act is mandatory for all building activities.

INTEGRATION

The environmental impact assessment of new buildings is a part of the existing decision-making process. According to Law No. 50/1976, the building authority in the course of the building procedure, inter alia, investigates on the basis of the documentation presented whether the building complies with the requirements concerning environmental protection; in cases where the buildings will be used as operational units (production units), the authority also investigates the impacts of their future operation on the environment.

PARTICIPATION IN THE EIA PROCESS

The proponent - the State organ - elaborates during the planning process a document which deals with among other items also environmental impacts of the proposed activity. The document is assessed by the authority responsible for such expertise (either State or enterprise expertise). Where activities may significantly affect the environment, a review by chosen experts from State organs or scientific or research institutes is required. The public (either organizations or individuals) may also voice its opinion.

CONTENT REQUIREMENTS

The document should contain the following elements:

- A statement of the need for the building;
- Description of the building;
- Description of alternatives if deemed useful and/or if the character of the investment so requires;
- Description of the consequences for the environment.

II. FRANCE

The law of 10 July 1976 concerning nature protection and the decree of 12 October 1977 form the basis for the application of EIA in France. The second article of the law of 10 July 1976 introduces the concept of EIA and defines its operational use. The decree establishes the content of EIA and the kind of activities which are not subject to it as well as those for which a short-form EIA is appropriate. Because EIA is meant to be inserted into existing procedures, the decree concerns modifications of existing regulations in order to accommodate EIA.

FIELD OF APPLICATION

The decree of 1977 defines the scope of application of the law in particular circumstances. The latter refers more particularly to the nature of the project rather than to the physical environment in which the project is planned. Article 3 of the decree refers to three appendices which list those projects automatically submitted to an impact assessment and those projects which are not submitted to an impact assessment under specific thresholds of magnitude and under specific conditions. Article 4 refers to a fourth appendix which enumerates the kind of activities which although not requiring an impact assessment do require a "notice" (short description of the impacts on the environment).

Strictly speaking there is no legal definition of EIA. The law states (article 2) that:

"All construction activities and development plans as well as urban planning proposals, which are undertaken by a public administration or which require a public authorization or formal decision must respect the concern to maintain the integrity of the environment.

"The studies preparatory to the realization of development plans or construction activities which, by the importance of their scale or their impingement on the natural environment, could have substantial influence on the natural environment must include an impact study that allows the potential consequences to be examined.

"An executive order shall indicate precisely the way in which this article will be applied".

INSTITUTIONAL SETTING

There is no agency or office that has a general responsibility for EIA. Various offices within the "Ministère de l'environnement" have responsibilities, the most significant among them being the "Atelier Central de l'environnement". Its task is:

- To participate in the training of proponents and consulting firms;
- To promote EIA to the public and various administrations;
- To promote or to realize studies and research on methodologies;
- To instruct on cases requiring an EIA which are submitted to the Minister.

INTEGRATION

French regulations require that an EIS be included by the proponent in the planning permission file submitted before the decision is taken.

PARTICIPATION IN THE EIA PROCESS

The proponent is in charge of producing the EIS, whether it is prepared by the proponent or contracted out to a consulting firm. The proponent is responsible for:

- Ensuring that the required EIS has been included in the planning permission file;
- Ensuring that the content of the EIS reflects the importance of the envisaged project as well as its possible impact on the environment.

The Minister of the Environment may express his opinion on every EIS brought to his attention, whether an individual or an association. His opinion is compulsory for a number of important projects which are subject to an interministerial inquiry. In most cases, the public is consulted by means of a public inquiry.

CONTENT OF THE EIS

The content requirements for the EIS are set out in the decree of 1977. They include.

- An analysis of the existing state of the environment;
- An analysis of the impacts of the project on this environment;
- An indication of the reasons put forward, particularly with regard to the environment, to justify the choice made by the proponent among possible alternatives;
- An indication of the measures considered by the proponent in order to mitigate, reduce or compensate for the impacts of the project on the environment.

ENVIRONMENTAL ASPECTS COVERED

In France, the analysis of the impacts on the environment encompass, inter alia, the following aspects: water, soil, air, mankind, fauna, flora, landscape, natural and cultural heritage.

III. HUNGARY

In Hungary there is no general, formalized EIA system. Within the scope of its co-ordination activities, the National Authority for Environment Protection and Nature Conservation (OKTH) has started to work out principles and methods for establishing a formalized EIA system.

IV. PORTUGAL

Portugal does not yet have a general, formalized EIA system. At present some projects need prior advice from the Quality of Life Ministry before final approval. Thereby the environmental consequences must be taken into account. However, many projects still do not need such an advice. In those cases there is no obligation to reflect the environmental consequences. Portugal intends to introduce a general, formal procedure with specific legal, administrative rules.

V. SWITZERLAND

On 1 January 1985, the Bundesgesetz über den Umweltschutz (Federal Law on Environmental Protection) was enacted. An EIA executive order based on this Law was being prepared.

FIELD OF APPLICATION

It is intended to list EIA-mandatory activities in the EIA-executive order. This list will contain projects such as installations for traffic, energy, industry, hydraulic structures, national defence, waste management, sports and tourism, among others.

INTEGRATION

EIA will be integrated into the existing decision-making processes in Switzerland.

PARTICIPATION IN THE EIA PROCESS

Proponent advisers, (review) agencies, competent authorities (decision), public.

PROCEDURAL STEPS

There is no formal start of the EIA process; it involves:

- Preparation of the EIS;
- Review;

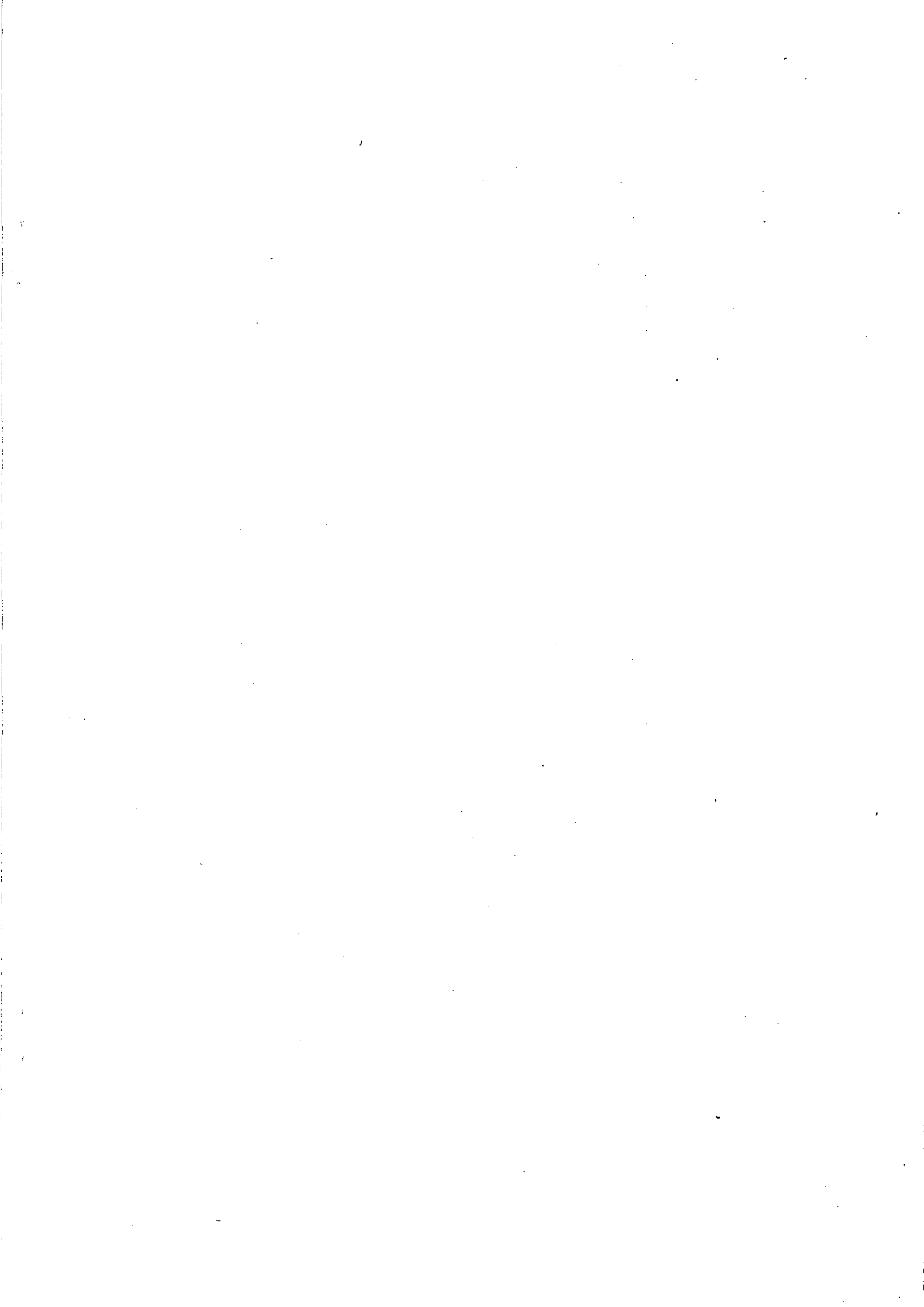
- Decision;
- Publication of documents; right of appeal for national environmental protection organizations.

CONTENT REQUIREMENTS

- Description of the existing state of the environment;
- Description of the proposed activity with mitigating measures in case of catastrophe;
- Description of the consequences for the environment if the proposed activity takes place;
- Description of the measures which would further reduce environmental pollution and its cost;
- Statement of the need for the project as far as a public or licensed activity is concerned;
- Summary.

ENVIRONMENTAL ASPECTS COVERED

The following aspects are included in the scope of the EIS: water, soil, air, human kind, animals, plants, inanimate objects, aesthetic values, natural and cultural values (landscape, monuments). No socio-economic aspects have to be included in the Swiss EIS.



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